EDUCATIONAL PSYCHOLOGY

ROXANA MORENO







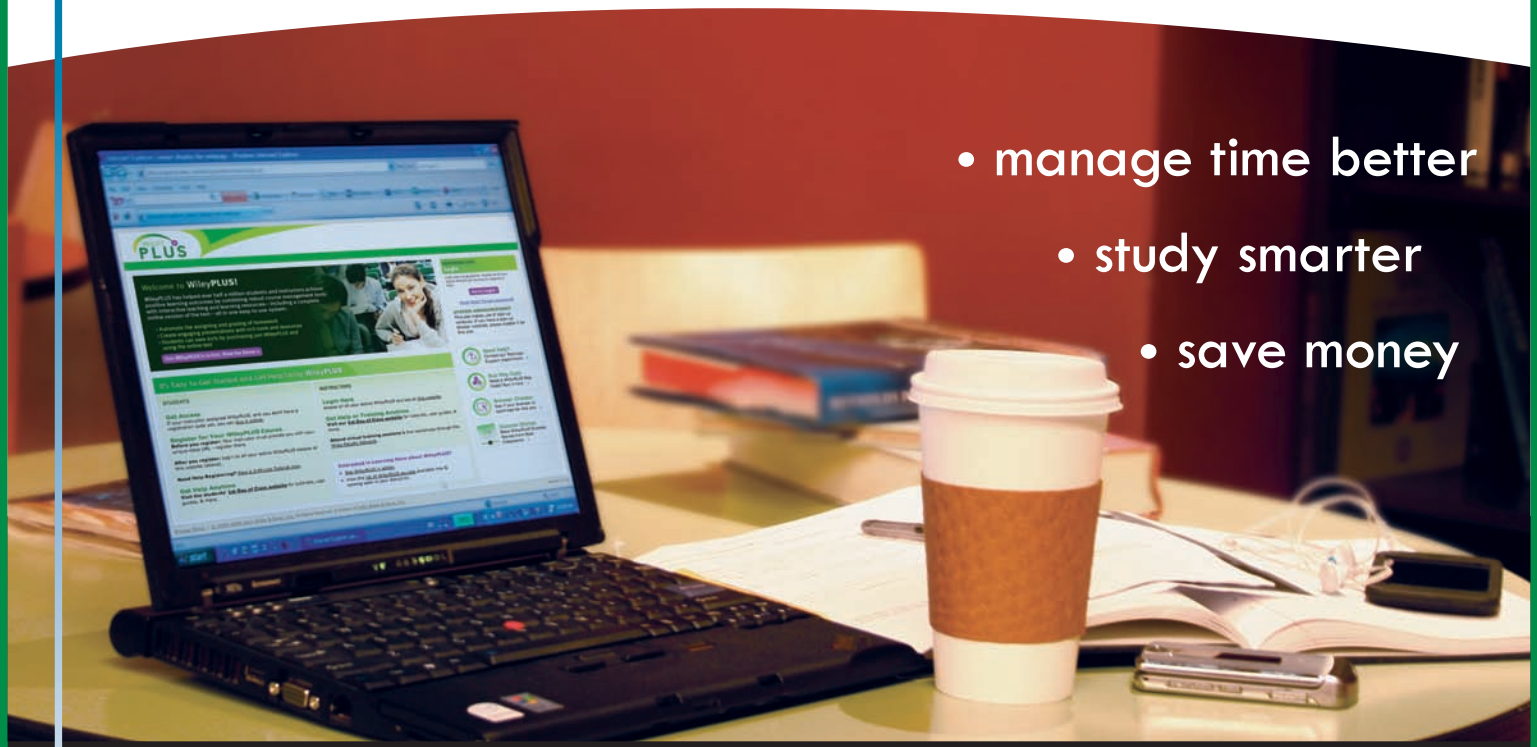
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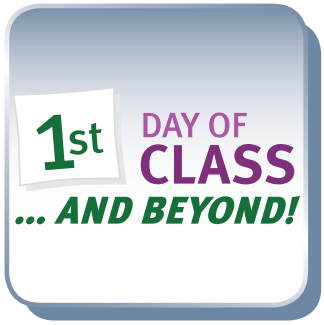


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Educational Psychology

Case Matrix

CH	ENDING CASE TITLE	TEACHER/LOCATION CHARACTERISTICS	STUDENT CHARACTERISTICS	SUBJECT	DIVERSITY CASE TITLE	TEACHER/SCHOOL CHARACTERISTICS	STUDENT CHARACTERISTICS	ISSUE
1	What Knowledge and Skills Do Teachers Need in the Classroom?	F-1st year Charlotte, North Carolina	High-school (No specific grade)	French	No Diversity Case			
2	Teaching in a Culturally Diverse Classroom	F-1st year New Mexico	Elementary (1st grade) 72% Navajo, 26% Hispanic, 2% Caucasian. 60% LEP, 92% F&RL	Reading	Identifying Exceptionalities in a Third Grade ESL Classroom	M Minnesota Elementary School	68.1% F&RL, 37.5% ESL, 17.7 % Special Ed, 29% AA, 28% Caucas, 29% Hmong, 12% H, 2% NA	Language diversity
3	How Does this Fourth Grade Classroom Use Development Principles?	M San Francisco, California	Elementary (4th grade)	Science	Language Differences in a Seventh-Grade Classroom	F Chicago Middle School	85.6 % F&RL, 13.7% ESL, 16.8 % Special Ed, 49% AA, 38% Latino, 8% Caucasian, 3% Asian, 2% other	At risk, background and language diversity
4	How Does this High School Classroom Use Development Principles?	F Hartford Connecticut	High-school (10th grade) Low SES	Reading, mentoring, service learning	Issues of Identity in a Ninth Grade Classroom	F Los Angeles High School (9th)	92.4% F&RL, 53% ESL, 14.2 % Special Ed, 73.5% Hisp, 25.3% AA, .2%Cauc, 1% Asian	Sexual diversity
5	How Does this High School Classroom Use Behavioral Principles?	M Billings, Montana	High-school freshman	Technology (Typing, publisher, powerpoint)	Behavior Differences in a Fourth Grade Classroom	F Iowa Elementary School (4th)	9.3% F&RL, 2.6% ESL, 10.1% Special Ed, 78% White, 15%AA, 5% Hisp, 2% Asian	Behavioral differences
6	How Does this Elementary Classroom Teacher Apply Cognitive Principles?	F Sierra Vista, Arizona	Elementary (2nd grade) 65% Hispanic	Reading	Prior Knowledge Differences in an Eleventh-Grade Classroom	M Kentucky High School (11th)	77.1% F&RL, .2% ESL, 11.3% Special Ed, 98.1% White, 3% AA, 9% Hisp, 7% Asian	Religious diversity
7	How Does this Middle School Teacher Promote Complex Cognitive Skills?	M Portland, Maine	Middle-school (7th grade)	Science	Creativity Differences in a Fifth-Grade Classroom	F Maine Elementary School	37.8% F&RL, .4% ESL, 10.6% Special Ed, 95.6% White, 1.8% AA, 1.6% Hisp, .6% Asian	Giftedness and creativity differences

8	How Does this Eleventh Grade Classroom Use Sociocognitive and Constructivist Principles?	F Richmond, Virginia	High-School (11th grade) 91% African American, 5% Hispanic, 4% other ethnicities	History	Gender Bias in an Eleventh-Grade Science Classroom	F East Baton Rouge Parish High School	77.6% F&RL, .5% ESL, 12.3% Special Ed, 54.3% White, 41.2% AA, 1.8% Hisp, 2.5 % Asian .2% Native American	Gender Bias
9	How Does this Fifth-Grade Classroom Use Motivation Principles?	M St. Louis, Missouri	Elementary-school (5th grade)	Writing	Issues of Motivation in an Eighth-Grade Language Arts Classroom	F North Philadelphia Middle School	82.4% F&RL 17.3% ESL 14.2% Special Ed 44.6% AA 21.3% Hisp 18.5% Asian 9.3% White 3.6% Arab 2.7% Sub Saharan African	Motivation differences
10	How Does this Middle-School Classroom Use Motivation Principles?	F Detroit, Michigan	Middle-school (No specific grade) diverse, ELLs	Science	Motivation Issues in an Eighth-Grade Language Arts Classroom	M Chinle New Mexico Middle School	75.3 % F&RL, 47.2% ESL, 12.2% Special Ed, 91.5% Native American, 6.3% White, .2% AA 1.8% Hisp, .2 % Asian	Cultural differences
11	How Does this Ninth-Grade Classroom Use Classroom Management Principles?	F & M co-teach Bisby, North Dakota	High-school (ninth-grade)	Math	Managing Portable Technology in a Tenth-Grade Classroom	M Miami, FL High School	51.2% F&RL 38.2% ESL 11.9% Special Ed 60.3% Hisp 27.9% AA 9.4% White 2.1% Asian .3% Native American	Behavioral differences
12	How Does this Middle-School Classroom Apply Assessment Principles?	M St. Johnsbury, Vermont	Middle-school (5th grade)	Writing	Assessment Issues in a High-School Classroom	F Washington, DC High School	61.4% F&RL 6.2% ESL 12.5% Special Ed 84.3% AA 9.4% Hisp 4.6% White 1.6% Asian .1% Native American	Classroom assessment quality
13	How Does this Middle-School Teacher Ensure Effective Standardized Testing?	F Rio Grande, Texas	Middle-school (No specific grade) 91% Hispanic large LEP population	Math	Diversity in Teacher Beliefs and Attitudes towards Standardized Testing	M Anchorage, Alaska Elementary School	56.6% F&RL 10.8% ESL 12.2% Special Ed 60.6% White 13.1% Alaska Native 10.7% Asian 8.5% AA 7.1% Hisp	Teacher diversity (beliefs)
14	How Does this High-School Classroom Apply Technology Principles?	F Danbury, New Hampshire	Middle-school (5th grade)	Environmental science	Technology Integration Issues in an Elementary School Classroom	M Brooklyn, NY Elementary School	63.5 % F&RL, 16.2% ESL, 13.1% Special Ed, 39.1% White 34.8% AA 18.4% Hisp, 6.5 % Asian .4% Native American .8% Arab	Digital Divide

Educational Psychology

Roxana Moreno

University of New Mexico



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About the Author



Roxana Moreno is currently an Educational Psychology professor at the University of New Mexico.

Roxana Moreno was born in the United States a few years after her parents emigrated from Argentina in search of a better future for their family. When Roxana was six years old, she and her parents returned to their native country. Roxana completed her elementary and high school education in Argentina and continued her education in Argentina with a B.S. in Economics as well as a law degree. She moved back to the United States and studied artificial intelligence, then decided to apply her technical knowledge to education. She received a doctorate in cognitive psychology from the University of California at Santa Barbara.

Roxana used her skills in technology for the improvement of education, understanding how people learn, and applying this knowledge to design effective instructional technology. Her research focused on applying cognitive and motivation theories to derive principles for the instructional design of multimedia environments. She has conducted a great number of studies with undergraduate students in the lab and also in the classroom with elementary, middle, and high school students.

While living in California, Roxana developed a strong interest in diversity issues in education. The focus of her career became technology-based interventions aimed at helping minority and underachieving students. Post-doctoral work consisted of developing educational programs that included visual aids and explanations in students' first language to promote the achievement of English language learners. Professional interests focus on examining how technology can be used to better serve students' special needs.

Dedication

In memory of José María Angel Moreno,
who taught me to believe that anything is possible
if you set your heart and mind to it.

Preface

All authors want their textbooks to be read, understood, and enjoyed, and so do I. But most of all, I wish that this book will contribute to teacher students' professional growth in a meaningful way. When I started this book project, I had been teaching educational psychology to preservice teachers for several years. A significant motivation for writing this book was that I was not fully satisfied with any of the textbooks that I had adopted. I found some to be too simplistic, portraying a candy-coated version of what classroom teaching is really about. Others seemed too complex, providing a host of theoretical information of little practical value to the future teacher. What preoccupied me the most was the lack of evidence in support of many of the features. As a teacher educator, I asked myself year after year, "How do I know that this will help my students?" I felt the urge to answer that question and several others:

- How can I help preservice teachers understand the realities of the classroom?
- What activities promote the application of educational theory and research into practice?
- What methods might help preservice teachers develop into reflective practitioners?
- What strategies should be used to raise future teachers' awareness about learner diversity and the need to adapt instruction?

I tackled these questions by setting two goals. First, I conducted a focused research program in teacher education. With the support of a National Science Foundation grant, I collaborated with in-service teachers to develop studies that provided many answers to my questions. We learned that it is necessary to:

- build a solid understanding about learner diversity to ensure that teaching principles are not applied as recipes.
- provide and model the use of a thinking framework to help prospective teachers make effective decisions when faced with complex classroom dilemmas.
- offer beginning teachers varied opportunities both individually and in peer groups from virtual expert teachers, so they will be more likely to apply quality practices.

My second goal was to apply the lessons learned from my research to this book. I did not want to limit the potential impact of my research to disseminating the findings to the scientific community. I wanted to make a practical contribution to teacher education. As a result, I was determined to write an exemplar textbook for teachers, based on pedagogies that work. The organization and methods in this book have been successfully used with hundreds of student teachers who participated in my research and the research of other scholars.

You will find clear, coherent, and updated discussions about essential teaching topics: learner diversity, human development, learning, motivation, management, assessment, and technology. I applied my expertise in educational technology and multimedia learning to guide the design of the content of this book. This material is delivered with a clean design that purposefully avoids the "bells and whistles," which distract rather than contribute to students' learning. Graphic organizers structure the knowledge that students gain, and visual aids (figures and animations) reinforce the most challenging topics in educational psychology.

To help student teachers gain virtual classroom experiences, I worked with expert teachers to develop scenarios that depict the realities of today's classrooms. Each chapter presents opportunities to examine quality practices, reflect on classroom dilemmas, and observe a rich repertoire of classroom videos that include insightful teacher and expert commentaries. In sum, this book is based on best practices in educational research. Hopefully, your students will find this book an effective tool to better prepare them to meet the diverse and changing needs of the classroom.

MEETING THE CHALLENGES OF THE 21ST CENTURY CLASSROOM

Educational psychology instructors are placing more emphasis on giving their students firsthand knowledge of the joys and challenges of teaching. Future teachers need to embrace diversity and they want practical suggestions for why and how to use theory. It is critical that future teachers have skills in problem-solving to address the range of learner needs in their classrooms. To support the preparation of future teachers, this textbook emphasizes three challenges in teacher education:

- understanding and addressing the needs of the diversity of learners in the classroom,
- applying theories and research to the classroom, and
- critically examining teaching practices through reflection, problem-solving, and critical thinking.

Understanding and Addressing the Needs of a Diversity of Learners. Prospective teachers need to know more than what works for the "average" student. Given the changing demographics of schools, future teachers must be equipped to help every student succeed in the classroom and reach their full potential.

Applying Theories and Research in the Classroom. How can teacher education students learn to apply the theories and research to classroom practice? This challenge is due to the complexity of the teaching profession and the increasingly diverse student population.

Critically Examining Teaching Practices. Prospective teachers need to develop the dispositions and critical skills to create learning communities that are academically challenging, developmentally responsive, and socially equitable. In spite of the growing diversity in U.S. classrooms, teachers are not adequately prepared to question and examine their own assumptions, beliefs, goals, and practices with the objective of improving learning for all students.

These three current challenges in teacher education are the themes woven through this textbook's content, pedagogy, and media to create a comprehensive "virtual" experience that allows students to take on the role of the teacher for a variety of learners and classroom scenarios.

GOALS OF THIS BOOK

This textbook and its accompanying media provide comprehensive coverage of educational psychology topics that prospective teachers need, including the psychological explanations of human development, learning, motivation, classroom management, and assessment.

Educational psychology knowledge is a key to helping future teachers develop critical thinking skills and unlock their potential. This is accomplished by inviting them to reflect on their beliefs and assumptions about educational psychology and critically examine the potential of applying educational psychology principles and research to solve educational issues in the classroom.

This text offers the solid coverage of theory and research that is necessary in a comprehensive text in educational psychology. This essential material in educational psychology is combined with a research-based pedagogy that provides numerous opportunities for prospective teachers to develop, hone, and critically evaluate their teaching skills and practice. Students who prepare with this book will gain a toolset—insight into diversity, reasons for using theory, ability to think critically—for effective teaching that will endure throughout their careers.

How is this accomplished? Future teachers are immersed in the realities of classroom teaching, such as the increasing diversity of the student population, the standards-based accountability movement, and the role of teacher education, quality, and professionalism in helping all students unlock their potential and achieve their academic goals.

We will focus closely on the multiple sources of learner diversity, with a special emphasis on recognizing the multifaceted nature of students' identity, to avoid perpetuating harmful myths, stereotypes, and assumptions. Teachers with this contextual understanding of who they will be teaching *before* applying principles of teaching and learning are most successful in effectively connecting with their diverse audience. Diverse student identities are examined in several ways throughout the book:

- introduction to student diversity early in the text (Chapter 2),
- a major section on diversity in each chapter,
- a detailed case study of a real-life classroom situation in each chapter includes students' demographic information, and addresses a diversity issue related to that chapter's content,
- integrated and in-depth information about the effects of diversity on learners' development, learning, behavior, and assessment,
- connection between theory and practice by incorporating abundant classroom examples, dialogues, artifacts, classroom tips, and short vignettes, showing how theory and research "look" in the classroom, with concrete examples of how to apply educational psychology principles.

Research-Based Pedagogy to Support Student Learning

This text offers readers the opportunity to engage in the valuable exercise of reflecting regularly upon their personal assumptions and critically examining the effectiveness of teaching practices with the range of students with whom they are involved. In addition, you will find:

- videos and animations to help students remember and understand critical educational psychology topics (Moreno & Mayer, 2007; Sanchez & Wiley, 2006);
- case pedagogy, as evidenced by the author's recent research, which promotes prospective teachers' problem-solving transfer and motivation (Moreno & Abercrombie, in press; Moreno & Ortegano-Layne, 2008; Moreno & Valdez, 2007; Moreno, Abercrombie, & Hushman, 2009).
- a problem-solving framework provides structure for students to think about and work through cases rather than asking them to solve classroom cases without explicit direction (Moreno, Abercrombie, & Booker, 2008; Sweller, 2006); and
- opportunities for students to engage in active monitoring of their thinking (Darling-Hammond & Bransford, 2005).

When taught with these methods, students are more likely to build professional knowledge and skills and develop the habit of reflecting on their practices and the thinking that accompanies their practices.

Case-Based Features

Because the textbook practices what it preaches by applying research-based methods, it validates the relevance of educational psychology in teaching. This is accomplished in part by engaging the student with two types of cases in each chapter. *Diversity in the Classroom* cases present classroom dilemmas for students to practice problem-solving skills. *Putting It All Together* offers exemplar cases requiring application of theories in educational psychology. Each case is aligned with a set of high-order activities and learning objectives.

Diversity in the Classroom cases illustrate issues of learner diversity where the prospective teacher uses problem-solving techniques to suggest a viable classroom solution. This case-based activity is designed to help students develop a realistic view about teaching and promote their problem-solving and critical thinking skills. Students employ a problem-solving framework to work through the classroom dilemmas presented in each chapter's *Diversity in the Classroom*. This framework is introduced in Chapter 2 and requires students to critically evaluate the practices depicted in the case. Then, they test their own conclusions by applying what they learned in the chapter. Students will use this problem-solving tool frequently in their future classrooms to respond to a wide range of issues. Students are asked to justify their responses using the educational psychology principles learned in each chapter.

Putting it All Together cases provide a model of quality teaching practices that are based on the educational psychology theories and research covered by each chapter. This case-based activity is designed to help students identify educational psychology principles in action and to show the usefulness and relevance of educational psychology to the teaching profession.

Organizing Information

Each chapter includes pedagogical elements aimed at helping future teachers amass and organize their professional knowledge. Students will have first-hand experience with the following:

Graphic Organizers. A graphic of the chapter content opens each chapter as an advance organizer and provides students with a visual representation of the topics.

Chapter Learning Goals. This feature also functions as an advance organizer, listing the topics students will be learning about in the chapter.

Test Your Knowledge and Understanding. This activity appears at the end of each chapter and is designed to help students organize the new information learned and assess their understanding of the material in each chapter.

Summary. Each chapter ends with a brief summary reviewing the major points. Because the summaries are based on the Graphic Organizer and the Learning Goals preceding each chapter, students can use the Summary to better understand how concepts relate to each other.

Key Terms. Key terms aid student understanding of the main concepts in each chapter and expand on their vocabulary.

Integrating Information

This textbook integrates information in two ways. First, discussion of student diversity is integrated within each chapter. Specifically, diversity coverage begins with a focus on the diversity of the student in Chapter 2. Subsequent chapters—on child development, learning theories, motivation, classroom management, assessment, and

technology—integrate the information about student diversity into the discussion. In this way, future teachers gain deeper insights into how psychological processes may operate differently across diverse individuals, groups, and contexts. For example, students' self-esteem, attributions for success or failure, or classroom behaviors may take different forms depending on students' gender, culture, or ability. Because the material in Chapter 2 is referred to and expanded upon throughout each chapter, prospective teachers build on their understanding of diversity in the classroom and adapt their practices to meet the needs of each student.

The textbook also integrates content across chapters by offering the feature *Connect What You Learned to Other Chapters*. In this feature, students respond to questions that require them to make meaningful connections between new concepts with those learned in prior chapters. For instance, after reading Chapter 5, students are presented with a set of questions that require making connections with concepts learned in Chapters 1, 2, 3, and 4. Assigning these high-order questions in individual, group, or classroom activities help instructors promote a more structured and connected knowledge base in their students.

Encouraging Reflection and Critical Thinking

As mentioned, a key goal of this textbook is to help future teachers develop into critical thinkers and reflective practitioners. This requires planning instruction with thoughtful consideration of educational psychology theory and research and learner diversity, a careful analysis of the outcomes of such plans, and making adjustments as necessary. Reflective teachers extend their critical thinking skills to reflect upon themselves and regularly question and examine their own assumptions, beliefs, goals, and practices with the objective of improving learning for all students. In addition to the classroom case activities, features that underscore these essential skills for reflection and self-evaluation, include:

Imagine You Are the Teacher. Each chapter opens with a short scenario that functions as a schema activator and places the reader in a classroom situation, encouraging reflection on the topics examined in the chapter.

Assess Your Prior Knowledge and Beliefs. Each chapter begins with this set of open-ended questions. Students reflect on their prior knowledge, experiences, and beliefs about the chapter's central topics. Students' increased understanding of their current schemas prepares them to further explore the topic.

Think About It Again! At the end of each chapter, students have another opportunity to respond to the questions posed at the beginning of the chapter in Assess Your Prior Knowledge and Beliefs. Think About It Again! promotes an awareness of misconceptions, biases, and beliefs that students may have had and allows them to engage in the practice of becoming a reflective practitioner by looking back on the earlier thoughts and identifying whether and how their ideas have changed.

Issues in Education. This feature presents a set of debates on current controversial topics such as brain-based education, the use of rewards in the classroom, and student retention. To promote reflection and critical thinking, students are encouraged to advance their arguments about the issue at stake before a response to the issue is presented. At the end of the chapter, Revisiting Issues in Education presents the arguments and offers evidence in support of the different positions on the debate for students' evaluation.

Reflective Journal. Students are encouraged to keep a reflective journal—either in a notebook or on their computer—to record their thoughts as they respond to the reflective activities accompanying the textbook. Instructors may choose to use students' journal entries as part of their grading system.

Applying Theory to the Classroom

The following elements help future teachers apply their theoretical knowledge of educational psychology to classroom practice:

Examples, Dialogues, and Vignettes from Practicing Teachers. The numerous examples, dialogues, and vignettes help prospective teachers bridge theory and practice by illustrating how the theories and principles of educational psychology look in the classroom.

Classroom Tips. In every chapter, offer practical lists of strategies suggested by practicing teachers in different grade levels and subject areas.

Virtual Classroom Observations. Through a partnership with **Teachscape** professional development services, there is a rich collection of videocases available in *WileyPLUS* that feature authentic classroom situations. To help future teachers productively learn from these visual tools, each videocase is accompanied by teacher reflections and expert interviews explaining how educational theory and research was used to guide the teacher's classroom decisions. Together, the text cases and videocases create a comprehensive virtual experience that allows students to observe the role of the teacher for a variety of learners and classroom scenarios.

Get Connected! Assignments. These activities either direct students to *WileyPLUS* for additional material, or ask them to work with others to investigate or expand on

a topic. The activities provide an opportunity for students to apply the chapter information in a meaningful, real world way. In addition to the *Virtual Classroom Observations*, each chapter offers instructional animations with "check points" of understanding, and collaborative learning activities and assignments. Within the collaborative learning activity students are asked to reflect on their past experiences and knowledge and share their thoughts with their peers. This activity is based on the Think-Pair-Share method developed by Frank Lyman (1981). After students are given time for their individual reflections, a set of high-order questions is used to guide a productive group discussion aimed at promoting perspective taking, critical thinking, and raising awareness of students' biases. Any of the *Get Connected!* activities can be assigned providing instructors with additional ways to assess students.

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- With *WileyPLUS* you can identify those students who are falling behind and intervene accordingly, without having to wait for them to come to office hours.
- *WileyPLUS* simplifies and automates such tasks as student performance assessment, making assignments, scoring student work, keeping grades, and more.

CHAPTER ORGANIZATION

The text is organized so that prospective teachers engage meaningfully with current issues and trends in education and with learner diversity *before* encountering specific theories in educational psychology. This introductory context firmly establishes the relevancy of this material to the daily reality of the teaching profession.

Part I Preparing for the Realities of the Classroom

Chapter 1 *Educational Psychology: Becoming an Effective Classroom Teacher*

What is the role of the teacher in today's classroom? How do beginning teachers develop into expert teachers? This chapter introduces preservice teachers to the multiple roles that they play as reflective problem solvers.

Chapter 2 *Understanding Diversity in the Classroom*

This chapter gives an overview of the current demographic changes in the United States and their educational implications. Students are provided with numerous strategies and will examine:

- group differences (gender, culture, socioeconomic status, language),
- individual differences (temperament, ability, cognitive styles, learning preferences), and
- exceptionalities.

The chapter also discusses the role of the teacher in the inclusive classroom under the Individuals with Disabilities Education Act (IDEA). This chapter introduces an easy-to-follow, practical, problem-solving framework that students apply to the *Diversity in the Classroom* activity included in every chapter.

Part II In the Classroom: Practical Uses for Theories of Child Development

Chapter 3 *Cognitive and Language Development*

Classroom teachers need to prepare developmentally responsive lessons and activities for their students. This chapter includes substantial coverage of classic and contemporary knowledge of cognitive and language development. Prospective teachers build an understanding of the general principles of human cognitive and language development and the developmental theories of Jean Piaget, neo-Piagetians, and Lev Vygotsky. Topics discussed include the processes of brain, cognitive, and language development, and the special development of bilingualism and second-language acquisition.

Chapter 4 *Personal, Social, and Moral Development*

How do children come to understand themselves and others? This chapter examines this question, with a special emphasis on the developmental theories of Erik Erikson and Lawrence Kohlberg. Teachers need an awareness of a child's personal, social, and moral development in order to address concerns of classroom management, the relationships between students, and other critical issues. Topics include psychosocial and moral development, self-concept, self-worth, the collective self, the process of socialization, and the role of family, peers, and teachers in the development of social and moral skills.

Part III How Children Learn in the Classroom: Learning Theories

Chapter 5 *Behavioral Views of Learning*

Teachers frequently draw on behavioral theories for classroom management issues as well as for supporting individual students' development and learning. This chapter introduces behaviorism and its relationship with learning. Among the topics discussed are classical conditioning, operant conditioning, applied behavior analysis, and strategies that encourage desirable behaviors and reduce undesirable behaviors in the classroom.

Chapter 6 *Cognitive Views of Learning*

Teachers rely on their knowledge of cognitive learning theory to gain and maintain students' attention, help students organize, elaborate, and remember information, and develop effective approaches to studying subject matter. This chapter introduces the cognitive approach to learning represented by information processing. Topics include sensory memory; short-term or working memory; long-term memory; perception and attention; and rehearsal, encoding, and retrieval of information. The chapter also discusses knowledge types and the relationship between knowledge, metacognition, and learning.

Chapter 7 *Complex Cognitive Processes*

Teachers create lessons that develop students' ability to reason, think critically, and solve problems. Understanding the theories behind these complex cognitive processes enables teachers to support students' development of higher levels of thinking and learning. This chapter examines the theories behind the processes children and adolescents use to acquire new concepts, change their misconceptions, solve problems, use learning strategies, think critically, and transfer what they know to different contexts. In addition, this chapter discusses the characteristics of expert and novice problem solving.

Chapter 8 *Sociocognitive and Constructivist Views of Learning*

Every day in the classroom, teachers use a variety of approaches to learning. They model how to work through a math problem, they engage students in cooperative learning activities, and they set up classroom lessons where the student learns by doing, rather than by lecture. The theories behind these classroom strategies are presented in this chapter. The prospective teacher will discover social learning theory (modeling, self-efficacy, self-regulation, and reciprocal causation). Views of constructivism are presented including Piaget's individual constructivism and Vygotsky's social constructivism. Applications of constructivism are explained and illustrated, ranging from teacher-centered to student-centered approaches to learning and cooperative and collaborative learning methods.

Part IV Motivating and Managing a Diverse Group of Learners

Chapter 9 *Theories of Motivation and Affect*

This chapter examines the theories that explain how students may be motivated to learn and succeed at school. Discussion includes intrinsic and extrinsic motivation, behavioral, humanistic, cognitive, and sociocognitive approaches to motivation, and how emotion relates to learning. Prospective teachers will learn about current motivation theories such as interest theory, goal theory, self-determination theory, expectancy x value theory, attribution theory, and self-efficacy theory. This chapter also considers the most common sources of anxiety in the classroom and offers classroom tips to reduce student anxiety.

Chapter 10 *Motivation and Affect in the Classroom*

How can teachers enhance and encourage children's innate motivation to learn? This chapter prepares teachers to reinforce key motivational processes by synthesizing the conditions that lead to motivated students. These conditions are organized around the teacher, the learner, and the instructional environment. Topics include: how teachers can support students' need to feel safe, accepted, competent, and autonomous; methods to develop self-regulated learners; and strategies to create engaging classroom activities. The chapter provides examples of teacher characteristics that promote motivation in the classroom and classroom tips that nourish students' natural tendency to learn and grow.

Chapter 11 *Classroom Management: Creating a Successful Learning Environment*

This chapter examines essential teaching skills for creating and maintaining an organized and successful classroom. Topics center on:

- classroom management strategies, such as setting rules and consequences for different grade levels, communicating with parents, misbehavior interventions, violence and aggression management;
- the types of knowledge, attitudes, and skills that teachers need to create a productive learning environment (i.e., establishing learning objectives, aligning the objectives with instructional methods and assessment, effective use of time, communication, questioning, and feedback); and
- how to arrange the physical environment to prevent the occurrence of classroom management problems.

Part V Critical Elements in the Classroom: Assessment and Technology

Chapter 12 *Assessment in the Classroom*

Teachers are continually assessing students' progress. What have students learned? How do teachers find out what they have learned? This chapter addresses the effects of assessment on learning and motivation, examines teachers' assessment patterns, and describes strategies and principles to guide the design of effective classroom assessments. The functions and characteristics of effective assessments (reliability, validity, practicality, fairness) are thoroughly discussed, as well as traditional and alternative assessments, formative and summative assessments, and grading and reporting systems. A graphic organizer depicts the assessment and instruction cycle to help future teachers plan what, why, how, and when to assess learning in the classroom.

Chapter 13 *Assessing Learning through Standardized Testing*

This chapter revisits the issues of accountability introduced in Chapter 1 with a special emphasis on helping prospective teachers interpret a variety of standardized test scores, evaluate their validity and reliability, and better understand their own role in standardized testing. Topics also include the functions and types of standardized tests, basic descriptive statistics, current high-stakes issues such as the teaching-to-the-test phenomenon, and an in-depth discussion of test bias and student accommodations. The chapter concludes with a presentation of new directions in standardized testing, including authentic assessments and computer-based adaptive testing.

Chapter 14 *An In-depth Guide to Using Technology in the Classroom*

Recent changes in NCATE accreditation standards emphasize the teacher's ability to employ technology to help students learn. Prospective teachers need to know how to use technology in their classrooms. This chapter examines the promise and pitfalls of instructional technology. After reading this chapter, prospective teachers are prepared to critically examine the best uses of technology in their classrooms. This chapter offers a unique depth and breadth of coverage about instructional technology. The chapter:

- examines how technology promotes learning according to the theories of learning and motivation presented in prior chapters;
- presents numerous applications that demonstrate how to integrate technology across the curriculum to help students represent and organize knowledge and develop new skills in reading, writing, math, science, and art education;
- offers examples of how teachers can use technology tools to support instruction, management, and assessment;
- provides valuable practical guidelines and classroom applications.

Supplements

Instructors will have the following instructional support materials:

- *Instructor's Manual*, by Nancy Johnson, Geneva College, includes class and group activities for each chapter.
- *Test Bank,* by Melinda Maher, Ohio University, in Word and computerized formats.
- *Powerpoint slides,* created by Larry Rogien, Boise State University, representing the most important concepts in each chapter.

- Virtual classroom observations, provided through **Teachscape**, including accompanying teacher and expert interviews, corresponding classroom activities critical analysis questions, created by Karen Giorgetti, Youngstown State University. Available in *WileyPLUS*.
- Engaging instructional animations with "check points" of understanding, illustrating chapter topics.
- Sample responses prepared by the author to the *Diversity in the Classroom* questions presented with each classroom case.
- Sample responses prepared by the author to the *Putting It All Together* application and reflection questions following each chapter ending case.
- A website dedicated to this textbook that includes practice quizzes, essay questions, supplemental readings, and links to relevant websites for each chapter.

In addition to resources on *WileyPLUS*, students will have access to the following support materials:

a website dedicated to this textbook that includes:

- pre- and post-lecture practice quizzes and essay questions, by Cheryl Lovett, University of Central Oklahoma
- links to relevant websites for each chapter.
- portfolio building activities, tied to INTASC standards, written by Al Longo, Ocean County College

ACKNOWLEDGMENTS

I wish to thank the many people who made this book a reality. First, I am indebted to my students who motivated me to become the best teacher I can be and pointed me in the right directions about how to improve the teaching of educational psychology. Second, this book would not have been possible unless many teachers had taken the time to share their classroom experiences, strategies, and artifacts with me. I am especially grateful to Ilana Vogenthaler, Heather Sullivan, Patrick Arguelles, Suzanne Savage, Shelly Kennedy, Veronica Perez, Bonita Baxter, Cory Cardinal, Naomi Montoya, and Noa Kay. The collaboration of Anni Hanna, an amazing teacher with a special gift for creating rich, vivid vignettes from the testimonies of in-service teachers, and Carolyn Hushman, a talented teacher who helped me translate the findings of educational research into useful classroom tips, were invaluable to this book.

I also wish to express appreciation to the following publishing professionals with whom I have worked on this project: Ann Greenberger and Suzanne Ingrao, for their quality editing, proofreading, and managing the production process; Jennifer MacMillan, Photo Editor, for helping me find photos that clearly illustrate key teaching concepts; Sandra Rigby, Illustration Editor, for her patience and hard work in coordinating the illustration program; Danielle Torio for her dedication, support, and hard work in promoting and marketing the book; Lynn Pearlman, Margarita Valdez, and Anita Castro for their work on the *WileyPLUS* resources. Above all, I am extremely grateful to Robert Johnston, Acquisitions Editor, and Ellen Ford, Senior Development Editor at John Wiley & Sons. I come away from this book project with great admiration for their professionalism, personal qualities, and dedication.

I would also like to gratefully acknowledge the contributions of my colleague reviewers, focus group participants, and class testers. In addition to several rounds of review on manuscript and page proofs, the Wiley book team held several focus groups with instructors teaching the course. Additional instructors had their students provide us valuable feedback on select chapters. I appreciate their efforts and that of their students. The constructive criticisms, insights, and suggestions of the following have been incorporated into my writing.

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In addition to the students, teachers, publisher team, and reviewers, many other individuals played a significant role in supporting the development of this book. Within my institution, the University of New Mexico, I would like to express my gratitude to my colleagues in the Educational Psychology Program: Terri Flowerday, Jay Parkes, Scott Marley, and Jan Armstrong have embraced my dedication to improve the quality of the education of our teacher students. Last but not least, this textbook project has required a major time commitment for several years, which has placed a significant demand on my husband, Dante. I am especially grateful to him. Without his continued love and understanding this textbook project would not have been possible.

A Note from the Author to the Student

Welcome to your study of Educational Psychology! This is an exciting and enriching subject and will offer you insights into human development, learning, diversity, motivation, assessment, and technology. Whether you are planning a career in teaching or another career, you will benefit from both the theory and the practicality of this material. You will be able to build professional knowledge and skills that can be used as a guide for many decisions you will face in the future.

Before I tell you about this book, I would like to introduce myself. I was born in the United States a few years after my parents emigrated from Argentina in search of a better future for their family. When I was six years old, my parents and I returned to their native country. As you can imagine, this was not an easy transition for a small child. I had to make new friends and speak in a language that was different from what I was accustomed. Then, while attending my last years of high school, I experienced the dictatorship of a military government. Those years planted the seed that would eventually grow into a career of teaching, research, and service. I attended university where I received degrees in economics and law, taught, and conducted research. I moved back to the United States to study artificial intelligence and decided to apply my technical knowledge to education. I received a doctorate in cognitive psychology from the University of California at Santa Barbara. I am dedicated to using media, technology, and research in educational psychology to improve the education of all students.

In writing this book, I feel rewarded by having achieved the goal of integrating my teaching and research. I worked for many years with urban and rural teachers who serve children and adolescents from diverse cultural and linguistic backgrounds. Their concerns about motivating, teaching, assessing, and managing a classroom of diverse students made me aware of the need to provide empirically-based answers to their questions. This book has been inspired by my experiences with these teachers and their students and is an effort to make a positive change in the future of education. In addition, as I have experienced a similar background of being the non-native speaker and culturally 'different' during my own early school years, I feel a closeness to students as well as to teachers and can relate to both sides of the classroom experience. I believe this will be apparent throughout this book.

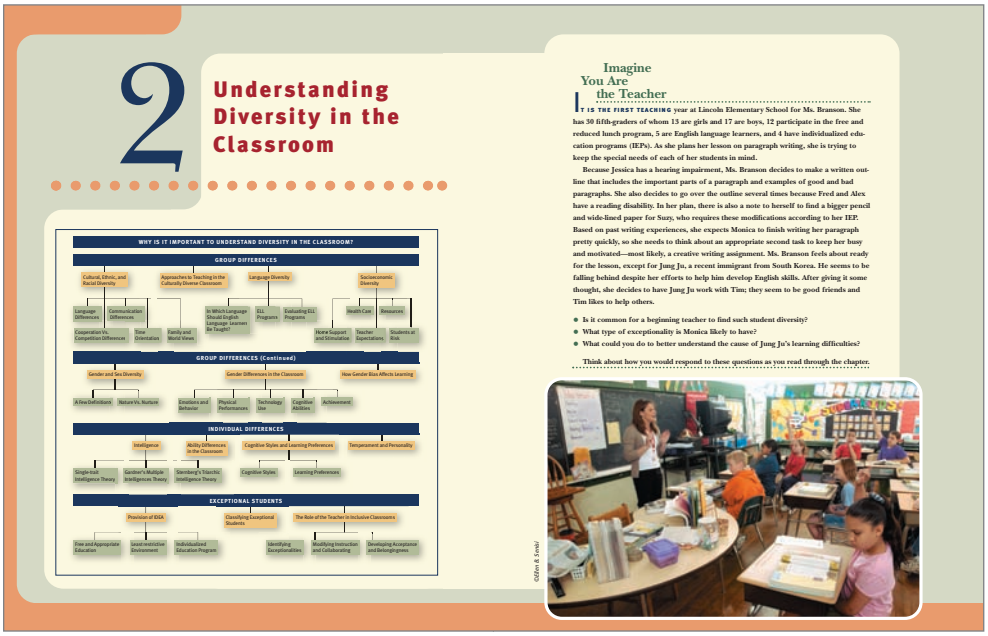
I give you a text that is informed by the realities of classroom teaching and that uses methods that have been shown by research to promote your professional development as an educator. I hope that you find this textbook and its ancillary materials useful and that it helps on your way to becoming a successful teacher. If you ever have any questions or comments, please contact me at moreno@unm.edu.

HOW TO USE THIS BOOK

This textbook will help you apply research in educational psychology to classroom instruction. The features in this book promote your reading comprehension, reflection, elaboration, problem-solving skills, and critical thinking skills. These skills are key to becoming an expert teacher. If you are not an in-service or preservice teacher, but are studying for a profession that requires knowledge of development, learning, motivation, management, or assessment, you can use this text as a guide for planning decisions that are based on well-documented principles. In either case, your foundation in educational psychology will help you unlock your future career potential.

The educational psychology topics covered within these 14 chapters are based on research that is a fundamental resource for teaching. For this reason, I suggest you use this text as a reference during your first years of teaching to help find research-based solutions to classroom situations as they arise.

Let's walk through the pedagogical features that will help you learn the material in this book.



Graphic Organizer and Imagine You Are the Teacher

The chapters begin with a *graphic organizer*, which is a tool to help you visualize how the upcoming materials are organized. (You might think about providing a similar visual map for the students you will be teaching!) Following is a short vignette that puts you into the shoes of a practicing teacher. These brief situations, and the questions posed, give you a hint of the chapter content and something to reflect on as you progress through the chapter.

Chapter 2 • Understanding Diversity in the Classroom

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Explain the importance of understanding classroom diversity.
2. Explain the different group and individual sources of diversity.
3. Describe approaches to teaching in culturally and linguistically diverse classrooms.
4. Explain the provisions of the Individuals with Disabilities Education Act.
5. Explain the characteristics of students with exceptionalities.
6. Describe the role of the teacher in the inclusive classroom.

Journal Activity — ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. How would you define intelligence?
2. Think of someone you know who has a higher or lower socioeconomic status than you. Do you think socioeconomic status has affected your learning or your friend's learning? If so, how?
3. Should teachers adapt lessons to students' learning preferences/styles (for example, a student who prefers to listen to books on tape than reading the printed book)?
4. Do you believe that boys and girls learn differently? If so, how?
5. As a teacher, how would you identify students with exceptionalities?

Chapter Learning Goals Every chapter then has a list of *Chapter Learning Goals,* which summarizes what you should be able to do once you have studied the chapter.

You can use the graphic organizer and learning goals in two ways. First, study them before reading the chapter to get an overall picture of how the concepts in the chapter are related to each other and what you will be learning. Then, after reading the chapter, use the graphic organizer and the learning goals to review what you have learned, either individually or in peer study groups. Advance organizers can improve learning and retention without significantly increasing study time (Calandra & Barron, 2005; Harry, Magnus, & Keegan, 1993).

Assess Your Prior Knowledge and Beliefs Each chapter also opens with an opportunity for you to write your responses to several questions pertaining to the topics in the chapter. This activity requires you to think about what you already know (activating your prior knowledge and beliefs) about the subjects that will be introduced in each chapter. This learning strategy called *schema activation* helps students integrate new information with their prior knowledge (Derry, 1996). In all activities where you are asked to think and provide answers to questions, you are encouraged to keep a reflective journal—either in a notebook or on your computer. Your instructor may choose to use your journal entries as part of the grading system for your class.

Get Connected!

VIDEO CASE ASSIGNMENT. . . Building Student Participation

Go to your WileyPlus course and view the video of Ms. Hughes' class. Be prepared to discuss how Ms. Hughes addresses ability differences as well as how her instructional techniques accommodate a variety of personalities.



Get Connected! Assignments Each chapter offers three types of assignments: animations, video cases, and collaborative learning assignments. These activities either direct you to WileyPLUS for additional material, or ask you to work with others to investigate or expand on a topic. *Get Connected!* provides an opportunity for you to apply the chapter information in a meaningful, real world way.

Get Connected!

ANIMATION ASSIGNMENT. . . Understanding Diversity in the Classroom

Go to your WileyPlus course and watch the animation on gender in society. Be prepared to discuss how gender can play a role in teaching. How could issues of gender impact student learning, and what would you do as a teacher to address these issues in your classroom?



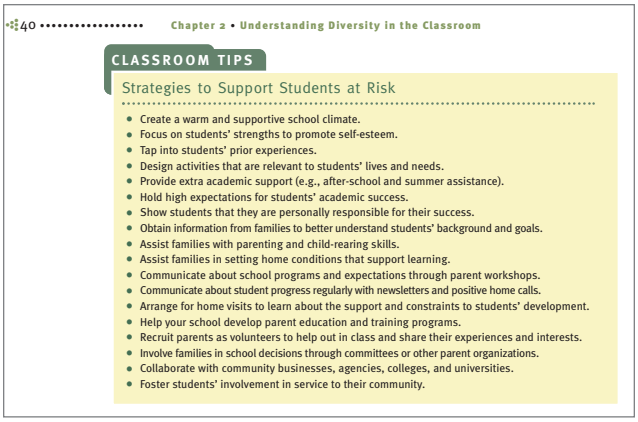
Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT

Using the categories about cultural differences discussed in this chapter, think about a time you have experienced culture shock in a school setting. Consider elementary school, middle school, high school, and college. What was the situation and why did you experience culture shock? How did you adapt? How did a teacher or a peer help you adjust? Be prepared with examples to discuss in class.



Classroom Tips These are practical, real-world applications of theory that you can use to make your future classroom a more productive and positive place of learning.



CLASSROOM TIPS

Strategies to Support Students at Risk

- Create a warm and supportive school climate.
- Focus on students' strengths to promote self-esteem.
- Tap into students' prior experiences.
- Design activities that are relevant to students' lives and needs.
- Provide extra academic support (e.g., after-school and summer assistance).
- Hold high expectations for students' academic success.
- Show students that they are personally responsible for their success.
- Obtain information from families to better understand students' background and goals.
- Assist families with parenting and child-rearing skills.
- Assist families in setting home conditions that support learning.
- Communicate about school programs and expectations through parent workshops.
- Communicate about student progress regularly with newsletters and positive home calls.
- Arrange for home visits to learn about the support and constraints to students' development.
- Help your school develop parent education and training programs.
- Recruit parents as volunteers to help out in class and share their experiences and interests.
- Involve families in school decisions through committees or other parent organizations.
- Collaborate with community businesses, agencies, colleges, and universities.
- Foster students' involvement in service to their community.

Figures, Photos, Tables A variety of visuals help you see examples of the many ways teachers connect in the classroom. They offer you a way to see real classroom ideas, situations, and actual student or teacher artifacts. Read and answer the questions posed for every photo as they provide a quick check of your understanding of the concepts in the chapter. Important information is also presented in the tables, and these are extremely useful for study purposes and to better understand the material. Tables can condense and summarize difficult material into manageable segments, offer you guidelines for effective teaching, or provide additional authentic examples.

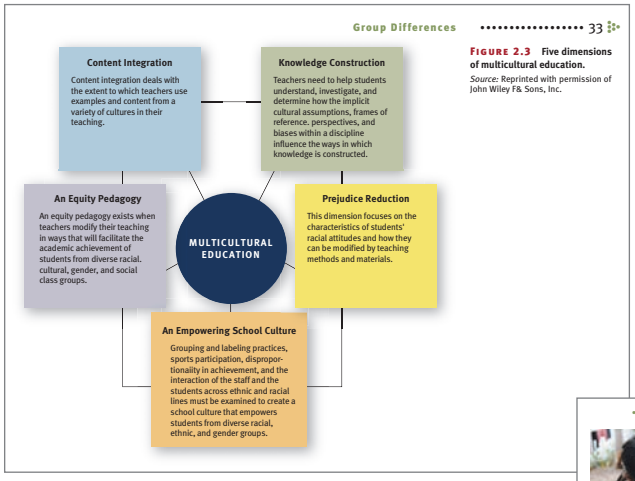
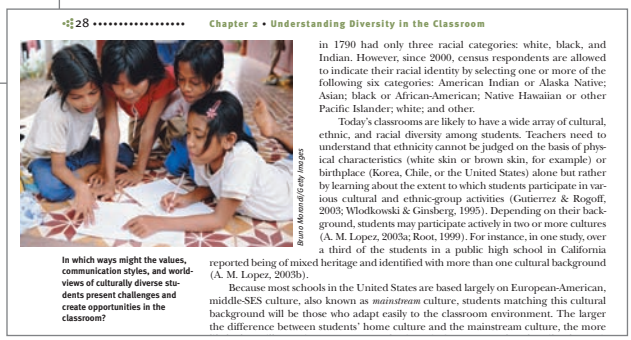


FIGURE 2.3 Five dimensions of multicultural education.
Source: Reprinted with permission of John Wiley F& Sons, Inc.

TABLE 2.4

Gardner's multiple intelligences.

INTELLIGENCE TYPE	DEFINITION
Linguistic	Sensitivity to the function of language and to the sounds, rhythms, and meaning of words.
Logical-mathematical	Sensitivity and capacity to discern logical or numerical patterns and handle long chains of reasoning.
Musical	Sensitivity and capacity to produce rhythm, pitch, and timbre and appreciation of musical expressiveness.
Spatial	Ability to perceive the visuospatial world accurately and to create, transform, or modify based on one's perception.
Bodily-kinesthetic	Ability to control body movements and handle objects skillfully.
Interpersonal	Ability to notice and respond appropriately to the moods, temperaments, motivations, and desires of others.
Intrapersonal	Ability to access one's own feelings and to discriminate among them; knowledge of one's own strengths, weaknesses, goals, and abilities.
Naturalistic	Sensitivity to make fine discriminations among natural objects such as plants and animals.



Bruno Ma/andEcstasy Images

In which ways might the values, communication styles, and worldviews of culturally diverse students present challenges and create opportunities in the classroom?

in 1790 had only three racial categories: white, black, and Indian. However, since 2000, census respondents are allowed to indicate their racial identity by selecting one or more of the following six categories: American Indian or Alaska Native; Asian; black or African-American; Native Hawaiian or other Pacific Islander; white; and other.

Today's classrooms are likely to have a wide array of cultural, ethnic, and racial diversity among students. Teachers need to understand that ethnicity cannot be judged on the basis of physical characteristics (white skin or brown skin, for example) or birthplace (Korea, Chile, or the United States) alone but rather by learning about the extent to which students participate in various cultural and ethnic-group activities (Gutierrez & Rogoff, 2003; Wlodkowski & Ginsberg, 1995). Depending on their background, students may participate actively in two or more cultures (A. M. Lopez, 2003a; Root, 1999). For instance, in one study, over a third of the students in a public high school in California reported being of mixed heritage and identified with more than one cultural background (A. M. Lopez, 2003b).

Because most schools in the United States are based largely on European-American, middle-SES culture, also known as *mainstream* culture, students matching this cultural background will be those who adapt easily to the classroom environment. The larger the difference between students' home culture and the mainstream culture, the more

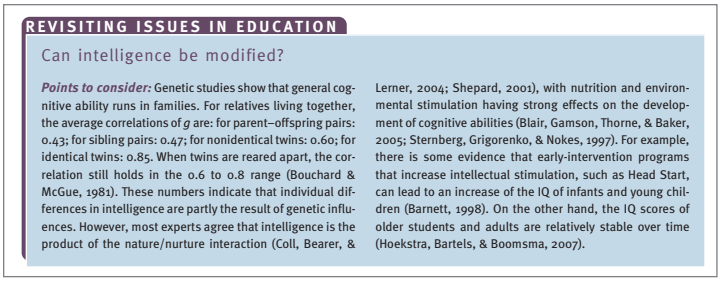
Key Terms Key terms are boldfaced within the text. The definition of the term is then called out in the margin, and a list of the key terms appears at the end of each chapter. As you incorporate these new terms into your vocabulary they will give you the words you need to express your reflections on education, your decisions, and eventually discuss your practices with other colleagues and administrators. Use the key terms in a similar fashion to studying with flashcards. Research shows that signaling methods such as highlighting or bolding new vocabulary promotes students' learning (De Koning et al., 2007).

Bilingual Education

Instructional programs where students are provided instruction in their first language as well as in the language of the majority.

KEY TERMS

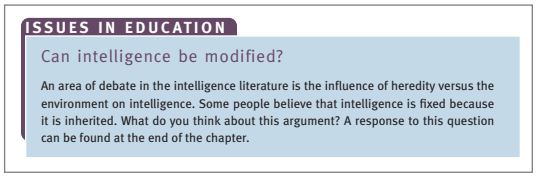
ability grouping 46
achievement gap 31
bilingual education 35
cognitive styles 48
cultural deficit model 31
dialects 28
differentiated instruction 46
gender 40
general intelligence (g) 44
inclusion 49
individualized education program (IEP) 50
Individuals with Disabilities Education Act (IDEA) 49
intelligence quotient (IQ) 44
language minority 34
learning preferences 48
least restrictive environment (LRE) 49
prereferral 57
resilience 39
self-fulfilling prophecy 31
sex 40
socioeconomic status (SES) 37
stereotype 27
tracking 46


REVISITING ISSUES IN EDUCATION

Can intelligence be modified?

Points to consider: Genetic studies show that general cognitive ability runs in families. For relatives living together, the average correlations of *g* are: for parent–offspring pairs: 0.43; for sibling pairs: 0.47; for nonidentical twins: 0.60; for identical twins: 0.85. When twins are reared apart, the correlation still holds in the 0.6 to 0.8 range (Bouchard & McGue, 1981). These numbers indicate that individual differences in intelligence are partly the result of genetic influences. However, most experts agree that intelligence is the product of the nature/nurture interaction (Coll, Bearer, & Lerner, 2004; Shepard, 2001), with nutrition and environmental stimulation having strong effects on the development of cognitive abilities (Blair, Gamson, Thorne, & Baker, 2005; Sternberg, Grigorenko, & Nokes, 1997). For example, there is some evidence that early-intervention programs that increase intellectual stimulation, such as Head Start, can lead to an increase of the IQ of infants and young children (Barnett, 1998). On the other hand, the IQ scores of older students and adults are relatively stable over time (Hoekstra, Bartels, & Boomsma, 2007).

Issues in Education Every chapter presents a current issue or controversy in education that is relevant to the chapter. The issue and its questions are then revisited at the end of the chapter with several points to consider in making an informed opinion or decision.


ISSUES IN EDUCATION

Can intelligence be modified?

An area of debate in the intelligence literature is the influence of heredity versus the environment on intelligence. Some people believe that intelligence is fixed because it is inherited. What do you think about this argument? A response to this question can be found at the end of the chapter.



Cases Research strongly supports the use of both classroom models (exemplars) and classroom dilemmas to promote learning in teacher education (Lundeberg, Levin, & Harrington, 1999; Moreno & Valdez, 2007). For this reason, there are two types of classroom cases in each chapter. *Diversity in the Classroom* offers a scenario portraying a current situation or dilemma that is likely to arise in the classroom. All cases are based on authentic classroom situations and have been developed by in-service teachers to represent a diversity of students, teachers, grade levels, and subject matter. To promote the development of problem solving and critical thinking skills (which you will need in the classroom as well as in other careers), these cases include a problem-solving framework to guide your thinking about classroom dilemmas. To help you learn how to apply the problem-solving framework when working with *Diversity in the Classroom* cases, Chapter 2 presents the first *Diversity in the Classroom* case as a worked-out example, modeling the problem-solving process (Sweller, 2006). Then, in subsequent chapters,



you are asked to solve new dilemmas on your own with the guidance of the model. The problem-solving framework is also described inside the cover of this book for your quick reference. When you read Chapter 7, you will realize that this framework is based on a general problem-solving model that is accepted in the contemporary literature (Bransford & Stein, 1984; Gick, 1986; Hayes, 1988).

The *Putting It All Together* case occurs at the end of each chapter and illustrates exemplar teaching and will help you envision how real classrooms and expert teachers rely on research and principles of educational psychology. These cases include *Application and Reflection Questions* that help you see beneath the surface of the classroom case and investigate how the classroom teacher made effective use of principles in educational psychology.

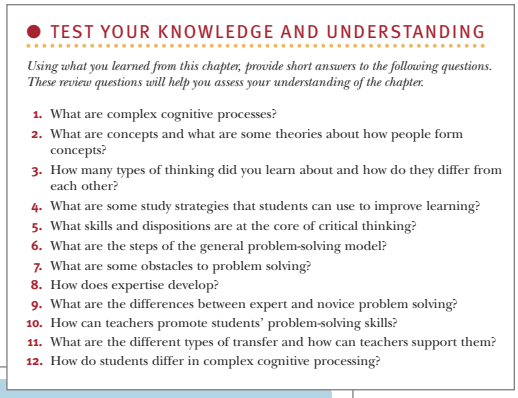


SUMMARY

- As a future teacher, you will need to understand and connect with a roomful of diverse students. You can use your expertise to help them develop the knowledge and skills that they need to succeed. The multiple sources of students' diversity are traditionally organized into three categories: group differences, individual differences, and student exceptionalities. However, teachers should take an individual rather than group perspective when considering diversity in the classroom and consider all factors that contribute to a particular student's identity when making classroom decisions. Differences within groups can be as large as differences between groups, so teachers should be cautious about stereotyping: generalizing what is known about groups to individual students.
- SES can influence the amount and quality of students' health care, resources, home support, and stimulation, and it may place them at risk of academic failure. However, resilient children succeed at school despite environmental adversities. Teachers can promote resiliency through high expectations, monitoring, and support. Cultural background includes the knowledge, attitudes, values, and behaviors that characterize a group of people. Teachers should be careful not to use a cultural deficit model when interpreting the thinking and behavior of students of diverse cultural backgrounds and focus on students' assets. Culturally responsive teaching, culturally relevant pedagogy, and multicultural education are examples of programs aimed at creating links between students' culture and instruction and helping students develop cultural sensitivity toward each other. English language learners are increasing in numbers, and current approaches to helping ELL students learn English vary in their emphasis on maintaining students' home language.

  Gender differences are found in students' emotions and behavior, physical performance, technology use, cognitive abilities, and achievement. The differential treatment of boys and girls at home and in the classroom can have a strong impact on students' gender-role identity and academic development.

Summary Each chapter ends with a summary aimed at representing the scope and emphasis of a relatively large amount of material in an efficient and concise form. Because the summaries are based on the graphic organizer at the opening of each chapter, you can use the *Summary* to better understand how concepts relate to each other. Or, write your own summary first, as a review strategy, and then check your work against the text summary to self-evaluate your understanding of the big picture in each chapter (Knowlton et al., 2004).

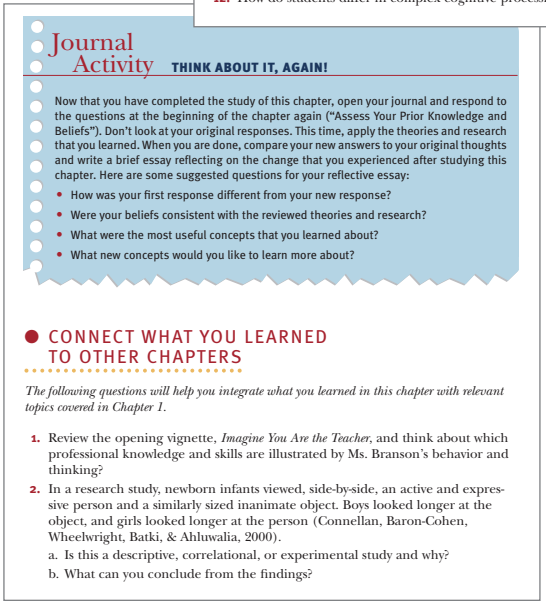


TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What are complex cognitive processes?
2. What are concepts and what are some theories about how people form concepts?
3. How many types of thinking did you learn about and how do they differ from each other?
4. What are some study strategies that students can use to improve learning?
5. What skills and dispositions are at the core of critical thinking?
6. What are the steps of the general problem-solving model?
7. What are some obstacles to problem solving?
8. How does expertise develop?
9. What are the differences between expert and novice problem solving?
10. How can teachers promote students' problem-solving skills?
11. What are the different types of transfer and how can teachers support them?
12. How do students differ in complex cognitive processing?

Test Your Knowledge and Understanding This activity appears at the end of each chapter and is designed to serve as a self-assessment of your understanding of the material in each chapter. Write an answer for each question and compare your responses to those on the student website. Because both your instructor and teaching certification exams are likely to include short answer questions, this practice should better prepare you to demonstrate your knowledge. Students learn more when they are assessed soon after they learn the instructional material and retested later on (Dempster, 1991).



Journal Activity **THINK ABOUT IT, AGAIN!**

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in Chapter 1.

1. Review the opening vignette, *Imagine You Are the Teacher*, and think about which professional knowledge and skills are illustrated by Ms. Branson's behavior and thinking?
2. In a research study, newborn infants viewed, side-by-side, an active and expressive person and a similarly sized inanimate object. Boys looked longer at the object, and girls looked longer at the person (Connellan, Baron-Cohen, Wheelwright, Batki, & Ahluwalia, 2000).
   a. Is this a descriptive, correlational, or experimental study and why?
   b. What can you conclude from the findings?

Think About It Again! You may discover as you read the chapter that your beliefs are changing as you acquire new information. So, at the end of the chapter, you have another opportunity to respond to the questions posed at the beginning of the chapter in *Assess Your Prior Knowledge and Beliefs*. This *Think About It Again!* activity promotes an awareness of knowledge gaps, biases, and beliefs that you may have had and allows you to engage in the practice of becoming a reflective practitioner by looking back on the earlier thoughts in your journal and identifying whether your ideas have changed. This method promotes deeper learning (Walker, 2006).

Connect What You Learned to Other Chapters With the exception of the first chapter, the text includes a set of questions at the end of each chapter to encourage you to integrate what you have learned by relating the concepts to relevant topics covered in prior chapters. This activity allows you to extend and refine your educational psychology knowledge. Although for practical reasons the text covers each of the main topics in separate chapters, your success will depend on how well you can integrate this information meaningfully. The more often students review their prior knowledge and connect it with new knowledge, the more automatic and refined learned knowledge and skills become (Buchel, Coull, & Friston, 1999).

Hopefully, by understanding the rationale for the pedagogical elements in this text, you will become more motivated to use them while you study. In turn, this will enrich the professional skills that you need to succeed in your future career. I hope you enjoy using this book as much as I enjoyed writing it for you!

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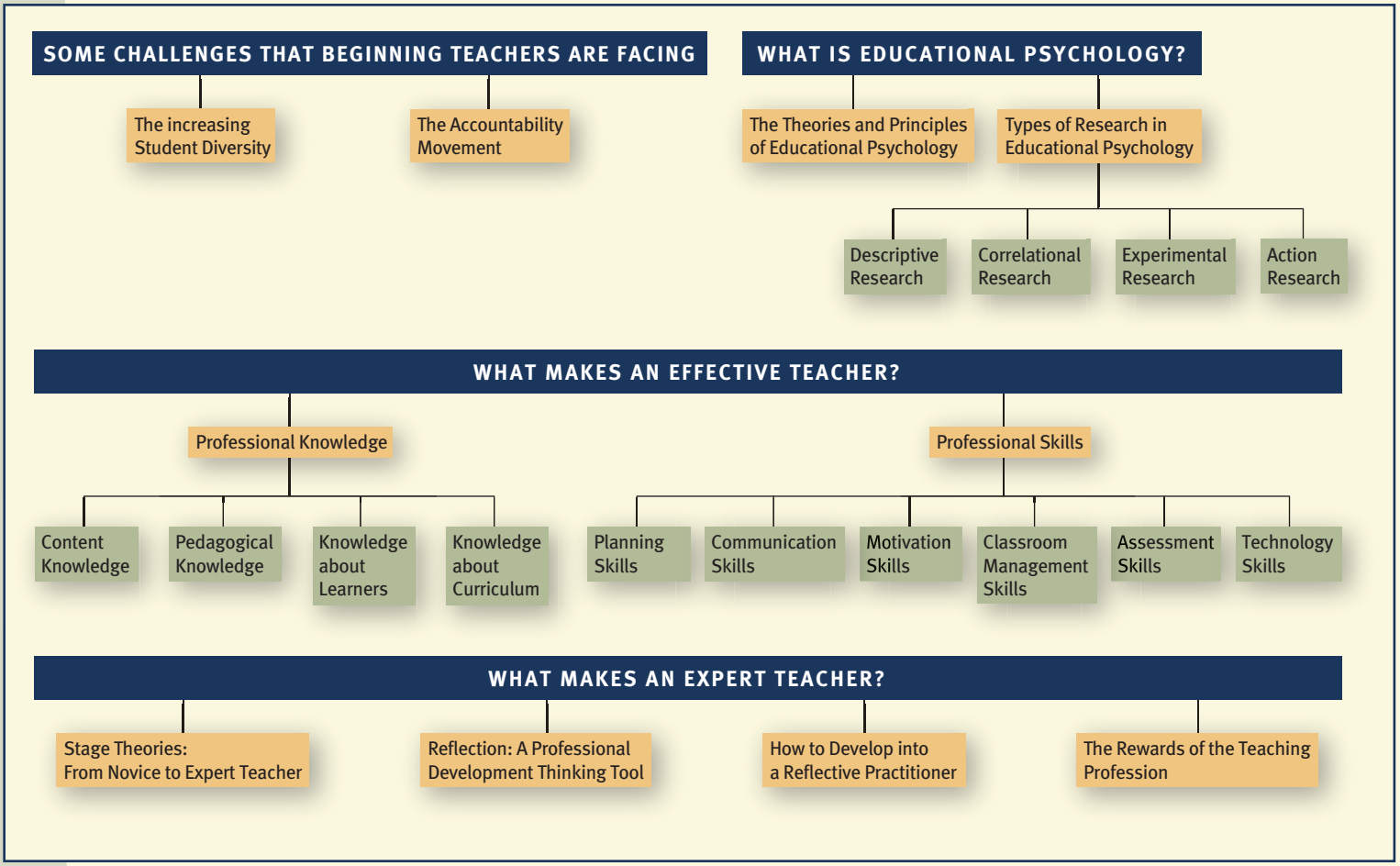
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1 Educational Psychology: Becoming an Effective Classroom Teacher



Imagine You Are the Teacher

MRS. HAMBLIN HAS JUST FINISHED her fourth week of teaching. It is Friday afternoon and she reflects back on her day in frustration. This was not how she had pictured her first semester of teaching at Silver Eagle High School. During the first week of classes, she was excited to be in her first classroom and the students seemed to share her motivation. Mrs. Hamblin was sure that this would be a great year. Four weeks later, she is becoming overwhelmed. As she laid her head down on her cluttered desk, Ms. Jasmine pops through the door. "Are you in there? I can't see you behind all those papers," she laughs.

"I'm in here, though I don't quite know what I am doing here," Mrs. Hamblin responds.

"What's wrong?" Ms. Jasmine asks. "You seem a little distraught."

Mrs. Hamblin answers, "I just had a rough day today, despite having a great lesson plan. My first class is a prime example. Cassandra was in a really bad mood. After reading the journal question that I had given as a group assignment, she refused to participate because she thought that the question was stupid. Martha's group members started making offensive comments about her disability and told me that they didn't want to



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work with her. I reminded them of our classroom rule that all students would be treated with kindness, but they still singled her out. While going back and forth between these two dysfunctional groups, Freddie walked in 20 minutes late for the tenth time this year. When I asked him why he was tardy, he responded with a smart remark, so I asked him to wait for me outside the classroom to talk about the issue in private. Freddie, instead, decided to leave school without my permission! I also just realized that I am behind in grading and planning, and I am still struggling trying to find strategies that will work for some of my students in math. On top of it all, my formal observations are coming up in just a week!"

Ms. Jasmine smiles sympathetically and says, "Well, I guess it is time to carefully reflect on each one of these challenges and brainstorm ways to overcome them. You have all the potential to be an excellent teacher, but you will need to come up with an effective system to help you manage the complexity of the classroom. How about we go to my room so I can show you the system that I created to keep track of students' assignments, grading, and progress? I can also share with you some of the math strategies that I have used in the past. As for the particular student issues that you mention, we can do some research together and come up with better ways to create a respectful community within your class."

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Describe the realities of classroom teaching.
2. Understand the role of educational psychology in the classroom.
3. Distinguish among educational research methods.
4. Describe the types of professional knowledge and skills of effective teachers.
5. Explain the characteristics of expert teachers.
6. Describe the process of developing into a reflective practitioner.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. What are some of the realities of classroom teaching that you may be concerned about?
2. Think about teachers that you had during your educational experience. What were the characteristics of good teachers and professors?
3. What are the types of knowledge and skills that teachers need to have?
4. What is educational psychology and why should you take this course?
5. What are some strategies that you could use to develop into an expert teacher?

SOME CHALLENGES THAT BEGINNING TEACHERS ARE FACING

The classroom vignette that you just read depicts a situation experienced by many beginning teachers. Despite being very excited about teaching for the first time, Mrs. Hamblin is overwhelmed with the number of decisions that she needs to make during any single classroom day, regardless of how well she plans her lessons. What can she do to motivate Cassandra? Why are many of her students not showing progress in math? How should she address Freddie's behavior? What could she do to help Martha become accepted by her peers?

You probably have much experience with formal education already because you had the opportunity to interact with several teachers and instructors and completed hundreds of classroom activities and assignments as a student. During all these years of education, you may also have developed strong preferences for certain subjects, teaching styles, and study strategies. However, if you are the typical student taking this course, you may not have much or any experience as a teacher and may be only a few months away from being in Mrs. Hamblin's shoes. Like her, you probably look forward to the day when you have developed as much expertise and confidence as Ms. Jasmine, her mentor teacher.

Beginning teachers will enter the classroom with enthusiasm, idealism, and optimism (Shea, 1993). Yet they share common concerns across the nation and the world due to the complexity of the teaching profession (Brock & Grady, 1998; Johnson, 2001). For example, a common finding among teachers who take on their first teaching position is the *shock* that stems from the conflict between their pre-service educational experiences and the reality of everyday classroom life, which is harsher and more complex than expected. Lampert (2001) suggests at least four elements that make up the complexity of the teaching profession.

1. Teaching is never routine: Teachers must constantly deal with changing standards and curriculum, learning needs, questions, and dilemmas.
2. Teaching has multiple goals: Teachers need to address at the same time students' intellectual, social, and emotional development.
3. Teaching is done in relationship with a diversity of learners: Teachers need to orchestrate the needs of a group of students who are diverse in terms of their strengths, backgrounds, areas for improvement, and special needs.
4. Teaching requires the integration of several knowledge types: Teachers need to continually combine their knowledge about child development, subject matter, individual and group pedagogies, and learner diversity to promote the learning of all students.

In addition, there is a complex set of external factors that will interact with teachers and students, adding to the complexity of teaching. For instance, teaching will be affected by the resources and organization of the school, the conditions and existing relationships with the community served by the school, the changing requirements of the standard-based and accountability movements, and the involvement of students' parents. Although the multifaceted nature of the teaching profession may seem overwhelming to the beginning teacher, keep in mind that all experts started as novices and, most likely, shared the same concerns of beginning teachers in their early career. Most beginning teachers question their adequacy as teachers at some point; worry about their professional survival; and are concerned about how their principal, fellow teachers, parents, and students judge their competency (Levin, 2003). This finding, however, comes as no surprise. Teaching seems to be one of the few professions in which a beginner teacher needs to assume the same or more responsibilities than a veteran

teacher (Glickman, Gordon, & Ross-Gordon, 1998). Because the increasing diversity of the student population and the current accountability movement are receiving much attention in education, let's examine each of these in more detail next.

The Increasing Student Diversity

The increasing diversity in the classroom has become one of the most significant realities for teachers. For instance, ethnic minority students make up the majority of the school population in 25 of the nation's largest school districts, which are overwhelmingly urban (Hoffman, 2003). Public schools include, on average, the following percentages of ethnic minority students: 20% Hispanic-Americans, 17% African-Americans, 5% Asian-Americans/Pacific Islanders, and 1.7% American Indian/Alaskan Native students (Fry, 2007; U.S. Department of Education, 2008). One of every five children in the United States is from an immigrant family, and it is estimated that by 2040 the proportion will increase to one-third (Suarez-Orozco, 2002). Furthermore, approximately 17% of public school students live in poverty, 13% receive special education services, and 8% speak little or no English at home (National Center for Education Statistics, 2003; U.S. Department of Education, 2008).

While the percentage of language and cultural minority students is increasing rapidly, the percentage of ethnic minority teachers is decreasing. This disparity emphasizes the need for teachers to become knowledgeable about students' backgrounds so that they can design instruction that is sensitive to their needs (Bennett, 2007; Okagaki, 2006; Spring, 2007). Effective teachers in today's classroom serve as cultural mediators; they guide students to think critically about diversity, reduce bias, and promote acceptance among diverse students (Banks, 2006; Cushner, 2006; Redman, 2007). Furthermore, competent teachers reflect on their own biases, expectations, and practices to work effectively with diverse students and take into consideration individual differences within groups to form hypotheses about what strategies are likely to be effective with each student (Pang, 2005). For example, based on past test scores and the former teacher's comments, Mr. Jensen had assumed (wrongly) that many of his students would not be motivated to learn to read. As he gets to know his students better, he finds that most of them are very interested in music, especially rap. Not being familiar with rap, Mr. Jenson learns about the genre and incorporates rap into his lessons. He finds that many of the students who seemed to be unmotivated at the beginning of the year are now excited during reading class and making significant progress.

How might student diversity add to the complexity of teaching?



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As you will learn in the next chapter, student diversity includes temperament; gender; a range of language, cultural, and socioeconomic backgrounds; differences in ability, cognitive styles, and learning preferences; and students with disabilities. Although in many cases teachers will be able to adapt instruction to students' unique characteristics, an additional challenge in today's classroom comes from the need to include students with special needs within the context of general classroom activities. About 13.6% of students in the U.S. public schools receive special education services today (U. S. Department of Education, 2008). The Individuals with Disabilities Education Act (IDEA) gives all students with special needs the right to a free and appropriate education and requires that, to the extent possible, they be provided with the least restrictive learning environment. As you will learn in more detail in the next chapter, schools are also required by law to provide students with special needs with an individualized education program (IEP), which is a blueprint for the academic, social, physical, and affective needs of each student. An important role for the general classroom teacher is to devise IEPs for special education students in collaboration with special education teachers, resource professionals, and parents as well as provide tailored instruction to alleviate some of the obstacles to learning of this group of students (Torgensen, 1996).

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT

Draw a picture of your future classroom. It should reflect the average diversity in today's schools. Be prepared to discuss with your classmates the following questions about your picture: What challenges will you face as a teacher because of the diversity represented by your students? What biases towards some of the students might you bring to the classroom? What differing expectations might you hold for different types of students?



The Accountability Movement

In January 2002, President George W. Bush signed into law the reauthorization of the Elementary and Secondary Education Act, more commonly known as **No Child Left Behind (NCLB)**. The law requires that all children in grades 3 through 8 score at the proficient level or above on tests of math, reading/language arts, and science by 2014, with negative consequences for schools and districts that fail to show progress toward those goals. When you read Chapter 13, you will learn that there is sharp disagreement about the benefits of this legislation for students and teachers. Some see it as an effective means to ensure the accountability of our education system. Because federal tax money is used to fund schools, there needs to be a mechanism to inform the public about school and teacher quality as well as children's progress in key subjects. Others see NCLB as an attempt to undercut the autonomy and vitality of public education. Regardless of your position in this debate, experts point out that the accountability system is here to stay (Scherer, 2001). Therefore, teachers will need to align instruction to national, state, and local standards so that all students can successfully achieve in large-scale mandated tests.

No Child Left Behind (NCLB)

Officially known as the Elementary and Secondary Education Act, this law requires that all children in grades 3 through 8 score at the proficient level or above on tests of math, reading/language arts, and science by year 2014, with negative consequences for schools and districts that fail to show progress towards those goals.

Teachers are also becoming accountable for their own knowledge and teaching skills. Based on the finding that quality teaching has a powerful effect on student achievement and that minority and low-income students are often taught by underqualified teachers (Darling-Hammond & Baratz-Snowdon, 2005), NCLB also required all teachers to be fully qualified by 2005–2006. In response to this mandate, a number of states collaborated to create the **Interstate New Teacher Assessment and Support Consortium (INTASC)**, which has set standards in each of the areas of professional teacher knowledge that we introduce in this chapter (i.e., student learning, diverse learners, assessment). The majority of the states require licensing exams such as the PRAXIS™ tests (Educational Testing Service, 2008), which are closely aligned with the INTASC standards. In the back of this book, you will find an appendix listing a set of 10 principles from the INTASC with corresponding topics from PRAXIS™ tests and the location of these topics in the text. As you see, the current accountability movement has an unprecedented focus on the role of the teacher's quality in promoting student achievement. Now that we have created some common ground about the realities of classroom teaching, let's discuss the role of educational psychology in the teaching practice.

Interstate New Teacher Assessment and Support Consortium (INTASC)

A multi-state collaboration to set standards in each of the areas of professional teacher knowledge.

WHAT IS EDUCATIONAL PSYCHOLOGY?

Educational psychology is the scientific discipline concerned with the development, evaluation, and application of principles and theories of human learning (Wittrock & Farley, 1989). **Principles** are descriptions of established relationships between events. An example is the well-known automaticity principle, which states that, with sufficient practice time, previously learned skills become automatic (Schneider, 1999). When several principles about a particular topic are developed, they can be combined into a **theory**, a scientific explanation for why events happen in a certain way that helps make predictions about such events in the future. For example, as you will learn when you

Educational Psychology

The scientific discipline concerned with the development, evaluation, and application of principles and theories of human learning.

Principles

Descriptions of established relationships between events.

Theory

A scientific explanation for why events happen in a certain way and which helps make predictions about such events in the future.

read Chapter 6, cognitive load theory uses several principles such as the automaticity principle to explain and predict how difficult it will be for a certain student to learn a complex skill (Sweller, 1999). Educational psychology can provide teachers with the principles and theories they will need to make good decisions in the classroom as well as with the concepts needed to discuss and reflect on their decisions.

You will learn more than one theory to explain a certain phenomenon (i.e., several theories have their own approaches to what motivates students). Each theory (behaviorist, cognitive, or sociocognitive, for example) focuses on different factors or mechanisms that affect student motivation. For instance, behaviorist theory explains why rewards may motivate some students to study harder for a test. However, sociocognitive theory explains why rewards may not be motivating when students believe that they lack ability in the content domain. As you will learn in Chapter 9, both behaviorist and sociocognitive theories explain different phenomena by focusing on the effects of reinforcement or beliefs on students' behavior.

Furthermore, you will learn that quality teaching does not merely consist of applying a set of recipes but rather of developing and mastering a variety of perspectives and strategies and being flexible about their application. For example, although one study found that a rapid pace of mathematics instruction increased achievement (Good, Grouws, & Ebmeier, 1983), a teacher may decide to spend a significant amount of time on math concepts that are critical or decide to slow down the pace of instruction after realizing through a classroom assessment that students did not grasp the concepts as intended. In sum, making the right classroom decisions will depend on the teaching context, the objectives of the teacher, and the characteristics of the learners. As you will soon read in this chapter, one of the skills of effective teachers is to interpret educational psychology theories and research critically and apply those that are most appropriate for the unique characteristics of each learner in creative and practical ways (Borko & Shavelson, 1990).

The Theories and Principles of Educational Psychology

Where do educational psychology principles and theories originate? Before reading the answer to this question, think about teachers you have had. What was the origin of their decisions? Did your teachers use common sense to make classroom decisions? Or did they base decisions on personal educational experiences? Did they consult with more knowledgeable people, such as expert teachers or authorities in the field?

Although it is tempting to conclude that common sense, personal experience, and even expert advice are valid sources to guide teaching practice, you will soon find the limitations of this approach. First, common sense may lead you astray. To experience this yourself, decide whether each of the statements in Table 1.1 is true or false by using common sense.

TABLE 1.1

Should common sense guide teaching practices?

Write T (true) or F (false) for each of these statements, based on your common sense.

____ **1.** Grouping students with common abilities together promotes their self-esteem and motivation to learn.

____ **2.** Teachers should call students randomly during a lesson to ensure that everyone will be attentive.

____ **3.** When teachers reward one student for behaving properly, other students are more likely to behave properly.

____ **4.** Students will bring many misconceptions to the classroom, yet when presented with information that contradicts their beliefs, they are able to change the misconceptions.

Let's see how you did with the statements in Table 1.1. Educational psychology research has found that ability grouping has negative effects on students' self-esteem and motivation (Darling-Hammond, 2004), so the first statement is false. The second statement is also false. Although randomly calling on students to keep them attentive may make sense to many, research shows that going around a circle in order in a reading class leads to better achievement than calling on students randomly, presumably because the second method allows all students to participate and receive feedback (Woolfolk & Brooks, 1983). The third statement is true. When you learn about sociocognitive theories of learning, you will realize that a significant amount of what students learn comes from observing the consequences of other students' behavior (Bandura, 1977). Research shows that students will learn which behaviors are desirable and undesirable simply by watching whether the teacher rewards or punishes other students' behavior, respectively. The fourth statement is false. Once you read the chapter on complex cognitive processes, you will discover that misconceptions are much harder to change than most teachers believe (Alparsian, Tekkaya, & Geban, 2004; Yip, 2004). Educational psychology research shows that merely providing the right explanation does not change students' ways of thinking.

So common sense or personal beliefs are not a valid or reliable basis for making good classroom decisions. Let's assume for a moment that you decided to place your students in ability groups because it makes sense to you. Now imagine that one of your students is struggling and you decide to have a parent conference to strategize about how to help this student improve at school. What would you say to the students' parents if they asked you to explain the rationale for using ability grouping? Would you respond that it just makes sense to you? Would you state that ability grouping worked for you when you went to school? Or would you say that other teachers that you know engage in the same practice? As you read this text, you will realize that many of your beliefs and experiences may have research support, yet many others may be proven to be inaccurate, no matter how obviously appropriate or familiar they might be to you. So, going back to our original question regarding where educational psychology principles and theories originate, the answer is: They originate in educational psychology research.



Laura Dwight Photography

Why shouldn't teachers base their practices on common sense or personal experiences?

Types of Research in Educational Psychology

Educational psychologists conduct research on all the main topics of this text: group and individual learner differences, human growth and development, learning and motivation to learn, classroom management, assessment, and technology-based learning. Some researchers conduct *individual* studies, which are designed to answer particular research questions. Others set out to synthesize the current state of understanding about a topic by compiling past research findings in *review* studies.

Although most research is a one-time investigation of the topic of interest, some research is *longitudinal* and consists of following the participants of the study over time. For example, a language development study may be *cross-sectional* if it includes groups of children of different ages and conclusions are made by comparing the language skills of the developmental groups at the time of the study. Alternatively, the study can be designed to be longitudinal by following a group of young children over a certain time and recording the changes in language development over that time. The reason there are few longitudinal studies is that they are typically expensive, time consuming, and subject to attrition—the original participants may move or fail to participate in all research sessions.

All these types of research studies—individual, review, cross-sectional, and longitudinal—contribute to the science of learning and help develop guidelines for effective classroom practices. However, depending on their objectives (i.e., the research question that they aim to answer) and the methodology used, they vary in the type of

conclusions that can be drawn from the study findings. Next, we review a classification of research studies based on their objectives.

Descriptive Research

A type of research that describes what is occurring in a certain situation without altering the situation.

Descriptive Research. The goal of **descriptive research**, as its name implies, is to describe what is occurring in a certain situation without altering the situation. The researcher in this case is an observer who might engage in one of the following methods: observation, interviews, questionnaires, case studies, or ethnographic studies. For instance, a researcher interested in examining teachers' time management may sit in several classrooms and record the percentage of time students are on-task and off-task.

The researcher may interview the participating teachers to ask them how they planned their instructional time and give the participating students a questionnaire to rate their engagement in the lesson. Using all the information from observation, interviews, and questionnaires, the researcher can then write a research article describing the patterns found in teacher and students' behaviors and thoughts.

Researchers may also conduct *case studies* when they are interested in examining a few teachers or students in depth, such as by contrasting how an expert teacher makes use of time management in her lesson plans as compared to a beginning teacher or how a student with high spatial ability solves geometry problems using visual representations.

Finally, descriptive studies are *ethnographic* when they are designed to observe the naturally occurring events in the life of a target group with the goal of describing and interpreting the meaning of the observed events (Berg, 2007). Ethnographies are the products of anthropological research. Ethnographic studies are typically conducted over a long period of time, allowing researchers to get immersed in the culture of the target group. Observations can be documented with personal daily journals, audiotapes from personal interviews, films, and photography.

Correlational Research. Have you ever made a correlation between two things that weren't actually related? For example, every time you had a math test, you got an A when you wore your blue T-shirt. Of course, the reason you got an A wasn't because of the blue T-shirt, even though those two events happened at the same time (wearing the T-shirt and getting an A). The goal of **correlational research** is to describe whether and to what extent there is a relationship between two or more events or factors. For example, a researcher may collect students' GPAs and their school attendance record and find that there is a relationship between the two indicating that students with higher GPAs have higher school attendance, and vice versa. In this case, GPA and attendance are said to have a *positive* correlation because both factors vary in the same direction. In contrast, a *negative* correlation indicates that higher values in one factor correspond to lower values in the other factor, such as the occurrence of teacher anxiety during the first day of classes and the number of years that they have been teaching. Typically, the larger the number of years that teachers have been teaching, the lower the level of anxiety reported during the first day of classes.

Correlational Research

A type of research that describes whether and to what extent there is a relationship between two or more events or factors.

An important point to keep in mind when interpreting correlational research is that *correlation does not mean causation* (Vogt, 2007). In other words, even when two factors are found to be strongly correlated, we should not interpret such a finding as indicating that one of the factors caused the other factor (the blue T-shirt did not cause you to get an A on your math test). When researchers are interested in examining the causal relationship between events or factors, they engage in experimental research.

Experimental Research

A type of research that studies causal relationships between variables.

Experimental Research. The goal of **experimental research** is to study causal relationships between variables. To this end, researchers go beyond the observation or measurement of variables in an existing situation by introducing changes to the situation and measuring the effects of such changes. In any experimental study there are two types of variables. *Independent* variables are those that are hypothesized to produce a change in the dependent variables. *Dependent* variables are typically an aspect of students' classroom thinking or behavior, such as their attitudes, persistency, grades, test scores, or communication skills. Independent variables are *manipulated* by the experimenter as a way to investigate whether they have a significant effect on the dependent

variables. For example, imagine that you are interested in answering the following research question: Do students learn chemistry better when taught with molecular models? To answer this question, you can conduct an experimental study in which one group of students is taught a chemistry lesson that includes a molecular model of the topic to be learned whereas another group of students is taught the same lesson with no molecular model. The independent variable in this case is the molecular model. This variable is manipulated because one group is presented with the model, but not the other group. The dependent variable in this case is learning, which can be measured with a traditional or performance test after the intervention. If the molecular model has a causal relationship with students' learning, you will find that the group of students who learned with the model will significantly outperform the group of students who did not learn with the model.

In experimental research, the group that is subject to the manipulation (i.e., intervention) is called the *experimental* group and the group that is not subject to the manipulation is called the *control* group. However, good experimental design requires random assignment of students to each group, to ensure that the two groups will be mostly identical in any characteristic and variable (e.g., gender, age, prior knowledge) other than the variable that you are manipulating.

To summarize, the type of research conducted will depend on the particular research question that needs to be answered (see Table 1.2.). Nevertheless, many research studies will combine the three types of questions listed here and will consequently require the use of mixed research methods. After reading Table 1.2., take a few minutes to think about a potential mixed research method study.

Action Research. A special type of research of increasing interest is action research, the research that teachers conduct in their own classrooms with the objective of understanding and improving their practices (Creswell, 2005; van Manen, 1990). Reflective teachers draw from educational theory and research to hypothesize about effective classroom practices, which they apply, evaluate, and revise as needed. Although evaluating

TABLE 1.2

Research study types with corresponding research questions and examples.

TYPE OF RESEARCH AND RESEARCH QUESTION	EXAMPLE
Descriptive: Questions that require descriptions of teaching and learning	To investigate the level of Internet access in U.S. public schools, a researcher asks schools to complete a national survey reporting the number of rooms and computers with Internet access and the amount of time that the facilities were available to students during and outside of regular school hours.
Correlational: Inquiries about the potential relationship among two or more variables	In a certain school district, a researcher collects data on beginning teachers' scores on the state licensing exam (variable 1) and data on the achievement gains of their students (variable 2). The researcher then uses correlational statistics to measure the association between the two variables.
Experimental: Examining whether and to what degree a certain intervention affects teaching and/or learning	A research group wishes to test the effectiveness of using visual aids to understand science. They randomly assign half of the students in a certain high school to learn science with an instructional program that includes visual aids and half to use an identical program without the visual aids. They then make statistical comparisons between the learning gains of both groups.
Mixed: Combining descriptive, correlational, or experimental research questions	To examine whether and how students use laptops in a college course, a researcher observes a certain classroom for a full semester and conducts face-to-face interviews with laptop users. The researcher then reports the number of students using laptops, the average time per class using laptops, and the reasons why students use laptops (descriptive portion of the study). The researcher also presents correlations between students' laptop use and their final grades in the course (correlational portion of the study).

TABLE 1.3

Steps in an action research plan.

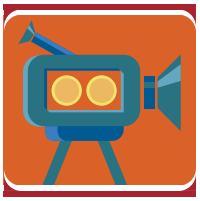
A typical action research plan involves the following steps:

1. Identifying a particular research question or classroom issue that needs investigation
2. Designing a research plan or intervention based on the teacher's hypotheses as suggested by educational theory and research
3. Systematically collecting and analyzing data to determine if the plan or intervention worked
4. Evaluating the results
5. Making modifications to the original plan as needed (Tripp, 1990).

the effectiveness of classroom practices can be done in a nonsystematic way, the drawback of this approach is that the information collected is subjective and anecdotal. In contrast, teachers can systematically evaluate the effectiveness of their practices through action research, which follows some of the methods of scientific research used by educational psychologists such as taking measurements of the frequency, duration, magnitude, or latency of specific student behaviors (Moore, 1992). See Table 1.3 for the steps involved in an action research plan.

The data collected during action research may come from classroom observations, student work, clinical interviews (where teachers interview students with a set of target questions), parent–teacher conferences, and so on. Action research may also involve school administrators, more than one classroom, and even several schools. Action research is different from other research in that it is intended not to meet the rigors of publication or theory building but to serve as a vehicle to help a reflective teacher make effective practical decisions (Parsons & Brown, 2002; Sardo-Brown, 1994).

Get Connected!



VIDEO CASE ASSIGNMENT. . . Video Reprise, Specialist Commentary

Go to your WileyPlus course and view the video of Mrs. Petrone's third grade class. Think about how research findings and theories can inform classroom practices. Consider her interactions with the students and the physical layout of her classroom. Be prepared to discuss how Mrs. Petrone may have enacted several educational psychology principles and theories.

WHAT MAKES AN EFFECTIVE TEACHER?

The previous sections have focused on the important roles that educational psychology theory and research play on guiding teachers' decision-making processes and action research. This section examines in more detail the different sources of professional knowledge that teachers draw from and the specific skills that make up effective teachers.

Professional Knowledge

According to research, effective teachers use the following types of knowledge (Bransford, Darling-Hammond, & LePage, 2005; Darling-Hammond & Baratz-Snowdon, 2005; Shulman, 1986).

Content Knowledge. First, teachers must know the subject matter that they intend to teach, also known as content knowledge. Effective teachers know their subject matter extremely well (Borko & Putnam, 1996; Windschitl, 2002). Some studies suggest that strong subject matter knowledge, typically measured as having a major that is relevant to

the field to be taught, is associated with teacher effectiveness and having a master's degree in the field contributes more to teacher effectiveness than having a master's degree in a different field (Goldhaber & Brewer, 1998; 2000; Wenglinsky, 2002). In most institutions, teachers learn content knowledge through courses in the disciplinary fields (e.g., math, science).



ColorBlind Images/GettyImages

Can you think of additional examples of pedagogical content knowledge?

Pedagogical Knowledge. Although necessary, well-developed content knowledge is not sufficient to make someone a good teacher. Otherwise, all experts in any domain would be good teachers by definition, and that is not the case. In fact, many experts lack the ability to verbalize the knowledge and skills that they have developed over time (Bereiter & Scardamalia, 1993). Thus, in addition to content knowledge, it is necessary to have *general pedagogical knowledge*, an understanding of principles of learning, development, classroom management, motivation, and assessment that can be used across content domains (Shulman, 1987). General pedagogical knowledge is typically learned in educational psychology courses such as this one. For instance, you will soon learn that effective teachers are aware that students make rather than take new information. This learning principle was derived from many years of research and suggests that it will be most effective to promote learning by using methods where students are actively engaged in the meaning-making process, such as experimenting, reflecting, or collaborating in groups with the guidance of the teacher (Henson, 2004; Ornstein, Lasley, & Mindes, 2005). Research shows that new teachers who had coursework in learning and development principles are more than twice as likely to stay in the teaching profession than those who did not (National Commission on Teaching and America's Future, 2003).

In addition to having general pedagogic knowledge, which is knowledge that can be applied to any subject, teachers also need to develop *pedagogical content knowledge*, teaching strategies that are specific to the content to be taught. For example, a chemistry teacher demonstrates pedagogical content knowledge when using visual representations such as molecular diagrams or models as part of her pedagogy. Effective teachers have a large repertoire of strategies for teaching a variety of subjects (Borko & Putnam, 1996; Cochran & Jones, 1998; Shulman, 1986). A longitudinal study of American youth using more than 2,800 students found that the amount of coursework completed in subject matter methods courses was positively related to student achievement gains (Monk, 1994). Another study found that the number of courses a teacher had taken in mathematics methods was more strongly correlated to student math performance than the number of courses the teacher had taken in mathematics content (Goldhaber & Brewer, 2000). However, research also finds that content and pedagogical content knowledge need to be combined to make teaching most effective (Loughran, Mulhall, & Berry, 2004; Segall, 2004).

Knowledge about Learners. Effective teaching requires significant knowledge about the numerous ways in which learners think and behave depending on their unique characteristics. Teachers should know how to plan instruction that is developmentally appropriate for students of different ages (Darling-Hammond & Bransford, 2005; Horowitz et al., 2005), and they should be sensitive to the needs of students from diverse backgrounds (Bennett, 2007; Diaz, Pelletier, & Provenzo, 2006; Okagaki, 2006). The next three chapters will help you gain valuable knowledge about learners. Specifically, they will describe the role that a student's developmental age, gender, language and cultural background, and abilities play in learning; they will also provide you with useful strategies to help all students learn effectively.

Knowledge about Curriculum. Even when teachers are provided with instructional materials such as textbooks for their classrooms, they need to know what to teach based on the guidelines developed by national, state, and local standards. Knowledge about curriculum, including standards and benchmarks for each content area, will allow the

teacher to make important instructional decisions including the selection of materials, the design and sequencing of tasks based on students' learning needs, and how to assess students' learning.

Professional Skills

Whereas professional knowledge is all the information that you have learned about teaching and learning, professional skill is the ability to use that knowledge effectively and readily in the classroom. Remember that a teacher might have read many books and journal articles about classroom management (knowledge), but if he is very disorganized or hasn't developed effective classroom routines (skills), then he won't be a very effective teacher for his students. Effective teachers demonstrate skills in several areas including planning, communication, motivation, classroom management, assessment, and technology. Let's examine each of these skills.

Planning Skills. Teachers need to set a variety of learning goals and organize plans for reaching those goals (Blumenfeld, Marx, & Harris, 2006). As teachers plan instruction, they consider when and how instruction should occur, what activities students should do, and the types of assessments that can be used to evaluate students' learning. Planning requires the combination of all professional knowledge types discussed in the prior section, including good knowledge of curriculum, subject matter, content pedagogical knowledge, general pedagogical knowledge, and knowledge of learners.

Communication Skills. Imagine the following scenario. Ms. Blight is having a meeting with Joe because he has been acting out for the fourth time this week in class. When Ms. Blight asks Joe to explain the reason for his misbehavior, he responds, "You hate me!" Ms. Blight responds, "Where did you get that idea? I do not feel that way at all. In fact, I think that you are a funny, likeable guy, although undisciplined." Joe responds, "I just know you hate me. You glare at me; at least you don't look nice at me like you look at the others. You never ask me how I am doing when I walk in. You *never* smile at me. And when you talk to me, you cross your arms like you're my dad or something." This example illustrates the relationship between the ways that teachers communicate and students' learning and behavior. In this case, Ms. Blight unintentionally communicated to Joe that she did not like him. Teachers need to be good verbal and nonverbal communicators. Effective teachers speak clearly, actively listen to students and parents, interpret students' body language, and constructively resolve conflicts in the classroom. They also have assertive rather than passive or hostile communication styles and work to improve students' communication skills (Powell & Caseau, 2004).

Motivation Skills. Effective teachers give students the opportunity to think about their personal interests and goals and use strategies to help them become self-motivated and responsible for their own learning (Anderman & Wolters, 2006). In addition, teachers with good motivation skills set high standards for all students yet adjust the level of challenge and support to different ability levels to ensure that every child becomes motivated to succeed (Wigfield, Byrnes, & Eccles, 2006). For example, a third-grade reading teacher might expect a gifted student to understand stories at the fifth-grade level, an average student to understand stories at the third-grade level, and a student with a learning disability in reading to understand stories at the second-grade level. To promote motivation to learn, she should assign each student a story that is challenging for their respective comprehension level rather than assign a story that is at the average grade level. Assignments that are too hard or too easy can be frustrating and hurt students' motivation. Teachers can also promote motivation in the classroom by modeling their own excitement to learn and the value of learning. We will discuss motivation theories, research, and classroom applications in Chapters 9 and 10.

Classroom Management Skills. Consider the following scenario: A teacher is trying to start a science lesson. She raises her voice for attention and gestures frantically as students leave their seats to sharpen pencils, retrieve their science journals, or ask

friends for help. One student asks in frustration, "What are we supposed to be doing?" The time the teacher has allotted for science is half over before the lesson even begins! As you will learn when you read Chapter 11, teachers need to manage their classrooms to create a successful, orderly environment that is conducive to learning. To this end, effective teachers use a repertoire of strategies for developing classroom rules and procedures, monitoring and preventing misbehavior, and intervening when discipline problems arise (Evertson, Emmer, & Worsham, 2006).

Assessment Skills. When you read Chapters 12 and 13, you will learn that effective teachers regularly assess the knowledge and skills of their students with a variety of formal and informal methods (McMillan, 2007). Formal assessments include students' presentations, quizzes, project assignments, and state-mandated tests. Teachers also use informal assessments, such as portfolios of student work, student journals, and examination of students' questions, comments, and behaviors during classroom and group activities. This set of skills includes the planning, development, administration, evaluation, and revision of classroom assessments and the administration and evaluation of commercially made tests.

Technology Skills. Effective teachers also have well-developed technological skills and critically evaluate the potential of technology before integrating computers into their classrooms (Cruz & Duplass, 2007; Sawyer, 2006). When you read the final chapter of this book, you will realize that technology itself does not promote students' learning (Moreno, 2006). For technology-based instruction to improve learning there are some conditions that must be met. Among these conditions are the following:

- The design of technology should be based on theories of learning and motivation.
- Teachers need to be skilled in the use of technology.
- Technology should be embedded in learner-centered classrooms, where students are given opportunities to actively construct knowledge and skills (Bereiter & Scardamalia, 2006; Berson, Crum, Duplass, & Johnston, 2007; Bitter & Legacy, 2006).

ISSUES IN EDUCATION

Is teaching a science or an art?

Some educators believe that teaching is a science—that you can become a good teacher if you base your teaching on the research. Others believe that teaching is an art—that there is more to teaching than following the recommendations of the research. After reading about the professional knowledge and skills described in the above sections, do you think teaching is a science or an art? A response to this question can be found at the end of the chapter.

WHAT MAKES AN EXPERT TEACHER?

Educational psychologists have studied the characteristics of expert teachers as a way to better understand the process of developing teaching expertise. Expert teachers have a large body of quality knowledge, such as the content knowledge, pedagogical content knowledge, general pedagogical knowledge, and knowledge of learners and curriculum discussed in prior sections (Garmston, 1998; Peterson & Comeaux, 1989). For instance, Ms. Dossen teaches elementary physical education. As she plans a lesson for kindergartners, she needs to combine her knowledge about the curriculum standards (e.g., that students know how to safely move in space), content pedagogical knowledge (e.g., use verbal cues to guide students' movements such as "step left, hop right"),



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general pedagogical knowledge (e.g., providing multiple opportunities for practice), and knowledge about learners (e.g., present the information in visual formats for students with hearing impairments).

The more knowledge a teacher has and the better the knowledge is organized, the more likely the teacher can draw on it to make effective decisions in the classroom. The well-developed professional knowledge of expert teachers also allows them to recognize more complexities in the classroom and bring to bear many information sources about how to respond to them (Berliner, 2001). In our prior example, Ms. Dossen will need to apply management techniques and effective communication strategies to respond to the variety of behaviors displayed by her kindergartners as they engage in the lesson, and she will need to assess individual student learning and adjust instructional strategies accordingly.

In addition, although they do not possess higher ability or memory than beginning teachers, the expert teachers are characterized by having automatized classroom procedures and skills through years of practice, allowing them to accomplish more things in less time (Schneider, 1999). For example, during a math lesson, an expert teacher may be observed circulating among small working groups and consulting with some students while continuing to monitor the others. As you will learn in Chapter 11, expert teachers have developed automatic monitoring skills, which allow them to notice and prevent discipline problems without interrupting classroom activities (Sabers, Cushing, & Berliner, 1991). In general, expert teachers make decisions routinely and efficiently and perform a variety of activities without having to stop and think about how to do them (Berliner, 2000).

What are some characteristics of expert teachers?

Expert teachers also regularly reflect on their practices and carefully plan, monitor, and evaluate progress toward previously set goals (Copeland, Birmingham, de la Cruz, & Lewin, 1993; Moallem, 1997). For example, expert teachers spend more time planning their lessons and trying to understand classroom problems than novice teachers (Swanson, O'Connor, & Cooney, 1990), and their plans are typically more flexible and adaptive to changes in the classroom than those of novices (Borko & Livingston, 1989; Tsui, 2003). Ms. Jasmine, one of the teachers in Imagine You Are the Teacher, is likely to be an expert teacher. Recall her words: "Well, I guess it is time to carefully reflect on each one of these challenges and brainstorm ways to overcome them."

Teaching Efficacy

A teacher's belief in his/her ability to make a significant change in students' lives.

Last but not least, expert teachers have high personal **teaching efficacy** (Bruning, Schraw, Norby, & Ronning, 2004). When you read Chapter 8, you will learn that self-efficacy is an individual's belief in his/her ability to achieve a certain goal (Bandura, 1977). Teachers with high personal teaching efficacy believe that they can make a significant change in students' lives and are more likely to persist when faced with challenges (Woolfolk & Hoy, 1990). Ms. Jasmine shows high teaching efficacy when she offers to help Mrs. Hamblin find effective strategies to address the challenges in her classroom.

Teaching efficacy is found to be positively associated with the quality of the teacher's decision-making process, students' achievement and self-efficacy levels, teacher expectations for students, the number of strategies taught, and the amount of time focused on learning (Alderman, 1999; Goddard, Hoy, & Woolfolk Hoy, 2000; Langer, 2000; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). How do beginner teachers eventually develop into experts? We discuss some answers to this question next.

Stage Theories: From Novice to Expert Teacher

A number of stage theories have been proposed to describe teachers' professional development (Berliner, 1994; Richardson & Placier, 2001; Sprinthall, Reimen, & Theis-Sprinthill, 1996). For example, Fuller (1969) proposed that new teachers develop through two main stages. First, they focus on themselves and their teaching, especially on their ability to control the classroom and the supervisor's perceptions of their teaching quality. This stage gradually shifts to a focus on issues related to students and student learning, such as curriculum design, instructional strategies, assessment, and,

eventually, the conditions of school and schooling. Other theories have focused on the differences between expert and novice teachers (Carter, Cushing, Sabers, Stein, & Berliner, 1988). For instance, Berliner (1994) proposed that teachers develop through the stages of novice, advanced beginner, competent, proficient, and ultimately expert teacher. This sequence shows a progress over time from learning the basic elements of the teaching tasks, to accumulating knowledge about learning and learners, to making conscious decisions about their practices, to reflecting on the effectiveness of their practices, and ultimately to sensing the appropriate course of action for any classroom situation. According to this line of research, teachers develop their expertise over the course of five to seven years, with only a small percentage of teachers developing into experts (Berliner, 2001).

Get Connected!

ANIMATION ASSIGNMENT. . . Educational Psychology: Becoming an Effective Classroom Teacher



Go to your WileyPlus course and watch the animation on Prediction. Be prepared to discuss how to establish a relationship between two variables. How could prediction and expectations influence you as a teacher? What are the positive and negative aspects of prediction in the classroom?

Reflection: A Professional Development Thinking Tool

Stage theories seem to suggest that teachers develop professionally in invariant, sequential, and fixed ways (Richardson & Placier, 2001). However, the goal of stage theories should not be misinterpreted. Their goal is to describe the typical trajectory of teacher development rather than inform us about the type of learning experiences that can help teachers acquire expert skills (Berliner, 2001). Nevertheless, some recent studies indicate that new teachers can develop more expert practice even as beginning practitioners when provided with particular kinds of learning experiences (Darling-Hammond, 2000; Snyder, 2000; Zeichner, 2000). In particular, there is strong evidence that programs that emphasize the active monitoring of one's thinking and behavior and taking a reflective stance have a beneficial effect on learning and teaching (Bolin, 1990; National Research Council, 2005; Pollard, 1996). **Reflection** is the process of thinking about your thinking and practices in critical ways, learning from the process, and applying what you learned to improve learning for all students (McEwan, 2002; Schön, 1983; York-Barr, Sommers, Ghere, & Montie, 2001).

Reflection

The process of thinking critically about one's thinking and practices, learning from the process, and applying what is learned to improve learning for all students.

Imagine the following scenario. Mr. Gonzalez is a ninth-grade science teacher interested in helping his students evaluate and monitor their own learning. After researching different methods of self-assessment, he decides to periodically ask students to write journal entries to reflect on their past performance. A few weeks later, he feels disappointed about students' self-evaluation progress. After carefully reading the student journals, he notices that most of his students are unable to examine their performance objectively and that they tend to focus on the learning products rather than the process. For instance, in many journal entries students merely write, "I think I deserve an A because I worked hard" or "I made a lot of progress, I went from a B to a B+ in the last two tests." Mr. Gonzalez then decides to conduct further research on self-assessment. After reading several research articles, he is able to conclude that reflective journals are found to be an effective learning tool for experienced learners; less experienced learners such as Mr. Gonzalez's students need more guidance and structure to benefit from self-evaluation methods (Gustafsson, 2004). He then decides to develop a very structured performance checklist to guide students' thinking as they self-evaluate their learning and to model how to reflect on past performance using the checklist. Since then, his students have shown significant progress not only on the quality of their self-evaluations but also on their science learning and motivation.

Like Mr. Gonzalez, teachers can develop their professional knowledge and skills by using reflection and critical thinking to evaluate and adjust their knowledge, practices, and beliefs in the face of new evidence (Hogan, Rabinowitz, & Craven, 2003). For instance,

reflection and critical thinking allow teachers to interpret educational psychology theories and research wisely and then apply those that are most appropriate for the unique characteristics of their students (Borko & Shavelson, 1990). The need to become a reflective practitioner is recognized by many experts and professional organizations such as the National Board for Professional Teaching Standards (1994), which states that teachers should think systematically about their practice and learn from experience.

How to Develop into a Reflective Practitioner

Reflection can be facilitated by several mechanisms involving student, peers, and administrators. A first important reflective tool for teachers is classroom assessment. By gathering formal and informal information about what students know and are able to do, teachers can gain significant insight about the effectiveness of their practices. In addition, students can complete teacher surveys or evaluation forms anonymously to provide teachers with feedback about their classroom perceptions. The feedback from parents can also be very important. You can get significant information during parent conferences, but you can also develop a survey.

To gain a more professional insight about their teaching quality, teachers can use peer classroom observations. Informal observations will typically result in a summary of the strengths and weaknesses observed by the peer teacher. However, more systematic data can be gathered when using an observation ranking. In this case, the observer needs to check whether and how often certain behaviors (e.g., praise, questioning, monitoring) are displayed during the observation (Simon & Boyer, 1974). Clearly, the feedback of veteran teachers can be most helpful to the beginner teacher. New teachers should seek the observation, advice, and even mentoring of a more experienced teacher and take their principal's advice into consideration when self-reflecting on their practices. Most teachers in their early practice years will undergo administrator observations and ratings. Although principal observations are typically short and ratings will have a tendency to be too global and lenient, they can give the developing teacher a better understanding of his/her progress and expectations.

To promote self-evaluation, teachers can also videotape their classroom during a lesson. Videotapes of teaching have the advantage that they can be shared with other teachers who may not be able to observe you in real time, can be shown more than once, and can prove useful when teachers team up to evaluate each others' practices. Moreover, videotapes can be entered into teaching portfolios for administrative evaluation or advanced certification.

Finally, a powerful tool for self-evaluation is a reflective journal, a paper or computer file where teachers regularly document their thinking and practices. Keeping a journal will help you engage in the practice of reflecting on the success of a lesson, assessment, parent conference, and so on rather than moving on to something else once the event is over. Even veteran teachers acknowledge the benefits of keeping a journal to help them reflect on their curriculum, their methods, student progress, and the development of their thinking (Rowls & Swick, 2000; Streib, 1993). Some teachers combine reflective journals with portfolios as a way to analyze and improve their teaching quality (Roberts & Pruitt, 2003; Van Wagenen & Hibbard, 1998).

Because a goal of this text is to engage you in the process of becoming a reflective practitioner, we recommend keeping a journal to document your learning. For instance, throughout this book, you will find activities that are aimed at bringing an awareness of your prior knowledge and beliefs, evaluating the practices of other teachers, and applying the knowledge that you learn to think about concrete classroom situations. Using a reflective journal to engage in these activities can help you develop the self-assessment and critical thinking skills that are characteristic of effective teachers (Doyle, 1997; Uline, Wilson, & Cordry, 2004). In addition to reflective journals, other factors that help beginning teachers develop into reflective practitioners and ultimately experts include the following:

- Having a positive school climate
- Being encouraged and supported by other teachers and administrators during difficult times

TABLE 1.4

Strategies to become a reflective practitioner.

- Continue to learn about the subject matter you teach (content knowledge).
- Continue to learn specific strategies for teaching subject matter (pedagogical content knowledge).
- Stay updated with current educational psychology theory and research (pedagogical knowledge and knowledge of learners).
- Stay updated with current educational policies and curriculum changes.
- Continue to learn about the learners that you teach and the communities where you teach.
- Continually reflect on your beliefs, assumptions, goals, and practices.
- Conduct your own research to solve issues that existing theories and research do not address.
- Seek the advice of more experienced professionals, such as veteran teachers and principals.
- Team up with other teachers to share and discuss ideas.
- Seek student and parent feedback.
- Regularly assess students' learning to evaluate your practices.
- Take a positive attitude about making a difference in students' lives.

- Being committed to their students (Brennan, Thames, & Roberts, 1999; Darling-Hammond & McLaughlin, 1995; Yost, 2002).

Table 1.4 summarizes some strategies that you can use in your journey to becoming a reflective practitioner.

The Rewards of the Teaching Profession

If you are a pre-service or beginning teacher, you may wonder if the hard work of reflecting on your practice will be worth the effort. The reports of experienced teachers are very positive in this regard. In one study of high school teachers, the vast majority stated that they would choose the teaching profession if they had to start their careers all over again (Brunetti, 2001). Teachers' sense of satisfaction seems to be intimately connected to making a difference in the well-being of their students and families, particularly when they had a positive influence in the lives of "hard to reach" or "problem" students. Both elementary and secondary teachers report that their joy of teaching comes mainly from interacting and connecting with children and adolescents, watching how their students learn and grow, and seeing that former students have succeeded (Marston, Brunetti, & Courtney, 2005; Stanford, 2001). Other sources of satisfaction are the emotional and intellectual stimulation engendered by classroom interactions, the passion for a subject, the autonomy of the teaching profession, and the collegiality of fellow teachers (Brunetti, 2001; Muchmore, 2001).

Even when having to contend with challenging teaching conditions such as large urban classes, highly diverse student populations, and a shortage of supplies, resources, and facilities, many teachers persist in the classroom and experience success and satisfaction in their work (Brunetti, 2006; Marso & Pigge, 1997). In sum, finding the joy that many experienced teachers feel may seem a difficult path for exploration today; however, time, practice, and reflection will reward you with the opportunity to professionally grow and make a significant difference in your students' lives.

REVISITING ISSUES IN EDUCATION

Is teaching a science or an art?

Points to consider: Because teaching is unpredictable and complex by nature, some educators have argued that it is an art that cannot be studied or practiced (Dawe, 1984; Hansgen, 1991; Rubin, 1985). In an analysis of teaching behaviors, Flinders (1989) described the artistry of teaching by giving examples of how teachers communicate beyond speaking and writing, such as using body language; variations in voice intonation, volume, and rate; eye contact; and leaning or stepping in the direction of a student. Part of the art of teaching consists of improvising and knowing when to change or introduce a new assignment. Expert teachers demonstrate the artistry of teaching by making global, flexible plans that can be changed depending on students' reactions and environmental circumstances (Livingston & Borko, 1989; Westerman, 1991).

On the other hand, there is a strong argument that teaching is a science because it rests on the existence of research-validated instructional practices that have proven to promote students' learning and motivation (Wang, Haertel, & Walberg, 1993). Expert teachers show the scientific nature of teaching by quickly and accurately retrieving relevant content and pedagogical knowledge during their decision-making process (Berliner, 1986; Sternberg & Horvath, 1995). In sum, both art and science play an important role in the success of a teacher (Morrison, 2006; Oakes & Lipton, 2007). The scientific basis of teaching helps good teachers avoid the pitfall of arbitrarily making classroom decisions or basing them on instinct, what seems to be common sense, or fads. Yet the artistry of teaching helps good teachers avoid the pitfall of basing every decision on rigid prescriptions from scientific evidence rather than using science as a tool to gain situation-specific insights.

SUMMARY

- Beginning teachers enter the profession with great enthusiasm but also with many concerns due to the complexity of teaching. Among the challenges that new teachers face are those of responding to standards and curriculum changes; setting and reaching multiple goals by integrating several knowledge types; adapting their practices to meet students' diverse needs; and ensuring that all students successfully achieve in large-scale mandated tests.
- Educational psychology is the scientific discipline concerned with the development, evaluation, and application of principles and theories of human learning. Learning about the research findings and principles of educational psychology can help teachers become effective decision makers because educational psychology can provide scientifically based knowledge to guide their decision-making process. In conducting research, educational psychologists may use one or more of the following methods: descriptive studies, correlational studies, and experimental studies.
- Scientifically gathered information is more reliable than teachers' common sense, personal experiences, and anecdotal information. However, research on teaching and learning cannot provide recipes to handle every classroom situation or every learner. Therefore, good teachers display a balance between the art and science of teaching: They critically interpret educational psychology theories and research and apply those that are most appropriate for the unique characteristics of each learner in creative and practical ways.
- Effective teachers have a deep understanding of content knowledge, general pedagogical knowledge, content pedagogical knowledge, and knowledge about learners and curriculum. Due to the complexity of the classroom, teachers also need solid professional skills including planning, communication, motivation, classroom management, assessment, and technology skills.

- Expert teachers are characterized by having well-developed professional knowledge and skills, a repertoire of efficient classroom procedures, high teaching efficacy, a commitment to their students, and a reflective approach to teaching. Although the multifaceted nature of the teaching profession may seem overwhelming, taking a reflective approach to teaching can help the beginning teacher become an expert. Reflection is the process of thinking about your thinking and practices in critical ways, learning from the process, and applying what you learned to improve future action. Reflective teachers are aware of the type of practices they engage in; are able to justify their practices with scientifically based evidence; use systematic approaches to gather information about the effectiveness of their practices; and reflect on their assumptions, beliefs, goals, and practices with the objective of improving learning for all students. Reflection can be facilitated by several mechanisms involving students, peers, and administrators.

KEY TERMS

correlational research 10
descriptive research 10
educational psychology 7
experimental research 10
Interstate New Teacher Assessment and Support Consortium (INTASC) 7
No Child Left Behind 7
principles 7
reflection 17
teaching efficacy 16
theory 7

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What are some of the challenges for the beginning teacher?
2. What is the role of educational psychology in the classroom?
3. What are the different methods used in educational psychology research?
4. What are the different types of knowledge and skills that teachers can use when making classroom decisions?
5. What makes an expert teacher?
6. What are some mechanisms to help beginner teachers develop into reflective practitioners?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and answer the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

A Case Study: PUTTING IT ALL TOGETHER

What Knowledge and Skills Do Teachers Need in the Classroom?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then, answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"Well, today's lesson didn't turn out the way I planned," Ms. Lisle confides to her mentor teacher who's been observing her class. "My students weren't excited about playing charades in French or motivated to talk with their conversation partners. Last year in my teacher training program I learned so many learning strategies. But now when I use them in my lesson plans, students don't seem interested in participating. I'm not sure why. What do you think?"

"Well, first I want to hear more of your thoughts about the lesson," Mrs. Ruiz responds. This is Ms. Lisle's first year teaching high school French. In college she majored in teaching foreign languages and spent a year abroad in Marseilles studying French literature. Based on her own experiences, Ms. Lisle is eager to incorporate authentic materials and conversations into her lessons. Her mentor teacher, Mrs. Ruiz, also uses a variety of teaching and assessment strategies to engage her students in language learning. She has been teaching Spanish at the high school for five years and chaperones an intensive summer language course in Mexico every summer.

"What do you think worked well in the lesson?" Mrs. Ruiz asks.

"My objective this month is to strengthen students' conversational skills," Ms. Lisle replies. "So activities include dialogues with their language partners, watching French conversational videos, learning new vocabulary, and writing short sentences. I think students learned good ideas from the video, and I heard them incorporate new phrases into their conversations. But their dialogues with each other were so short today. On average, I heard them respond with one or two words. It's as if they feel uncomfortable talking with each other. I just want them to enjoy talking in French. You know what I mean?"

"Yes, I love to see my students chatting away in Spanish," Mrs. Ruiz agrees. "But conversational skills take time to learn. It's still early in the year."

"What would you do differently if you could teach the lesson again?" Mrs. Ruiz questions.

"I wouldn't have students play charades with the new vocabulary," Ms. Lisle responds. "The game was too far out of their comfort zone, and they don't know enough descriptive words to make good guesses. I think it was frustrating for them. Also, I noticed the game caused sensory overload for my student Cynthia, who has an IEP. I think she learns best when activities are highly structured. What do you think?" Ms. Lisle asks her mentor.

"Well, I like the idea of teaching vocabulary through interactive games," Mrs. Ruiz responds, "but I think you're right. Students need to feel comfortable and have enough language skills before they can play complex games like charades. I would also meet with our inclusion teacher to go over accommodations listed in Cynthia's IEP. He may have additional ideas about how to modify lessons."

Ms. Lisle reflects on her lesson objectives, "Maybe I've overestimated students' language skills and should plan easier activities."

Mrs. Ruiz cautions, "Well, you want to uphold high expectations and challenge your students. Of course, you need to provide enough guidance and modeling for students to effectively learn new material. But I'd be careful not to oversimplify your lessons."

Ms. Lisle agrees, "You are right, I should definitely incorporate more modeling."

"Based on what happened today," Mrs. Ruiz continues, "how will you teach tomorrow's lesson?"

"I'd like to create a routine sequence of activities that students can expect everyday. For example, all lessons include a conversation, a passage to read, a short grammar lesson, and vocabulary practice. I think this structure would help students feel comfortable participating. Also, I'd like to do more modeling of activities, especially when I introduce new concepts."

"Sounds good to me. I think you have a lot of good teaching strategies," Mrs. Ruiz encourages. "This week in my Spanish class we're also working on conversational skills. Why don't you observe my class tomorrow?"

The following day, Ms. Lisle arrives in Mrs. Ruiz's classroom, where the tables and chairs are arranged in a U shape to facilitate conversation. Vocabulary words are posted on the wall and organized under categories such as family, household, school, and entertainment. In addition, every object in the room is labeled in Spanish. Lesson objectives and activities for the week are posted on the board. "Buenos Días!" Mrs. Ruiz greets her students at the door and points to the assignment on the board. "Using as much Spanish as you can, write down all the activities in your week." Students start brainstorming ideas in their journals. As they write, Mrs. Ruiz collects their homework. In her notebook, Ms. Lisle jots down observations: "Smooth transition, students are on-task from the start." Mrs. Ruiz asks students to share their ideas with the class as she compiles a list of daily activities in Spanish on large chart paper. Then she



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asks students to write a schedule of their week in Spanish that they will share with their language partner.

Next, Mrs. Ruiz pulls two colorful puppets from her bag. "Of course, you remember Jose and Valencia?" she asks the class in Spanish. "Sí" they nod. The puppets come to life as they talk about their daily activities in Spanish. "Oh, yesterday you went to see a movie? "Who did you go with?" "My brother. We ate ice cream afterwards." "What are you going to do this weekend?" "I'm going fishing with my grandpa." She models how the puppets use the vocabulary wall for help. "Now we're going to practice all together as a class," she tells the students in Spanish. Mrs. Ruiz asks in Spanish, "What did you do yesterday?" The class repeats the question. "I went to school." Once again, they repeat the answer. They practice asking the question and answering three times before practicing a new question and answer. She writes these sentences on the board for easy reference. Afterwards, students practice with their partners. Ms. Lisle writes: "First, model; second, whole-group practice; third, partner practice." Students feel comfortable participating in assignments because of scaffolding.

After school, Ms., Lisle and Mrs. Ruiz meet to debrief. "It was really helpful for me to see modeling in action," Ms. Lisle says. "I like how you wrote phrases on the board so students could easily refer to them if they got stuck during their dialogues. They seemed to respond well to the puppets, too."

"Yes, I think the puppets make language learning less intimidating and a lot more fun." Mrs. Ruiz continues, "As I was teaching the lesson and thinking back on our conversation yesterday, I realize dialogues are simplistic at this point in the year because of students' limited grammar and vocabulary. Nonetheless, I think it's important for them to practice speaking as much as possible in order to gain confidence and fluency."

"I agree," Ms. Lisle responds. "Next week I'm going to teach students how to make conversation flashcards, so they can refer to them if they get stuck."

"That's a great idea," exclaims Mrs. Ruiz. "So, looking ahead to next week, let's plan on observing each other again and let me know if you come across games for teaching past tense."

"Oh, I've got to show you this great website for vocabulary practice."

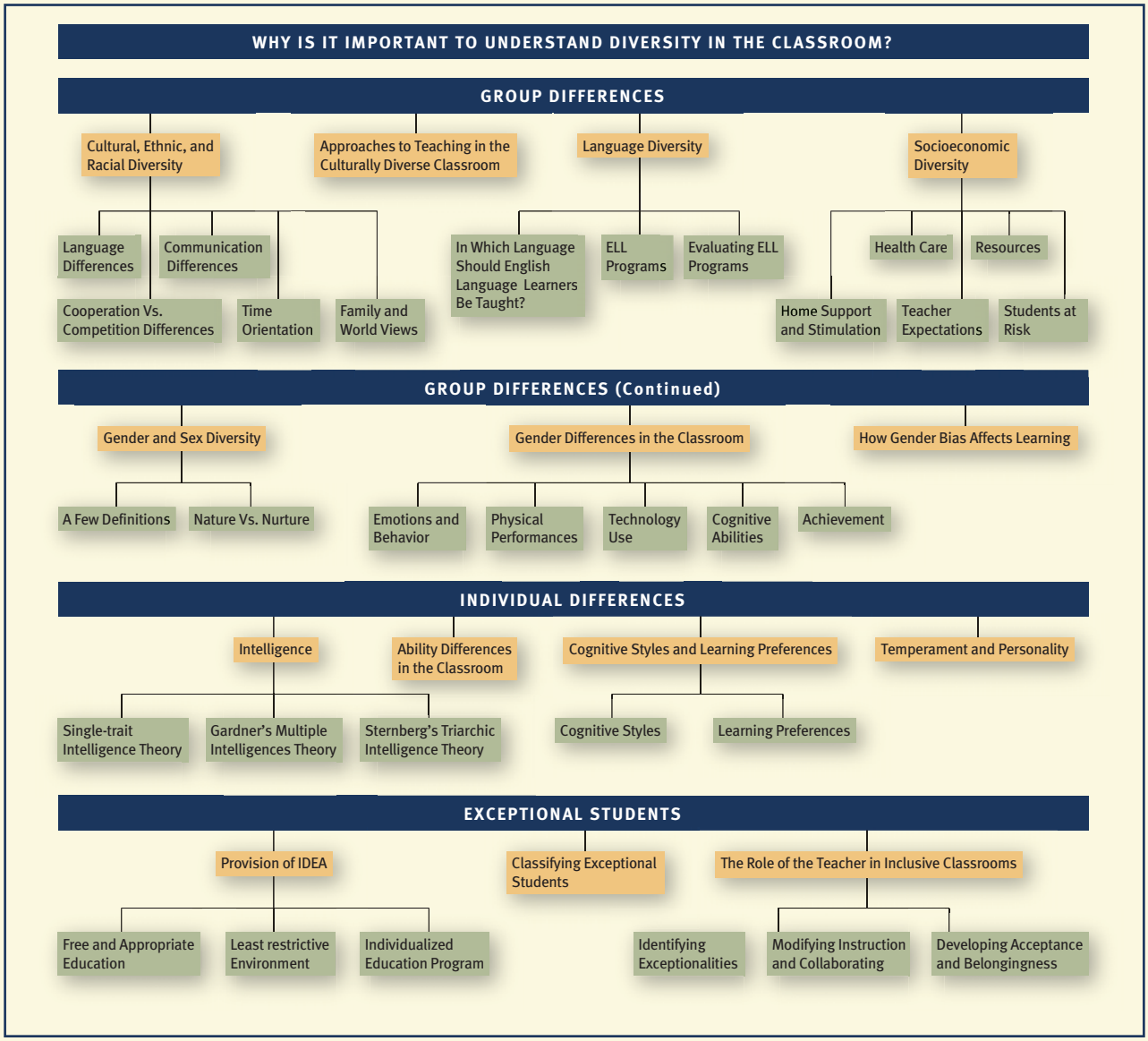
Mrs. Ruiz and Ms. Lisle continue to meet on a weekly basis throughout the school year to discuss observations, lesson plans, teaching strategies, tools, assessments, and issues that arise in the classroom.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What types of knowledge did the teachers draw on when making decisions?
2. Which professional skills did Mrs. Ruiz demonstrate in the case?
3. What strategies did Ms. Lisle use to reflect on her beliefs and practices?
4. In what ways did Ms. Lisle show awareness of challenges in the classroom?
5. Evaluate the overall effectiveness of Ms. Lisle's decision-making process by including both strengths and areas for improvement.

2 Understanding Diversity in the Classroom



Imagine You Are the Teacher

IT IS THE FIRST TEACHING year at Lincoln Elementary School for Ms. Branson. She has 30 fifth-graders of whom 13 are girls and 17 are boys, 12 participate in the free and reduced lunch program, 5 are English language learners, and 4 have individualized education programs (IEPs). As she plans her lesson on paragraph writing, she is trying to keep the special needs of each of her students in mind.

Because Jessica has a hearing impairment, Ms. Branson decides to make a written outline that includes the important parts of a paragraph and examples of good and bad paragraphs. She also decides to go over the outline several times because Fred and Alex have a reading disability. In her plan, there is also a note to herself to find a bigger pencil and wide-lined paper for Suzy, who requires these modifications according to her IEP. Based on past writing experiences, she expects Monica to finish writing her paragraph pretty quickly, so she needs to think about an appropriate second task to keep her busy and motivated—most likely, a creative writing assignment. Ms. Branson feels about ready for the lesson, except for Jung Ju, a recent immigrant from South Korea. He seems to be falling behind despite her efforts to help him develop English skills. After giving it some thought, she decides to have Jung Ju work with Tim; they seem to be good friends and Tim likes to help others.

- **Is it common for a beginning teacher to find such student diversity?**
- **What type of exceptionality is Monica likely to have?**
- **What could you do to better understand the cause of Jung Ju's learning difficulties?**

Think about how you would respond to these questions as you read through the chapter.



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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Explain the importance of understanding classroom diversity.
2. Explain the different group and individual sources of diversity.
3. Describe approaches to teaching in culturally and linguistically diverse classrooms.
4. Explain the provisions of the Individuals with Disabilities Education Act.
5. Explain the characteristics of students with exceptionalities.
6. Describe the role of the teacher in the inclusive classroom.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. How would you define intelligence?
2. Think of someone you know who has a higher or lower socioeconomic status than you. Do you think socioeconomic status has affected your learning or your friend's learning? If so, how?
3. Should teachers adapt lessons to students' learning preferences/styles (for example, a student who prefers to listen to books on tape than reading the printed book)?
4. Do you believe that boys and girls learn differently? If so, how?
5. As a teacher, how would you identify students with exceptionalities?

WHY IS IT IMPORTANT TO UNDERSTAND DIVERSITY IN THE CLASSROOM?

Regardless of where you teach, you will encounter many manifestations of student diversity in your classroom. The goal of this chapter is to help you build a framework to better understand the many sources of diversity in the classroom and to develop an open mind when interpreting students' thinking and behavior. Some teachers may believe that using a package of good teaching techniques can promote the learning of all students. However, expert teachers know that students differ in many fundamental ways that affect how they learn. Effective teachers will adapt their teaching to reach every student. Each one of your students will have an identity that is the product of his/her past experiences, abilities, personality, gender, social class, nationality, ethnicity, and religion. You will also bring your own identity to the classroom, including your professional knowledge and skills. Your task, as a teacher, will be to understand and connect with a roomful of diverse students and use your expertise to help them develop the knowledge and skills they need to succeed in our society. Today's teachers are likely to find classrooms as diverse as Ms. Branson's. Although the specific numbers will vary depending on where you teach, in the average U.S. classroom approximately 50% of students are girls and 50% boys, 40% of students are in free or reduced lunch programs, 20% are English language learners, and 13% are in special education programs (National Center for Education Statistics [NCES], 2006; U.S. Department of Education, 2008). To help organize our discussion of diversity, this chapter is divided into three sections: group differences, individual differences, and student exceptionalities.

GROUP DIFFERENCES

Group differences are the ways in which one group of people may be different from another group. For example, people from Russia have different characteristics (e.g., customs, values, dress code) than people from China or Cuba. Group differences include differences in culture, ethnicity, language, socioeconomic status (SES), and gender. Keep in mind that individuals belong to several groups at the same time. For instance, a person can be Hispanic American, female, and of high SES simultaneously and feel different degrees of identification with each one of these groups. Remember also that the uniqueness of all human beings stems from the great variation that is found within any group of reference. For example, compare yourself to a friend that you know well and who shares many group identifiers with you, such as someone of your same gender, ethnicity, and social class. Now think about the many ways in which you and your friend are different from each other. You will soon realize that group identification can only give teachers very broad clues about their students' thinking and behavior.

There are also many individual differences (which are discussed in the next section of this chapter). In sum, the information presented in this section is not intended to help you predict any particular student behavior or thinking but rather to make you aware of group differences that may affect students' learning and performance. The challenge is to keep the information presented in this section in mind without assuming that all students from a particular group will display the typical or average patterns found by research (not all children from Asian countries are good at math, for example). It's important not to reinforce a **stereotype**, a rigid, overly simplistic, and inevitably inaccurate representation of any particular group of individuals. Expert teachers never assume that a particular student will think or behave in a manner that is expected for his/her gender, culture, or SES but rather view each student as a unique individual and use what they know about group differences to help explain why students learn differently in school.

Stereotype

A rigid, overly simplistic, and inevitably inaccurate representation of any particular group of individuals.

Cultural, Ethnic, and Racial Diversity

Culture is a term that describes the knowledge, attitudes, values, and behaviors that characterize a group of people. It can be thought of as a schema or blueprint that guides the thinking and behavior of a group, including the ways to dress, work, play, and communicate verbally and nonverbally with others. Cultures are subject to change over time, especially when cultural groups come into contact with others (Lee, 1999; Rogoff, 2003). For example, the daily diet of many Europeans today includes potatoes, tomatoes, and chocolate. However, these food sources were unknown to Europeans until the 16th century, when they came in contact with the Native American cultures. Likewise, when speakers of different languages interact closely, it is typical for their languages to influence each other. For instance, the Romanian language was influenced by the Slavic languages spoken by neighboring tribes after the fall of the Roman Empire.

A major determinant of the culture in which people grow up is *ethnicity*, a term that refers to their common place of origin. Ethnic groups share a sense of interdependence due to the fact that they are comprised of people of the same race, national origin, or religious background (NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992). For instance, since 2000, U.S. census respondents have been allowed to identify their ethnicity as being Hispanic or Latino, a category that includes "a person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race" (Office of Management and Budget, 1997). Ethnic groups may be made up of subgroups with distinctive characteristics. For instance, there are significant differences in appearance, customs, and beliefs among Hispanics who may distinguish themselves as Chicano, Mexicano, of Mexican descent, or of Spanish descent (Losey, 1995). *Race* is the category of people who share biologically transmitted traits such as skin color or hair texture (Macionis, 2006). However, there are no biologically pure races and, depending on the definition, people identify between 3 and 300 different races (Betancourt & Lopez, 1993). In fact, the original U.S. census



Bruno Morandi/Getty Images

In which ways might the values, communication styles, and worldviews of culturally diverse students present challenges and create opportunities in the classroom?

in 1790 had only three racial categories: white, black, and Indian. However, since 2000, census respondents are allowed to indicate their racial identity by selecting one or more of the following six categories: American Indian or Alaska Native; Asian; black or African-American; Native Hawaiian or other Pacific Islander; white; and other.

Today's classrooms are likely to have a wide array of cultural, ethnic, and racial diversity among students. Teachers need to understand that ethnicity cannot be judged on the basis of physical characteristics (white skin or brown skin, for example) or birthplace (Korea, Chile, or the United States) alone but rather by learning about the extent to which students participate in various cultural and ethnic-group activities (Gutierrez & Rogoff, 2003; Wlodkowski & Ginsberg, 1995). Depending on their background, students may participate actively in two or more cultures (A. M. Lopez, 2003a; Root, 1999). For instance, in one study, over a third of the students in a public high school in California reported being of mixed heritage and identified with more than one cultural background (A. M. Lopez, 2003b).

Because most schools in the United States are based largely on European-American, middle-SES culture, also known as *mainstream* culture, students matching this cultural background will be those who adapt easily to the classroom environment. The larger the difference between students' home culture and the mainstream culture, the more likely they will experience some type of *culture shock,* a term used to describe the anxiety and confusion felt when people have to operate within an entirely different cultural or social environment, such as a foreign country. Culture shock can threaten students' adjustment to school and achievement (Casanova, 1987; Ramsey, 1987), especially when there is a cultural mismatch between the teacher and the student, because teachers are likely to misinterpret ethnic minority behaviors by viewing the world from their own cultural frame of mind (Ogbu, 1992). Although this is understandable, it may lead teachers to unfairly judge students' cultural practices as less desirable or inferior. The next sections describe some examples of cultural diversity to help you become more aware of the potential differences in your students' thinking and behavior. Keep in mind that there is significant variation within ethnic groups. One of the skills of a reflective practitioner is to carefully consider individual differences when interpreting students' verbal and nonverbal behavior and to avoid forming stereotypes about any group. Before reading any further, look at the photo on this page and take a few minutes to reflect on your beliefs about ethnic and cultural differences.

Language Differences. Perhaps the most obvious cultural difference is students' language background. The number of native student languages (other than English) in U. S. school districts ranges from 1 to 119, with the average number of languages represented in individual districts being 8 (Hopstock & Stephenson, 2003). Recall from Chapter 1 that 8% of public school students speak little or no English at home (NCES, 2006). Even when English is spoken at home, students may speak **dialects**, which are special forms of English with distinctive pronunciations and grammatical structures. Dialects are usually the preferred way to communicate in the everyday life of a cultural group and are considered to be part of group identity (McAlpine, 1992; Ogbu, 1999). An example is African-American Vernacular English, also known as Black English or Ebonics.

Dialect

A special form of a language with distinctive pronunciations and grammatical structures.

Teachers may find it difficult to perceive speakers of other dialects in the same positive light as those students who speak *Standard English,* the form of the English language that is thought to be the norm for educated speakers (Gollnick & Chinn, 2002). The attitude a teacher displays toward students whose first language is not English or who speak a dialect of English shapes how these students perceive school and how they are supported (or not) as learners (Gupta, 1999). Respecting a student's first language is essential for building a solid classroom community. Experts argue that it is very important to clearly communicate with students about

when it is appropriate for them to use Standard English or their first language. Teachers must communicate their expectations and their rationale (Pugach, 2006). Because success in mainstream society is facilitated when adults have good Standard English proficiency, ideally, students should be encouraged to develop and use both, depending on the communication context and purpose (Casanova, 1987; Ogbu, 1999). We discuss different ways to instruct students with varying language needs in the upcoming section on language diversity.

Communication Differences. Regardless of the language used, different cultural and ethnic groups have diverse verbal and nonverbal communication practices. For instance, although mainstream culture is characterized by frequent talking and filling up of silent spaces with small talk, many Native American and aboriginal cultures place great value on silence (Basso, 1972; Popat & Dinnage, 2006; Trawick-Smith, 2003). In some cases, excessive talking can even be interpreted as a sign of immaturity or lower intelligence, such as in many Japanese communities and the Inuit culture (Crago, 1988; Minami & McCabe, 1996). Mexican-American, Southeast Asian, and African-American cultures in the southeast part of the country and many Puerto Ricans, Mexican-Americans, and Native Americans in the United States teach children not to engage in adult conversations unless their participation is solicited (Delgado-Gaitan, 1994; Grant & Gomez, 2001; Hidalgo, Siu, Bright, Swap, & Epstein, 1995; Lomawaima, 1995). In addition, the mainstream classroom practice of interacting by asking students questions to evaluate their understanding may be unfamiliar in some cultures or even run against their expectations. This is the case of people from some African-American and Mexican cultures, who consider asking questions to be appropriate only when the initiator does not know the answer to the question (Losey, 1995; Rogoff, 2003). Another source of cultural diversity comes from the amount of wait time, the time given to respond to a question. According to research, teachers' typical wait time is a second (Rowe, 1987). When no answer is produced quickly, they either provide the answer themselves or call on another student. However, some cultures express their respect for others by giving significant time to respond to a question (Gilliland, 1999; Grant & Gomez, 2001; Tharp, 1989). As you will learn in Chapter 6, it is important that teachers leave enough wait time for students' responses not only because of the potential cultural differences in this regard but also as an effective method to engage them in deeper thinking.

In some cultures, it is inappropriate for children to make eye contact with an adult who speaks to them (Gilliland, 1999; Irujo, 1988; Torres-Guzman, 1998). Therefore, teachers should be careful to not quickly judge lack of eye contact as a sign of passive listening or disrespect. This nonverbal behavior could signify quite the opposite. Likewise, depending on the culture, interrupting rather than taking turns to speak may be an acceptable way to communicate. For example in some African-American, Puerto Rican, and Jewish families, adults and children speak simultaneously, presumably because waiting for one's turn can exclude the person from the conversation (Condon & Yousef, 1975; Hale-Benson, 1986; Slonim, 1991).

Cooperation versus Competition Differences. Because most classrooms emphasize individual performance, this may lead to competition among students (see Figure 2.1). As you will learn in Chapter 9, motivation experts discourage competitiveness in the classroom, which is found to detract from students' intrinsic motivation to learn (Wentzel, 1999). A competitive orientation can be especially detrimental to cultures that emphasize cooperation such as some Mexican-American, Native American, South Asian, and Pacific Island groups (Aronson, Wilson, & Akert, 2005; McDevitt & Ormrod, 2004). In these cultures, children are taught the value of group rather than individual achievement; consequently, students will be more likely to feel comfortable working with others, helping one another on assignments, or sharing knowledge (Deyhle & Margonis, 1995; Lipka with Mohatt & the Ciulistet Group, 1998; Rogoff, 2003). If criticized for sharing their work with peers (which many mainstream teachers misinterpret as "cheating") or made to compete rather than cooperate with their peers,

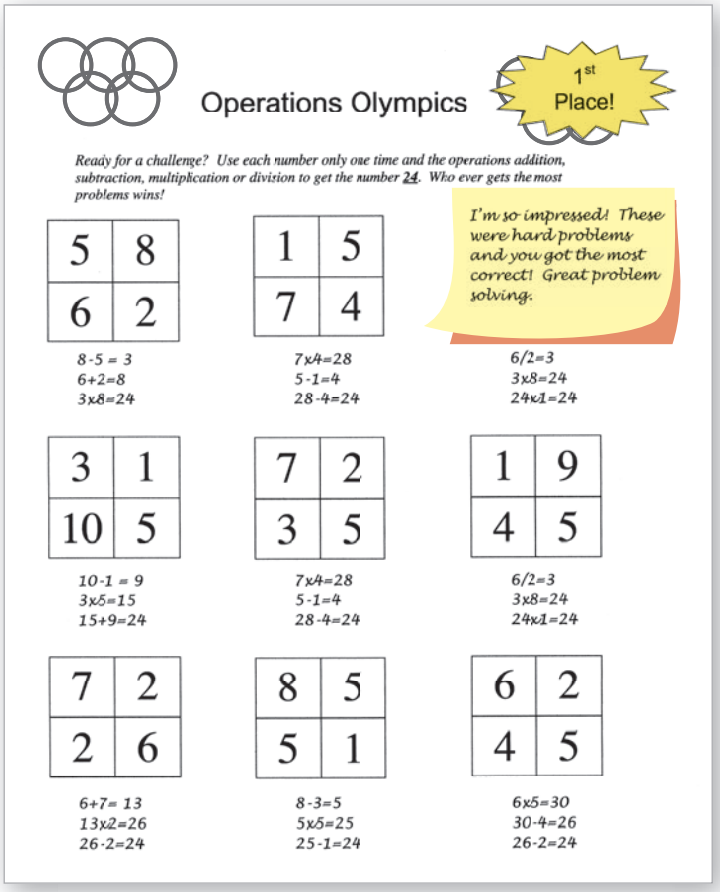


FIGURE 2.1 **Should teachers assume that all students will respond positively to a competitive orientation in the classroom? Why or why not?**

these students may rebel or withdraw from further attempts to succeed in school (Grossman, 1990; McIntyre, 1996). Research finds that these students will also respond more positively to praise that is focused on their family, community, or cooperative learning group rather than on their individual accomplishments (Bennett, 1999; Vasquez, 1990). For instance, Mr. Duncan is reviewing the progress of one of his reading groups. He brings together all group members and says, "I am very pleased with your work. You are all working really well together. You have read five stories and increased your vocabulary by 20 words. That is a lot of improvement in just two weeks! Congratulations!"

Time Orientation. American mainstream culture is very time oriented. Children are taught to monitor and make the most out of their time, and individuals who are better time managers and work efficiently are rewarded by society. Typical classrooms also reflect this orientation by having a set schedule, with starting and ending times for each class, project, or activity, and establishing deadlines to turn in homework, papers, and other assignments. However, for some cultures, this view may be limiting, rigid, or even upsetting (Bennett, 1999). For instance, Principal Nez is a Navajo woman who strives to help her non-Navajo teachers understand the traditions and worldviews of her community. At Eagle Rock Middle School, 98% of the students are Navajo. Ms. Smith, a recently hired sixth-grade teacher from the Teach for America program (www.teachforamerica.org), is having her first meeting with Principal Nez to learn more about her future students. Among the many helpful tips, the principal offers the following: Use time frames for turning in work instead of due dates (e.g., accept papers from September 23 to 29 rather than have papers due on September 25); give students partial credit for completing work within a reasonable delay (e.g., establish a penalty of 10% of the grade for finishing an assignment after three days from the deadline); and, when possible, allow students to work at their own pace.

Family and Worldviews. Although most cultures value school achievement highly and parents encourage their children to do well at school, for some cultural groups, family needs may take precedence over academic needs (Duran & Weffer, 1992; Goldenberg, Gallimore, Reese, & Garnier, 2001; Yee, 1992). Therefore, it is not unusual to observe students in many Hispanic, Native American, and Asian communities to leave school when their family requires their assistance (Banks & Banks, 2004; Fuligni, 1998). Additional conflict between academic values and cultural values may arise for students from traditional Native American culture, as they are expected to participate in the ceremonies of their community and develop art, dance, and other traditional skills (Kirschenbaum, 1989; Reid, 1989). For instance, tenth-grader Takoda is torn. His mom just called to tell him that his grandfather died and that his family will be going to the reservation for the Keeping of the Soul ceremonies. Takoda knows that this means missing the next two weeks of school and midterm exams. He feels that he has to honor his grandfather and family, but he is worried about how he will make up for missed schoolwork and tests, and he is afraid to lose his spot on the basketball team for missing so much practice.

Finally, students may not only show differences in their behaviors but will have different beliefs and assumptions about the world. For instance, depending on their culture, children will believe that hurricanes are the result of natural forces or believe that they are a consequence of people's actions or supernatural forces, as illustrated by the following example (Lee, 1999). In Mrs. Fredricks's social studies class, they are discussing the increase in hurricanes over the last three years and the impact this has had on coastal societies. Mrs. Fredricks explains, "Scientists believe that the oceans are getting warmer. This means that there is more heat in the atmosphere for these large storms to grow, making stronger hurricanes and more hurricanes. If this is true, what do you think the future holds for coastal cities?" Tamara replies, "I don't think that is true. My dad told me that the hurricanes are sent by God. He said that Katrina was a message from God reminding us that we need to be good. If people were good, hurricanes would not happen." As you see, the different worldviews that students bring to the classroom will affect the ways they interpret what is taught.

Cultural Deficit Model

A model used to explain the achievement gap as the result of a home culture that fails to prepare students to succeed academically as compared to the mainstream culture.

Achievement Gap

A term used to describe the difference in academic achievement between African American or Latino students and white, middle-SES students.

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT



Using the categories about cultural differences discussed in this chapter, think about a time you have experienced culture shock in a school setting. Consider elementary school, middle school, high school, and college. What was the situation and why did you experience culture shock? How did you adapt? How did a teacher or a peer help you adjust? Be prepared with examples to discuss in class.

Self-Fulfilling Prophecy

The process by which people's expectations about a person lead them to elict behavior that confirms the expectations.

Approaches to Teaching in the Culturally Diverse Classroom

During the 1960s and 1970s, educators felt that minority students were having problems at school because they were not assimilated into mainstream American culture, whereas many ethnic groups expressed their interest in maintaining their culture and identity and rejected the idea of becoming completely assimilated into the mainstream culture. During that time, students were described as "disadvantaged" or "handicapped," and a **cultural deficit model** was used to explain the achievement gap as the result of a home culture that failed to prepare them to succeed academically. The term **achievement gap** is commonly used to describe the difference in academic achievement between African-American or Latino students and white, middle-SES students. Because the cultural deficit model focuses on what students and their families *do not* have or *cannot* do, teachers who take that approach are likely to interact differently with diverse students. For instance, they may call on them less frequently during discussions, give them less time to construct responses to questions, identify and correct misbehaviors more frequently and more harshly, give them lower grades, engage in less informal talk, and fail to establish close relationships with their families (Pugach, 2006). Nieto (2004) points out that most teachers do not adopt a deficit model consciously, yet, once the low expectations for cultural minority students have been set, the result can be a **self-fulfilling prophecy**: Low-expectation minority students perform poorly and confirm the teacher's original bias against them.

Today, most educators reject the cultural deficit model. Some well-intentioned teachers take a "neutral" position, claiming that they "don't see color" in their classroom and treat all

How might teachers' low expectations affect students' learning and achievement?



Elizabeth Crews/The Image Works

What's in a name?

What stories are there behind your name? In a short essay explain what significance your name has to you. You could include information about what your name means or how you got your name. You could also describe how you feel about your name.

I have a few names. My first name is Caroline. My parents named me this because when my parents first moved here from Taiwan North Carolina was the first place that they lived. I also have a Chinese name which is like my middle name. But its also the name that my relatives all call me. My Chinese name is Kuan-Chi. All of my cousins have the name Kuan in their name. It means crown. Chii is just my name and it means outstanding. I go to Chinese school on Saturdays and we learned to write our names in characters. You don't use letters like you do here for Chinese names. Characters all come from pictures and this is how to write the characters in my name.

冠 琦



FIGURE 2.2 The varied experiences and knowledge that students from other countries and cultures bring to the classroom are assets for teachers and peers.

students as individuals (Paley, 2000). The problem with this view is that *all* students have a color (white is a color, too!) that is central to their life experiences and affects how they make sense of the world. By ignoring color or cultural diversity in the classroom, teachers take an easy way out and free themselves from reflecting on issues they may find uncomfortable. Others, instead, value the assets of different cultural communities and believe that culturally diverse students can maintain their cultural identity while still being successful in school (see figure 2.2). Therefore, they are committed to learn about the differences among their students and use this knowledge to create the conditions in which all have the opportunity to achieve well. This approach will be most important if you work with students who belong to a cultural, linguistic, or socioeconomic group that is different from your own. By acknowledging that each one of your students is a unique individual with distinctive strengths and connecting your teaching to their experiences, you can play an important role in narrowing the achievement gap across ethnic and socioeconomic lines.

One approach that was born from the need to respond to the increasing diversity of the student population and the need to offer equal opportunity to all students is *multicultural education*. Multicultural education is not a specific educational program but rather "a wide variety of programs and practices related to educational equity, women, ethnic groups, language minorities, low-income groups, and people with disabilities" (Banks & Banks, 2007, p. 7). Figure 2.3 shows the five dimensions of multicultural education according to Banks and Banks (2007). The ultimate goal of this approach is to help students develop the knowledge, attitudes, and skills needed to function within their culture, other cultures, and the global community.

There is no best approach to creating a multicultural classroom but rather quality practices have been recognized to help reduce racism, sexism, and prejudice while providing equal opportunities to learn for all students. For example, Ladson-Billings (1990, 1992, 1995) uses the term *culturally relevant pedagogy* to describe the practices of exemplar teachers who served an African-American community in California. The basic principles of culturally relevant pedagogy are the following:

1. Learners must experience academic success.
2. Learners must maintain their cultural competence.
3. Learners must develop a broad sociopolitical consciousness to be able to critique the social norms, values, and institutions that produce and maintain social inequities.

Gay (2000) describes an approach called *culturally responsive teaching* consisting of using the "cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 29). Teachers can find a massive reservoir of instructional materials and pedagogies about how to implement multicultural education in the classroom on the National Association for Multicultural Education website



FIGURE 2.3 **Five dimensions of multicultural education.**

Source: Reprinted with permission of John Wiley & Sons, Inc.

(http://www.nameorg.org). Effective multicultural educators strive to know their students through interaction and exploration, examine their own attitudes and beliefs about cultural diversity, resist the tendency to make judgments about students' behaviors when these are in conflict with their own, and help students develop the same sensitivity toward each other. A synthesis of the characteristics of effective multicultural teachers is presented in Table 2.1 (Garcia, 1999).

Even when classrooms do not include students from different ethnic backgrounds, teachers will still need to address conflict, differences, and biases about ethnic groups not represented in the classroom (Pugach, 2006). Teachers can include in the curriculum multiple perspectives on knowledge and the role of social justice. Teachers who work in monocultural white schools may need to decide which perspectives on history or social sciences will be discussed and be prepared to address students' responses, especially when they disclose misconceptions or biases. For example, Mr. Costello, an

TABLE 2.1

Characteristics of effective multicultural teachers.

- Show deep caring for all students.
- Provide clear learning objectives.
- Communicate high expectations for all students.
- Monitor progress and provide immediate feedback.
- Explain the rationale for instructional methods.
- Embed instruction in culturally meaningful contexts.
- Provide opportunities for active learning in groups.
- Are committed to their students during and after school hours.
- Use materials and practices that are culturally relevant.
- Have several years of experience teaching diverse students.

American history teacher in a monocultural white school, has decided to discuss the role of the Buffalo Soldiers, primarily black military units serving from 1866 to 1948. After reading a passage describing their history, he asks the students to compare how black soldiers' experience may have differed from that of white soldiers.

"Well, I think the black soldiers should consider themselves lucky because they didn't have to fight in the trenches in Europe. They got to hang back and supply the troops with what they needed. No one was shooting at them," Jenny responded.

"Maybe, but that wasn't what they were trained to do, right? Is that fair?" Mr. Costello prompted.

"I guess it's not fair, but at least they got to serve their country. Isn't that what they wanted to do?" Jenny asked.

Tom responds, "But they were trained to do much more than that, and the only reason they weren't allowed is because of their skin color. Its kinda like training eight years to be a doctor and then being told you can't really practice medicine because your hair is curly. Plus, they didn't get to be officers. Also, they died serving like the white soldiers but they didn't get their medals and recognition."

As you see, teachers who work in monocultural minority schools will also need to be prepared to discuss issues of equity, prejudice, and bias because social issues are likely to permeate the classroom conversation. In sum, regardless of having or not having culturally diverse students in their classroom, teachers have the responsibility to work with their students to achieve a more harmonious and tolerant society.

Language Diversity

Language Minority

A minority group whose primary language is different than that of the majority group.

Until 1979, 9% of students in the United States were from families whose primary language was other than English, also known as **language minority** students. By 2004, the percentage of language minorities had risen to 19%, and projections estimate that by 2026, 25% of students will come from families in which the primary home language is not English (NCES, 2006). The number of school-age children who spoke English with difficulty has also increased, from 3% in 1979 to 5% in 2004. Students whose English proficiency level is lower than what it should be to succeed in English-only educational programs have been called limited English proficient (LEP), English language learners (ELLs), or considered to be learning English as a second language (ESL). The No Child Left Behind (NCLB) Act gives states flexibility in defining the students who constitute the LEP or ELL subgroup and makes state education agencies responsible for increasing ELLs' English language proficiency and core content knowledge. Similarly, the law gives states, districts, and schools flexibility to implement any language instruction program that is based on scientifically based research on teaching English to LEP children. These programs may use both English and the student's home language and may include English-proficient students to allow all students to become language proficient. Teaching language minority students to read and write well in English is an urgent challenge because some language minority students are not faring well in U.S. schools. For instance, whereas 10% of students who speak English at home fail to complete high school, the percentage is five times as high (51%) for language minority students who speak English with difficulty (August & Shanahan, 2006).

In Which Language Should ELLs Be Taught? The increasing number of ELLs presents a dilemma to the education system. On one hand, many educators and policymakers feel that the language of instruction should be English only, because English skills are essential to achievement in every academic subject and to educational and economic opportunities in the United States. On the other hand, many language minority parents feel strongly about the need to instruct their children in their home language as a way to maintain their cultural identity. Due to the political nature of this question, it is difficult to come up with an unequivocal answer. In which language do you think ELLs should be taught? Keep reading and you will find out about the advantages and disadvantages of different English language learner programs.

English Language Learner Programs. Historically, the most common method used in the United States for ELLs is *immersion*, where ELLs are immersed in an English-only classroom. An alternative is structured English immersion (SEI) programs, which are carefully designed to build students' vocabulary and language skills (Echevarria, Vogt, & Short, 2000). Specifically, SEI programs teach English at a level that is appropriate to the class of ELLs, teachers try to maximize instruction in English over the first three years of instruction, and classroom aides who speak a non-English language provide instructional support to children having temporary difficulties following a lesson in English (Baker, 1998). SEI has been successfully implemented in Canada (Genesee, Holobow, Lambert, & Chartrand, 1989), Texas (El Paso Independent School District, 1992), and New York (Tobias, 1994). A third, promising solution to help language minority students develop literacy in both their first and second language is **bilingual education**, instructional programs where ELLs are provided instruction in their first language while they learn English. Bilingual education comes in many flavors. Each of these approaches is listed in Table 2.2.

Bilingual Education

Instructional programs where students are provided instruction in their first language as well as in the language of the majority.

The very idea of bilingual education, however, is very controversial. Its legislative foundation comes from the 1968 Title VII Elementary and Secondary Education Act, which supported bilingual education for all language minority students, especially for those of lower SES (Crawford, 1991). This law was followed up by the 1974 *Lau v. Nichols* court decision, which resulted in the Lau Remedies, a document including specific guidelines to meet the needs of language minority students (Hakuta, 1986). Many Americans, however, believe that English-only or English immersion programs, a "sink-or-swim" method, worked in the past and should work now as well (Crawford, 1991; Hakuta, 1986). People who hold this position have sponsored active political efforts to eradicate bilingual education through state referendums and in some cases, such as in Arizona, California, and Massachusetts, have succeeded. Before reading the next paragraph, take a few minutes to reflect on the benefits of bilingual education from the standpoint of today's classroom teacher.

Experts argue that the pros of bilingual education are to allow ELLs to keep up with their peers in core academic topics while they develop proficient English skills. If this support is not given, students will not be able to access their prior knowledge, which is the foundation for interpreting new information (Cummins, 1996). Students' home language should never be sacrificed, since it is the only mechanism through which they

TABLE 2.2

Bilingual education programs.

BILINGUAL EDUCATION PROGRAM	DEFINITION
Transitional bilingual education	A common yet declining method that consists of teaching children reading and other subjects in their first language (typically Spanish) for a few years and then transitioning them to English-only classrooms.
Early-exit bilingual program	A program in which first-language instruction is given in kindergarten and first grade and phased out by the second grade.
Late-exit bilingual program	A program in which students receive decreased instructional time in their first language throughout their elementary experience (e.g., 100% in kindergarten, 75% in grades 1 and 2, 60% in grade 3, and 40% or less in grades 4 and 5).
Pullout programs	Students who have enough English proficiency receive most instruction in the regular classroom and are pulled out for additional language support (Peregoy & Boyle, 2005).
Paired bilingual education	Children are taught in both their native language and English at different times of the schoolday.
Dual-language programs, also called two-way programs	These programs teach all students in English and another language (typically Spanish) with the goal of developing dual-language proficiency in all students (Calderón & Minaya-Rowe, 2003; Lessow-Hurley, 2005).

make sense of their own world experiences (Macedo, 1991). Moreover, not providing language minority students with a voice in the classroom can hinder their need to feel accepted, which, as you will learn in Chapter 10, is one of the learner-based conditions to become motivated to learn (Ryan & Deci, 2000).

Additional arguments in favor of bilingual education come from research in language development, which shows that the more proficient students are in their first language, the easier it is to learn a second language (Bozzone, 1995), and that adding English to a well-developed first language can enhance thinking skills and metalinguistic skills, the ability to think about language itself (Bialystok, 2001; Bowey, 1986; Diaz & Klinger, 1991). Furthermore, bilingualism can increase student interaction in cases where students speak only one of two different languages (Doyle, 1982).

Evaluating ELL Programs. The arguments mentioned in the previous section suggest that bilingual education programs can have positive results for both ELLs and native English speakers (Snow, 1986). But do they actually show these benefits? Let's take a look at what the research says. On the one hand, total immersion helps English-speaking students who live in their native country become proficient in a second language fairly quickly (Collier, 1992; Cunningham & Graham, 2000; Krashen, 1996; Thomas, Collier, & Abbott, 1993). On the other hand, non-English-speaking students who have recently immigrated to an English-speaking country show higher academic achievement, greater self-esteem, and a more positive attitude toward school when taught with bilingual education (Marsh, Hau, & Kong, 2002; Snow, 1990; Wright & Taylor, 1995). The different results for the two groups seems to stem from the fact that English speakers who are learning a second language in their native country still have many opportunities to keep developing their first language. Recent immigrants, in contrast, only have the opportunity to use their native language with their family; thus, they are likely to lose proficiency in their first language before developing proficiency in English (Perez, 1998; Wright, Taylor, & Macarthur, 2000).

The benefits of bilingual education are also confirmed by a recent analysis of ELL programs (Rolstad, Mahoney, & Glass, 2005) and by a report from the National Literacy Panel on Language-Minority Children and Youth (August & Shanahan, 2006). In both studies, after reviewing the extant research on bilingualism, the researchers concluded that bilingual education programs are effective in promoting academic achievement as compared to English-only programs and transitional bilingual education programs. A caveat, however, is that the programs that were compared may have differed in many ways, such as the diversity of languages spoken by the students, the geographic location of the school, the quality of instruction, the instructional materials used, and so on. More controlled research (i.e., experimental, quasi-experimental) is needed to better understand the effectiveness of bilingual education.

What types of programs are currently in use for English language learners and how effective are they?

What are some known limitations of bilingual education? One limitation is the lack of teachers who are fluent bilinguals (Carrier & Cohen, 2005; Flores, Keehn, & Perez, 2002). A second limitation is the difficulty of the transition from a bilingual to an English-only program. Although it takes about two years to develop basic interpersonal skills in a language, students may need an additional five to seven years to develop academic language proficiency, a skill that allows students to handle complex and abstract thinking (Cummins, 2000). Transitional programs are often too short to prepare students to successfully learn in English (Gersten & Woodward, 1995; Padilla, 2006). Third, the positive effects of bilingual education seem to be modest, at best, and even bilingual education advocates recognize that high-quality English-only instruction can produce similar outcomes for ELLs (Hayes & Salazar, 2001; Lesaux & Siegel, 2003). Also, remember that there is diversity within language groups and that immigrant children will vary in their ability to learn English, depending, among other factors, on their experiences with literacy and schooling in their first language (Lessow-Hurley, 2005). For instance, children from lower-case socioeconomic backgrounds have more difficulty developing English proficiency than their more well-off counterparts (Rueda & Yaden, 2006). For these children, bilingual education



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TABLE 2.3

Characteristics of different social classes.

	UPPER CLASS	MIDDLE CLASS	WORKING CLASS	LOWER CLASS
Income	$160,000+	$80,000–$160,000 (1/2) $40,000–$80,000 (1/2)	$25,000–$40,000	Below $25,000
Occupation	Corporate, professional, family money	White-collar, skilled blue-collar	Blue-collar	Minimum wage, unskilled labor
Education	College and professional school	High school, college, or professional school	High school	High school or less
Home ownership	At least one home	Usually own home	About half own a home	No
Health coverage	Full	Usually	Limited	No
Political power	National, state, or, local	State or local	Limited	No

Source: Adapted from Macionis (2006).

programs may need to be longer and focused on a combination of effective teaching strategies and positive, warm encouragement (Chamot & O'Malley, 1996; Goldenberg, 1996).

Socioeconomic Diversity

Sociologists often classify individuals into upper class, middle class, working class, and lower class, depending on their relative wealth, power, and prestige. Table 2.3 shows selected characteristics for each one of these groups (Macionis, 2006). The term **socioeconomic status (SES)** is also used to categorize individuals based on their economic, educational, and occupational characteristics. SES is one of the most powerful factors influencing student achievement, often shadowing other group differences such as those stemming from ethnic background or gender. For example, upper-SES European-Americans share many more characteristics with upper-SES African-Americans and Hispanic-Americans than with lower-SES European-Americans, including how they spend their vacation time, the sports they play, and how and where they socialize. At school, SES predicts students' intelligence and achievement scores, grades, and dropout and suspension rates (Macionis, 2006).

Socioeconomic Status (SES)

A categorization of individuals based on their economic, educational, and occupational characteristics.

Health Care. As shown in Figure 2.4, about 17% of children under 18 years of age in the United States were living in families below the poverty line in 2006, with a rate of almost

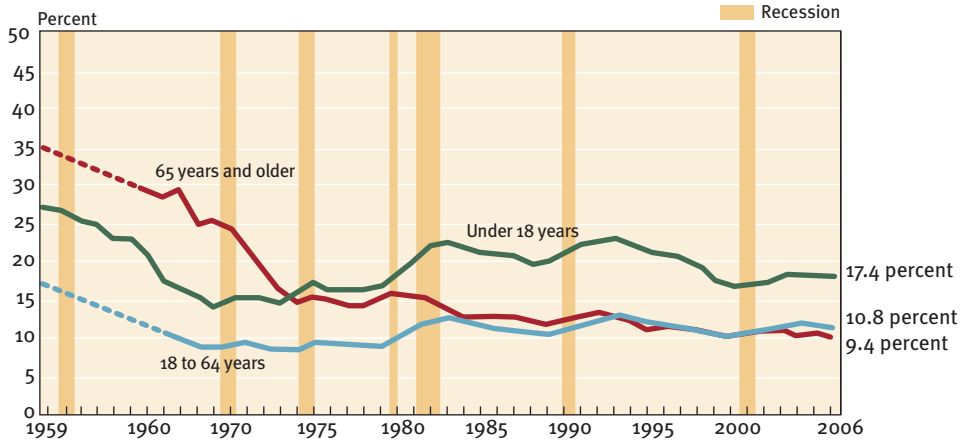
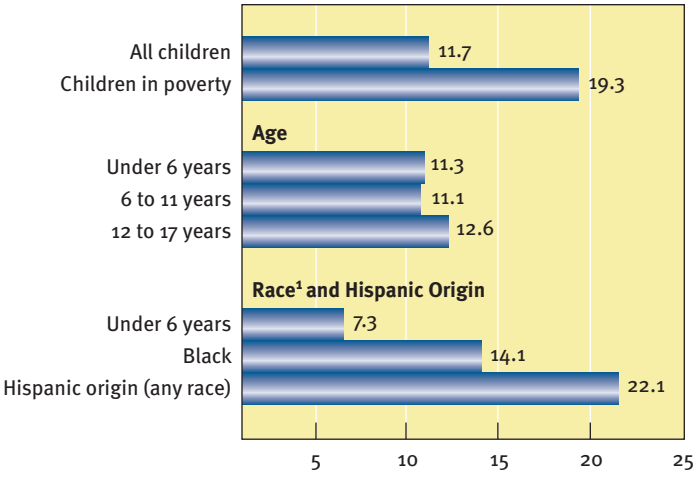


FIGURE 2.4 Poverty rates by age from 1959 to 2006.



[1]Federal surveys now give respondents the option of reporting more than one race. Therefore, two basic ways of defining a race group are possible. A group such as Asian may be defined as those who reported Asian and no other race (the race-alone or single-race concept) or as those who reported Asian regardless of whether they also reported another race (the race-alone-or-in-combination concept). This table shows data using the first approach (race alone).

FIGURE 2.5 Percentage of uninsured children by poverty status, age, race, and Hispanic origin—2006.

Source: U.S. Census Bureau, Current Population Survey, 2007. Annual Social and Economic Supplement.

53% for single-mother families, approximately 33% for African-Americans, 27% for Hispanics, 11% for Asians and Pacific Islanders, and 10% for whites (DeNavas-Walt, Proctor, & Smith, 2007). Low-SES families have less access to good prenatal and infant health care and nutrition and are more likely to have premature babies, and children in poverty are more likely to be exposed to legal and illegal drugs before birth. Figure 2.5 shows that children in poverty were more likely to be uninsured than the population of all uninsured children in 2006 (DeNavas-Walt et al., 2007). These factors are all associated with impairments in higher cognitive development and with lower school achievement (McLoyd, 1998). Poor children do not receive medical or dental care regularly and suffer from untreated illnesses at a rate that is estimated to be at least twice that of middle-SES children (Sanders-Phillips, 1989).

Resources. Low-SES families have less access to high-quality preschool care for their children, and this can place them at a disadvantage in intellectual and social development (Duncan & Brooks-Gunn, 2000). In addition, the schools that low-SES children attend often have fewer resources than those in higher-income neighborhoods (McLoyd, Aikens, & Burton, 2006). Although low- and high-SES children are found to make similar gains in reading and math during the school year, low-SES children fall behind when schools are closed in the summer (Entwisle, Alexander, & Olson, 1997). This results from the limited number of neighborhood and home resources of lower-SES families, including computers, books, museums, and libraries, which has a negative impact on students' opportunities to learn outside of school. To facilitate continuous learning, some experts have recommended year-round education, with students having several short vacations rather than one three-month summer break (Weaver, 1992).

What type of learning experiences can be offered over the summer months to prevent students from falling behind in school?



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Home Support and Stimulation. Lack of emotional and cognitive stimulation at home can account for up to a half of low-SES children's academic disadvantages (Korenman, Miller, & Sjaastad, 1995). One study with over 1,200 adolescents found that poverty was related to lower math and reading scores and less cognitively stimulating home environments (Eamon, 2002). Higher-SES parents are, on average, more involved in their children's school activities than lower-SES parents (Brown, Anfara, & Roney, 2004; Diamond & Gomez, 2004). This is partly because parents in low-SES households need to work at two or more jobs (Weiss et al., 2003) and partly because many low-SES parents had limited education themselves, so they are not as capable of helping their children with schoolwork (Finders & Lewis, 1994). On average, higher-SES parents talk with more elaborated language and encourage their children to engage in problem solving more than do lower-SES parents (McDevitt & Ormrod, 2004). They also have positive expectations for their children and encourage them to graduate from high school and attend college (Brown et al., 2004; McGrath, Swisher, Elder, & Conger, 2001). In contrast, many low-SES students may not place a high value on education (Graham, 1997) and may have no definite career plans after leaving school (Pollard, 1993).

Teacher Expectations. In low-income neighborhoods, middle-SES teachers are likely to have low expectations for these learners and fail to provide sufficient stimulation to promote the development of high-order thinking skills (Persell, 1997; Spring, 2006). Similar to the case of cultural minority students, once these low expectations have been set, the result is a self-fulfilling prophecy: Teachers subtly communicate these expectations to students in a variety of ways, and students come to behave in a way that is consistent with such expectations (Rosenthal & Jacobson, 1968).

Students at Risk. Children from disadvantaged homes are less likely to have good nutrition, access to good health care, and opportunities to learn both outside of school and at school. They are also typically held to lower expectations and likely to live in impoverished neighborhoods where crime prevails and positive role models are absent (Vernez, 1998). These factors place students at risk of failing to complete their education with the skills necessary to succeed in today's society. However, remember that there is diversity within socioeconomic groups. Not all poor families lack appropriate health and nutrition or opportunities to learn for their children, and many parents, despite being poor, are able to help their children succeed. In fact, some low-SES parents are actively invested in their children's learning and education, and their children achieve at higher levels as a result (Jimerson, Egeland, & Teo, 1999). The opposite is also true. Coming from a high-SES family does not guarantee academic success. Many children will not get the stimulation, caring, and support found among the average high-SES families. Parents' attitudes and behaviors can be more predictive of students' achievement than their SES (White, 1982). Furthermore, the many negative factors that we reviewed do not automatically doom low-SES children to failure. As you will learn in Chapter 11, many children from impoverished environments develop what is called **resilience**, the ability to not only survive but thrive in adverse environments (Dole, 2000).

Resilience

The ability to not only survive but thrive in aversive environments.

In addition, many other individual, family, peer, school, and community factors are found to be positively correlated with being at risk (Yeakey & Henderson, 2003), such as the following:

- Being a male
- Being a member of a cultural minority (except Asian-Americans)
- Being a non-native English speaker
- Living in a large city
- Frequently moving from one school to another
- Having low psychological well-being and self-esteem
- Having low expectations or commitment to educational goals
- Poor early academic performance and poor study habits
- Unstable family relationships (e.g., divorce, separation, domestic violence)
- Weak or harsh parent–child relationships
- Associating with delinquents
- Low teacher expectations
- Living in a community where the prospects for socioeconomic success are low
- Living in a community where unemployment, poverty, and crime are high

What are some factors that place students at risk of failing to complete their education?

How can teachers help support the success of students at risk? One way is to create a mentorship program. For instance, a four-year program funded by the Ford Foundation provided ninth-grade students with the daily support of a caring mentor, academic activities outside school, community service projects, and cultural and personal enrichment activities (Carnegie Council on Adolescent Development, 1995). An evaluation of this program showed that 63% of the mentored students graduated from high school as compared to only 42% of a nonmentored control group. Teachers can also reach out to families and community members and encourage and support students' learning and motivation in a variety of ways. *Classroom Tips: Strategies to Support Students at Risk* lists some research-based strategies (Alderman, 1990; Epstein & Sanders, 2002; Garcia, 1999; Pianta, 1999; Ramey & Ramey, 1998).



Jeff Greenberg/The Image Works

CLASSROOM TIPS

Strategies to Support Students at Risk

- Create a warm and supportive school climate.
- Focus on students' strengths to promote self-esteem.
- Tap into students' prior experiences.
- Design activities that are relevant to students' lives and needs.
- Provide extra academic support (e.g., after-school and summer assistance).
- Hold high expectations for students' academic success.
- Show students that they are personally responsible for their success.
- Obtain information from families to better understand students' background and goals.
- Assist families with parenting and child-rearing skills.
- Assist families in setting home conditions that support learning.
- Communicate about school programs and expectations through parent workshops.
- Communicate about student progress regularly with newsletters and positive home calls.
- Arrange for home visits to learn about the support and constraints to students' development.
- Help your school develop parent education and training programs.
- Recruit parents as volunteers to help out in class and share their experiences and interests.
- Involve families in school decisions through committees or other parent organizations.
- Collaborate with community businesses, agencies, colleges, and universities.
- Foster students' involvement in service to their community.

Gender and Sex Diversity

Gender

Traits and behaviors that a particular culture believes to be appropriate for men and women.

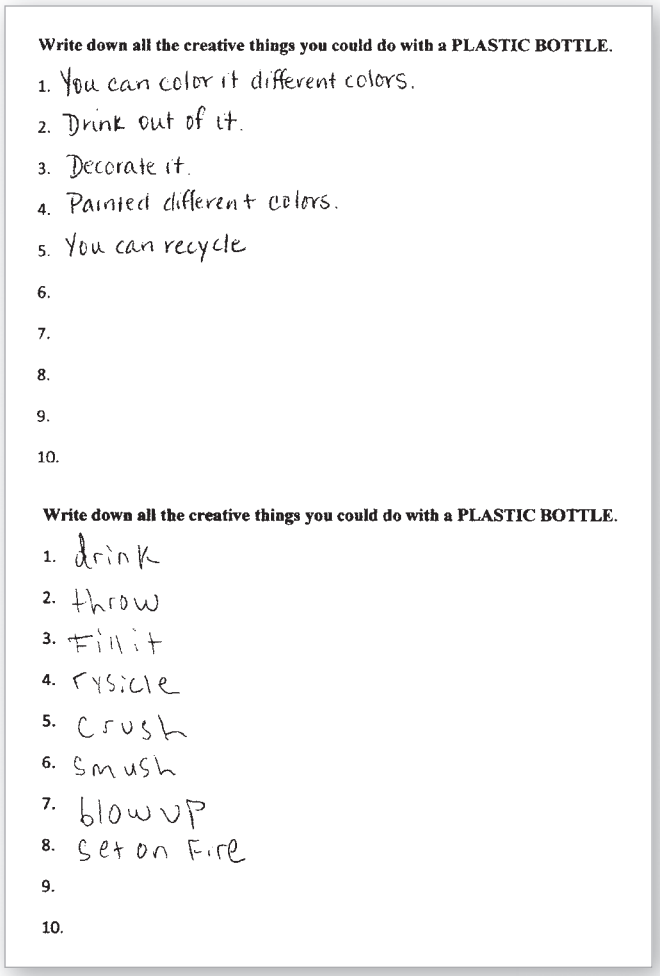
Sex

The biological differences of men and women.

A Few Definitions. In this section we discuss what is known about learning differences between males and females. Let's start by distinguishing between the word **gender**, which refers to traits and behaviors that a particular culture believes to be appropriate for men and women, and the word **sex**, which refers to the biological differences of men and women (Brannon, 2002). Regardless of the age, culture, and many other differences among your students, you will be confronted with both sex and gender differences. Sex differences are almost always immediately obvious and controlled by nature. Gender differences instead are psychologically and socially controlled differences related to how individuals express their biological sex in their behavior. Gender *bias* occurs when a person has unjustified views of female versus male competencies favoring one gender over the other.

Nature versus Nurture. There is much debate about the extent to which biological differences (nature) and gender socialization (nurture) affect people's behavior. There are physical characteristics such as size and growth rate that can be explained by genetics (Berk, 2006). In addition, sex hormones affect the development of gender differences in the brain. For example, testosterone affects the development of the right and left hemispheres of the brain, with males exhibiting more lateralization of their brains than females (Meinschaefer, Hausmann, & Guentuerkuen, 1999). Other evidence for the role of hormones in gender differences comes from research on women's change in abilities across their menstrual cycle. Specifically, when female hormones are at their lowest, females do better on tasks in which males are typically superior, (such as visuospatial ones), and when female hormones are at their peak, females do better on tasks in which females typically excel, such as verbal fluency (Hampson, 1990). However, males and females are mostly indistinguishable in their brain anatomy. The two documented exceptions are that the corpus callosum is larger in females than in males (LeDoux, 1996, 2002) and that the areas of the brain involved in visuospatial processing are larger in males than in females (Frederikse et al., 2000). Still, what is not clear is whether these brain differences are the cause of the different behaviors that females and males display or their effect.

The case for nurture is supported by cross-cultural research, which shows that all societies engage in **gender socialization**: teaching the behavior and attitudes considered appropriate for a given sex. All cultures have gender-specific roles and treat males and females differently in many respects; however, different societies display quite different gender roles (Feingold, 1992; Grossman & Grossman, 1994). Additional support comes from a sociocognitive theory of gender, which emphasizes the role that observation, imitation, rewards, and punishment play in children's gender development. For instance, many parents encourage different activities, traits, and toys for boys and girls (Brannon, 2002; Bronstein, 2006). Peers are also found to reward gender-appropriate and punish gender-inappropriate behavior (Rubin, Bukowski, & Parker, 2006), playing an important gender-socializing role. Finally, the media also shape gender roles by portraying females and males as having different traits or engaging in different activities (Comstock & Scharrer, 2006; Pacheco & Hurtado, 2001). The role of gender socialization is illustrated in Figure 2.6, which shows the responses of two fourth-graders, a girl and a boy, to the *Unusual Uses Test*, which is used to measure students' creativity (Silvia & Phillips, 2004). Can you tell which of the two sheets was written by a boy?


Write down all the creative things you could do with a PLASTIC BOTTLE.

1. You can color it different colors.
2. Drink out of it.
3. Decorate it.
4. Painted different colors.
5. You can recycle
6.
7.
8.
9.
10.

Write down all the creative things you could do with a PLASTIC BOTTLE.

1. drink
2. throw
3. Fill it
4. rysicle
5. Crush
6. Smush
7. blow up
8. Set on Fire
9.
10.

FIGURE 2.6 **Which of these two sets of responses is likely to come from a boy?**

Gender Differences in the Classroom

The strong evidence in favor of both nature and nurture as sources of gender differences has led most experts to conclude that they are the result of the interaction between genetics and the environment (Jones & Dindia, 2004; Lippa, 2002). Regardless of their origin, teachers should understand what is known about gender differences that may have an impact in the classroom.

Emotions and Behavior. In general, girls are more sociable and trusting but have lower assertiveness and self-esteem than boys of their same background and age (Halpern & LaMay, 2000). Girls also report more intense emotions than boys; yet females are better able to self-regulate their emotions and behavior than males (Eisenberg, Spinrad, & Smith, 2004). Females engage in more prosocial behaviors than males, such as demonstrating kindness, empathy, and consideration for others (Eisenberg, Fabes, & Spinrad, 2006). In the classroom, males are more likely to participate in learning activities, ask questions, and be verbally aggressive than females (Altermatt, Jovanovic, & Perry, 1998; Brophy, 2004). Across cultures and from a very early age, boys are also more likely to be physically aggressive than girls (Ostrov, Keating, & Ostrov, 2004). This difference can be partially accounted for by males' hormonal makeup and partly by social expectations; it is reflected in boys' higher tendency to engage in bullying, rough play, competitive games, and risk-taking physical activities (Lippa, 2002; Maccoby, 2002; Pellegrini, Kato, Blatchford, & Baines, 2002). Males are also less likely to read for pleasure, do homework, take college preparatory classes, and complete high school than females and more likely to skip class, hold part-time jobs out of school, and drop out of school than females (NCES, 2001; Riordan, 1996).

Physical Performance. From a very young age, boys are more active than girls. Therefore, in the classroom, boys have a greater tendency to not pay attention, move around the room, and pose discipline problems (Ruble, Martin, & Berenbaum, 2006). Although before puberty boys and girls have similar potential for physical and motor growth, girls show a slight advantage on fine motor skills. Puberty results in increased

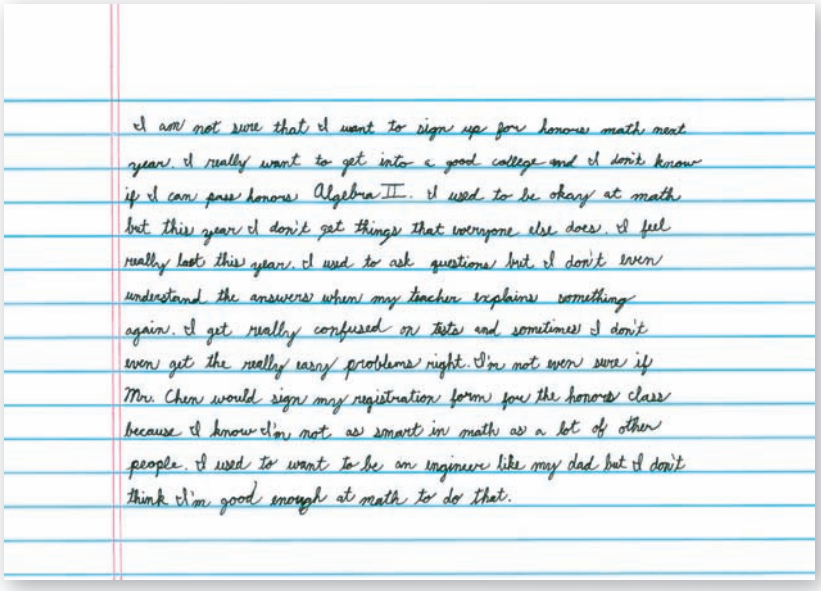
muscle mass for boys and increased body fat for girls, leading to an advantage for males in activities that require strength. In the middle school years, males outperform females in athletic activities such as running, throwing, and jumping (Smoll & Schutz, 1990).

Technology Use. According to a national survey of kindergarten through sixth-grade students, males and females reported having equal access to computers at home and school (Bae, Choy, Geddes, Sable, & Snyder, 2000). Gender differences, however, exist for the ways in which computers are used. Whereas females are more likely to use computers for word processing, graphics design, and educational applications, males favor the use of computers for playing games (Libsch & Breslow, 2000). A computer technology gap seems to appear during the teenage years, with females reporting less favorable perceptions of computer-based instruction than males (Martin, Heller, & Mahmoud, 1992; Proost, Elen, & Lowyck, 1997).

Cognitive Abilities. Although a large number of studies have found no gender differences in intelligence, certain differences are found when examining different abilities within intelligence tests (Flynn, 1998; Halpern, 2000; Mackintosh, 1996). On average, females score higher than males on tests of verbal ability, such as those assessing reading, vocabulary, spelling, grammar, and comprehension (Hyde & Mckinley, 1997; Smedler & Torestad, 1996). In contrast, on average, males score higher than females on tests of visuospatial abilities, such as tasks where they are required to mentally rotate objects, judge the velocity of moving objects, track movement through three-dimensional space, and aim at a moving or stationary target (Gurian & Stevens, 2005; Halpern, 2004; Nordvik & Amponsah, 1998; Ruble et al., 2006).

Achievement. Females have higher reading and writing achievement than males in grades 4, 8, and 12 (Coley, 2001; National Assessment of Educational Progress, 2002, 2005). This difference is also consistently found in international studies of reading literacy such as PISA, the Program for International Student Assessment (Mullis, Martin, Gonzalez, & Kennedy, 2003: NCES, 2002). In math achievement, the picture is not so clear. Males tend to outperform females on standardized achievement tests, but girls tend to get higher math grades at school than boys (Halpern, 2000). However, no gender differences on math achievement are found among Asian-American students (Yee, 1992). An additional finding of interest is that the math scores of boys are more variable than those of girls, with boys having very high and very low scores on tests (Willingham & Cole, 1997). Unlike reading literacy, international studies on math achievement do not show consistent results. Only 7 out of the 33 countries that participated in the Trends in International Mathematics and Science Study (TIMSS) showed significant achievement differences in favor of eighth-grade boys (Halpern, 2004). In science, a recent national study showed that males outperform females in grades 4, 8, and 12 (National Assessment of Educational Progress, 2005). A similar finding was found in another study of eighth- and tenth-graders (Burkham, Lee, & Smerdon, 1997) and in 22 out of the 33 countries that participated in the TIMSS (Halpern, 2004). In terms of students' self-efficacy (sense of competency), girls and boys report similar self-efficacy in math and science up to middle school, yet, by the twelfth grade, females feel significantly less confident about their math skills than boys (see Figure 2.7) (Bae et al., 2000; Jovanovic & King, 1998). Despite the noted findings, experts have pointed

FIGURE 2.7 **What is this student's journal entry revealing?**


I am not sure that I want to sign up for honors math next year. I really want to get into a good college and I don't know if I can pass honors Algebra II. I used to be okay at math but this year I don't get things that everyone else does. I feel really lost this year. I used to ask questions but I don't even understand the answers when my teacher explains something again. I get really confused on tests and sometimes I don't even get the really easy problems right. I'm not even sure if Mr. Chen would sign my registration form for the honors class because I know I'm not as smart in math as a lot of other people. I used to want to be an engineer like my dad but I don't think I'm good enough at math to do that.

out that gender differences in achievement seem to be getting smaller (Halpern, 2000; Hyde, 2005; Spelke, 2005). Therefore, teachers should not have different expectations for girls and boys for different subject areas.

How Gender Bias Affects Students

The general agreement among experts is that gender differences in achievement are the result of the gender bias in the home and school environments (Meece & Scantlebury, 2006). First, although there is more acceptance of similarities in male and female behavior in the United States, many other cultures instill dramatic gender-specific roles. For instance, in many Middle Eastern countries, females are socialized to remain in the private world of home and child rearing, and recent research indicates that Latino girls are subject to greater restrictions about getting involved in after-school activities and job seeking (Raffaelli & Ontai, 2004). Research finds that, on average, parents have higher expectations in math and science for their sons than for their daughters and are more likely to believe that boys have more talent for careers in math and science than girls (Eccles et al., 1993). Not surprisingly, a higher percentage of boys enroll in physics and engineering courses and earn bachelor's degrees in computer and information sciences, physical and biological sciences, engineering, and mathematics (Bae et al., 2000). Textbooks are also gender biased in that they show males more often than females as role models in history and science (Eisenberg, Martin, & Fabes, et al., 1996), and female peers are likely to ridicule or shun classmates who enroll or excel in math and science classes (Sadker & Sadker, 1994).



Noel Hendrickson/Digital Vision/Getty Images

Because textbooks rarely show women in science and history, teachers should make special efforts to present female models in these fields.

Teachers may also subtly affect the gender-role expectations of their students (Garrahy, 2001; N. Lopez, 2003). For instance, there is evidence that teachers spend more academic time with boys in mathematics and with girls in reading (Altermatt et al., 1998) and that boys are more likely than girls to be criticized and identified as having learning problems (Sadker & Sadker, 2005).

In conclusion, the differential treatment of boys and girls at home and in the classroom can have a strong impact on students' identity and academic development. Thus, as reflective practitioners, teachers should make special efforts to think about their expectations and biases to ensure equal treatment of both sexes. Although boys and girls have distinctive characteristics, teachers need to make sure that they give them the same academic opportunities and encouragement. Here are some of the questions you can ask yourself to help prevent gender bias in your classroom:

- Do I call on boys and girls equally?
- Do boys and girls equally share classroom chores?
- Do I have equal expectations for boys and girls?
- Do I provide equal opportunities for boys' and girls' engagement and development?

Additional strategies to reduce gender bias in the classroom are to critically examine texts and instructional materials and ensure that there are female and male models in all academic domains, bring to the classroom men and women who are successful and happy in nonstereotypical professions and careers, and make students aware of gender bias by communicating openly about gender issues.

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ANIMATION ASSIGNMENT. . . Understanding Diversity in the Classroom

Go to your WileyPlus course and watch the animation on gender in society. Be prepared to discuss how gender can play a role in teaching. How could issues of gender impact student learning, and what would you do as a teacher to address these issues in your classroom?



INDIVIDUAL DIFFERENCES

How do teachers determine what each one of their students is capable of achieving? What characteristics do they focus on to teach each child to his/her fullest potential? In this section we discuss student characteristics that have been traditionally classified as individual differences. Similar to the gender differences discussed before, individual differences are typically the result of a combination of nature and nurture factors. Due to the significant role that the environment can have on students' thinking and behavior, we discuss many ways in which teachers can accommodate individual differences to promote academic success.

Intelligence

There is no consensus on what intelligence means. Some experts define intelligence as problem-solving ability. Others describe it as the ability to adapt to and learn from life's everyday experiences. Still others believe that intelligence is the ability to think in the abstract (Sattler, 2001). The concept of intelligence has been discussed since the ancient Greeks. However, its scientific study started with the work of Alfred Binet, who was asked by the French government to develop a measure that could identify children with special education needs. Binet devised the first intelligence test, which yields an overall **intelligence quotient (IQ)**, a global index of people's intelligence, plus individual scores on ability subtests (e.g., memory, spatial ability, vocabulary). In Chapter 13, we discuss the most common individual and group tests of intelligence, which are considered to be general aptitude tests for school learning.

Intelligence Quotient (IQ)

A global index of people's intelligence, derived from one of several different standardized tests attempting to measure intelligence.

Single-Trait Intelligence Theory. One of the biggest problems in defining intelligence arises when experts are asked whether intelligence is a general aptitude. Binet's work began to establish the idea that intelligence is a general trait. Likewise, Charles Spearman (1927) believed that intelligence is a single trait that people have in varying degrees. Spearman called this trait **general intelligence**, or ***g***. Although various intelligent tests yield somewhat different scores, research supports the single-trait theory of intelligence by showing that scores in all subtests tend to be correlated (Brody, 2007; Carroll, 1993). However, Cattell (1987) found that general intelligence is better understood by distinguishing two components: *fluid* intelligence, the ability to reason and process information quickly, and *crystallized* intelligence, the knowledge and skills acquired by learning and experience. General intelligence test scores are strong predictors of academic achievement and moderately predict work performance (Lubinski, 2000). More recently, theorists have developed multitrait theories of intelligence. We discuss two of the most common theories next.

General intelligence (*g*)

The term used for the theory that intelligence is a single trait that people have in varying degrees.

Gardner's Multiple Intelligences Theory. After analyzing people's performance in several domains, Howard Gardner (1983) concluded that there are eight different types of human intelligence. Table 2.4 lists each one with its corresponding definition. The attractiveness of Gardner's theory is that it makes intuitive sense because we all have experience with people (including ourselves) being better at some skills than others. On the other hand, there are serious criticisms of Gardner's theory. First, experts note that the research base to support the theory is not yet developed. Second, the intelligence types proposed seem arbitrary. Why eight intelligences? Gardner (1999) himself has later added a ninth, existential type of intelligence. And what is the evidence in support of the idea that these intelligences are independent? For instance, spatial and logical-mathematical abilities are strongly correlated (Sattler, 2001). Until these questions are answered, Gardner's theory is not likely to be accepted within the scientific community. Educators, on the other hand, have embraced the theory, presumably because one of its implications is that by using a variety of instructional methods, teachers can capitalize on students' diverse abilities (Gardner, 2000). A similar phenomenon occurs with the theory of *emotional intelligence*, which is defined as the

TABLE 2.4

Gardner's multiple intelligences.

INTELLIGENCE TYPE	DEFINITION
Linguistic	Sensitivity to the function of language and to the sounds, rhythms, and meaning of words.
Logical-mathematical	Sensitivity and capacity to discern logical or numerical patterns and handle long chains of reasoning.
Musical	Sensitivity and capacity to produce rhythm, pitch, and timbre and appreciation of musical expressiveness.
Spatial	Ability to perceive the visuospatial world accurately and to create, transform, or modify based on one's perception.
Bodily-kinesthetic	Ability to control body movements and handle objects skillfully.
Interpersonal	Ability to notice and respond appropriately to the moods, temperaments, motivations, and desires of others.
Intrapersonal	Ability to access one's own feelings and to discriminate among them; knowledge of one's own strengths, weaknesses, goals, and abilities.
Naturalistic	Sensitivity to make fine discriminations among natural objects such as plants and animals.

ability to effectively recognize and manage our own emotions and those of others (Goleman, 1995; Mayer & Cobb, 2000). Despite its intuitive appeal, it is not clear whether emotional intelligence is a distinct type of intelligence, a personality trait, or just general intelligence applied to a particular domain: social relationships (Eysenck, 1998; Landy, 2005; Locke, 2005).

Sternberg's Triarchic Intelligence Theory. Robert Sternberg (2003), another multitrait theorist, suggests that intelligence is made up of three dimensions—hence the name, *triarchic* intelligence:

1. An *analytical* dimension, which is the ability to think abstractly and process information, similar to more traditional intelligence definitions
2. A *creative* dimension, which involves the ability to deal with novel situations effectively by turning new solutions into automatic processes that require little cognitive effort
3. A *practical* dimension, which is the ability to deal with everyday tasks, including adapting to the environment and/or changing the environment

Sternberg believes that people's intelligence can be enhanced by providing them with opportunities to think analytically, creatively, and practically. Similar to Gardner's theory, there is no strong research support for Sternberg's triarchic theory to date. Experts have argued that the vagueness of the theory makes it difficult to be empirically tested (Sattler, 2001; Siegler, 1998).

ISSUES IN EDUCATION

Can intelligence be modified?

An area of debate in the intelligence literature is the influence of heredity versus the environment on intelligence. Some people believe that intelligence is fixed because it is inherited. What do you think about this argument? A response to this question can be found at the end of the chapter.

TABLE 2.5

Type of ability grouping.

METHOD	DEFINITION
Between-class grouping	All students in a certain grade are divided into ability levels (e.g., low, average, high) and placed in different classes or curricula.
Within-class grouping	All students in a certain classroom are divided into ability levels and placed in different reading or math subgroups.
Joplin plan	Homogeneous ability groups of various ages are used in reading, but heterogeneous grouping is used in other areas.
Multi-age grouping	Students of various ages work together in a particular subject in ability groups.

Ability Differences in the Classroom

Ability Grouping

A method in which students of similar abilities are placed into groups so that instruction can be matched to the group needs.

Tracking

Ability grouping that occurs across all academic areas.

Differentiated Instruction

Providing different learning environments to different students that are sensitive to individual levels of readiness.

The most common response to ability differences in the classroom is called **ability grouping**, a method whereby students of similar abilities are placed into groups so that instruction can be matched to the group needs (Lou, Abrami, & Spence, 2000). Table 2.5 lists four different ability-grouping methods.

Between-class grouping occurs when all students in a certain grade are divided into different ability levels and placed in different classes or curricula. Typically, elementary schools do not use between-class ability grouping. In middle and high school, however, it is still practiced and can consist of placing lower-ability students in vocational or work-related instruction and higher-ability students in advanced or college preparatory courses (Oakes & Wells, 2002). When between-class grouping occurs across all academic areas, it is called **tracking**. At first glance, it seems that tracking can be an efficient way to teach. However, research has documented that in the lower tracks the curriculum is less challenging, interesting, and motivating than that in higher tracks (Darling-Hammond, 2004). Because ethnic minority and low-income students are much more likely to fall into lower tracks, some experts also argue that tracking can serve to segregate schools and increase the achievement gap (Le Tendre, Hofer, & Shimizu, 2003). Others believe that being in a low-ability group can stigmatize students socially and lower their self-esteem (Oakes & Guiton, 1995). Moreover, it is likely that students in tracks are kept in the assigned group for the entire schoolyear or longer, even when their skills have changed (Oakes, 1992).

Within-class grouping is generally found to be more successful, especially when the instructional pace and materials are adapted to students' needs (Slavin, 1987). It typically consists of presenting a lesson to the whole class and then placing students into small groups for specific activities based on their prior knowledge and demonstrated performance (Renzulli, 1994). Yet within-class grouping presents the following challenges. First, teachers must plan and monitor independent activities for some students while working in a group with others (Oakes, 1992). Second, teachers need to provide **differentiated instruction**, learning environments that are sensitive to individual levels of readiness (Benjamin, 2005; Gregory, 2003; Tomlinson, 1999). Third, teachers need to plan activities that are manageable in terms of student behavior, which creates the risk of overemphasizing the use of extensive drill and practice (especially for students with lower ability levels), to keep the classroom under control (Newman & Schwager, 1992). Therefore, the National Association of School Psychologists (National Association of School Psychologists, 2007) recommends removing repetitive and

Ability grouping consists of selecting and placing students in homogeneous ability groups.



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CLASSROOM TIPS

How to Make Within-Class Grouping Effective

Principle	Example
Assess students' prior knowledge and skills before making group assignments.	Mr. Marquez gives his students a pre-test on bar graphs before having groups create graphs based on the M&M colors in their candy bags.
Adapt curricular practices that are based on students' pre-assessment.	Ms. Johnson was surprised when students didn't know the five characteristics of life on a pre-assessment and decided to add another two days to her unit plan to address the concept.
Avoid the use of negative labels to identify lower-ability groups.	In his fourth-grade class, Mr. Russell has group members create their own group names.
Monitor students' progress by assessing their learning regularly.	In her physical education class, Ms. Tang assesses students' understanding by asking them to answer a three-question exit slip during the last five minutes of class.
Keep group composition flexible as suggested by ongoing assessments.	Mr. Pomphry tries to keep all learning units to two weeks so that he can rearrange his groups according to new student needs.
Hold high expectations for all students.	Mrs. Miranda expects all her third-grade students to be able to write sentences with correct noun–verb agreement, though the complexity of the sentences varies between students according to their ability level.
Make every effort to ensure equal-quality instruction for all groups.	Mrs. Ramsey prepares directions to guide lab groups. All the directions are the same, but some have more illustrations or have larger steps broken into smaller steps for students to follow.

unchallenging content as well as enhancing existing curricular materials with higher-level questioning and independent thinking. When carefully planned and not overused, some form of temporary ability grouping can have significant effects on student achievement, especially in the areas of mathematics and reading (Marzano, Pickering, & Pollack, 2001; Tieso, 2003). Classroom Tips: How to Make Within-Class Grouping Effective summarizes some principles for effective within-class grouping with corresponding classroom examples (Kulik & Kulik, 1992). You will be able to expand on these strategies when you learn about cooperative learning methods in Chapter 8.

Research also finds that the *Joplin plan* can increase students' reading achievement without producing negative side effects (Slavin, 1987). In its earliest version, the Joplin plan included ability grouping of elementary students in reading across grades; however, this was later expanded to arithmetic instruction. For instance, during reading time, students in grades 4, 5, and 6 go to different classrooms to receive instruction geared to their ability level. Students in the high-ability group use sixth-, seventh-, and eighth-grade textbooks; students in the middle-ability group use fifth-, sixth-, and seventh-grade textbooks; and students in the low-ability group use fourth-, fifth-, and sixth-grade textbooks (Kulik, 1992). Once the reading hour is over, students return to their regular classrooms. An advantage of the Joplin plan is that grouping is temporary; students move into and out of groups based on their current demonstrated achievement in a particular subject matter. A similar ability-grouping method is cross-grade or *multi-age grouping*, where students of different age levels are grouped together in a single classroom for the purpose of providing effective instruction (Miller, 1996). The purpose of this approach is to allow students of various ages and abilities to progress at their own rate rather than according to specified objectives for a particular grade level. When children of various ages work together, self-esteem and willingness to take responsibility for learning increase and students perform as well as or better than students in traditional classrooms (Anderson & Pavan, 1993; Gutierrez & Slavin, 1992; Mackey, Johnson, & Wood, 1995).

Cognitive Styles and Learning Preferences

Next, we turn to individual differences that are related to how students process information (cognitive styles) or prefer to process information (learning preferences).

Cognitive Styles

Characteristic ways of processing information that develop unconsciously around underlying personality trends.

Cognitive Styles. **Cognitive styles** are characteristic ways of processing information that develop unconsciously around underlying personality trends (Messick, 1994). For instance, a cognitive style that has been studied extensively is *impulsivity/reflectivity* (Kagan, 1965). Impulsive students tend to offer quick answers in problem-solving situations without carefully thinking about them; therefore, they tend to make more errors than average when processing information. In contrast, reflective students tend to consider several alternative solutions before offering an answer; therefore, they tend to make fewer errors than average when processing information. Being reflective or impulsive is unrelated to intelligence. On the other hand, impulsive students are more likely to show lower achievement in classroom activities such as reading, problem solving, and decision making (Smith & Caplan, 1988). Nevertheless, reflective modeling, instruction to delay responding, and self-regulation methods in which impulsive students are taught how to stop and reflect on alternative solutions before offering answers to problems, can improve their performance significantly (Moreno, & Durán, 2004).

Learning Preferences

Individuals' approaches to studying and learning differ from cognitive styles in that they are conscious inclinations that may be subject-specific.

Learning Preferences. **Learning preferences** (commonly called *learning styles*) are individuals' approaches to studying and learning and differ from cognitive styles in that they are conscious inclinations that may be subject-specific (Sternberg & Grigorenko, 2000). Despite the attractiveness that learning preferences have for educators, experts have warned against taking learning preferences into consideration in the classroom for a variety of reasons. First, the literature is very unclear and divided about the number and types of learning preferences. The multiple learning preference models include preferences about the classroom environment (e.g., amount of lighting, level of noise, hard or soft seats), sensory modality (e.g., visual, auditory, kinesthetic), the depth to which students prefer to study (e.g., deep processing, surface processing), extroverted versus introverted styles, sensing versus intuition, thinking versus feeling, and judging versus perceiving (Biggs, 2001; Dunn & Dunn, 1987; Keefe, 1982; Pintrich & Schrauben, 1992).

Second, the surveys and instruments used to assess students' learning preferences have been criticized by many experts for lacking evidence of reliability and validity (Coffield, Moseley, Hall, & Ecclestone, 2004; Stahl, 2002; Wintergerst, DeCapua, & Itzen, 2001). Another concern is that proponents of learning preferences argue that students learn more when they study in their preferred conditions (Dunn & Dunn, 1987). Yet the research shows that this is not always the case. For instance, Willingham (2005) shows that tailoring instruction to students' preferred learning modality (e.g., visual, auditory) does not necessarily improve their learning. Likewise, other studies show that attempts to match learning environments to learning preferences do not improve and can even decrease learning (Klein, 2003). In sum, although the idea of learning styles may be appealing, the research warns teachers against categorizing students based on tests of questionable technical quality and using the results to differentiate instruction. On the other hand, the idea of learning styles reminds us of the diversity of learning approaches among our students, which suggests that we should use a variety of instructional methods in the classroom.

Temperament and Personality

Temperament is an individual's typical style of responding to environmental stimuli and events. Children display different temperaments from a very early age, and most experts agree that temperamental differences are biologically based (Keogh, 2003; Pfeifer, Goldsmith, Davidson, & Rickman, 2002). However, the environment can have an effect on genetic predispositions such as temperament. For instance, children in China are raised to be shy whereas European-American children are typically encouraged to be outgoing and assertive (Ho, 1994; Joshi & MacLean, 1994). Eventually, the interaction of nature and nurture contribute to the development of *personality*, individuals' distinctive way of thinking, feeling, and behaving (Fox, Henderson, Rabin, Calkins, & Schmidt, 2001). Many researchers believe that there are five big personality factors: openness, conscientiousness, extraversion, agreeableness, and emotional stability (DeRaad, 2005; Lee, Ashton, & Shin, 2005). Students' personality will affect how they interact and engage in classroom activities, which in turn can have an effect on their academic achievement

(Keogh, 2003). For example, although there is no "winner" personality, some characteristics, such as being persistent, outgoing, and adaptive, might help students succeed, even in the face of adversity (Hart, Atkins, & Fegley, 2003). Research also shows that children are more likely to succeed in environments where their personalities match teacher expectations, such as the case of quiet, introverted children doing better when teachers emphasize independent seatwork and energetic, extroverted children doing better when teachers emphasize participation in group work and classroom discussions (Keogh, 2003). Therefore, it is important to adapt instruction and classroom management strategies to accommodate a diverse range of student personalities.

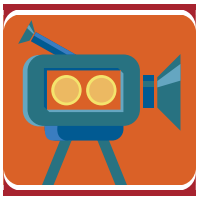
Individuals with Disabilities Education Act (IDEA)

A series of major special education laws which prescribe a free, appropriate public education for every child.

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VIDEO CASE ASSIGNMENT. . . Building Student Participation

Go to your WileyPlus course and view the video of Ms. Hughes' class. Be prepared to discuss how Ms. Hughes addresses ability differences as well as how her instructional techniques accommodate a variety of personalities.



EXCEPTIONAL STUDENTS

During the first half of the 20th century, *exceptional students*, those identified as having special needs, received few or no special services in the schools. By the late 1960s, many were criticizing the fact that exceptional children were left without the skills that are necessary to become an integral part of society (Dunn, 1968). As a result, in the 1970s, a series of major special education laws were enacted, starting with Public Law 94-142, the Education for All Handicapped Children Act, which prescribed a free, appropriate public education for every child, and ending in 1990 with Public Law 101-476, the **Individuals with Disabilities Education Act (IDEA)**. IDEA was amended in 1997 to include provisions about the participation of exceptional children in standardized test programs. We review the major provisions of IDEA next.

Least Restrictive Environment (LRE)

A setting where exceptional students have the opportunity to be educated with non-exceptional peers to the greatest extent possible.

Inclusion

A comprehensive approach to educating exceptional children in regular classrooms with a coordinated web of services.

Provisions of IDEA

Free and Appropriate Public Education. This IDEA provision is based on the Fourteenth Amendment to the U.S. Constitution, which guarantees equal protection of all citizens. In 1982, the Supreme Court defined appropriate education as one that is specially and individually designed to provide educational benefits to a certain student (Hardman, Drew, & Egan, 2005).

Least Restrictive Environment. The law requires states to develop procedures for educating children in the **least restrictive environment (LRE)**, that is, a setting that is as normal as possible. This provision gave a legal basis for the practice of *mainstreaming*, the idea of moving students with exceptionalities from segregated settings into regular classrooms. Mainstreaming has been replaced with the term **inclusion**. Although initially inclusion was viewed as providing exceptional children with additional services so that they could function in regular school settings (Turnbull, Turnbull, Shank, Smith, & Leal, 2004), today it is conceived as a comprehensive approach to educating exceptional children in regular classrooms with a coordinated web of services (Sailor & Roger, 2005). Depending on the case, these services may include simple consultations with special education teachers, providing resource rooms for specialized instruction, placing the student full-time in special education classrooms within the school, and placing the student in a separate school for children with special needs (U.S. Department of Education Office of Special Education Programs, 2002).

IDEA's least restrictive environment provision has led to the inclusive classroom, the idea of moving students with exceptionalities from segregated settings into regular classrooms.



Bob Daemmrich/The Image Works

Individualized education program (IEP)

An instructional plan mandated by the Individuals with Disabilities Education Act (IDEA) that is devised by the general and special education teachers, resource professionals, and parents to meet the needs of exceptional students.

Individualized Education Program (IEP). An **individualized education program (IEP)** is an instructional plan devised by the general and special education teachers, resource professionals, and parents. Sometimes, students may also be part of the design of IEPs. The components of IEPs are as follows:

- Assessment of student's current performance level
- Short- and long-term learning objectives with corresponding schedules
- Strategies and/or services to be used
- The criteria to evaluate the plan's success.

Figure 2.8 shows a sample IEP.

Classifying Exceptional Students

Approximately 13.6% of learners receive special education services for conditions ranging from mild learning problems to physical impairments such as hearing and visual disabilities (U. S. Department of Education, 2008). The law has defined categories to identify a variety of exceptional students who qualify for special education services. Some categories are called *disturbances*, general malfunctions of psychological processes, such as emotional disturbances. Others are called *disabilities* or *impairments*, functional limitations in performing certain tasks, such as specific learning disabilities and hearing impairments. Although many argue that these labels are arbitrary, overly general, and stigmatizing, you should be familiar with them because they are widely used (Cook, 2001). Educators are increasingly speaking of *students with disabilities*, which emphasizes the whole person, rather than using the term *disabled children*, which emphasizes the disability rather than the person. Figure 2.9 shows the percentage of students in each category of disability. As you see, the largest disability category is specific learning disabilities (47.4%), followed by speech or language impairments (18.7%), mental retardation (9.6%), emotional disturbance (8.0%), and other health impairments (7.5%).

FIGURE 2.8 **Sample IEP.**

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Edgewater School District

Individualized Education Program (IEP)

Student: Jasmine L. Domier **School:** San Juan Elementary IEP#: 7 **Date:** 8/19/99
Birthday: 12/8/89 **Grade:** 4th **Reg. Ed. Teacher:** Sonia Corona **Sp. Ed. Teacher:** David Hatch
IEP Team: Jasmine L. Domler (student), Tabrina Domier-Grey (mother), Sonia W. Corona (reg. ed. teacher), David Hatch (sp. ad. teacher), Elwood L. Shinkle (Assistant Principal), Narvonia G. Clay (orthopedic therapist).

1. Description of the Exceptionality

When she was 5, Jasmine was diagnosed with juvenile rheumatoid arthritis. Most of the time, there is inflammation in most of her joints (especially in the joints of the lower extremities). The severity of the condition fluctuates throughout most days. The stiffness in her joints makes movement uncomfortable and restricted. At times, it is so uncomfortable for her to move some parts of her body (most often her hips, knees, and ankles) that she uses unconventional methods of locomotion (e.g., using her hands to slide herself from one point to another) or needs to use a wheelchair (with which she is very proficient).

Unpredictably, the severity of the inflammation varies. This is especially true for joints above the hips, which can be functioning with no apparent stiffness or discomfort for hours at a time followed by a sudden attack (usually lasting from 5 to 20 minutes) in which only slight movements and external contacts (e.g., bumping into another person) result in extreme discomfort. On the other hand, the severity of the condition in her hips and the joints of her lower extremities varies within a smaller range never disappearing, but hardly ever reaching the extreme levels she occasionally experiences in her upper-body joints.

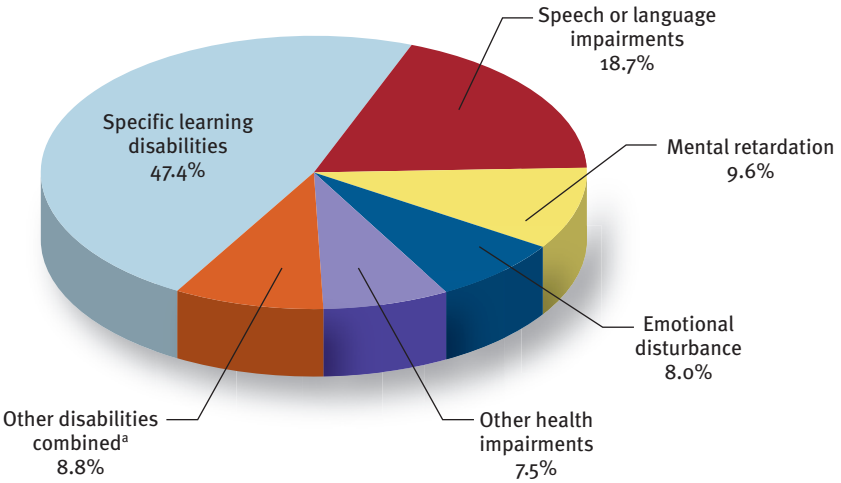
The causes of juvenile rheumatoid arthritis are unknown and, as of this date, no cure has been invented. However, Jasmine engages in a daily program of physical therapy, medication, and pain-management therapy that, at this time, appears to help her reduce the debilitating effects of the condition.

Although the condition restricts Jasmine's psychomotor activities and the therapy requires about three hours a day, she's able to engage in cognitive activities to the same degree as anyone else. In fact, she can read, view videotapes, operate a computer, and be involved in other leaming activities while concurrently involved with at least some of her physical therapy.

See Attachment 1 to this document for a more detailed description of Jasmine's condition and treatment program.

Next, we define each category in more detail. Keep in mind that a disability category provides a general idea of the challenges a student might face in the classroom. However, there is more to a student than his/her disability. Teachers will want to get to know the individual qualities of each student. Students' needs will also be influenced by their unique intellectual ability, personality, style, culture, language, and life experience. Importantly, under IDEA, students may not be identified as "students with a disability" just because they speak a language other than English and do not speak or understand English well or just because they have not had enough instruction in math or reading.

Learning Disabilities. Students with learning disabilities have significant difficulties in a school-related area such as reading, writing, reasoning, listening, or math (National Joint Committee on Learning Disabilities, 1994). For example, students with a reading disability may lack reading fluency and reverse the order of words (e.g., *tip* for *pit*); students with a writing disability may have difficulty copying, staying on line, or forming letters; and stu-



[a]Other disabilities include multiple disabilities (2.2 percent), hearing impairments (1.2 percent), orthopedic impairments (1.1 percent), visual impairments (0.4 percent), autism (2.3 percent), deaf-blindness (0.03 percent), traumatic brain injury (0.4 percent), and developmental delay (1.1 percent).

FIGURE 2.9 Classification of students ages 6 through 21 receiving special education and related services under IDEA.

Source: U.S. Department of Education (2005).

dents with a math disability may have difficulty with story problems and calculations, and reverse the order of digits (e.g., *129* for *192*). Learning disabilities in reading, writing, and math are also known as dyslexia, dysgraphia, and dyscalculia, respectively. This group of learners with exceptionalities is characterized by having average IQ scores (yet showing uneven performance in subtests) and no other diagnosed disorder.

Speech or Language Impairments. Students with speech or language impairments have difficulty receiving and/or expressing information and ideas. Receptive impairments involve difficulty understanding messages. Expressive impairments involve problems in forming and sequencing sounds and may include stuttering and mispronunciation. This exceptionality may be associated with other problems such as a hearing impairment, learning disability, mental retardation, severe emotional problems, or inadequate language and cognitive development in the early years of life.

Mental Retardation. Mental retardation is a disability that is characterized by significant intellectual and adaptive behavior limitations. *Adaptive behaviors* are those that help people function in their everyday lives, such as eating, dressing, toileting, managing money, using transportation, and doing housekeeping activities. Before the 1960s, the diagnosis of mental retardation was primarily based on intelligence test scores, with IQ scores between 50 and 70 reflecting mild retardation, IQ scores between 35 and 50 reflecting moderate retardation, and IQ scores below 35 reflecting profound mental retardation. Unfortunately, a disproportionate number of students who were English language learners were identified as mentally retarded using this IQ criterion. Also, students with identical IQ scores varied widely in their ability to cope with the real world. For these reasons, the most recent criterion is to consider both students' intellectual functioning and adaptive behavior when determining if he/she has mental retardation.

Emotional Disturbance. Students with emotional disturbances show serious and persistent age-inappropriate behaviors that adversely affect their ability to learn and get along with others. They are characterized by (1) an inability to learn that cannot be explained by intellectual, sensory, or health factors; (2) an inability to build or maintain satisfactory interpersonal relationships with peers and teachers; (3) inappropriate types of behavior or feelings under normal circumstances; (4) a general pervasive mood of unhappiness or depression; or (5) a tendency to develop physical symptoms or fears associated with personal or school problems (National Dissemination Center for Children with Disabilities, 2004). Emotional disturbances are categorized as externalizing and internalizing. Students with externalizing emotional disturbances show behavior problems outwardly (externalized). They display hyperactivity, defiance, hostility, and even cruelty and violence. Boys

are three times more likely than girls to fall in this category. Students with internalizing emotional disturbances display behavior that is more inward focused; these students withdraw and may exhibit depression, guilt, anxiety, and even suicidal tendencies.

Sensory and Physical Impairments. Sensory and physical impairments are those that adversely affect a student's educational performance and may include visual, auditory, and orthopedic impairments. Experts estimate that approximately 1 in 3,000 children have a visual impairment that cannot be corrected with glasses, surgery, or therapy (Batshaw, 2003). Although most visual problems are diagnosed before the school years, teachers should be watchful for undetected visual impairments. In this case, students may complain about headaches, nausea, and dizziness; show redness or swelling of their eyes; and may write out of line, move too close when needing to read, and frequently squint or rub their eyes. Visual impairments include both partial sight and blindness. Suzy, one of the students in Imagine You Are the Teacher, is likely to have a visual impairment. Recall that Ms. Branson makes plans to bring a bigger pencil and wide-lined paper to help Suzy with the lesson on paragraph writing. Students with hearing impairments also fall into two categories: deaf students, whose hearing is impaired to such a degree that they need other senses to communicate, and hard-of-hearing students, who may need to use a hearing aid to communicate effectively. Students with orthopedic impairments are those who have a limitation on the ability to use their arms, legs, hands, or feet that significantly affects their academic performance.

Multiple Disabilities. Students with multiple disabilities are those who display a combination of two or more disabilities (e.g., mental retardation and blindness) that cause such severe educational problems that their needs cannot be adequately met by programs designed solely for one of the impairments. A special case of multiple disabilities defined by the law is deaf-blindness, a term used to refer to the simultaneous hearing and visual impairments found in some students. Deaf-blindness can cause severe communication and educational needs that cannot be accommodated in special education programs solely for students with deafness or students with blindness.

Autism Spectrum Disorders. Autism spectrum disorders have been a separate category under IDEA since 1990. Students with autism are characterized by extreme social withdrawal and deficiencies in cognitive and language processes. As with mental retardation, autism cases range from mild to severe. Although the symptoms vary from case to case, they can include social unresponsiveness, lack of verbal and nonverbal communication, repetitive stereotypic behavior (e.g., rocking, flapping arms or hands, turning in circles), echolalia (i.e., echoing something heard repetitively), and a narrow and extensive attention to objects. Students with autism show great variability in specific abilities. Some have average or above-average intelligence, others show varying degrees of retardation, and a few exhibit *savant syndrome*, an extraordinary ability that is remarkable as compared to other cognitive skills. Asperger's syndrome (AS) is a neurobiological disorder on the autistic spectrum. Students diagnosed with AS may appear to lack in empathy and typically have difficulty with organization, using and understanding nonverbal behaviors, and developing appropriate peer relationships.

Traumatic Brain Injury. Students with traumatic brain injury are those who acquired injury to the brain caused by an external physical force, resulting in a total or partial impairment that adversely affects their educational performance. The term applies to open or closed head injuries resulting in impairments in one or more of the following functions: language; memory; attention; reasoning; abstract thinking; judgment; problem solving; sensory, perceptual, and motor abilities; psychosocial behavior; physical functions; information processing; and speech. The term does not include brain injuries that are congenital, degenerative, or induced by birth trauma.

Developmental Delay. Developmental delay was added as an optional category under which students are eligible for special education services in 1997. This category is only available for children under age 9. According to the law, states and local education agencies may choose to include as an eligible "child with a disability" a student who is expe-

riencing developmental delays in one or more of the following areas: physical development, cognitive development, communication development, social or emotional development, or adaptive development; and who, because of the developmental delays, needs special education and related services. Developmental delays are defined by the state and must be measured by appropriate diagnostic instruments and procedures.

Other Health Impairments. Students with other health impairments include those who have limited strength, vitality, or alertness, or a heightened alertness to environmental stimuli that results in limited alertness about the educational environment. These symptoms can adversely affect a child's educational performance and are the result of chronic or acute health problems such as asthma, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, sickle cell anemia, and attention-deficit disorder or attention-deficit/hyperactivity disorder.

Attention-Deficit Disorder (ADD). Students with ADD experience persistent limitations in their attention span, are highly distractible, have difficulty in concentrating and finishing tasks, and are impulsive. When these conditions are accompanied by hyperactivity, the disorder is called attention-deficit/hyperactivity disorder (ADHD). Experts estimate a correlation between 25% and 70% for students with ADHD and learning disabilities. Many students with ADHD are treated with medication such as Ritalin, Concerta, or Metadate CD, which help them focus better in the classroom. Yet the use of behavioral therapy, which is aimed at changing behavior and thought patterns to learn how to relate to others and succeed, can significantly reduce or even eliminate the need for medication (Pelham et al., 2005). ADHD is not listed as a distinct disability category in IDEA. However, students with ADHD may qualify for special education services under the category of "other health impairments" in IDEA or under Section 504 of the Rehabilitation Act.

Giftedness and Talent. Students who are gifted and talented have been traditionally defined as those who have above-average ability (IQ scores of 130 and above), high levels of motivation and commitment, and high levels of creativity (Renzulli & Reis, 2003). However, because traditional IQ tests are argued to be biased in favor of the knowledge and skills valued by the mainstream culture, many school districts do not rely on the IQ cutoff score to identify gifted and talented students and instead use a variety of criteria in the areas of academics, creativity, leadership, and the arts (Reid, Romanoff, & Algozzine, 2000; Renzulli, 2002).

Characteristics of Gifted and Talented Students. There is a great deal of diversity within the group of students who are identified as gifted and talented. Many have unusually high ability across domains; others may be talented in only one or a few areas and display average ability in most other domains; and still others may have two or multiple exceptionalities, such as the case of gifted students who also have ADHD, a learning disability, or a behavioral disorder (Hettinger & Knapp, 2001). Nevertheless, this group of students is found, on average, to share the following characteristics (Coleman & Cross, 2001; Frasier & Passow, 1994; Johnsen, 2004; Piirto, 1999; Rogers, 2001):

- Ability to learn at a much faster pace than peers
- Processing of information at a much deeper level than peers
- More and better organized knowledge than peers
- Ability to think independently, flexibly, critically, and creatively
- Willingness to entertain complexity and to thrive on problem solving
- The need to seek challenging activities
- A tendency toward perfectionism
- Above-average social development
- Above-average verbal skills
- Keen observation and abstraction power
- Intensity in energy, imagination, and sensitivity

The characteristics associated with gifted and talented students may have both desirable and undesirable consequences in the classroom (Clark, 2002). For example, gifted students' desire to seek knowledge may be seen by others as an attempt to show off and may lead to peer rejection; their high expectations can lead to perfectionism, personal dissatisfaction, or feelings of hopelessness; and when the instructional environment does not support their strong need to grow, gifted students may engage in undesirable behaviors such as rejecting assignments, sabotaging group work, procrastinating, or rebelling against teachers. In these cases, teachers may fail to identify the exceptionality due to the stereotypical expectations of how gifted students should perform (i.e., early reader, academic achiever, well-behaved).

Some groups of students are particularly vulnerable to exhibiting behaviors that are not necessarily stereotypical of gifted and talented students. These groups include culturally diverse students, students from lower-income families, disabled students, and girls, all of whom have been historically underrepresented among the gifted and talented (Johnsen, 2004; Manning, 2006). Therefore, as educators, we should ensure that we continuously reflect on our assumptions and beliefs about the characteristics and behaviors of gifted students and provide plenty of opportunities for gifts and talents to emerge in all learners.

Instruction for gifted and talented students. The education of students identified as gifted or talented does not fall under IDEA, and states do not receive federal funds to educate this group of students. Programs for these students are funded at the state or school district level (Donovan & Cross, 2002). Still, similar to students with other exceptionalities, gifted and talented students cannot reach their full potential in the regular classroom unless they are provided with special programs (Davis & Rimm, 2004; Louis, Subotnik, Breland, & Lewis, 2000). Specifically, because gifted students have typically mastered many of the concepts and skills that they are expected to learn in a given class, a large part of their school time will not provide them with the opportunity to learn and grow. Experts, therefore, propose a variety of methods to support the special needs of gifted and talented students and to prevent them from not being adequately challenged and motivated in the classroom.

One such method is to place this group of students in the regular classroom and pull them out at regular intervals for special instruction. A second method is to create cluster groups, which typically consist of five to eight identified gifted students who work with a teacher who has specialized training in this type of exceptionality. A third approach is to have special schools for students who have above-average ability or who are talented in a particular domain, such as math and science. Two other programs for the gifted are acceleration and enrichment programs. In *acceleration* programs, students are given a normal course, but the presentation of material is speeded up. This may entail allowing students to skip one or more grades with a compressed curriculum, taking additional classes during the summer, or even taking college classes during high school. Studies suggest that acceleration programs are an effective way to provide this group of students with adequate levels of intellectual challenge without showing adverse emotional or social consequences (Gallagher, 2003; Kulik, 2003).

In *enrichment* programs, students are taught a normal course but activities are added to enhance the understanding and application of what they learned. For example, in Imagine You Are the Teacher, Monica is likely to be a gifted student for whom Ms. Branson plans enrichment activities (i.e., creative writing) to support her exceptional intellectual and creative skills. Basically, enrichment is a form of differentiated instruction for gifted and talented students (Benjamin, 2005; Gregory, 2003; Tomlinson, 1999). Renzulli and colleagues (Renzulli & Reis, 2003; Renzulli, Gentry, & Reis, 2003) describe three types of enrichment programs: Type I, where teachers provide students with exploratory activities that are aimed at stimulating new interests; Type II, where teachers develop methods and materials that are aimed at developing higher thinking skills such as creative and critical thinking; and Type III, where teachers provide students with inquiries that require students to research a real-life issue and brainstorm solutions to the problem.

You can find several classroom strategies for gifted and talented students in Classroom Tips: How to Promote the Learning of Exceptional Students.

CLASSROOM TIPS

How to Promote the Learning of Exceptional Students

Exceptionality	Strategies
Learning disabilities	Overall: • Combine direct instruction with strategy instruction. • Place only materials to be used on the desk or within sight. • Give brief assignments. • Divide complex materials into smaller parts. Reading: • Create quiet reading environments. • Have students read aloud to themselves. • Highlight distinguishing word characteristics. • Use handouts with large print. • Use supplemental books on tape and videos. • Teach reading strategies. Writing: • Encourage the use of a dictionary. • Allow tape-recorded lectures to compensate for poor note taking. • Give extra time on written tests. • Allow the use of word processors; teach writing strategies. Math: • Encourage the use of a calculator. • Teach students to check their work. • Give extra time on tests.
Speech or language impairments	• Provide language models by reading to students. • Supplement instruction with audiotapes and videotapes. • Give plenty of opportunities to use listening and expressive skills. • Positively reinforce students' attempts to comprehend and express ideas. • Scaffold students with prompts, questions, and restatements. • Encourage classmates to talk and encourage them to talk.
Mental retardation	• Model readiness skills (e.g., sit still, pay attention, discriminate auditory and visual stimuli, follow directions, use fine motor skills, use self-help skills, interact with others). • Avoid placing students in situations that may lead to frustration. • Encourage a sense of self-esteem. • Present tasks that can be completed in a short period of time. • Break down assignments into smaller components or steps. • Provide frequent and immediate feedback. • Teach strategies for improving memory and show their benefits. • Create record-keeping methods to help monitor assignments. • Teach basic skills involved in everyday life. • Involve students' families by inviting parents and holding frequent conferences.
Emotional disturbances	• Design activities that encourage social interaction and cooperation. • Arrange the classroom so that disruptive behavior is minimized. • Emphasize classroom rules, use positive reinforcement when rules are followed, and follow through with consequences when they are not. • Use behavior management strategies such as those discussed in Chapter 11. • Teach self-management strategies. • Teach interpersonal skills. • Create an area in the room to help externalizing students calm down.

(continued on next page)

Sensory impairments	Visual: • Use tactile materials (e.g., Braille atlases, molded plastic relief maps, abacus, raised clock-faces, Braille answer sheets). • Use hands-on materials. • Keep students informed of changes to physical surroundings. • Make sure lighting is available. • Provide written materials with high contrast. • Sit students close to board. Auditory: • Position yourself where your face is illuminated and facing the student at all times. • Use overhead projectors to emphasize what is important. • Provide lecture notes. • Shorten and repeat directions and main points. • Repeat questions raised by other students. • Use facial expressions to communicate. • Signal changes. • Monitor comprehension often. • Teach American Sign Language and finger spelling to classmates.
Physical impairments	Depending on the specific physical impairment of the student, strategies may include: • Provide a hand grip for pen or pencil. • Provide a customized stamp for desired regular responses (e.g., letter and number stamps, name stamp). • Provide adapted paper (e.g., raised line, enlarged spacing, and graph paper for math work). • Provide reading/writing stabilizers (e.g., clipboard, bookstand). • Provide a word-processing application with appropriate adaptations (e.g., key repeat rate adjustments, pointing device for keyboard use, enlarged keyboard, touch screen, joystick). • Provide a computer with talking word-processing features, word prediction software, or voice dictation software. • Maximize foreground–background contrast and enlarge print on computers. • Provide a talking spell-checker or dictionary. • Provide books on tape.
Multiple disabilities	Instructional strategies will vary depending on students' symptoms and behaviors. • Work with specialists and teacher aides to find the most effective strategies. • Use strategies that apply to students with physical and sensory challenges, as appropriate. • Use strategies that apply to students with cognitive challenges, as appropriate. • Teach skills that can help students develop adaptive behaviors, as appropriate. • Celebrate gradual and slow improvement. • Provide continuing teacher and peer scaffolding.
Autism spectrum disorders	• Create a well-structured classroom. • Minimize changes in classroom arrangements. • Follow regular schedules and prepare students when changes need to occur. • Use visual aids for learning. • Individualize instruction. • Use small-group activities. • Use behavior modification techniques. • Apply strategies that are useful for students with mental retardation.
Traumatic brain injury	• Sit the student near you. • Minimize distractions and allow earplugs to reduce external noise. • Provide written materials to back up instruction. • Display the classroom activity schedule and follow regular classroom routines. • Use peer note takers and allow tape recording of lectures. • Use memory aids such as organizers, fact cards, and cue sheets.

(continued on next page)

	• Provide in-school travel training and maps for between-class travel. • Plan frequent breaks and slow the pace of presentations. • Give extra time for classroom assignments. • Check for comprehension regularly. • Repeat information and provide frequent practice opportunities.
Developmental delays and other health impairments	Instructional strategies will vary depending on students' symptoms and behaviors. The strategies need to be based on specific areas of learning and/or developmental difficulties that are present. • If physical problems are present, strategies should assist with physical comfort and the completion of motor tasks. • If vision problems are present, strategies specific to students with visual impairments must be used (e.g., preferential seating, enlargements, specialized equipment). • If seizures are present, the school nurse in cooperation with the teacher and school staff should develop plans and accommodations that meet the student's specific needs (e.g., an individual health care plan and/or emergency health plan). • If behavior problems are present, use behavior modification strategies such as those presented in Chapter 5. • If absences occur due to the student's condition, help the student keep current with schoolwork. • Communicate frequently with the student's family and support them in consulting with the medical providers. • Work with specialists and teacher aides to find the most effective strategies.
ADD/ADHD	• Break down assignments into smaller components. • Use flashcards and drills to develop automatic skills and confidence. • Teach them how to "self-talk" to monitor performance. • Incorporate motor activity and hands-on activities into curriculum. • Move students to a quiet part of the classroom to avoid distractions. • Create record-keeping methods to help monitor assignments. • Use behavioral interventions such as those discussed in Chapter 5 (e.g., applied behavioral analysis, principles of reinforcement and punishment).
Giftedness & talent	• Involve students in planning their own curriculum, goals, and assignments. • Use contracts to help facilitate self-directed learning. • Focus on creative thinking and problem-solving activities. • Assign students individual study and research projects. • Encourage supplemental reading and writing. • Use the KWL method to identify what students know (K), what they want to learn (W), and have them reflect on what they learned (L). • Assign students to act occasionally as tutors or lab assistants.

The Role of the Teacher in Inclusive Classrooms

Regular education teachers have three main responsibilities in the inclusive classroom. First, they help identify students with exceptionalities. Second, they participate in modifying instruction and collaborating with parents and other professionals. Third, they build classroom communities where students with disabilities belong. The following sections examine these responsibilities in more detail.

Identifying Exceptionalities. To reduce the likelihood that students are inappropriately referred for a special education evaluation, teachers are expected to engage in a **prereferral** process, where interventions are attempted in general education. Sadly, many studies have documented that a disproportionate number of children from ethnic minority and low-income groups are inappropriately referred for special education services (Donovan & Cross, 2002; McLoyd, 1998; NCES, 2007). For instance, a student's struggle to learn

Prereferral

A process where interventions are first attempted in general education before a student is referred for special education evaluation to reduce the likelihood of inappropriate referrals.



Laura Dwight Photography

Teachers work with a multidisciplinary team when making decisions about whether a student qualifies for special education services.

English may be misinterpreted as a learning disability, a student who comes from a culture where acting out is typical may be misinterpreted as one with a behavior disorder, and a student with less access to early educational resources may be misinterpreted as having mental retardation (McLoyd, 1998). Because misidentification can have very harmful effects on students' academic achievement, teachers need to thoroughly document the nature of the problem (e.g., the student has difficulty learning to read or is withdrawn from the class) and the strategies used in attempting to solve the problem (Hallahan & Kauffman, 2006). In doing so, teachers work with a multidisciplinary team (e.g., teacher assistance team, teacher intervention team) composed of the student's parents or guardians, at least one general education teacher, at least one special education teacher, and one or more specialists who administer the evaluation instruments and interpret its results. The team gathers information about the student from the school and parents, generates hypotheses about the possible causes of the problem, and designs a specific intervention to be implemented by the classroom teacher. If the student's problem persists, then he/she may be referred for evaluation for special education services. This is the process that Ms. Branson (see Imagine You Are the Teacher) should follow to better understand the cause of Jung Ju's learning difficulties. The process from referral to writing an IEP includes the following steps:

1. Notifying the parents about the proposed evaluation and obtaining their written consent
2. Conducting an evaluation by a school psychologist
3. Examining the evaluation results with family members to determine whether the student is eligible for special education services
4. Preparing the IEP in collaboration with the IEP team (typically the same team that has evaluated the student) within 30 days

To ensure a fair and nondiscriminatory evaluation, the law requires using a variety of assessments in the areas that are related to the student's suspected disability and prescribes that tests must be administered in the student's primary language. Parents have the right to request an independent educational evaluation (IEE) if they disagree with the results of the evaluation.

Modifying Instruction and Collaborating. Once the IEP has been written, the IEP members agree to and sign it and then continue to review and revise it (if necessary) at least once a year. The teacher's responsibility then is to be flexible in making accommodations and modifications in all aspects of the classroom operation to help students with disabilities learn. In any classroom, students will have a range of student needs whether or not they have disabilities. Some students will learn easily and "run" with the



Ellen Senisi/The Image Works

Effective teachers in inclusive classrooms are able to engender a sense of community and take account of students' varied life experiences and needs.

work while others will need you to break down tasks in detail and provide explicit directions about how to perform each part of the task. Likewise, some exceptional students will require minor accommodations to learn successfully whereas others will require complex interventions. In the latter case, the expertise of a special education teacher will be critical. If you are preparing to be a general education teacher, you are not expected to have specialized knowledge about every type of disability. This is precisely why it is important that you learn to work collaboratively with a team of specialists. Depending on the school, collaboration between general and special education teachers is organized as consultation or sharing teaching responsibilities (co-teaching) either part- or full-time. Special and general education teachers may also rely on the help of assistants and specialists such as audiologists, speech and language therapists, occupational therapists, or physicians, each of whom may be working with a student who has a complex disability. Finally, teachers need to collaborate with the families of students with disabilities, who are often a crucial source of information and your partners in achieving success.

Developing Acceptance and Belongingness. The culture of our schools has improved significantly in terms of access to public schools and general education classes for students with disabilities. The challenge for teachers, however, is to guarantee that students with disabilities are not simply present in the educational system but that they are accepted and fully integrated into the classroom. This requires reflecting about how you and the students who do not have disabilities will interact with those who do. For instance, Pugach (2006) offers the following questions to the reflective practitioner:

- What friendship patterns exist in your classroom between your students with and without disabilities?
- What leadership roles do you make available to students with disabilities?
- How do your students learn to work together and support each other across the differences they each bring to the classroom? (p. 232).

The third role of the inclusive classroom teacher is to create learning conditions where students with disabilities can build their sense of confidence and belongingness and to model and instill a sense of understanding and acceptance among the nondisabled students.

IN THE CLASSROOM: A THINKING FRAMEWORK

This section introduces you to a thinking framework that you can use to work through the Diversity in the Classroom case included in this book. In each Diversity case activity, you will find an authentic classroom situation followed by three guiding questions. These questions are aimed at helping you think about the classroom case by focusing on the three problem-solving steps illustrated in Figure 2.10.

Your goal is to do the following:

1. Identify the issue
2. Evaluate the teacher's approach
3. Propose a plan of action given the variables and constraints defined by the issue.

Applying the case analysis framework to think about classroom issues will help you do the following:

- Become more aware of your personal biases, attitudes, and beliefs
- Appreciate the value of using educational psychology theory and research rather than your intuition, personal experiences, or anecdotal information to guide your practice
- Understand that classroom dilemmas do not have "one right answer." This will be most apparent when you compare your responses to the cases to those of your classmates and instructor
- Develop efficient problem-solving and critical thinking skills by engaging in the regular, structured practice of thinking about classroom cases.

Let's take a look at each of the three steps in the process in more detail.

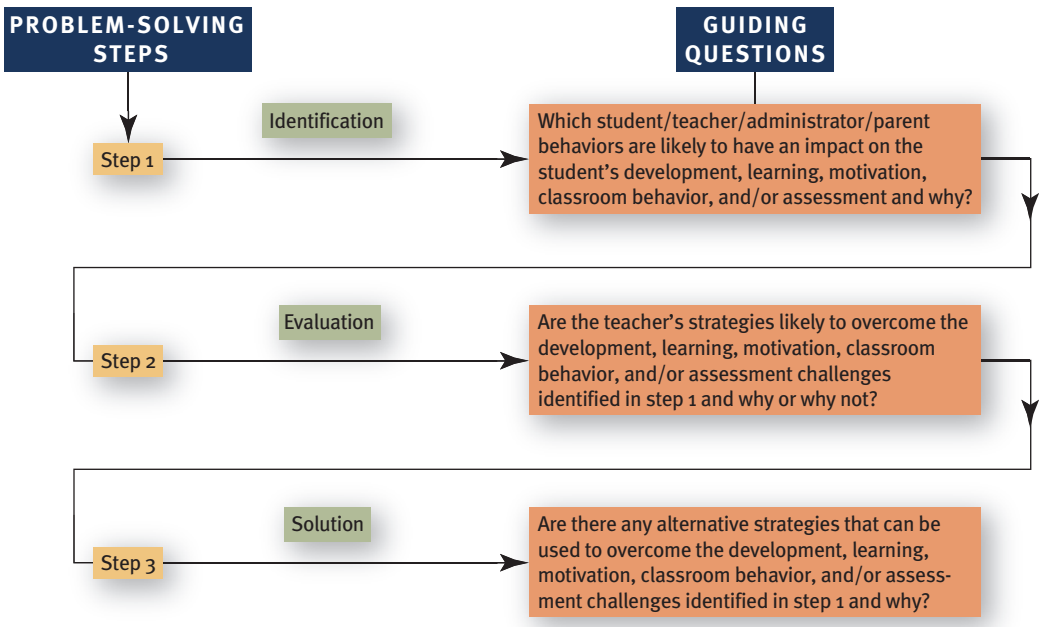


FIGURE 2.10 A problem-solving framework.

Three Steps in Case Analysis

(1) ***Identification:*** This step requires that you interpret the events described in the case using your professional teaching knowledge. You are not asked to provide a summary or retelling of the case but rather to "find" the main issues that are relevant to the teaching profession. A strategy that can help you in this step is to take notes as you read the case. Make a list of student, teacher, parent, or administrator verbal and nonverbal behaviors that you believe have relevant or significant implications for the classroom. Next, review your list and add the specific type of implications that you expect those behaviors to have based on your educational psychology knowledge.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

(2) ***Evaluation:*** This step requires that you evaluate the teacher's decision-making process described in the case, including pros and cons. Therefore, you will need to use your professional knowledge and critical thinking skills to judge whether the teacher's plan can successfully overcome the challenges that you identified in step 1.

Take the list of relevant teacher behaviors identified in step 1 and classify them into two categories: pros and cons. Next, summarize in one or two sentences why each behavior is effective or ineffective, respectively, according to your educational psychology knowledge.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

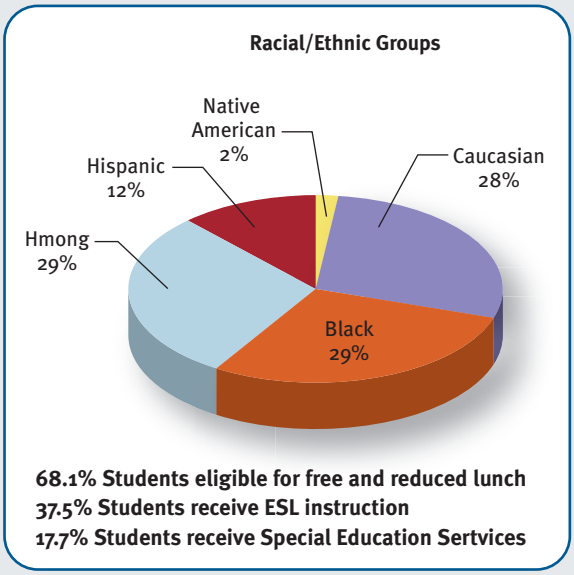
(3) ***Solution:*** This step requires that you propose a set of alternative strategies not illustrated by the case that you believe can effectively help solve the classroom dilemma. Therefore, you will need to use your professional knowledge and creativity to devise a plan that can successfully overcome the challenges that you identified in step 1. Take each one of the issues identified in step 1 and write down a set of strategies that you think are likely to effectively overcome each challenge. Next, summarize in one or two sentences why each of your strategies is effective according to your knowledge about educational psychology and learner diversity.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

A Case Study: DIVERSITY IN THE CLASSROOM

Identifying Exceptionalities in a Third-Grade ESL Classroom

Here is the first classroom case dilemma that you will need to solve using the problem-solving framework that is shown in Figure 2.10. Recall from the Note to the Student walkthrough that the Problem Solving in the Classroom activity presents a classroom dilemma in each chapter that is based on real issues experienced by in-service teachers. They were written to help you develop the decision-making, critical thinking, and reflective skills that you will need to solve similar teaching issues in your own classroom. At the end of each case, you will find three questions to guide you as you work through the case. In this chapter, you are provided with a worked-out response to each question. In the remaining chapters of the book, it's your job to apply the problem-solving framework to think about each dilemma and propose your solution. For your convenience and reference, we have repeated the problem-solving framework on the flap of the cover of the book.



68.1% Students eligible for free and reduced lunch
37.5% Students receive ESL instruction
17.7% Students receive Special Education Sertvices

"Here's the new English as a second language [ESL] schedule. You can send your third-graders to me after lunch," Mrs. Walker announces.

"I notice a conflict with this schedule," Mr. Flores responds. "I teach math during the same period. The students in ESL class will miss 40 minutes of math instruction each day."

"I realize there may be scheduling conflicts, but students must receive ESL instruction as mandated by the state of Minnesota. I'm sorry. I'm not able to change my schedule, because I service 48 other students," Mrs. Walker explains.

"Wow, you sure have your work cut out for you," Mr. Flores replies. "I'll send students to your ESL class on Monday. I'm not sure what I'll do about math instruction. I just wish there were more hours in the schoolday."

The new ESL schedule is not the only surprise Mr. Flores experiences during his first week of teaching in St. Paul's school district. On the fourth day of school, three new students enroll in his class and he realizes he needs to reteach all of his classroom procedures. Then, at the first staff meeting, he is told the inclusion teacher will be in his classroom for only 45 minutes each afternoon, due to her tight schedule. "How can I accommodate my students with exceptionalities?" Mr. Flores asks. "We'll have to schedule another meeting next week to discuss their IEP modifications. Until then, just give them extra support." Mr. Flores begins to understand that he will have to find the time, energy, and specific strategies to meet his students' diverse learning needs.

He rearranges the daily schedule to provide math instruction for the ESL students. In the afternoons he starts the whole class on a social studies or science lesson and pulls the ESL students aside to teach them math. He gives them exercises from the lesson as homework. When ESL students try to do their homework, they frequently leave problems blank and report that they don't understand how to solve them. In addition, he has no time to teach the ESL students important problem-solving strategies. By the end of the first quarter, Mr. Flores realizes some of the ESL students are scoring significantly lower in math, social studies, and science. Yet he feels this is the best he can do, given the tight schedule.

During his first month of teaching, Mr. Flores becomes concerned about one of his students. Ka-Ying is a shy Laotian whose home language is Hmong. She attends ESL classes, yet her overall academic scores are low, with a reading score of 1.3 (first grade, third month) and similar math scores. Writing simple sentences is challenging for Ka-Ying, and she does not seem to grasp science and social studies concepts.

At first, Mr. Flores wonders whether Ka-Ying is too shy to ask for assistance in class. He notices her conversing with her Laotian friend in Hmong. She seems embarrassed to use her home language in class but cannot switch to English because of her limited vocabulary. Based on first-quarter assessments, Mr. Flores realizes Ka-Ying has made little progress, but as a new teacher, he is unsure of the next steps to take.

First, he schedules a meeting with Ka-Ying's mother and requests a parent liaison to translate. Mrs. Pha is relieved when the liaison greets her in Hmong. Mr. Flores briefly describes his concerns and asks Mrs. Pha to talk about Ka-Ying's school experiences. She explains that Ka-Ying has been taking ESL classes since kindergarten and began first grade at the same level as her peers. During her first-grade year, a crisis called the family back to Laos. When Ka-Ying returned, she was placed in second

grade, despite her six-month absence. Mrs. Pha concludes that she and her husband are willing to do anything to help their daughter; however, they have no formal education and speak very little English. As Mr. Flores thanks Mrs. Pha for their meeting, he hands her some books. "You can take these home to read with Ka-Ying because regular practice will help her make progress."

Next, Mr. Flores speaks with the school's ESL teacher, Mrs. Walker, who tells him: "Ka-Ying struggles to write English and her [language assessment skills] LAS scores are very low. I've been teaching her since kindergarten, and it's been a long, slow process"

"How do her current LAS scores compare to last years?" Mr. Flores asks.

"That's a good question. I'm not sure. That information is kept in her permanent file."

"Well, I'm just wondering if in addition to being a limited English proficient [LEP] student, Ka-Ying may have a learning exceptionality."

"That's something you could discuss with the student assistance team [SAT] and then start the prereferral intervention process. In my opinion, some students just need more time to learn a second language. Also, let me warn you, it's a real headache to refer ESL students for services, especially Hmong students. Assessments need to be conducted in students' home language, and there's a shortage of Hmong translators. There's a big fear of lawsuits in this district for referring too many LEP students to special education."

With Mrs. Walker's words ringing in his ears, Mr. Flores immediately schedules a meeting with the SAT team. To his dismay, the next available date is 10 weeks away. How can he wait that long to provide Ka-Ying with the support she so urgently needs? He sets aside extra time during his lunch break to work one-on-one with Ka-Ying on reading and also enrolls her in an after-school program that offers tutoring.

At the first SAT meeting in February, the team suggests further interventions to support Ka-Ying's learning.

"It will be difficult to determine if her low academic performance is due to her second language, or if she has an emotional, cognitive, neurological, or sensorial learning exceptionality. After six weeks of documented interventions, we will consider further testing," the principal informs him.

"As part of the intervention, she'll receive small-group phonics instruction, but we're unable to provide extra support for math, social studies, or science. You'll be responsible for ensuring interventions are consistently implemented and for closely monitoring her progress," the reading teacher concludes.

Mr. Flores feels overwhelmed. How can he implement interventions for Ka-Ying, accommodate his four students with exceptionalities, tutor his ESL students in math, and effectively teach his class of 26 third-graders? "Well, no one ever said teaching would be easy, I'll just have to try harder," he says to himself. The next weekend, he missed his son's soccer game because he was sick with the flu.

At the SAT meeting in March, the team determines Ka-Ying has made modest gains in phonics but little progress in math. The team decides to continue phonics instruction, add extra math support after school, and start a comprehensive evaluation.

"Some assessments have to be conducted by fluent Hmong speakers so we can get valid results. It will be at least six weeks before these assessments will even begin," the principal informs the team.

"So, assessments won't be completed until May?" Mr. Flores asks.

"Yes, if we're lucky," the principal replies.

"I thought we would submit the prereferral packet to the special education department before the end of the schoolyear. I wouldn't want to retain Ka-Ying or have her experience this all over again next year. What can I tell her parents?" Mr. Flores says.

"I appreciate your concerns," the principal replies. "We'll just have to wait and see."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

Sample Response: First, there is a lack of communication between teachers about scheduling and providing services for students. For instance, teacher input is not solicited when the ESL schedule is created. Therefore, ESL students in Mr. Flores's class miss critical math instruction on a daily basis throughout the year, which significantly affects their academic progress.

Second, there is not an exchange of assessment data or other helpful student information between the ESL teacher, the inclusion teacher, and the classroom teacher. For example, the ESL teacher, Mrs. Walker, has been teaching Ka-Ying since kindergarten, yet she does not inform Mr. Flores that Ka-Ying was absent for six months of first grade, due to a family crisis in Laos. Nor does she notify him of Ka-Ying's low LAS scores and does not know how they compare to her LAS scores from previous years. As a new teacher, Mr. Flores has not been told that

LAS scores are kept in students' permanent files and consequently does not know how to utilize this helpful data.

Third, the school placed Ka-Ying in second grade after her six-month absence during first grade without comprehensively assessing her academic performance. This placement may be contributing to her low LAS scores and low reading, writing, and math performance.

Fourth, the inclusion teacher is in Mr. Flores's classroom for only 45 minutes a day, leaving him with much of the responsibility of modifying instruction and providing extra support for students with exceptionalities. This limited support challenges IDEA's provision for providing appropriate public education to students with special needs and may result in Mr. Flores's frustration and eventual burnout.

An additional issue is that Mr. Flores seems inexperienced at working in a multicultural classroom. Mrs. Pha tells him that she and her husband have no formal education and speak very little English, yet Mr. Flores sends home English books for her to read with her daughter, insisting that reading regularly will help Ka-Ying academically. Despite Mr. Flores's good intentions, Mrs. Pha and her husband may not be able to help their daughter in this way. This insensitivity may create distance between Ka-Ying's parents and the school.

Step 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his/her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

Sample Response: On the positive side, Mr. Flores is clearly dedicated to meeting his students' needs. For instance, when he is notified that his ESL students will miss math instruction each day, he makes time in his schedule to teach them math concepts in the afternoon. When he recognizes Ka-Ying needs extra support in reading, writing, and math, he uses his lunch break to provide tutoring.

Mr. Flores also promptly identifies that reading, writing, and math are all difficult subjects for Ka-Ying. By noticing her numerous academic challenges early in the year, Mr. Flores is able to identify that Ka-Ying is a second-language learner who may also have an exceptionality and need additional services. A useful strategy to learn more about Ka-Ying's special needs was scheduling a parent meeting and providing a translator at the meeting because Ka-Ying's parents had limited English proficiency.

On the other hand, Mr. Flores works tirelessly in his classroom to the point of burnout. His main strategy is to provide his students with extra help rather than trying to brainstorm a school-level, long-term solution with the help of his colleagues and administrators.

Step 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

Sample Response: First, Mr. Flores can encourage more effective communication between teachers by raising the issue with administrators or at a faculty meeting. A possible solution would be to develop common planning periods during which time teachers can meet together to discuss concerns they may have about lessons, assessments, and particular students. A second possibility would be to implement a routine way for teachers to exchange information about students. For example, Mr. Flores could regularly meet with the ESL and inclusion teachers to discuss the progress of his students.

Second, teachers must receive administrative support and sufficient training to meet their students' needs. Additional special education personnel should be hired if the existing staff is unable to provide services to students in the least restrictive environment. As a new teacher, Mr. Flores should be meeting regularly with a mentor teacher to discuss his concerns, lesson plans, assessment strategies, IEP modifications, parent meetings, and the prereferral process. A mentor teacher could also encourage Mr. Flores to find an appropriate work–life balance.

Third, the school should focus on building collaborative relationships with the community. Parents of students learning English must be viewed as capable advocates for their children and valuable resources. By being involved with the families and communities of English learners, educators can start to understand the social, linguistic, and cultural contexts in which the children are being raised. Thus, educators learn to respect cultural differences in child-rearing practices and how the parents are involved in their children's education.

Fourth, the school district must recruit more Hmong speakers as classroom teachers, special education staff, and parent liaisons. For Laotian students and their families to receive services as mandated by IDEA, there must be efficient ways to assess students' academic and social needs in their native language. Considering the large Hmong population, the district could institute a language program in the students' native language that could provide the foundation for achieving high levels of English proficiency.

REVISITING ISSUES IN EDUCATION

Can intelligence be modified?

Points to consider: Genetic studies show that general cognitive ability runs in families. For relatives living together, the average correlations of *g* are: for parent–offspring pairs: 0.43; for sibling pairs: 0.47; for nonidentical twins: 0.60; for identical twins: 0.85. When twins are reared apart, the correlation still holds in the 0.6 to 0.8 range (Bouchard & McGue, 1981). These numbers indicate that individual differences in intelligence are partly the result of genetic influences. However, most experts agree that intelligence is the product of the nature/nurture interaction (Coll, Bearer, & Lerner, 2004; Shepard, 2001), with nutrition and environmental stimulation having strong effects on the development of cognitive abilities (Blair, Gamson, Thorne, & Baker, 2005; Sternberg, Grigorenko, & Nokes, 1997). For example, there is some evidence that early-intervention programs that increase intellectual stimulation, such as Head Start, can lead to an increase of the IQ of infants and young children (Barnett, 1998). On the other hand, the IQ scores of older students and adults are relatively stable over time (Hoekstra, Bartels, & Boomsma, 2007).

SUMMARY

- As a future teacher, you will need to understand and connect with a roomful of diverse students. You can use your expertise to help them develop the knowledge and skills that they need to succeed. The multiple sources of students' diversity are traditionally organized into three categories: group differences, individual differences, and student exceptionalities. However, teachers should take an individual rather than group perspective when considering diversity in the classroom and consider all factors that contribute to a particular student's identity when making classroom decisions. Differences within groups can be as large as differences between groups, so teachers should be cautious about stereotyping: generalizing what is known about groups to individual students.
- SES can influence the amount and quality of students' health care, resources, home support, and stimulation, and it may place them at risk of academic failure. However, resilient children succeed at school despite environmental adversities. Teachers can promote resiliency through high expectations, monitoring, and support. Cultural background includes the knowledge, attitudes, values, and behaviors that characterize a group of people. Teachers should be careful not to use a cultural deficit model when interpreting the thinking and behavior of students of diverse cultural backgrounds and focus on students' assets. Culturally responsive teaching, culturally relevant pedagogy, and multicultural education are examples of programs aimed at creating links between students' culture and instruction and helping students develop cultural sensitivity toward each other. English language learners are increasing in numbers, and current approaches to helping ELL students learn English vary in their emphasis on maintaining students' home language.

  Gender differences are found in students' emotions and behavior, physical performance, technology use, cognitive abilities, and achievement. The differential treatment of boys and girls at home and in the classroom can have a strong impact on students' gender-role identity and academic development.
- Intelligence is defined as the ability to think in the abstract, problem-solve, and adapt to life's experiences. Most experts believe that intelligence is the result of the nature/nurture interaction. Ability differences in the classroom have been treated with different ability-grouping methods such as within- and between-class ability grouping and the Joplin plan. Tracking can cause students to become

trapped in an ability group that may no longer be appropriate. Cognitive styles are students' unconscious ways of processing information across domains and include reflectivity/impulsivity. Learning preferences are students' preferred approaches to learning. Research does not support the idea that students' learning should be matched to their learning preferences. Other individual differences that are evident in the classroom stem from students' temperament and personality.

- Federal laws guarantee parents' right to be involved in the process of determining whether and how their children will receive special education. IDEA requires that students with special needs be taught in the least restrictive environment and that they be provided with IEPs. Students with learning disabilities have difficulty in specific academic areas such as reading, writing, and math. Students with speech or language impairments have difficulty expressing or understanding ideas and thoughts. Students with mental retardation display significant intellectual and adaptive behavior limitations. Students with emotional disturbance display seriously inappropriate externalizing and internalizing behaviors that result in academic and social failure. Students with sensory/physical impairments include those with visual, hearing, and orthopedic disabilities that interfere significantly with learning. Students with autism spectrum disorders are characterized by varied degrees of social withdrawal and deficiencies in cognitive and language processes. Students with traumatic brain injury may show a variety of cognitive impairments. Each state is responsible for defining and determining when students have developmental delays by using appropriate diagnostic instruments and procedures. Students with ADHD may qualify for special education services under Section 504 of the Rehabilitation Act and are characterized by having persistent limitations in their attention span and being impulsive. Gifted students, those who have above-average ability, motivation, and creativity, do not fall under IDEA. Special programs for these students are funded at the state or school district level. Teachers' responsibilities in the inclusive classroom include participating in the identification of exceptionalities and IEPs; adapting instruction; collaborating with special education teachers, specialists, and parents; and creating a classroom climate that promotes social integration and acceptance.

KEY TERMS

ability grouping 46
achievement gap 31
bilingual education 35
cognitive styles 48
cultural deficit model 31
dialect 28
differentiated instruction 46
gender 40
general intelligence (*g*) 44
inclusion 49
individualized education program (IEP) 50
Individuals with Disabilities Education Act (IDEA) 49
intelligence quotient (IQ) 44
language minority 34
learning preferences 48
least restrictive environment (LRE) 49
prereferral 57
resilience 39
self-fulfilling prophecy 31
sex 40
socioeconomic status (SES) 37
stereotype 27
tracking 46

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. Why is understanding diversity in the classroom important for teachers?
2. What are the main group differences studied in education?

3. In which ways may students from diverse cultural backgrounds show differences in the classroom?
4. What are some approaches to teaching in the culturally diverse classroom?
5. What are some approaches to teaching language minority students?
6. How may students' socioeconomic status affect their learning?
7. What is known about gender differences in the classroom and their origin?
8. What are the main individual differences studied in education?
9. Describe the intelligence theories covered in this chapter. How are ability differences treated in the classroom?
10. What are some differences between cognitive styles and learning preferences?
11. What exceptionalities are listed under IDEA and what are the roles that teachers have in working with exceptional students?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in Chapter 1.

1. Review the opening vignette, *Imagine You Are the Teacher*, and think about which professional knowledge and skills are illustrated by Ms. Branson's behavior and thinking?
2. In a research study, newborn infants viewed, side-by-side, an active and expressive person and a similarly sized inanimate object. Boys looked longer at the object, and girls looked longer at the person (Connellan, Baron-Cohen, Wheelwright, Batki, & Ahluwalia, 2000).
   a. Is this a descriptive, correlational, or experimental study and why?
   b. What can you conclude from the findings?

A Case Study: PUTTING IT ALL TOGETHER

Teaching in a Culturally Diverse Classroom

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"*Yá'át'ééh abínil*" (Good morning!) Gabrielle announces as she shakes Mrs. Lopez's hand upon entering the first-grade classroom. "*Yá'át'ééh*," Mrs. Lopez replies. Gabrielle's classmates giggle as they hang up their winter jackets. "*Shimasani* (Grandma), don't touch my basketball," Damien warns Gabrielle, as they pull out pencils and homework from their backpacks. The greetings mark the start of a new schoolday at Red Mesa Elementary in the town of Gallup, located in northwestern New Mexico.

Red Mesa serves a diverse population: 72% of the students are Navajo, 26% Hispanic, 2% Caucasian. 60% have limited English proficiency (LEP), and 92% are eligible for free and reduced lunches.

Such a diverse community is where Mrs. Lopez had always hoped to teach. She grew up in a large Hispanic family in southern New Mexico and recently moved to Gallup to start her teaching career. This is her first experience working with the Native American community, and she has been particularly sensitive to their traditions. For example, Navajo parents expressed concern when she planned a field trip to tour an Anasazi heritage site. "It would be unhealthy for us to visit Anasazi ruins; our stories tell us it may bring sickness to our children," they told Mrs. Lopez. She quickly scheduled an alternative field trip to a local museum. In an effort to honor her students' cultures, she includes a variety of diverse literature in her lessons and encourages students to share and write about their own experiences with the class.

Mrs. Lopez directs the first-graders to sit on the rug in the reading area and holds open the first page of the book. "Today I'll be reading *Annie and the Old One* by Miska Miles, and then you'll have a chance to write in your journals." They eagerly comment on the pictures; "Hey, there's a mesa." "Look at the corn and sheep." "Even a hogan, like my Grandma's." A hogan is a traditional Navajo round house used for ceremonies and family events. "Yes, you're right—this is a story about a girl growing up on the Navajo reservation," Mrs. Lopez explains. She begins to read and frequently stops to give students the opportunity to share. Mrs. Lopez has found that it is particularly helpful for LEP students to make personal connections with the readings. She chooses names randomly from a pocket in her apron that contains popsicle sticks with all the students' names to ensure they have equal opportunity to talk in class.

"Quintana, would you like to share something with the class?" Mrs. Lopez asks after selecting her name. "Yeah, when Annie talks about making fry bread with her mother, it reminds me of going to the Gallup flea market on Saturdays," Quintana respond. "My mom lets me and my brother share a piece of fry bread. She says, 'Fry bread is real yummy, but real greasy.'" Mrs. Lopez has sampled her fair share of fluffy warm fry bread since she moved to Gallup and laughs: "I know what your mom means, Quintana."

"I just love, love, love fry bread!" Selena says in a high-pitched voice. Then she stands up and does a comical impression of eating fry bread and falls back onto the rug. Her classmates laugh. "Selena that's enough now, I'm going to start reading our story again. Please sit right here next to me." Mrs. Lopez continues the story with Selena sitting by her side.

When she finishes the next paragraph, Mrs. Lopez pulls Vincent's name from her pocket. She asks, "What would you like to share, Vincent?" "Well, why are we reading another book about Navajos?" Vincent responds. "It seems like we're always reading books about them." Vincent comes from a large Hispanic family and has three older siblings enrolled at the school. "Vincent, this story is part of our writing lesson today," Mrs. Lopez responds, not wanting to disrupt the lesson. "We can discuss your question during tomorrow's lesson."

She begins to read again, but Gabrielle starts to respond to Vincent's comment. "Hey, there's a lot of us Navajos in this class. That's why we're reading this book. Raise your hand if you're Navajo." A number of students raise their hands. "See, Vincent." Gabrielle says in a matter-of-fact tone. Mrs. Lopez is unsure how to respond to this exchange. Should she continue reading? Should she discuss how the class will be learning about many different cultures over the course of the year? Should she lead a discussion about how everyone is unique and special?

Before Mrs. Lopez has a chance to make a decision, she is alerted to the sound of giggles. Selena is making clown faces. Mrs. Lopez gives her a choice, "You may listen to the story with us, or you may go sit at your desk, which is it going to be?" "I'll sit here," Selena replies resolutely. Soon the class is distracted again when Selena starts to take off her shoes. "Pew-eee, something stinks," Jeremy declares and plugs his nose. Mrs. Lopez decides to have students return to their desks to avoid further disruptions and gives Selena a simple errand. "Selena, can you please take this box to Mrs. Garcia for me?" Selena gets to stretch her legs and the class refocuses.



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Mrs. Lopez has been concerned by Selena's behavior lately, which is not only affecting her academic achievement but disrupting the entire class. Before the start of the schoolyear, Mrs. Lopez was informed Selena had mild attention-deficit hyperactivity disorder and took medication to help her focus during school. Mrs. Lopez immediately observed typical ADHD symptoms such as inattention, hyperactivity, and impulsivity.

Selena's ADHD symptoms are most apparent during whole-class activities when she fidgets or talks out of turn. Yet during language arts, Selena also struggles to stay on-task when completing assignments. First, she has difficulty finding the correct materials, such as a sharp pencil or her writing journal. Then, as she writes, she will erase words midway through a sentence, either because she has a new idea to add or because she is displeased with her handwriting. Frequently, Selena will tear out her current journal page and start the assignment over again. These symptoms worry Mrs. Lopez because Selena's writing skills are quickly falling behind grade level. Also, she is not always able to provide the extra support Selena needs to complete assignments because she is busy working with other students.

In October, Mrs. Lopez began to work closely with the school counselor and Selena's mother, Ms. Yazzie, to ensure Selena regularly receives the correct dosage of ADHD medication. As a single mother without transportation, it is a challenge for Ms. Yazzie to attend to all her daughter's needs. But Ms. Yazzie has never missed a meeting. At these meetings, she frequently expresses concern about Selena's behavior and her resistance to completing homework and chores at home. On the counselor's suggestion, she enrolled in a parenting class for help and support with these issues. Now, in mid-November, Mrs. Lopez realizes it is time to reevaluate Selena's progress.

Questions remain for Mrs. Lopez. Are Selena's academic and social challenges a result of her ADHD or does she also have learning disabilities? Does Selena need additional services from the school or does she need an adjustment to her ADHD medication? Mrs. Lopez keeps a careful record of Selena's behaviors to discuss with the counselor, Ms. Yazzie, and Selena's pediatrician. She also requests permission from Ms. Yazzie to start a comprehensive evaluation of Selena's learning. This will include an evaluation by the school's literacy specialist, psychologist, and counselor, as well as documentation of researched-based interventions in the classroom, to determine whether Selena has an exceptionality and may be eligible for services.

Mrs. Lopez is also planning an activity for tomorrow's lesson that will encourage unity in her classroom. Students will write appreciation notes to each other, highlighting things they enjoy doing together. She will model how to write a simple note and then give each student a decorative paper with another student's name written at the top. Students will have 10 minutes to write a note that Mrs. Lopez will then read aloud to the class. She wants to emphasize how learning about people's unique cultural heritage strengthens friendship and understanding.

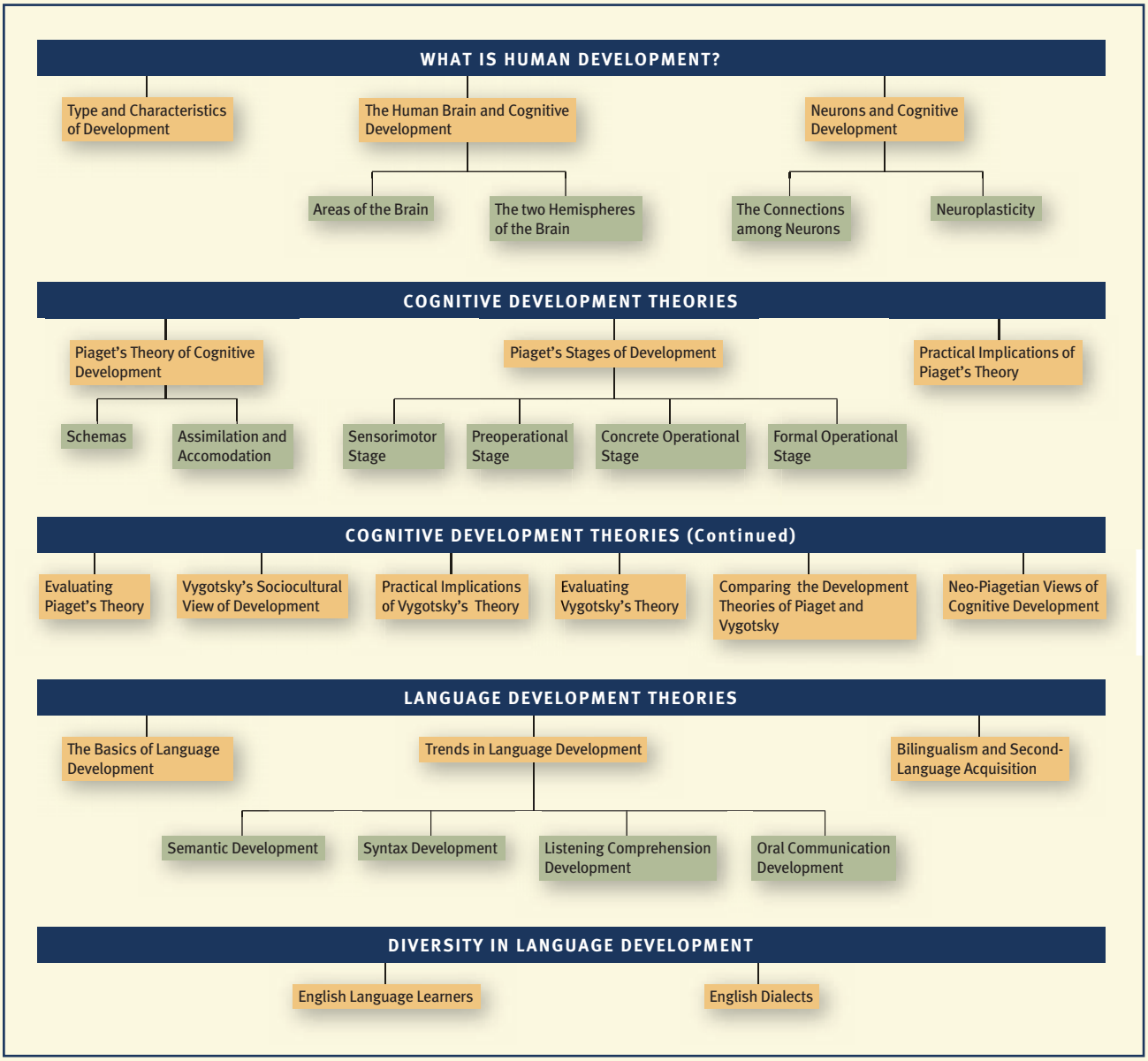
Miles, M. (1971). *Annie and the old one*. New York: Little, Brown and Company.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. How many types of diversity did you recognize in the classroom case?
2. Did the teacher use any strategies to learn about her students' diversity?
3. What did the teacher do to adapt instruction to students' diverse needs?
4. Which of the IDEA provisions were followed in the case and how?
5. Do you think the lesson was likely to promote gender equity?
6. Using what you know about the role of teachers in inclusive classrooms, evaluate the teacher by including both strengths and weaknesses.

3 Cognitive and Language Development



Imagine You Are the Teacher

IT IS MATH TIME IN Mrs. Lovit's class. Her learning objective is to have students master the addition of multiple-digit numbers. To this end, she has written the steps of the arithmetic procedure on the board and guided the whole class as they worked on three sample problems. Next, she asks her students to work on three additional problems individually. Mrs. Lovit is now walking around the classroom, monitoring students' progress.

Clara is concentrating very hard on the problems and has many eraser marks on her worksheet. As Mrs. Lovit walks by Clara's desk, she can hear Clara saying, "First, add 6 and 8 in the ones column."

Clara then looks up at the board frowning. After several minutes, her attention goes back to her worksheet as she says, "Write 4 under the ones and carry the 1 to the tens column. Then add 1 + 2 + 9. Write 12 in front of the 4."

- What are Clara's behaviors revealing?
- At what grade level is Clara likely to be?
- Should you be concerned about Clara's cognitive development?

Think about how you would respond to these questions as you read through the chapter.



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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define cognitive development.
2. Describe the brain's structure and development.
3. Apply the developmental theories of Piaget, Vygotsky, and neo-Piagetians to explain learning.
4. Explain language development and second-language acquisition.
5. Discuss issues of diversity in language development.
6. Apply cognitive and language development principles to classroom scenarios.

Journal Activity — ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Should a teacher wait to teach certain skills until learners reach a certain age?
2. Can students' cultural backgrounds affect the ways in which they think?
3. Does having a second language interfere with the development of English skills?

WHAT IS HUMAN DEVELOPMENT?

Human development is a general term used to refer to the changes that occur between conception and death. The term, however, does not apply to all changes but only to those that appear in a certain order and that remain for a reasonably long period of time. Any change that we experience that is transitory in nature, such as in the case of an illness, is not considered part of human development.

Types and Characteristics of Development

There are several types of human development. Physical development refers to the changes in the body and motor skills. Cognitive development refers to how our minds and mental processes change over time. Language development is concerned with the ways that humans develop the ability to communicate with others. Personal and social development, to be discussed in the next chapter, refer to how our concepts of ourselves and relationships with others change over time.

Experts agree that human development has the following characteristics:

1. It is relatively orderly; for instance, children develop abilities in a logical sequence, such as developing the ability to say words before producing full sentences.
2. It takes place gradually; children's development does not happen overnight but rather over a relatively long period of time.
3. It may happen at different rates for different individuals; for example, in a typical classroom, some students will be more emotionally mature than others or will display higher cognitive skills than others.

Some developmental changes occur naturally, as a consequence of our genetic programming, and are therefore called *maturation* changes. Maturation happens over time and is relatively unaffected by the environment. Most of human physical development falls in this category. Other changes, such as social development, do not occur unless a person is able to interact with the environment and other people.

You will soon learn that cognitive and language development are affected by both—maturation processes and the interaction with the physical and social environments. These two development forces are commonly called the nature and nurture factors in human development, respectively. You may recall that in Chapter 2 we discussed whether the gender differences found in education originate in biological/nature differences (such as those stemming from different brain structures and/or hormones) or social/nurture influences (such as the different expectations that are set for females and males in our society). A similar discussion applies to human development: exactly how much nature and nurture contribute to development is still under debate. Let's examine the role of nature in human cognitive development—the human brain.

The Human Brain and Cognitive Development

Although the relationship between mind and brain is still not totally understood, current research suggests that the workings of the mind are associated with the structure of the brain, an idea that is called **specialization**. Using new technologies such as functional magnetic resonance imaging (fMRI) and single photon emission computed tomography (SPECT), neuropsychologists have started to identify how anomalies in the structure of the brain relate to certain cognitive impairments, suggesting that there are several areas of the brain involved in specialized functions.

Specialization

The idea that the workings of the mind are associated with the structure of the brain.

Areas of the Brain. Take a look at Figure 3.1. We now know that an important function of the cerebellum is to coordinate balance and coordinate fine-tuned movements ranging from those required for everyday activities (e.g., walking, eating) to the more

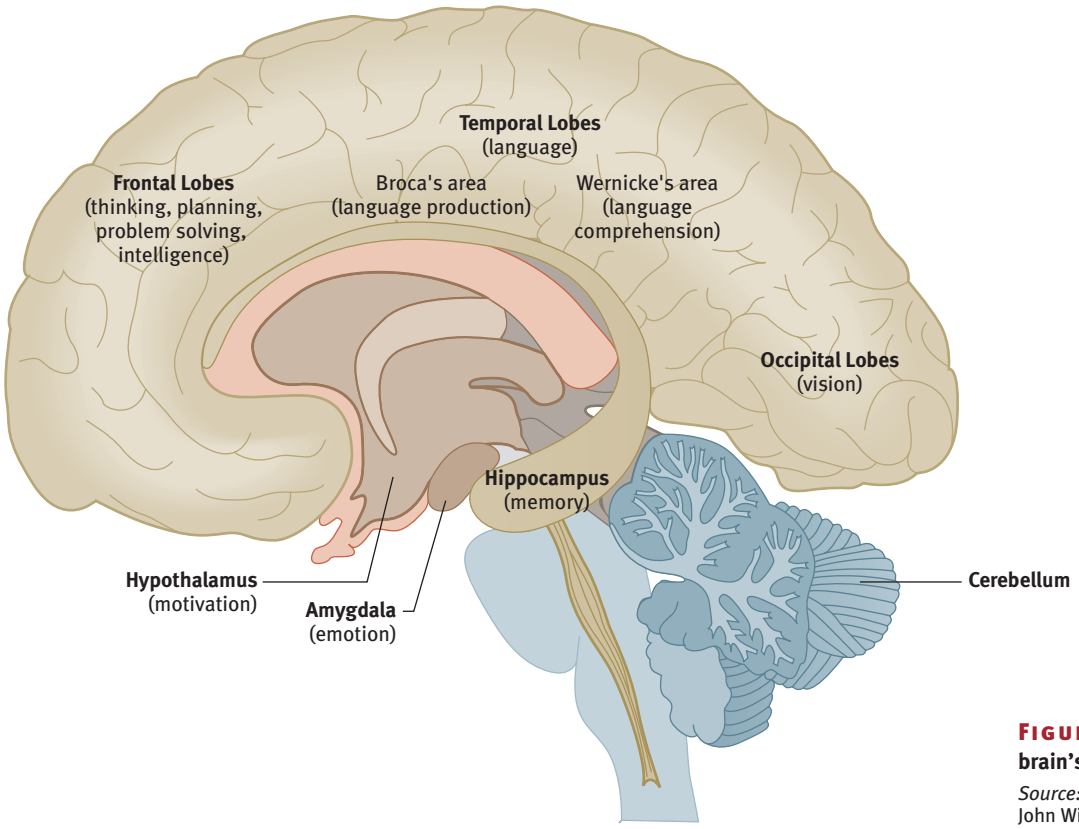


FIGURE 3.1 A view of the brain's different components.

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sophisticated moves involved in playing sports and dancing. There is also significant evidence that the reticular formation plays a crucial role in attention, working as a filter that either blocks or sends some messages for further processing to other, higher brain centers. Additional areas that were found to have a specific function in the brain include the following:

- The hippocampus, which is critical in recalling recent information and experiences
- The amygdala, which directs human emotions
- The thalamus, which helps us learn new information, especially if it is verbal
- The corpus callosum, which moves information from one hemisphere of the brain to the other (Meece, 2002; Wood & Wood, 1999)

Cortex

The largest human brain component, it is a 1/8-inch-thick wrinkled-looking region that encompasses 85% of an adult's brain weight and contains the largest number of neurons.

Figure 3.2 shows different areas of the largest human brain component, the **cortex**. The cortex is a 1/8-inch-thick wrinkled-looking region that encompasses 85% of an adult's brain weight and contains the largest number of *neurons*—the cells that are in charge of storing and transmitting information. The cortex develops more slowly than other brain parts. Within the cortex, the area that controls physical movements is the first to mature, followed next by the areas that control the senses (e.g., vision, hearing) and finally by those that control complex cognitive processes (e.g., language, thinking). For example, research indicates that the prefrontal cortex, which controls our impulses by means of reasoning, planning, or delay of gratification, can take up to 20 years to become fully developed (Weinberger, 2001). Thus, an important role that parents and teachers need to play in cognitive and emotional development is helping children regulate and plan their behavior (Meece, 2002).

Despite the specialization of the brain, when complex functions take place, different areas of the cortex work together to produce an integrated result (Byrnes & Fox, 1998). For example, take a child's ability to speak. To be able to produce language in response to a question, the child will need to process the question through the primary auditory cortex and produce a controlled vocal response using a cortex area known as *Broca's area*, which controls the movements of the lips, jaw, and tongue. In addition, the process of connecting meaning to particular words requires the functioning of *Wernicke's area*. All the above brain areas need to work in unison to produce a meaningful verbal response. Research shows that when Broca's area is damaged, the production of speech is not well articulated, resulting in short, ungrammatical, but appropriate responses (Anderson, 1995). The opposite effect arises when Wernicke's area is damaged, with people producing responses that are grammatically correct yet meaningless.

Lateralization

The specialization of the two brain hemispheres.

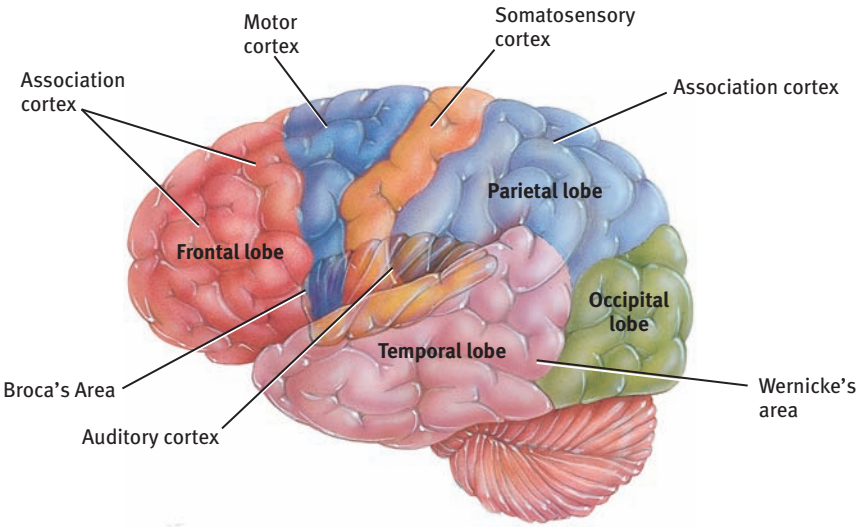


FIGURE 3.2 The Brain's Cortex and Its Different Areas.
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The Two Hemispheres of the Brain. In addition to specialization and integration, the brain develops **lateralization**, which is the specialization of the two brain hemispheres. The first evidence for lateralization comes from the motor cortex. The motor cortex in the left hemisphere controls the movements of the right side of the body, and vice versa. This is why people who have a stroke in one hemisphere of the brain usually become paralyzed on the opposite body side, a case of hemiplegia. For most right-handed people, lateralization will also be displayed by having the left hemisphere of the brain

specialize in verbal processing and the right hemisphere specialize in nonverbal processing (e.g., visual recognition, spatial perception, and emotion). Left-handed people may experience the opposite lateralization or, in some cases, they may have less hemispheric specialization altogether (Josse & Tzourio-Mazoyer, 2004).

Lateralization means that one side of the brain is more efficient than the other in performing certain functions. For instance, for most people, the left side of the brain will be more efficient at processing words as compared to processing pictures and the right side of the brain will be more efficient at recognizing pictures, faces, and others' emotions (Heller, Nitschke, Etienne, & Miller, 1997). Nevertheless, left-handed people and females, on average, show less hemispheric specialization (Kansaku, Yamaura, & Kitazawa, 2000; O'Boyle & Gill, 1998).

What are the teaching implications of lateralization? There have been many claims about the need to base educational practices on brain research. Although these claims are valuable because they emphasize using such research evidence as a guide for teaching practices, educators sometimes misinterpret brain research to suggest practices that are detrimental to students (Bruer, 1999a). Research on hemispheric lateralization is a good example of this potential problem.

Many educators believe that one of the implications of lateralization is to identify left-brain individuals, who are presumably more logically inclined, and right-brain individuals, who are presumably more creative (Sousa, 1995). However, as you well know now, all people use both hemispheres in their daily and classroom functions. Which hemisphere is more likely to be involved depends on the type of processing (e.g., verbal versus nonverbal) and where the specialization developed for a particular individual. Therefore, "teaching to a particular side of the brain" should be avoided because it is not supported by neuroscientific research (Byrnes & Fox, 1998; Hugdahl & Davison, 2007; Stanovich, 1998). As a future teacher, you will need to be aware of simplistic educational approaches such as the left-brain—right-brain approach. There are, in fact, no right-brain or left-brain students (unless one hemisphere has been totally removed!) but rather students who engage in integrated right and left hemisphere processing and communication.

Neurons and Cognitive Development

Another important aspect of cognitive development happens at the neuron level. **Neurons** are the brain's cells, also called nerve cells. Despite their variation in size and shape, all neurons include the same components, which are shown in Figure 3.3.

Neurons

The cells that are in charge of storing and transmitting information.

- First, neurons have a *cell body*, which contains the nucleus and is responsible for the cell's health.
- Second, they have a set of branches called *dendrites*, which are in charge of receiving messages from other neurons.
- Third, they have an *axon*, which is the long, armlike structure that ends in terminal buttons. The axon is in charge of transmitting information to other neurons.
- Finally, Figure 3.3 shows how the axon is covered by a white, fatty coating called the *myelin sheath*. When dendrites are stimulated by other neurons, they become electrically charged. If the total charge exceeds a certain value or threshold, the neuron reacts by sending an electrical impulse along its axon to the terminal buttons.

Neurons grow in number and size at least until adolescence. Part of the size increase is due to *myelination*, the process by which the neurons become covered with the myelin sheath. Myelination in brain areas that are specialized in hand–eye coordination takes about four years to complete, and myelination in brain areas specialized in focusing attention is not complete until the end of the elementary school years (Tanner, 1978). Can you guess how this might be important when planning a lesson for elementary students? Teachers should prepare lessons that are just the right length of time for the attention span of their students. Teachers also need to develop ways to

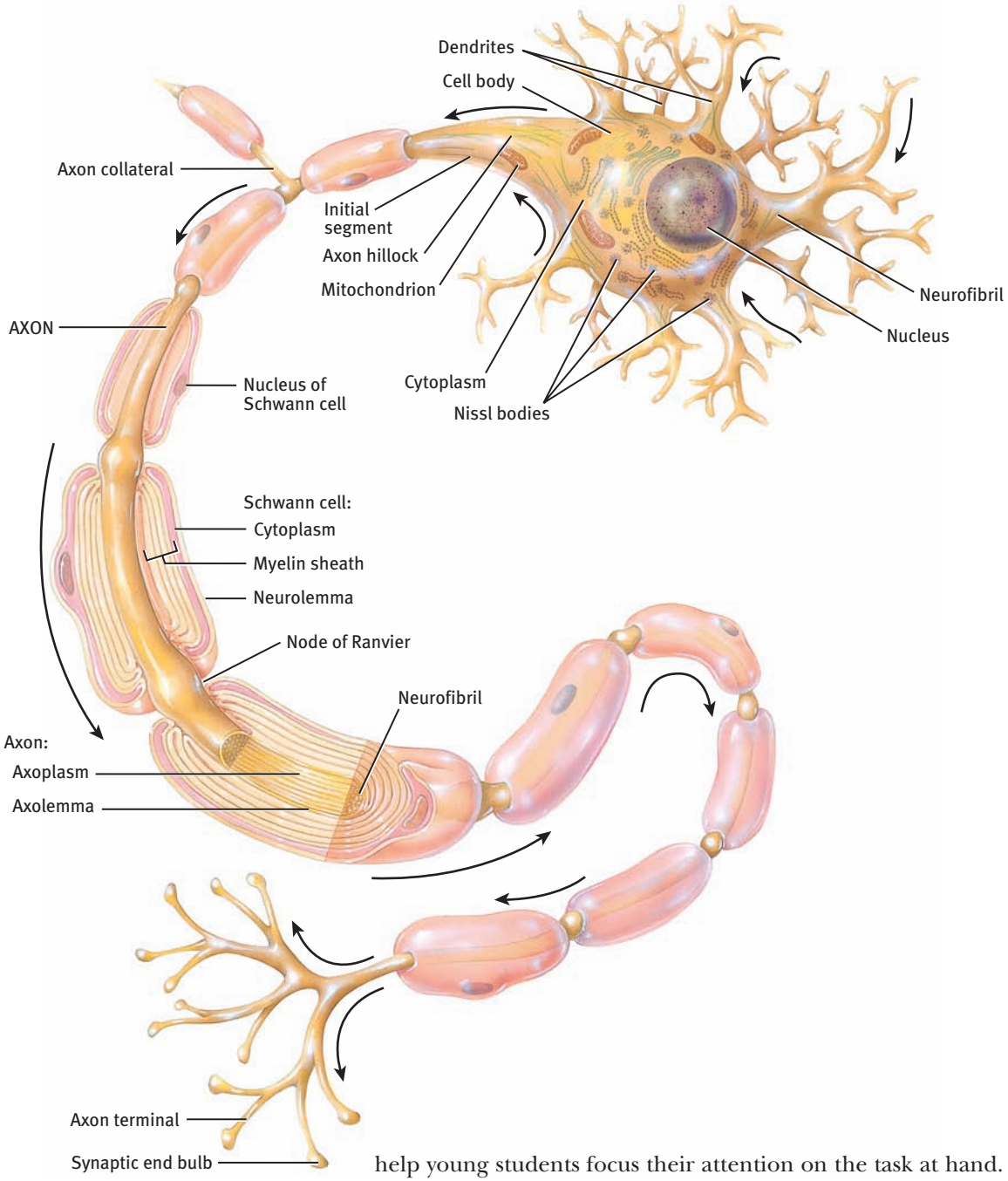


FIGURE 3.3 Neurons and their connections.

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help young students focus their attention on the task at hand. Myelination is very important to cognitive development. The fat cells that cover neurons are responsible for speeding the transmission of information between neurons. In other words, if the axon has a complete and healthy myelin sheath, the impulse travels quite rapidly from neuron to neuron.

The Connections among Neurons. In addition to neurons' growth in number and size, there is a dramatic increase in the number of connections among neurons (Ramey & Ramey, 2000). Take another look at Figure 3.3. You will notice that neurons don't touch one another but are separated from each other by a space that is called a **synapse**. It is in this space that the connections between neurons happen. When an electric impulse moves through the axon, it signals the terminal buttons to release certain chemicals (i.e., neurotransmitters), which travel across the synapses and stimulate the dendrites or cell bodies of neighboring neurons. Neurons may have synaptic connections with hundreds or thousands of other neurons, forming altogether a

Synapse

The space between neurons where electric connections happen.

neural network (Goodman & Tessier-Lavigne, 1997; Lichtman, 2001; Thompson, 1985). Humans develop nearly twice as many connections than will ever be used during their lifetimes (Huttenlocher & Dabholkar, 1997; Huttenlocher, Haight, Bruk, Seltzer, & Lyons, 1991). Which connections remain in adulthood and which disappear will depend on their activation. The connections that are activated will become strengthened and survive, while the ones that are not activated will be "pruned" and eventually disappear. Synaptic density is an important indicator of the extent of connectivity between neurons. How fast synapses develop and stabilize depends on the brain area that the neuron serves. For temporal lobes (specialized in language and long-term memory processing) and parietal lobes (specialized in spatial processing), development typically happens between age six and puberty. The prefrontal cortex, which is specialized in higher-order thinking, planning, and control, experiences a peak of synapse overproduction at about 1 year of age, but it is not until middle to late adolescence that the density of synapses stabilizes. Brain scans show that children experience rapid spurts of growth until age 15 (Thompson et al., 2000). As the brain reorganizes itself, some areas may double in size, whereas others may experience a dramatic tissue loss due to lack of activity.



MARCO LONGARI/ AFP/Getty Images/Newscom

How might children's malnutrition affect their cognitive development?

Neuroplasticity. Nevertheless, people of all ages continue to form new synapses in response to their experiences with the world, suggesting that a person will never be too old to acquire new knowledge and skills (Brown & Bjorklund, 1998; O'Boyle & Gill, 1998). In fact, there is no evidence that children's educational experience needs to be maximized during a certain **critical period**. Although a critical period exists for developing normal vision (which is lost if infants are not exposed to normal patterns of light) or language (which may not develop if children don't hear spoken language until the age of 5), cognitive development in general is a long-term endeavor. Moreover, there is ample evidence for brain's *neuroplasticity*, the reorganization of the synaptic networks of the brain. Although in classical neuroscience the adult brain was considered as immutable as a precise clock, current findings show that the human brain is as malleable as clay, not only during infancy, as scientists have long known, but also well into old age (Hugdahl & Davison, 2007). An example of neuroplasticity is a stroke patient who at first may be unable to move a limb yet will slowly recover the lost skills after sufficient practice. When neuroscientists look at the brain of stroke patients who have recovered their functioning, they find that the functions of the brain areas killed in the stroke have transferred themselves to healthy regions of the brain.

Research on the neuroplasticity of the normal brain is also amazing, showing, for instance, that people who learn to play a sequence of notes on the piano develop characteristic changes in the brain's synaptic connections, changes that are also found even when these people sit in front of a piano and just think about playing that note sequence. Furthermore, the more frequently a pattern of connections is activated, the more automatic the memory or task that originated such a pattern will become (Buchel, Coull, & Friston, 1999). These findings show the powerful effects that the mind can have on the brain and explain how learning experiences change the brain's structure (Doidge, 2007; Schwartz, & Begley, 2002).



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What is the relationship between neuroplasticity and learning?

Critical Period

A period of special sensitivity to specific types of learning that shapes the capacity for future development.

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT

What's so amazing about the brain? Write a haiku or an acrostic poem to describe the amazing brain we all use to learn. Remember a haiku consists of three lines. The first and third lines have five syllables each and the second line has seven syllables. In an acrostic poem the first letter of each line spell the topic, in this case *human brain*. Read your poem to the class.



ISSUES IN EDUCATION

Can brain-based research inform classroom practices?

Brain-based research has provided exciting discoveries about the structure of the brain and how the brain processes and stores information. Many educators are so enthusiastic about these findings that they endorse "brain-based education," a teaching approach that is claimed to be based on recent brain-based research. In contrast, "brain-based education" critics argue that although neuroscience has helped us understand how humans learn and develop, it has not contributed to our understanding of what practices are needed to foster students' learning and development. Do you think that brain-based research can inform classroom practices? A response to this question can be found at the end of the chapter.

COGNITIVE DEVELOPMENT THEORIES

Many explanations of how and why children's thinking processes change over time have been offered in the past. In the next sections, you will learn about the three most influential cognitive development theories, those of Jean Piaget, Lev Vygotsky, and the neo-Piagetian theorists. Each of these theories views cognitive development from a different perspective and, therefore, will give you alternative strategies to foster children's cognitive growth.

Piaget's Theory of Cognitive Development

Swiss psychologist Jean Piaget conducted a lifelong study of children's cognitive development in the past half-century (Piaget, 1954, 1964, 1969). His research method consisted of observing children and adolescents in natural situations and asking them certain questions as they engaged in different cognitive tasks. To examine how children's thinking processes changed over time, Piaget conducted observations that were longitudinal in nature; that is, he followed the same children over a period of years. Take the following dialogue, which is an example of how Piaget examined the thinking of a 9-year-old:

> What is your nationality?—I am Swiss.—How come?—Because I live in Switzerland.—Are you also a Genevan?—No, that's not possible . . . I'm already Swiss, I can't also be Genevan.
>
> (Piaget, 1965/1995, p. 252)

The question above may seem quite simple to you, but it is not so simple for the 9-year-old, who has trouble classifying one concept (Geneva) as a subclass of another (Switzerland). According to Piaget, children can learn many things, but there are some concepts that will not be learned until the child reaches a certain developmental stage, no matter how hard we try to teach them.

Piaget believed that our thinking processes change from birth to maturity as we try to make sense of the world around us. This change in thinking is not just the result of accumulating more knowledge over the years; it is also the consequence of radical and slow qualitative changes. Influenced by his background in biology, Piaget argued that all organisms have a need to organize and adapt to the demands of the physical environment to find equilibrium. In the case of humans, maturation, activity, and social experiences interact to help children develop their changes in thinking (Piaget, 1970).

As we discussed earlier, maturation, the "nature" factor in cognitive development, consists of the unfolding of biological changes that are genetically programmed.

However, with physical maturation comes also the ability to interact with the environment (i.e. activity) and with others (i.e., social experiences). Because the last two factors depend on the relationship of an individual with his/her environment, they are the "nurture" influences on cognitive growth.

Schemas. How do children use these three factors (maturation, activity, social experiences) to make sense of the world? According to Piaget, children are naturally curious explorers who are constantly trying to make sense of the world by interacting with their environment and with others (Loewenstein, 1994). In this process, they construct **schemas**, or schemata, mental networks of organized information. Once formed, schemas can be used to identify and understand new information based on past stored experiences. In other words, schemas are the building blocks of learning and will vary in complexity depending on the age of the child. For example, very young infants may have separate schemas for looking at an object and grasping an object. As they grow older, however, they are able to organize the two into a higher-order schema that can be used to grasp an object (Ginsburg & Opper, 1988; Miller, 2002).

Schemas

Mental networks of organized information.

Assimilation and Accommodation. How do schemas develop over time? Piaget believed that children use two cognitive processes to develop their schemas over time: assimilation and accommodation. **Assimilation** takes place when individuals use their existing schemas to make sense of the events in the world. It involves trying to relate something new to something that we already know. For instance, the first time a child sees a cat, he may say "doggy" because he has a schema for his pet dog but has not learned about any other animals yet. **Accommodation,** on the other hand, takes place when an individual changes an existing schema so that it can explain the new experience. This occurs when the new information does not fit well with our existing schemas, causing us to expand or elaborate on the older schema to make sense of the new information. In the prior example, a child who interacts with enough cats and dogs will eventually accommodate his animal schemas to include differentiated cat and dog categories. When new experiences arise, individuals will usually try to use their existing schemas (assimilation); when these don't work, they will modify or add to their old schemas until the new information makes sense in their mind (accommodation). If the new information has no relation to any prior schema, neither assimilation nor accommodation can happen. This is the case with young infants who have not learned how to read yet. As they move through the pages of a storybook, they will ignore the printed words and make sense of the story by focusing only on the pictures.

Assimilation

A cognitive process that takes place when individuals use their existing schemas to make sense of the events in the world, involving trying to relate something new to something that we already know.

Accommodation

A cognitive process that takes place when an individual changes an existing schema so that it can explain the new experience because the new information doesn't fit well with existing schemas.

According to Piaget, the processes of assimilation and accommodation are motivated by the need to find **equilibrium**, the natural tendency to find consistency in one's thinking. Disequilibrium, on the other hand, is the state of cognitive conflict that arises when one's thinking is not consistent or when our current schemas are not confirmed by our experiences with the world. Piaget argued that disequilibrium acts as a force to drive cognitive growth. Therefore, teachers should find ways to promote cognitive conflict to help children learn in meaningful ways. For example, in the case of a child who uses a dog schema for understanding what a cat is, a teacher can help the child focus on defining characteristics of dogs that are absent in cats (e.g., barking) to promote cognitive conflict, accommodation, and equilibrium. Limón (2001) identified the following steps to produce students' cognitive conflict:

Equilibrium

The natural tendency to find consistency in one's thinking.

1. Assess students' current state of knowledge or beliefs.
2. Confront students with contradictory information.
3. Evaluate the degree of change from students' prior knowledge or beliefs.

Table 3.1 provides cognitive conflict examples for three grade levels.

TABLE 3.1

Classroom examples showing how to create cognitive conflict to promote students' cognitive growth.

GRADE LEVEL	CLASSROOM EXAMPLES
Elementary school	Ms. Allen's first-grade art class is studying colors. She puts dabs of yellow, red, and blue tempera in front of her students and asks them how many colors they will be able to use in their paintings. Most students hold up three fingers. She asks if there is any way to paint green grass. Alex answers, "Only if you get green tempera." Ms. Allen then asks the students to start mixing their paint to see if they can make green from the three colors on the table.
Elementary school	Ms. Perez asks her science class what makes plants grow strong and healthy. Tommy responds, "I know! Just like us, plants get stronger and healthy when they have good food. My mom always puts in plant food when she waters the plants." To help Tommy understand the importance of light, Ms. Perez decides to have her students do an experiment where two plants are given the same amount of nutrients during a month yet one plant is left in the shade. She then engages the class in a discussion by revisiting her initial question.
Middle school	Mr. Jenson asks his social studies class if Christopher Columbus should be considered an American hero. Jenny is quick to respond, "Sure! He was the guy who discovered America!" Most of the class agrees with her. Mr. Jenson then asks his class to read two articles about Columbus, one describing the implications of the discovery for Western society and another piece describing the effects on Native American societies. He then revisits his initial question.
Middle school	Ms. Dustin is starting her unit on dividing fractions. After reviewing adding and subtracting fractions, she asks the students what they think will happen when you divide two fractions. Karen answers, "When you divide numbers together you get a smaller number, so you should get a smaller fraction." Most of the class agrees. Ms. Dustin then divides the groups into pairs and gives them paper pizzas to divide into pieces to show that fractions increase with division.
High school	After studying data on global temperature and atmospheric changes, Mr. Olsen asks his environmental science class what the social and political implications of the data are. Many students say that there should be stricter laws on pollution, cars should be made more fuel-efficient, and people should drive less. So his students can gain greater perspective of this issue, he assigns each student a country to research and represent in a mock United Nations meeting. Most students are asked to represent developing or third world countries.
High school	Mr. Jenkins asks his literature class what role a government should play in people's lives. Jackson answers, "Man, all the government does is keep you down. It's just a bunch of people telling you what you can and can't do. We need to lose it." MaryLou responds, "Yeah, it doesn't do nothing to help me but take money." He then has the class read George Orwell's *Animal Farm* and then revisits his original question.

Piaget's Stages of Development

Piaget believed that cognitive development happens in a structured sequence of four stages: sensorimotor, preoperational, concrete operational, and formal operational. Movement from one stage to the next represents a qualitative shift in children's cognitive development rather than a quantitative change in the amount of information they know (Meece, 2002; Vidal, 2000). Piaget concluded that children develop gradually from stage to stage, with prior stages being the foundation of successive stages (Miller, 2002). Although Piaget offered approximate ages for each developmental stage, individual differences may affect the exact chronological age at which children pass through each stage. In fact, some older children and adults may show characteristics of young children's thinking if they have not had sufficient interaction with the environment or others (Keating, 2004). Table 3.2 lists Piaget's cognitive development stages with their corresponding approximate ages and cognitive characteristics.

Sensorimotor Stage. At the sensorimotor stage, infants are able to coordinate their sensory and motor abilities to create a set of behavioral schemas. A common test to examine whether an infant has moved from the sensorimotor stage to the next stage consists

of object permanence tasks. **Object permanence** is the understanding that objects remain in the environment even when they cannot be seen or perceived by other senses. Did you ever play peekaboo with a baby? If so, you probably noticed the baby's amusement once your face pops back into her view. Developmental psychologists interpret the infant's surprise to be a demonstration of the inability to understand object permanence. Likewise, when you show a 1-year-old infant an object and later hide it behind your back, he will act as if the object had disappeared. However, by 24 months of age, infants usually understand that the object is still present and will use different strategies to try to get the object. According to Piaget, the sensorimotor stage may include up to the following five substages:

- *Primary circular reactions (1–4 months):* Infants discover that some behaviors are satisfying (e.g., sucking) and learn to use those behavioral schemas repeatedly.
- *Secondary circular reactions (4–8 months):* Infants discover that some behaviors produce interesting reactions in their environment (e.g., throwing an object on the floor).
- *Goal-directed behavior (8–12 months):* Infants act to intentionally produce effects on the environment (i.e., development of causality).
- *Tertiary circular reactions (12–18 months):* Infants develop curiosity and start experimenting with objects.
- *Symbolic problem solving (18–24 months):* Infants begin to use symbols of actual objects and master object permanence tasks.

TABLE 3.2

Piaget's stages of cognitive development and cognitive characteristics.

STAGE AND AGE	COGNITIVE CHARACTERISTICS
Sensorimotor: 0–2	Dependence of thinking processes and understanding on sensory and motor processing (e.g., tasting, touching, grasping) Goal-directed behavior Object permanence arises at the end of the stage
Preoperational: 2–7	Reliance of thinking processes on perception more than logic Use of symbols (e.g., language, numbers, images) Imaginary play Animism Egocentrism
Concrete operational: 7–11	Use of mental operations to solve concrete problems Conservation, transformation, reversibility Classification, seriation, transitivity
Formal operational: 11+	Propositional logic Hypothetical deductive reasoning Analogical reasoning Combinatorial reasoning Probability and proportional reasoning

Object Permanence

The understanding that objects remain in the environment, even when they cannot be seen or perceived by other senses.

Preoperational Stage. At the preoperational stage, children have not yet developed the ability to think logically. Instead, they use their intuition and perception to understand the world and solve problems. For instance, children at this stage are unable to understand **conservation**, the idea that the amount of a substance remains the same regardless of its container's shape or how many pieces and shapes the substance is transformed into.

Conservation

The idea that the amount of a substance remains the same regardless of its container shape or how many pieces and shapes the substance is transformed into.

Conservation. Figure 3.4 shows three typical conservation tasks. A mass conservation task consists of showing a child a flat piece of clay first and later transforming the flat piece of clay into small clay balls. When asked whether the flat piece of clay contains the same amount of clay as the small clay balls, children below the age of 7 or so will say that there is more clay in the flat piece than in the small balls. Likewise, in a liquid-conservation task, children in the preoperational stage will believe that a tall, skinny glass contains more water than a short, thick glass, even when the water is poured from one container to the other in front of the child. Finally, a conservation-of-number task will typically show children two rows containing a certain number of chips. When the chips in one row are rearranged to be more spaced out, preoperational children will believe that the row that "looks longer" has more chips than the one that was not altered.

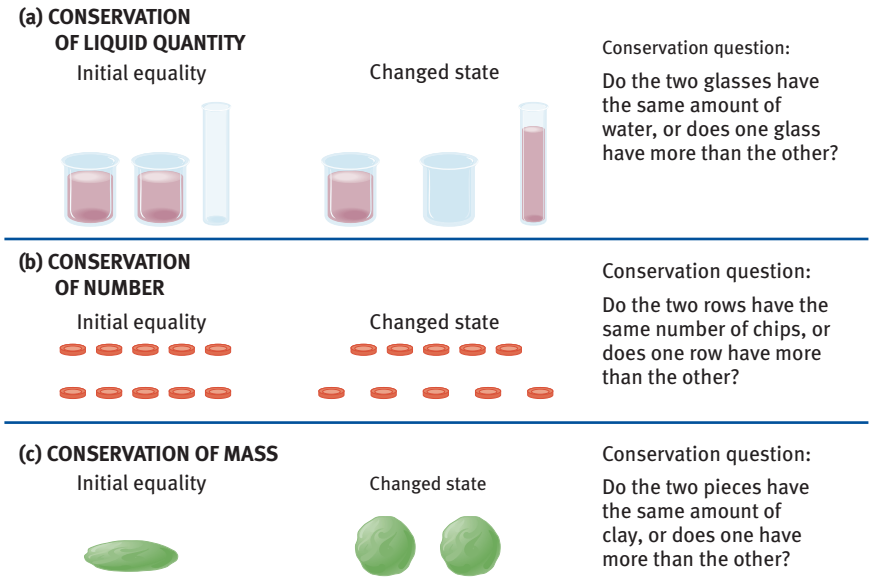


FIGURE 3.4 **Three conservation tasks.**

a) A typical liquid conservation task. In a liquid conservation task, a nonconserver will believe that a tall skinny glass of water contains more water than a short thick glass of water, even when the water is poured from one container to the other in front of the child.

b) A conservation of number task will typically show children two rows containing a certain number of chips. When the chips in one row are rearranged to be more spaced out between each other, nonconservers will believe that the row that "looks longer" has more chips than the one that was not altered.

c) A typical mass conservation task consists of showing a flat piece of clay first and later transforming the flat piece of clay into small clay balls. When asked whether the flat piece of clay contains the same amount of clay than the small clay balls, a nonconserver will be affected by the perceptual saliency of the flat piece of clay (which looks larger to the naked eye than the smaller balls) and respond that it has more clay than the small balls.

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Centration

The tendency to focus on the most perceptually obvious aspect of an object.

Symbolic Thought

The use of symbols to represent the actual objects and events around them.

Pretend Play

The use of objects that are available in the environment to represent another object that is not available in the environment during play.



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What does children's pretend play tell us about their cognitive development?

According to Piaget, nonconservers suffer from **centration**—the tendency to focus on the most perceptually obvious aspect of an object (e.g., surface, height, length). Centration arises out of children's inability to mentally perform transformation and reversibility. *Transformation* is the ability to perform mental operations on an object to understand how it can be transformed from one state (e.g., flat clay) to another (e.g., small clay balls). *Reversibility* is the ability to mentally trace back how a substance that has changed into a certain state (e.g., large glass) may revert to its original state (e.g., short glass).

Symbols and Pretend Play. Another characteristic of the preoperational stage is children's use of symbols (e.g., words, images) to represent actual objects and events around them, such as knowing that the word *Fido* represents the furry four-legged animal that lives with the child. Piaget referred to this cognitive ability as **symbolic thought**. Of all symbols, the most salient development occurs in the area of language acquisition, which develops very quickly during this stage. A third characteristic of this stage is the use of **pretend play** (Piaget, 1951), in which children use objects that are available in the environment (e.g., a chair) to represent another object that is not available (e.g., a car) during play. Pretend play is a mechanism that fosters cognitive development. Preschool children who engage in more sophisticated pretend play perform better on language, creativity, cognitive development, and social maturity tests than those who engage in less pretend play (Colwell & Lindsey, 2005; Connolly & Doyle, 1984; Doyle & Connolly, 1989; Howes & Matheson, 1992).

Egocentrism. Finally, children in this stage display preoperational **egocentrism**, the inability to consider the world from a perspective other than their own. Children at this stage will typically assume that other people share their feelings, attitudes, and knowledge. For instance, Jenny and Tommy are coloring a picture together at their table. While Jenny colors the sky, Tommy is coloring the grass. Jenny becomes very upset when she sees that the grass is brown, because she thinks all grass should be green. The egocentrism that characterizes preoperational children should not be confused with adolescent egocentrism. The difference is that, despite their ability to consider other perspectives, many adolescents become extremely focused on their own and may even believe in an *imaginary audience* that is watching and evaluating them (Bell & Bromnick, 2003).

Egocentrism

The inability to consider the world from a perspective other than one's own.

To investigate children's egocentrism, Piaget used the three-mountain task shown in Figure 3.5. In this visual perspective–taking task, children are placed at one end of a model and a doll is placed at the opposite end. Children are then shown a set of pictures with different visual perspectives of the model and asked to select the picture that shows the doll's view of the mountains. Preoperational children typically select a picture showing their own view of the mountains rather than the doll's view (Piaget & Inhelder, 1956).

Concrete Operational Stage. Ms. Jamison asks Ashley to solve the following math problem: "Imagine that you have 3 cookies on a plate. Now you invite some of your friends to play. Sara brings 6 cookies, Tom eats 1 cookie, Marcus brings 5 cookies, and Susie eats 6 cookies. How many cookies are left?" Ashley replies, "Well, first I am going to add 3 and 6 and I get 9. Then I take away 1 and get 8. Then I add 5 for 13. Finally, I take away 6 and get 7."

The concrete operational stage occurs approximately between ages 7 and 11 and is characterized by children's ability to think logically about concrete objects (Flavell, Miller, & Miller, 2002). At this stage, children have overcome the limitations of egocentrism and show conservation, transformation, and reversibility. The three typical logical operations that are used to test whether children fall in the concrete operational stage are classification, seriation, and transitivity (Piaget, 1977).

Classification is the ability to group objects on the basis of common characteristics. Before children enter this stage, they might be able to classify objects into groups that share one characteristic (e.g., blue objects and green objects) but are unable to classify the objects into subclasses. For example, when presenting

Classification

The ability to group objects on the basis of common characteristics.

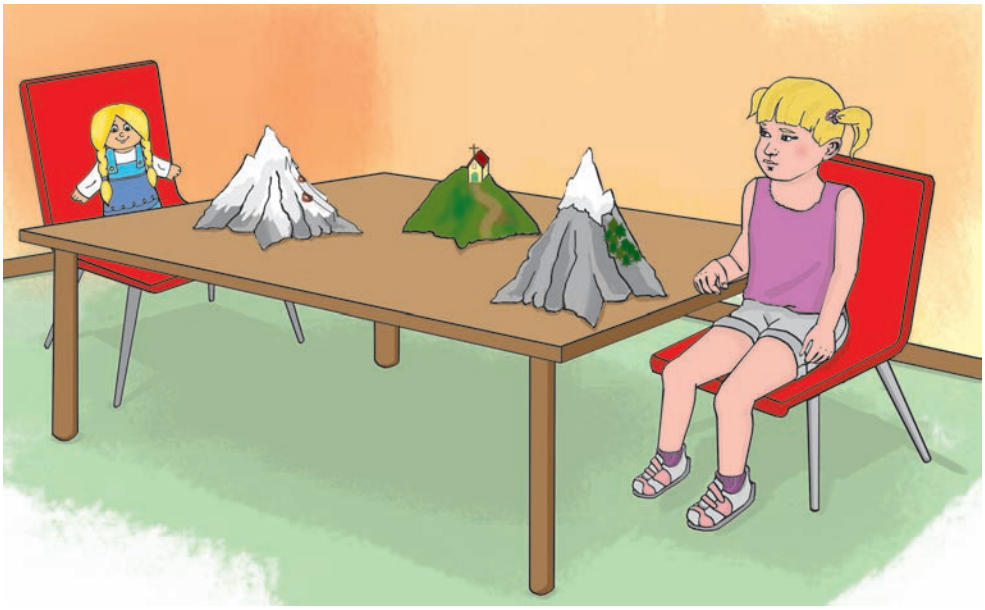


FIGURE 3.5 Piaget's three-mountain egocentrism task.

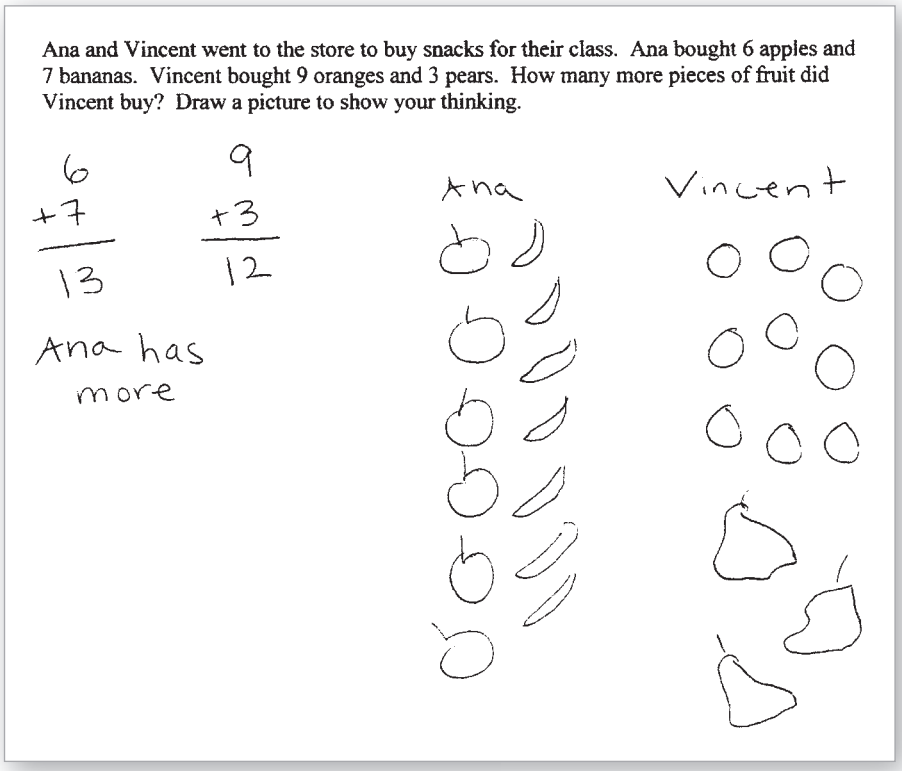


FIGURE 3.6 According to Piaget, what type of problems should teachers give children at the concrete operational stage?

preoperational children with cutouts of blue and green triangles and circles, they may classify the objects as blue and green objects, whereas children in the concrete operational stage will be able to subclassify the blue and green objects into triangles and circles.

Seriation

The ability to order objects on the basis of increasing or decreasing length, volume, or weight.

Seriation is the ability to order objects on the basis of increasing or decreasing length, volume, or weight. Once seriation is mastered, children will develop *transitivity,* the ability to infer a relationship between two objects based on the known relationship of one of the objects with a third object. For instance, a child shows transitivity when he concludes that stick number 3 is longer than stick number 2 after he was shown that stick number 1 is longer than stick number 2 and that stick number 3 is longer than stick number 1. Figure 3.6 shows the work of an elementary school student demonstrating that he has developed a logical system of thinking about tangible problems.

Formal Operational Stage. The stage of formal operations is similar to the stage of concrete operations in that both include the ability to engage in logical and systematic thinking. However, learners with formal operational thinking are able to apply the wide repertoire of cognitive abilities developed in the concrete operational stage to abstract and hypothetical situations. For example, learners can generate hypotheses and think systematically about the hypotheses. It is at this stage that learners are able to conduct "thought experiments" and think in terms of metaphors, ironies, analogies, and satire. However, not all learners will reach the formal operational stage. Innate conditions, trauma, or limited opportunities to explore the world may inhibit cognitive development.

There are five main mental operations that are characteristic of this stage. First, formal operational thinkers can use *propositional logic*, which is the ability to judge the

internal consistency of arguments even when the arguments are at odds with reality. For example, take the following syllogism:

All fish live in trees.

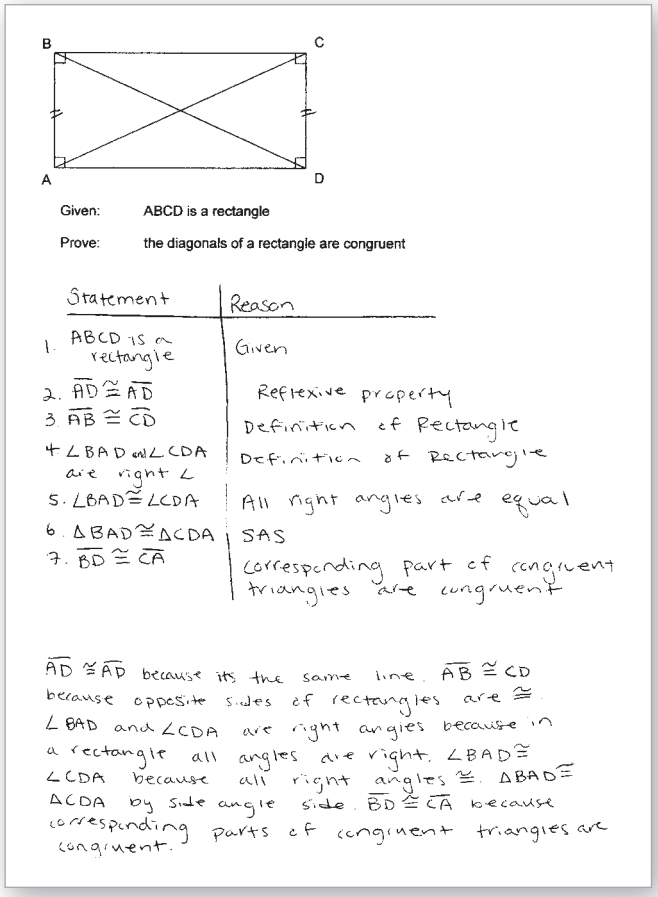
A molish lives in the ocean.

Therefore a molish is not a fish.

A concrete operational thinker will probably not be able to think beyond the first sentence because it is a false assertion of reality. In contrast, a formal operational thinker is able to abstract the *content* from the *form* of the sentences and successfully decide that the third sentence is a conclusion that can be logically derived from the first two sentences.

Second, formal operational thinkers are able to engage in *hypothetical deductive reasoning*, the ability to generate and test hypotheses or predictions by separating and controlling variables. This ability is necessary for scientific reasoning and may not develop until after puberty or even adulthood (Byrnes, 1988; Kuhn, Garcia-Mila, Zohar, & Andersen, 1995). A common problem used to study this type of reasoning is the pendulum problem, in which students are given strings of different lengths that can be attached to a pole and objects of various weights to hang from the string and make pendulums. Students need to find out what makes the pendulum swing faster by conducting a set of experiments in which they need to separate and control the effects of the length of the string, the weight of the pendulum, the height from which the weight is dropped, and the force exerted on the weight when it is dropped (Bjorklund, 2000). It is not until children reach the formal operational stage that they can systematically control the many variables to arrive at a correct and logical conclusion. Figure 3.7 shows the problem-solving work of a high-school student demonstrating that he has developed hypothetical deductive reasoning.

FIGURE 3.7 **How might formal operational thinking help students succeed in higher education?**



Third, formal operational thinkers can use *analogical reasoning*, the ability to understand how something unfamiliar works based on an understanding of how something more familiar works. Consider the analogy cat : meow :: dog : ?, which is usually read as "cat is to meow as dog is to?" A formal operational thinker will quickly know that the word *bark* is the right answer for this above analogy question. As you can see, completing the analogy requires understanding the relationships between the four elements (i.e., cat, meow, dog, bark), which is only possible through reflective thinking, not through observation alone.

Fourth, formal operational thinkers can use *combinatorial reasoning*, the ability to conceptualize how several elements might be combined. An example of this ability would be to successfully determine how many combinations of 4 marbles can be obtained from a pool of differently colored marbles (e.g., 3 white, 4 red, 6 green).

Fifth, a formal operational thinker will also be able to solve problems involving *probability and proportional reasoning*. A learner will demonstrate probability reasoning when she is able to calculate the likelihood of drawing a Jack from a deck of cards and will demonstrate proportional reasoning when she can determine the ratio of girls and boys in her classroom. Table 3.3 lists each of the five skills in formal operational thinking with a classroom example of each.

TABLE 3.3

Five skills in formal operational thinking with corresponding classroom examples.

FORMAL OPERATIONAL THINKING SKILL	CLASSROOM EXAMPLE
Propositional logic	In science class, students are given characteristics of certain species of beetles and asked to identify a set of beetles accordingly. They must present logical explanations for why their beetles are categorized correctly.
Hypothetical deductive reasoning	In computer class, students are asked to fix a computer whose monitor is not turning on by analyzing what is wrong and systematically testing each possible solution.
Analogical reasoning	The art teacher is introducing students to the basic elements of photography and explains how the human eye works to help students understand how a camera works.
Combinatorial reasoning	In math class, students are given two dice and asked to write down all the number combinations that may result from rolling the dice.
Probability and proportional reasoning	In government class, students are learning to take polls and interpret results to predict upcoming student election results.

Practical Implications of Piaget's Theory

Several teaching implications can be derived from Piaget's theory of cognitive development. Classroom Tips: Applying Piaget's Theory to the Classroom presents cognitive development principles derived from Piaget's theory with corresponding classroom applications.

Evaluating Piaget's Theory

Piaget's theory and research have been very influential in education. As you will see in Chapter 8, Piaget set the foundation for the individual constructivist view of learning. His findings clearly show how children are able to construct their understanding of the world by actively exploring the environment and interacting with others. Piaget's practical contribution is also important. For instance, his research suggests that curricula need to be designed to present very concrete experiences first, followed by abstract and more complex relationships later, and that students need to be given many cognitive-conflict opportunities to engage in conceptual change. On the other hand, Piaget's theory is not without criticism. Let's take a look at some of the limitations of Piaget's theory next.

Questionable Validity of Piaget's Tasks. An important source of criticism is the lack of suitability of the cognitive tasks used to test children's developmental stages (Bidell & Fisher, 1992; Gelman & Baillargeon, 1983). Specifically, Piaget's classic tasks (e.g., conservation) were not motivating and used objects that were not very familiar to the child. For instance, Gelman (1972) found that preoperational children who were given the traditional conservation task in the format of a game involving mice and plates were able to perform the task successfully. Furthermore, a close examination of the interviews conducted while children engaged in Piagetian tasks reveals that the questions used by experimenters were often vague and misleading.

Questionable Validity of Piaget's Stages. A related criticism relates to the validity of the developmental stages. Overall, experts believe that Piaget used tasks that underestimated young children's abilities and overestimated older students' abilities, challenging the idea of the stages altogether. For example, when conservation tasks include fewer than six or seven items, 3-year-olds succeed on the task (Berk, 2006), suggesting that the reason children fail at this task may be that the number of items that need to be manipulated exceeds children's attention and memory capacity. When you read

CLASSROOM TIPS

Applying Piaget's Theory to the Classroom

Principle	Classroom Tips
Take advantage of students' natural tendency to resolve disequilibrium.	• Survey students before a new unit to discover what misconceptions they might have and present information that challenges their knowledge or beliefs. • Hook the students' interest by starting a lesson with an intriguing question. • Ask students to predict a certain outcome and test whether their prediction is correct.
Use discovery-based learning methods.	• Give students time to interact and explore a new instrument/tool before formal instruction. • Give students a sample of elements representing a concept you wish to teach and ask them to discover what the examples have in common. • Ask students to run experiments to test whether a certain hypothesis or theory is true.
Ask learners to explain their reasoning and misconceptions.	• Present a debate in which there are two or more conflicting answers to a question. • Use examples that contain misconceptions and ask students to explain why they are wrong. • Allow students to correct wrong responses on homework and assessments by explaining what their thinking was at the time and why their thinking was incorrect.
Assess students' ability level.	• Administer a test before a unit starts to understand students' current understanding. • Use scores from standardized tests to understand students' strengths and weaknesses. • Continually assess student understanding through the use of exit slips, one-minute essays, think–pair–share, and other nonformal assessment techniques.
Use classroom activities that foster the development of higher skills.	• Help the preoperational child overcome egocentrism. • Give the concrete operational child opportunities to classify objects of increasing complexity. • Present the formal operational student with hypothetical problem scenarios.

Chapter 6, you will learn that only adults are able to consciously pay attention to approximately seven items at one time. The capacity of children is much lower.

Additionally, although Piaget predicted that middle and junior high school students would be able to think in the abstract, it is not uncommon to find many students at that age and older who are unable to use formal operations in their thinking (Flavell et al., 2002). Moreover, despite the fact that Piaget conceived developmental stages as unitary structures of thought, there is evidence that some concrete operational concepts do not appear in synchrony. For instance, children do not necessarily learn to conserve at the same time as they learn to cross-classify objects (Bjorklund, 2000; Case, 1999; Goswami, 2001).

Questionable Generalizability of Cognitive Skills. A third line of criticism stems from research showing that students' logical abilities depend on their domain knowledge and experience (Alexander, 2006; Cole, Cole, & Lightfoot, 2005; Fujimura, 2001). Piaget believed that the stage designations apply to all mental activities in which people engage. The demonstration/lack of concrete operations in one domain, for example, should also show in another domain. However, people are found to not be uniformly logical or illogical, and they may demonstrate higher levels of reasoning in different areas (Kuhn, 1992). Consequently, the generalizability of the stage theory has been questioned and a domain-specific rather than domain-general pattern of cognitive development has been proposed instead (Alexander, 2003a, 2003b; Flavell et al., 2002).

Cultural Diversity and Cognitive Development. Finally, you may be wondering about the influence of culture on Piaget's stage model. Although Piaget disregarded cultural influences on cognitive development, research suggests that children's experiences, values,

language, and interactions with others can deeply affect their ways of thinking. For example, Cole and Cole (2001) identified the following four ways in which children's patterns of cognitive development may be affected by their particular culture or background.

First, children's development will depend on their opportunity to have learned the cognitive task at hand. For instance, the conservation tasks that Piaget designed may be approached very differently by a child who has grown up in a desert area, which presents very few opportunities for children to manipulate water. Consequently, this child may not show signs of having reached the concrete operational stage, but he might be able to engage in other, more meaningful and complex cognitive skills for survival (e.g., weaving, hunting).

Second, cognitive development may be affected by the frequency with which children are exposed to a certain activity in their culture. If the activity is practiced more frequently, it is more likely that individuals will acquire the necessary skills to perform the activity. For example, although the mathematics ability of Brazilian children who rely on many daily computations to sell goods on the street is extremely sophisticated, they are unable to show the same math ability on typical school tasks (Carraher, Carraher, & Schlieman, 1985).

Third, the cognitive skills that are considered to assess cognitive development need to bear a relationship with children's culture. If the activity has cultural value, it is more likely that individuals will have acquired the necessary skills to perform the activity. For instance, children raised in Western countries develop some of the logical reasoning abilities described by Piaget earlier than children raised in developing countries, presumably because those abilities are more valued in Western culture (Berk, 2002; Cole, 1990; Trawick-Smith, 2003).

Finally, Piaget's model of development does not consider the strong role that apprenticeship plays in some cultures. How individuals solve problems on their own does not necessarily explain how individuals develop cognitively with the guidance of more capable others, including parents, teachers, peers, and other competent members of their community (Rogoff, 1990). We examine the role of the learner's sociocultural context in cognitive development next.

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ANIMATION ASSIGNMENT. . . Cognitive and Language Development

Go to your WileyPlus course and watch the animation of Piaget's theories of cognitive development. Be prepared to describe and discuss his four stages of development. How could these stages influence student learning? Do you think that cultural experience can impact cognitive development?

Vygotsky's Sociocultural View of Development

Russian psychologist Lev Vygotsky offered a theory of cognitive development often referred to as sociocultural because, unlike Piaget, he believed that thinking is a function of both social and cultural forces. A good example of the role that the sociocultural context has on thinking comes from Glick's (1975) research on classification tasks with the Kpelle, a tribal people in rural Liberia. When asked to sort 20 items into categories, the Kpelle grouped the items by functional categories (e.g., apple was placed in the "eat" category) rather than by the intended taxonomic categories (e.g., apple was expected to be placed in the "fruit" category). Glick then tried, and failed, to teach the Kpelle to categorize items by taxonomies. Because functional grouping is done only by very young children in Western culture, he eventually concluded that the Kpelle lacked the mental ability to categorize by taxonomy. However, when Glick asked the Kpelle how a stupid person would do the categorization task, without any hesitation, they sorted the items into taxonomic categories! In short, the Kpelle could do the task but in their culture it was of no practical value; it was deemed stupid.

Vygotsky studied learning and development to improve his own teaching (Wink & Putney, 2002). During his brief lifetime (he was only 38 when he died of tuberculosis), he produced over 100 books and articles, some of which have been translated into English (Vygotsky, 1978, 1986, 1987, 1993, 1997).

Vygotsky's ideas about cognitive development have become very influential in educational psychology and have provided alternative explanations to many of Piaget's ideas (John-Steiner & Mahn, 1996; McCaslin & Hickey, 2001; Wink & Putney, 2002). For instance, Vygotsky believed cognitive growth to be a seamless process shaped and stimulated by learners' sociocultural context rather than the succession of invariant stages proposed by Piaget. According to Vygotsky, infants start demonstrating object permanence by age 2 not because they have achieved a higher stage of development but because they had the repeated social interactions necessary to understand the type of response that was expected from them.

Vygotsky himself had experienced the effects of social interaction on his cognitive growth. As a boy, he was taught by private tutors who used a Socratic instructional method, a question-and-answer technique aimed at challenging current schemas and promoting deeper understanding (Kozulin, 1990, 1998). Taken together, his own experience with tutors and his experience teaching others led him to conclude that the two main forces driving cognitive development are social interaction and language (Vygotsky, 1978, 1986). Let's examine each one separately.



NewsCom

What can you conclude from Glick's research with the Kpelle?

The Role of Social Interaction in Cognitive Development. Vygotsky's sociocultural view asserts that social interactions do not just influence cognitive development but rather create individuals' schemas and thinking processes (Palincsar, 1998). Unlike Piaget, who believed social interaction to be a mechanism for testing current schemas and facilitating assimilation and accommodation, Vygotsky believed social interaction to be the key mechanism for acquiring the language and culture of a community. For Vygotsky, cognitive development moves from socialization to **internalization**, the appropriation of the language and culture of one's community.

Internalization

The appropriation of the language and culture of one's community.

According to Vygotsky, as children engage in activities in their social environments, they create their understandings of the world (Thomas, 2000). Each environment provides cultural tools to support children's activities (Miller, 2002). Cultural tools are fundamental for cognitive growth because they allow an individual to go beyond his/her physical and mental limitations (Greening, 1998). Cultural tools can be technical (those used to act on the environment) or psychological (those used to guide thinking processes). A shovel is a technical tool because it allows us to transform the shape of the ground. Mnemonics, on the other hand, are psychological tools because they allow us to extend beyond our memory limitations. You will learn about different mnemonics in Chapter 6. Unlike Piaget, Vygotsky believed that children gain significantly from the cultural tools handed down to them by those who are more intellectually advanced.

Vygotsky also argued that social interactions need to include **mediation** if they are to affect cognitive growth. Mediation occurs when a more capable individual interprets a child's behavior and helps transform the behavior into a representation that has the same meaning to the child and others (Light & Littleton, 1999; Wertsch & Tulviste, 1996). For example, after observing a child reaching out with her hand toward an object that is out of her reach, a parent may say "OK, you would like me to give you this cup!"—and then present the child with the object. This mediation process will help the child create shared understandings with the parent and others in the future. Mediation transforms the child's reaching into the internalized thought "I want you to give me that object" (Driscoll, 1994). Mediated learning experiences encourage the child to think about her actions by attaching labels to them, recognizing principles or patterns underlying them, or inferring conclusions. Take the following example: Aden is a new kindergartner in Ms. Henderson's class. As the tip of his pencil breaks, he abruptly gets up and shows the pencil to Ms. Henderson. Ms. Henderson then says, "Aden, I see that the tip of your pencil broke! Let me show you how to sharpen it so that you can keep drawing."

Mediation

When a more capable individual interprets a child's behavior and helps transform the behavior into a representation that has the same meaning to the child and others.

The Role of Language in Cognitive Development. According to Vygotsky, children use language not only for communication but also to plan, guide, and monitor their own behavior (Vygotsky, 1986). In other words, language has a self-regulation function in cognitive development. The Vygotskian term that is used to refer to the self-regulatory function of language is **inner speech**, also called *private* or *egocentric speech*. Inner speech is the phenomenon of talking out loud to ourselves (Feldman, 2000).

Inner Speech

The phenomenon of talking out loud to ourselves.

Although children's first experience with speech is as a means to communicate with others, Vygotsky observed that at about age 3, children start using inner speech as they regulate their problem solving. Research supports the idea that inner speech is self-regulatory by showing that the use of inner speech increases as the level of a task's difficulty increases (Berk, 1985). Vygotsky also observed that, by age 7, inner speech disappears, although it may still be used even through adulthood as a guiding mechanism when people are confronted with a very challenging task. For example, Clara, the student depicted in Imagine You Are the Teacher, is demonstrating the use of inner speech. She is likely to be in the early elementary school grades, learning multiple-digit addition for the first time. Because the new arithmetic procedure is quite challenging, Clara's behavior is normal and should not be interpreted as a cognitive deficit.

In fact, children who use inner speech to guide their thinking during problem solving are more likely to remain focused, avoid distractions, and perform better than those who do not (Berk, 1986; Winsler, Diaz, & Montero, 1997). A point of disagreement between Piaget and Vygotsky is how they interpreted children's use of inner speech. Whereas for Vygotsky inner speech is an important thinking tool during early childhood, Piaget viewed inner speech as another indication of egocentrism.

The Zone of Proximal Development. One of the key concepts in Vygotsky's theory is the **zone of proximal development (ZPD)**. According to Vygotsky, the cognitive level at which children are able to solve problems independently is their zone of actual development. In contrast, the cognitive level at which children can solve problems with the assistance of a more capable other is their ZPD. Beyond the ZPD are tasks that children cannot accomplish, even with the assistance of a more capable other. Learning, therefore, takes place when a child is working in her ZPD, and effective teachers are those who plan instruction within the ZPD of each student. Tasks within students' zone of actual development will be too boring and those beyond students' ZPD will be too challenging.

Zone of Proximal Development (ZPD)

The cognitive level at which children are able to solve problems under adult guidance, or in collaboration with more capable peers.

How can teachers know what the ZPD is for each child? In the classroom, teachers can assess students' ZPD by designing pre-tests that include a range of difficulty levels prior to instruction. For example, to assess students' ability to solve problems involving order of operation, teachers might include addition, subtraction, multiplication, and division problems as well as problems that combine two or more of the operations. They can use the results of the pre-test to help narrow down the range of operations that students can and cannot do on their own. Then teachers can assess what students can do with assistance in one-on-one meetings—by helping students solve challenging tasks with the support of explanations, modeling, or prompting. Because the tasks that can be achieved with the assistance of a more capable other involve cognitive skills that are in the process of maturing, Vygotsky called them the "buds" or "flowers" of development. The "fruits" of development are shown at a later stage, when assistance is removed and the child can perform independently. Figure 3.8 is a visual representation of a student's ZPD.

Can you think of a past educational experience in which a more capable other guided you through your ZPD?



Laura Dwight Photography

Now that you are familiar with the concept of ZPD, take a few minutes to answer the following questions before reading the next paragraphs: Is there a relationship between children's ZPD and their use of inner speech? How would Vygotsky assess students' learning?

Recall that Vygotsky viewed language as a tool to promote cognitive growth. Vygotsky observed that children engaged in inner or private speech while they were working in their ZPD. Often, they repeat in a loud voice the words of advice that were previously offered by an adult (Berk & Garvin, 1984). Vygotsky believed that this phenomenon demonstrates the first step of cognitive growth. Children incorporate the words of more capable others into their own speech as a learning mechanism, to scaffold themselves during a difficult task (Karpov & Bransford, 1995; Kozulin & Presseisen, 1995). Research findings support this idea. Children who use private speech learn complex tasks much faster than those who don't (Bivens & Berk, 1990). As children become more proficient on a task, private speech becomes silent; eventually, children move into their zone of actual development.

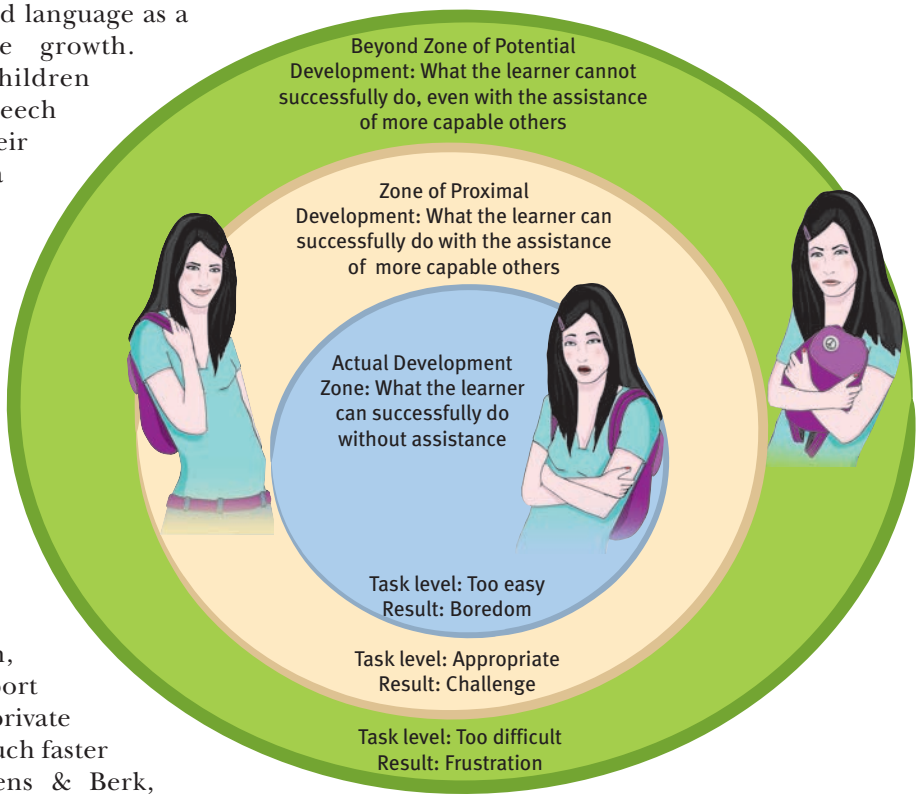


FIGURE 3.8 **The Zone of Proximal Development.**

How would Vygotsky assess students' learning? Vygotsky intended the ZPD to have implications for both instruction and assessment (Campione, 1996; Daniels, 1996; Wertsch, 1985). As the Director of the Institute of Pedagogy, he was concerned about the use of standardized ability tests to assess students' potential to learn (Griffin & Cole, 1984). He believed that, although these tests were helpful in assessing students' independent functioning, they were unable to convey information about how different students with identical test scores showed different learning potential when assisted by a more capable other. Therefore, Vygotskians usually suggest supplementing standardized ability tests with measures of student's ZPD to make predictions about their potential for academic progress. A ZPD assessment is one in which the evaluator scaffolds learners as they attempt problems that are above the assessed independence level. However, a criticism of using ZPD assessments is that different results may show, depending on the academic domain and who is providing the scaffolding, making the assessment unreliable for predicting learning potential across cognitive tasks (Allal & Ducrey, 2000).

Instructional Methods Supported by Vygotsky's Theory. Closely associated with the ZPD is the idea of scaffolding. **Scaffolding** is an instructional method in which support is given to students early on in the learning process, as they navigate their ZPD. This support can be slowly removed during the later stages of learning by having students take on more responsibility for their own learning. Similar to the case of buildings in progress, scaffolds are external structures that provide the necessary support until the building is sufficiently strong to stand by itself. Scaffolding can take many forms. Some examples are providing guidance during thinking or prompts and cues during problem solving; breaking down complex procedures into simpler steps; reminding students of learning objectives; and providing frequent and informational feedback about students' progress toward a

Scaffolding

An instructional method in which support is given to students early on in the learning process, as they navigate their ZPD.

goal. The process of gradually removing the scaffolds as students make progress within their ZPD is called *fading*. Table 3.4 is an example of how scaffolding may look in the classroom:

TABLE 3.4

A classroom example of scaffolding.

Mr. Ingram, a middle school teacher, encourages his students to use the keywords *who, what, why, when*, and *where* as they think about the meaning of an American history passage they just read. He reminds the class that the first question to answer is *who* the passage is about. Daniel raises his hand. "It is about Americans who are headed West," he says.

"Very good Daniel. You also answered our second question, *what* is the passage about? Who knows our third question?" Mr. Ingram inquires.

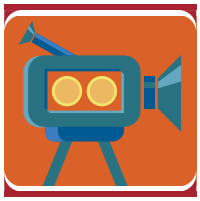
"*Why* are these people headed West? It's because they don't have the money to buy farmland in the East," answers Kendra.

Mr. Ingram replies, "Excellent, Kendra! The settlers are headed West for cheaper farmland. Does anyone know *when* this is happening?"

"This was happening in the 1800s, here in America," says Ben.

"Very good, class! You answered the five key questions. Now I would like you to read the next passage and answer the five questions on your own in your notebooks. When everyone is finished we will discuss your answers." Mr. Ingram knows that with enough repetition and practice, his students will be able to bring those five questions to mind without needing to be prompted.

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VIDEO CASE ASSIGNMENT. . . Establishing Classroom Rules

Go to your WileyPlus course and view the video of Mrs. Petrone's third grade class. When watching the video, think about how Mrs. Petrone scaffolds the students' initial suggestions about classroom rules. Be prepared to discuss how scaffolding promotes student learning and overall cognitive development.

Guided Participation

Engaging in learning activities with a more capable other who provides the mediation and encouragement needed to acquire new knowledge and skills.

Another instructional method supported by Vygotsky's theory is guided participation. **Guided participation** occurs when children engage in learning activities with a more capable other who provides the mediation and encouragement needed to acquire new knowledge and skills (Rogoff, 2003). This method is the most natural way of teaching everyday skills to children and adolescents. You may have experienced learning how to tie your shoes, get dressed, or cross a street with the guided participation of your parents or caretaker. In a similar fashion, teachers can use guided participation to help students gradually develop the necessary skills to succeed in a variety of real-world tasks such as writing an application letter for a job, conducting research on the Internet, or planning a trip. As students develop their skills and thinking, guidance can be faded and eventually eliminated.

Apprenticeship

A one-on-one relationship in which a less capable person or "apprentice" is paired with a more experienced person, also called the mentor or tutor.

A more structured Vygotskian method consists of **apprenticeship**, a one-on-one relationship in which a less capable person, or "apprentice," is paired with a more experienced person, also called the mentor or tutor. This method has been used in most traditional societies as a way to teach their young the specific skills and trades of their culture, such as fishing, hunting, weaving, or midwifery (Rogoff, 1990, 1991). For instance, the ancient Greeks and Romans used apprenticeship as a tool for transferring knowledge and skills, since most people, up until recently, received no formal education (Swanson & Holton, 2001). Apprenticeships allow learners not only to learn how to perform a task like their mentors but also to learn how to think like their mentors; this is why the method is also called *cognitive* apprenticeship (Brown, Collins, & Duguid, 1989; John-Steiner, 1997). The specific way in which cognitive apprenticeships are structured varies from case to case. Yet they typically combine scaffolding and guided participation with one of the methods defined in Table 3.5 (Collins, 2006).

Today, the applications of apprenticeship fall within the occupational training area (e.g., carpentry, cosmetology, auto mechanics), where apprentices learn by doing with the close guidance and supervision of an experienced mentor. In fact, if you are engaged in

TABLE 3.5

Apprenticeship methods and classroom examples.

COGNITIVE APPRENTICESHIP METHOD	CLASSROOM EXAMPLE
Modeling: The teacher demonstrates *how to perform* the task while speaking out loud and *how to think* about the task.	Ms. Newman teaches third grade. In a reading comprehension lesson, she demonstrates how to find the topic sentence in a paragraph by talking aloud to the students: "First, I read the paragraph, then I ask myself, what is the most important idea in this paragraph? I reread each sentence until I find the sentence that shows the important idea for the whole paragraph."
Articulation: Students are asked to explain what they are doing and why as they perform tasks.	In Mr. Arnold's high school Algebra II class, students are given a set of problems to solve. Mr. Arnold gives his students credit for providing the right answer to the problems and also for describing the strategies that they used to solve the problems and the rationale for using those strategies.
Reflection: Students are encouraged to evaluate their performance according to a model or standards set by the teacher.	Mr. Gibson, who teaches seventh-grade science, asks his students to write up a lab report describing the findings of their research. Before they turn in their final product, students are given Mr. Gibson's grading rubrics and asked to grade themselves and provide a justification for why they gave themselves that grade.
Exploration: The teacher encourages students to take over new projects or answer new questions with guidance.	Ms. Baskins, who teaches elementary physical education, gives each of her second-grade students a scooter board. She spreads the students out and tells them they must stay in their own space. She then instructs the students to figure out how many ways they can ride on the scooter.
Task variety: The teacher presents ever more challenging and varied tasks for students to tackle as learning progresses.	Mrs. Mumphry teaches eighth-grade health education. During a unit on first aid, students learn about treating minor wounds, burns, large wounds, and unconscious victims; they then progress to choking victims, rescue breathing, and CPR.

student teaching and learning about classroom methods, management, motivation, and assessment by working in an actual classroom with a mentor teacher, you are probably experiencing an apprenticeship. For practical reasons, however, there is little opportunity to use apprenticeship in the classroom. Consequently, most apprenticeship of young learners happens outside of school. For instance, there are after-school apprenticeship programs for middle school students, such as the Citizen Schools program (www.citizenschools.org), in which adult volunteers are paired with students in hands-on learning projects.

Practical Implications of Vygotsky's Theory

We can derive several implications for instruction and assessment from Vygotsky's theory of cognitive development. Classroom Tips: Applying Vygotsky's Theory to the Classroom presents cognitive development principles derived from Vygotsky's theory with corresponding classroom applications.

Evaluating Vygotsky's Theory

Vygotsky's theory has been embraced by many educators and applied successfully in the classroom (Budrova & Leong, 2007; Rowe & Wertsch, 2002). The main influence of Vygotsky's work has been to emphasize the idea that development needs to be understood in terms of the cultural and social contexts in which it occurs (Budrova & Leong, 2007; Goos, 2004; Rowe & Wertsch, 2002). According to Vygotsky, developmental differences need to first be interpreted as possible variations of the learner's sociocultural environment; thus, teachers need to be cautious about their interpretation of what "normal" development is and reflect on how students' past experiences may have affected their cognitive development (Greenfield, 1999).

CLASSROOM TIPS

Applying Vygotsky's Theory to the Classroom

Principle	Classroom Tips
Find students' ZPD.	• Use a variety of formal and informal classroom assessments to help establish students' ZPD. • Begin instruction where the student is able to reach the instructional goal in close collaboration with you. • Hold individual conferences with students to find out the knowledge and skills they have mastered and those where they still need assistance. • Gradually remove assistance as students gain more knowledge and skills.
Scaffold students' learning.	• Encourage students to attempt new challenges independently but monitor their performance closely and offer hints or prompts as needed. • Encourage students to seek help whenever they are unable to make progress and be responsive to their impasses to prevent frustration. • Break down a complex task into smaller components. • Give frequent and informational feedback during performance.
Use fading.	• As students make progress, reduce the use of explanations, hints, and prompts until they can perform independently. • When designing a unit, allow more time for individual practice and less time for guided practice as the unit progresses. • Provide written and oral prompts when students start tackling a task within their ZPD. Gradually remove oral prompts and refer students to written prompts as appropriate. • As students show progress, reduce your explanations and provide guiding questions to help them engage in self-explanations.
Encourage young children's use of private speech.	• During preschool years, encourage children to talk to themselves as they solve challenging tasks. • Model how to think about a task by thinking aloud the processes that are necessary to complete it. • During guided practice, ask students what they should be thinking about in their head during each step. • As students demonstrate mastery, encourage them to internalize and self-regulate their private speech.
Use more-skilled peers as tutors and models.	• Keep student model work from previous years to use as examples in following years. • Allow more capable students to explain processes or concepts to the class. • Assign partners so that less capable students are paired with more capable students for group work. • Create opportunities for discussion and debate among peers to help less capable students internalize the arguing process demonstrated by more capable students.
Use ongoing assessments of different types.	• Use standardized test results only to keep informed about the skills that students can perform independently. • Create classroom activities that keep the class on-task while allowing you to work with individual students and assess their learning potential. • Continually monitor student understanding throughout an entire unit in a variety of ways, not just at the end. • Help students evaluate their own progress and use self-evaluations to assess their learning.

On the other hand, Vygotsky's theory has been criticized for having underestimated children's natural ability to learn, which is evident even before they are able to interact with more-capable peers or adults (Schunk, 2004). Other criticisms are that verbal dialogues are not the only or most important means through which children learn in some

cultures and that Vygotsky's theory failed to recognize the biological contributions to children's cognitive growth. A strong limitation to Vygotsky's theory is that it fails to explain the mechanisms underlying cognitive development, such as the thinking processes that allow children of different ages to move from their zone of actual development to their ZPD. In fact, the main criticism to Vygotsky's cognitive development theory is that it is too general and, consequently, difficult to test, presumably because Vygotsky was unable to elaborate on his ideas and conduct research in his short lifetime (Gauvain, 2001).

Comparing the Development Theories of Piaget and Vygotsky

Piaget and Vygotsky explained cognitive development in different ways but shared some commonalities. For instance, both theories include language and social interaction as factors of cognitive growth. However, Piaget emphasized the role of the individual learner's interaction with the environment in constructing knowledge while Vygotsky emphasized the role of social interaction and language in cultural transmission and self-regulation (Rogoff, 2003).

For Piaget, language is a tool that children use to construct knowledge on their own. For Vygotsky, language is an essential mechanism that more-capable others use to transmit their culture and self-regulation skills. Piaget also differed from Vygotsky in that he believed that cognitive growth occurred in a series of stages, with development beginning with maturation processes that can be stimulated through activity. According to Vygotsky, cognitive growth unfolds in a continuous process and development is fostered through the interactions with more-capable others.

Despite these differences, both developmental theories recommend that teachers engage in active rather than passive teaching methods. Piaget's theory suggests that learners should be asked to manipulate objects and symbols as well as to test hypotheses, especially when these instructional activities are designed to disrupt their cognitive equilibrium. Vygotsky's theory, on the other hand, suggests that learners should actively participate in social interactions with more-capable others, who can guide their cognitive development through the ZPD using scaffolding. Table 3.6 presents a comparison of Piagetian and Vygotskian developmental theories.

Neo-Piagetian Views of Cognitive Development

How do children learn to pay attention and remember information? What can teachers do to help children increase these skills? Because the theories of Piaget and Vygotsky had limitations, a group of researchers developed an approach that addressed the mental processes children go through when learning.

This group, called **neo-Piagetians**, brings an information-processing view to Piaget's original theory. When you read Chapter 6, you will learn that information-processing views explain learning as the result of relationships among mental processes (e.g., perception, attention) and structures (e.g., memory systems).

Neo-Piagetians

A group that brings an information processing view to Piaget's original theory.

Neo-Piagetians argue that a more accurate vision of children's cognitive development requires understanding how their attention, memory, and strategies gradually increase over time. For instance, according to neo-Piagetian Robbie Case (1985, 1992; Case & Griffin, 1990), cognitive development stages are the result of children's increasing attention and memory capacity and the use of more effective strategies for remembering and monitoring tasks over time.

Another neo-Piagetian (Siegler 1983, 1985, 1998) believes that changes in cognitive growth reflect children's acquisition of increasingly more powerful rules and procedures. In fact, when children are shown the deficiencies in their thinking and taught how to overcome them, they are able to apply new rules or principles during performance (Gelman & Williams, 1998). For example, 7-year-old Sara is trying to learn her mom's phone number. She keeps mixing up the first three digits and cannot even remember the last four. Her mom shows her how to break the numbers into smaller chunks by remembering three numbers and then two sets of two. Using this strategy, Sara is now able to remember her mom's phone number.

TABLE 3.6

A comparison of Piagetian and Vygotskian developmental theories.

PIAGETIAN THEORY	VYGOTSKIAN THEORY
Cognitive development . . .	Cognitive development . . .
• occurs in a series of stages	• occurs in a continuous process.
• is largely dependent on the individual's interaction with the environment.	• is largely dependent on the sociocultural context of the learner and the use of language.
• is fostered by allowing the learner to manipulate objects and ideas.	• is fostered by creating active social contexts such as cognitive apprenticeship with scaffolding.
• begins with maturation and progresses as the mind is stimulated by cognitive conflict.	• Progresses as the learner interacts with more capable others who stimulate them with verbal interactions.
The key developmental concepts are . . .	The key developmental concepts are . . .
• schemata, assimilation, accommodation, equilibrium.	• the zone of proximal development, language, and other cultural tools.
The role of language is . . .	The role of language is . . .
• key in providing children with the symbols needed to engage in logical thinking and reasoning.	• fundamental because it is the cultural tool that helps children internalize the knowledge and ways of thinking of their community.
The role of the teacher is . . .	The role of the teacher is . . .
• to guide students as they explore their world and discover knowledge.	• to scaffold students as they navigate their ZPD.



Laura Dwight Photography

Why do early elementary school children use the min strategy according to neo-Piagetians?

An advantage of neo-Piagetian views of cognitive development is that they are useful for teachers because they identify the kinds of strategies and thinking that are likely to arise as children develop. For instance, when children are 4 or 5 years old, they typically use a counting strategy to solve addition problems. However, by the time they enter elementary school, many of them have started using the *min* strategy for single-digit addition (Rittle-Johnson & Siegler, 1998), which consists of saying the name of the larger number and counting up from that point. If a child needs to add 3 + 5, she will say "five" and then count up 3 by saying "six," "seven," "eight."

Neo-Piagetian theories are still evolving as new research is conducted. A criticism to these theories is that although they seem to provide good explanations about different strategies that children use as they grow older, they do not offer an explanation about *why* children approach tasks in different ways (Klaczynski, 2001).

Another criticism about these theories is that, similar to Piaget's theory, their advocates have not examined the role that children's sociocultural environment plays in their cognitive growth. In addition, similar to the theories of Piaget and Vygotsky, neo-Piagetian theories do not explain exactly how children experience cognitive growth (Gauvain, 2001) but rather focus on different factors that are associated with cognitive development.

Because all factors discussed by these perspectives have been found to be important in understanding cognitive development, teachers should use multiple theoretical perspectives to guide their practice. Because we discuss information-processing views of learning in detail in Chapter 6, we have focused only on the main cognitive development ideas proposed by neo-Piagetians in this chapter. When you read Chapter 6, you will learn

TABLE 3.7

Summary of cognitive development principles derived from Piaget, Vygotsky, and information-processing theories.

PRINCIPLE	EXPLANATION
Students' thinking tends to be qualitatively different at different ages.	Piaget believed that cognitive changes were the result of distinctive cognitive stages; information-processing theorists argue that children's thinking changes as their attention, strategies, and metacognition develops; and Vygotsky's theory suggests that children change their ways of thinking as they gradually internalize the knowledge and skills of more capable others.
Learning is more meaningful when learners actively construct their understandings.	As you will read in detail in Chapter 8, the theories of Piaget, neo-Piagetians, and Vygotsky are constructivist. That is, they assume that for meaningful learning to occur, learners need to *make* rather than *take* knowledge.
Learning activities are more effective when they take into consideration the cognitive developmental level of the learner.	Piaget's cognitive developmental stages, the information-processing theory of development, and Vygotsky's ZPD suggest that teachers need to assess students' current levels of understanding and abilities and design instruction that is within their learning potential.
Learning is dependent on interactions with the environment and with others.	Although Vygotsky overemphasized the role of social interaction in learning as compared to Piaget and neo-Piagetians, they all support the idea that the types of understandings learners construct depend on their interactions with the environment and others.

specific classroom strategies to promote students' cognitive growth that are based on an information-processing view of learning. Table 3.7 summarizes development principles that are common to Piaget, Vygotsky, and current information-processing theories.

LANGUAGE DEVELOPMENT THEORIES

Human language includes any spoken, written, or signed systems of symbols that people use to communicate with each other. Language enables us to know what others know and feel, to describe past events, to refer to the future, and to pass down information from generation to generation, creating a common cultural heritage. Educational psychologists are interested in language development not only because it facilitates cognitive development but also because it helps us better understand how to promote students' literacy and learning of one or more additional languages.

The Basics of Language Development

How does language develop? Would an infant be able to develop a language if he grew up isolated from other language-speaking adults? In answering these questions, once again, we are faced with the nature-versus-nurture question. If language is a natural biological process, the answer to the second question is affirmative. If language instead is a process that depends on the stimulation offered by the environment, the answer to the second question is negative. Of course, it would not be ethical to isolate an infant from society to obtain an answer to these questions.

Children display a remarkable natural ability to learn language. However, they do not absorb the language exactly as spoken to them but rather construct their own understanding of the language such as the meaning and grammatical rules governing how to combine words into meaningful sentences (Cromer, 1993; Karmiloff-Smith,



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What is the role of nature and nurture in language development?

Language Acquisition Device (LAD) (or language-making capacity)

An inborn linguistic processor put in place at birth and activated as children listen and respond to the naturally occurring verbal input of those surrounding them.

1993). This is why some experts have proposed that humans possess an inborn linguistic processor, specifically, a **language acquisition device** (LAD; Chomsky, 1959, 1972) or language-making capacity (LMC: Slobin, 1985). This linguistic processor is presumably in place at birth and activated as children listen and respond to the naturally occurring verbal input of those surrounding them. Does this mean that language will develop naturally under any circumstances?

Interestingly, there was a historic experiment in Paris in 1800 that may help answer this question. It was the case of "l'enfant sauvage de l'Aveyron," which translates "the wild boy of Aveyron." Victor (as he was later called) was an adolescent boy who was found living in the forests of Aveyron, France. Presumably, the boy had grown in the forest all by himself, without contact with any other human being. Despite being completely naked, dirty, and insensitive to temperature and pain, Victor had a very healthy body. On the other hand, the lack of contact with humans had made him very unsocialized. Victor ate his food raw, using only his hands; grunted and made very loud sounds; and had no problem taking care of his physiological needs anywhere. A physician named Dr. Jean-Marc Itard then decided that he would teach Victor how to become a civilized member of French society.

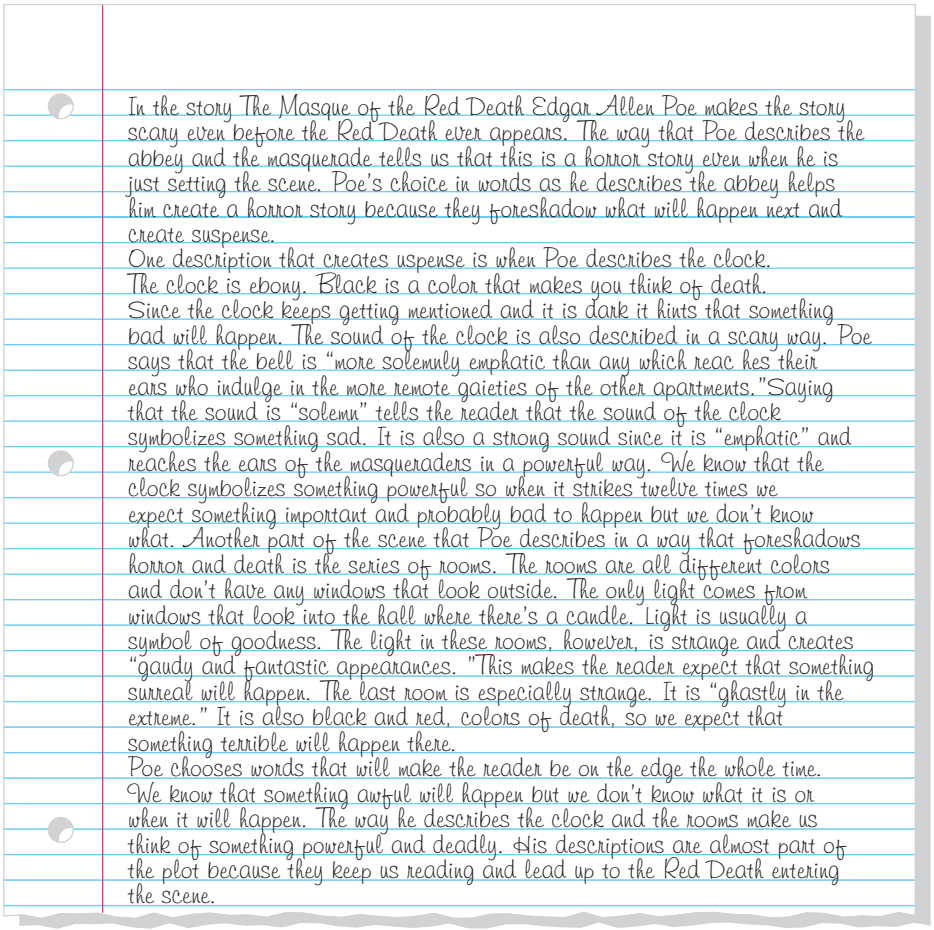
For five years, Dr Itard tried to teach Victor many different social skills. His hard work payed off in several ways. Victor was successful at learning how to dress himself, how to sleep in bed without wetting, and how to eat with utensils. He also learned to make use of his senses in ways that he had not used them before and learned how to show affection and please others. However, Victor never learned to speak (Itard, 1962). Genie (not her real name) is a modern-day "wild child" discovered at the age of 13 strapped to a potty-chair in her home in Los Angeles (Curtiss, 1977). Similar to the case of Victor, Genie wasn't taught to speak at an early age and was unable to learn language.

Today, many theorists believe that humans are born with a predisposition to learn a language, also called a "language instinct" (Pinker, 2007). That is, to some degree, our knowledge of language is wired or built into us (Chomsky, 1972; Gopnik, 1997; Karmiloff-Smith, 1993; Lenneberg, 1967). However, there is also evidence that children learn their first language best when immersed in the language within the first five to ten years of life, the sensitive period of language development mentioned earlier in our discussion of brain development (Bialystok, 1994; Borfeld & Whitehurst, 2001; Bruer, 1999b; Newport, 1990). Thus, experts believe that the reason the Wild Boy of Aveyron or Genie did not learn how to speak is because they did not develop their language abilities within such a sensitive period. Unless other biological impairments are present, children will develop language skills normally when people around them converse in that language during this sensitive period.

Trends in Language Development

Language development shows common trends across all cultures. For instance, without explicit instruction, all children will display the following language behaviors during the first two years of life: babbling at about 3 to 6 months of age; uttering the first words and using single words at about 10 to 13 months of age—especially those that refer to animals, body parts, and toys (Bornstein et al., 2004); and combining nouns with verbs to produce two-word speech at approximately 18 to 24 months of age.

Language capabilities continue to grow as children quickly learn to produce complete sentences between 2 and 3 years of age and into the elementary school years (Bloom, 1998). Students develop the ability to produce sentences of increasing complexity to effectively communicate with others and also slowly develop *metalinguistic awareness*, the knowledge of language that allows children to think about their language (Berko Gleason, 2005). For example, during elementary school, children will start becoming aware of when sentences are grammatically correct or not (Bowey, 1986). As they move into middle school, they begin to consider the function of different words in a sentence (e.g., nouns, verbs,



In the story The Masque of the Red Death Edgar Allen Poe makes the story scary even before the Red Death ever appears. The way that Poe describes the abbey and the masquerade tells us that this is a horror story even when he is just setting the scene. Poe's choice in words as he describes the abbey helps him create a horror story because they foreshadow what will happen next and create suspense.
One description that creates uspense is when Poe describes the clock. The clock is ebony. Black is a color that makes you think of death. Since the clock keeps getting mentioned and it is dark it hints that something bad will happen. The sound of the clock is also described in a scary way. Poe says that the bell is "more solemnly emphatic than any which reac hes their ears who indulge in the more remote gaieties of the other apartments."Saying that the sound is "solemn" tells the reader that the sound of the clock symbolizes something sad. It is also a strong sound since it is "emphatic" and reaches the ears of the masqueraders in a powerful way. We know that the clock symbolizes something powerful so when it strikes twelve times we expect something important and probably bad to happen but we don't know what. Another part of the scene that Poe describes in a way that foreshadows horror and death is the series of rooms. The rooms are all different colors and don't have any windows that look outside. The only light comes from windows that look into the hall where there's a candle. Light is usually a symbol of goodness. The light in these rooms, however, is strange and creates "gaudy and fantastic appearances. "This makes the reader expect that something surreal will happen. The last room is especially strange. It is "ghastly in the extreme." It is also black and red, colors of death, so we expect that something terrible will happen there.
Poe chooses words that will make the reader be on the edge the whole time. We know that something awful will happen but we don't know what it is or when it will happen. The way he describes the clock and the rooms make us think of something powerful and deadly. His descriptions are almost part of the plot because they keep us reading and lead up to the Red Death entering the scene.

FIGURE 3.9 **In what way does this student work demonstrate metalinguistic awareness?**

pronouns). By high school, students further develop their metalinguistic awareness by understanding that words can be used not just literally but also in figurative and symbolic ways. Figure 3.9 shows an example of student work demonstrating metalinguistic awareness. Language skills mature throughout childhood and adolescence and encompass semantic, syntactic, comprehension, and oral communication skills.

Semantic Development. You can see that one important change over time is an increase in vocabulary. By age 2, children are able to use approximately 300 nouns, 100 verbs, and 30 pronouns. Although direct instruction may teach children the meaning of new words, they also infer meanings from the contexts in which they hear or read new words (Owens, 1996; Pinker, 1987). The knowledge of word meanings is called **semantics**. Semantics develops only through environmental support. For example, infants will point out to things in the environment as a way to ask about their name.

As children learn semantics, they are likely to develop two errors. First, they undergeneralize, or restrict the meaning of a word to include fewer concepts than it should. A typical example of **undergeneralization** in elementary school is thinking that the word *animal* means mammals only, neglecting the fact that fish, birds, and insects are animals, too (Carey, 1985; Saltz, 1971). Second, they overgeneralize, or wrongly extend the meaning of a word. A typical example of **overgeneralization** is to add *-ed* to any verb when it is in the past tense, such as saying *goed* instead of *went* or adding an *-s* to make a noun plural, such as saying *foots* instead of *feet*.

Another trend in semantic development consists of moving from understanding concrete words to understanding more abstract words. For example, a child may originally believe that having dinner consists of sitting at the dining table with mom and dad and watching TV while eating. With time, children are able to realize that dinner is a meal that happens at a certain time of the day, regardless of the place and

Semantics

The knowledge of word meanings.

Undergeneralization

Restricting the meaning of a word to include fewer concepts than it should.

Overgeneralization

Wrongly extending the meaning of a word to more concepts than it should.

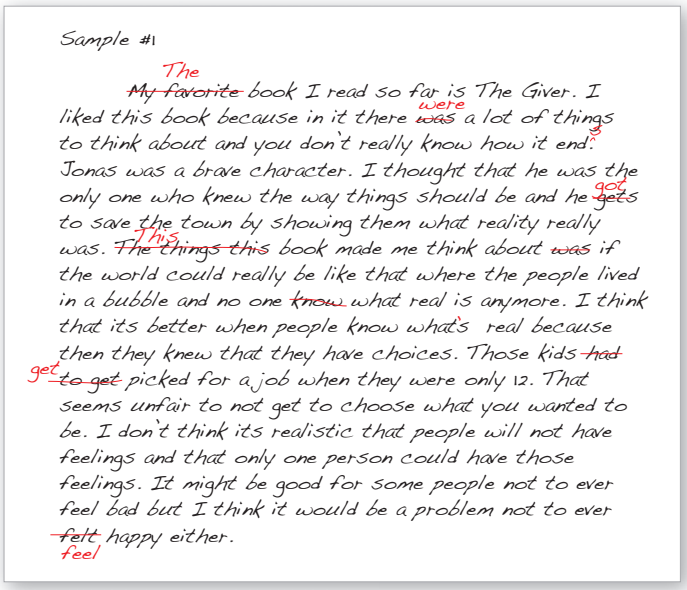
surroundings. The most effective way to help children's semantic development is to engage them in reading activities (Stanovich, 2000; Swanborn & de Glopper, 1999). In addition, teachers can teach new vocabulary words, have children explain the meaning of new words, and have them use the new words in a variety of contexts.

Syntax

The organization of words into grammatically correct sentences.

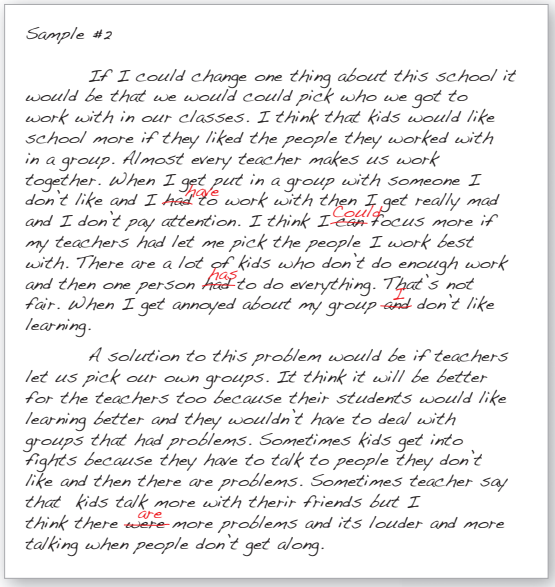
Syntax Development. Children also slowly develop rules of **syntax**, the organization of words into grammatically correct sentences. Despite its complexity, syntax develops unconsciously and without the need for instruction (Chomsky, 1972). For instance, when children start school, they have already developed many complex syntactic constructions, including the use of passive voice and sentences with multiple clauses. Syntactic rules become more and more sophisticated with instruction. Students use more complex syntax in their writing than in their talking by the beginning of middle school (Owens, 1996), and syntax continues to develop throughout high school. Around high school, students refine their understanding of syntax rules in language arts, English composition, and foreign language classes (Maratsos, 1998). Figure 3.10 shows a few selected samples from the writing portfolio of a student demonstrating syntactic development.

Listening Comprehension Development. Students' ability to comprehend a spoken message is highly dependent not only on their semantic and syntactic development but also on the context in which the message is given. Elementary school children often use cues given by context to aid in their comprehension but also often fail to understand what is really meant by the message (Donaldson, 1978). For instance, because they take the words they hear literally, they are not able to understand analo-



Sample #1

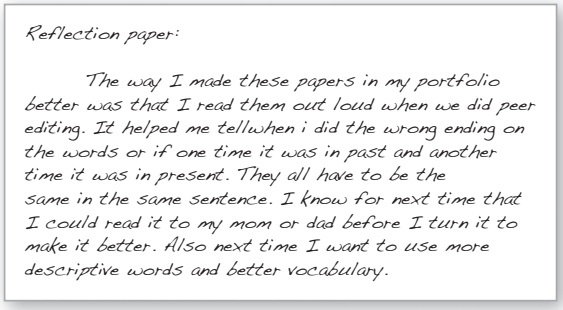
~~My favorite~~ The book I read so far is The Giver. I liked this book because in it there ~~was~~ were a lot of things to think about and you don't really know how it end~~s~~? Jonas was a brave character. I thought that he was the only one who knew the way things should be and he ~~gets~~ got to save the town by showing them what reality really was. ~~The things this~~ This book made me think about ~~was~~ if the world could really be like that where the people lived in a bubble and no one ~~know~~ knows what real is anymore. I think that its better when people know what's real because then they knew that they have choices. Those kids ~~had to get~~ get picked for a job when they were only 12. That seems unfair to not get to choose what you wanted to be. I don't think its realistic that people will not have feelings and that only one person could have those feelings. It might be good for some people not to ever feel bad but I think it would be a problem not to ever ~~felt~~ feel happy either.



Sample #2

If I could change one thing about this school it would be that we would could pick who we got to work with in our classes. I think that kids would like school more if they liked the people they worked with in a group. Almost every teacher makes us work together. When I get put in a group with someone I don't like and I ~~had~~ have to work with them I get really mad and I don't pay attention. I think I ~~can~~ could focus more if my teachers had let me pick the people I work best with. There are a lot of kids who don't do enough work and then one person ~~had~~ has to do everything. That's not fair. When I get annoyed about my group ~~and~~ I don't like learning.

A solution to this problem would be if teachers let us pick our own groups. It think it will be better for the teachers too because their students would like learning better and they wouldn't have to deal with groups that had problems. Sometimes kids get into fights because they have to talk to people they don't like and then there are problems. Sometimes teacher say that kids talk more with therir friends but I think there ~~were~~ are more problems and its louder and more talking when people don't get along.



Reflection paper:

The way I made these papers in my portfolio better was that I read them out loud when we did peer editing. It helped me tellwhen i did the wrong ending on the words or if one time it was in past and another time it was in present. They all have to be the same in the same sentence. I know for next time that I could read it to my mom or dad before I turn it to make it better. Also next time I want to use more descriptive words and better vocabulary.

FIGURE 3.10 **How might writing portfolios help students' syntax development?**

gies, metaphors, or proverbs, which convey a message "indirectly" to the listener. For this reason, it is very important that elementary school teachers speak in simple and unambiguous terms; they should not only ask students if they have understood a message but should check for understanding by, for example, asking them to rephrase the message in their own words.

As children grow, they become less dependent on the context and nonverbal cues and start looking beyond the literal meaning of spoken messages (Owens, 1996; Winner, 1988). The ability to interpret proverbs, for instance, continues to develop throughout high school (Owens, 1996). Research also suggests that it is not until about age 11 that children start understanding that comprehension is not just listening quietly to a teacher or peer while they speak, but that it also requires comprehending what is said (McDevitt, 1990; McDevitt, Spivey, Sheehan, Lennon, & Story, 1990). However, teachers should be aware of individual differences in students' comprehension strategies. While some children will actively ask questions when unable to understand a message, others may be too shy to ask or believe that it is disrespectful to interrupt an adult, such as the case of children from Mexican-American and many Asian cultures (Delgado-Gaitan, 1994; Grant & Gomez, 2001).

Oral Communication Development. To communicate effectively, children first need to learn the correct pronounciation of words, or **phonology**. At age 2, English-speaking children are able to pronounce simple sounds such as *b, p,* and *n*. In preschool and early elementary school, children may show difficulty pronouncing some sounds (e.g., *th, dr, sl,* and *str*), but these problems typically disappear by age 8 or 9. However, teachers may encounter older children who display pronunciation problems, in which case they should recommend that a speech pathologist examine the case and suggest remediation strategies.

Phonology

The correct pronunciation of words.

In addition to pronunciation, children must also learn to take into consideration the characteristics of the audience when speaking to others. For example, even in upper elementary school children speak to others without taking into consideration the listeners' prior knowledge (Glucksberg & Krauss, 1967; McDevitt & Ford, 1987). For instance, as an elementary school child describes her weekend activities to a peer, she may assume that the peer knows all the people and places she is referring to. Elementary teachers therefore should model how to communicate appropriately by asking children to repeat or rephrase their messages when they are ambiguous or not understandable and by asking children to explain who or what they are referring to when prior knowledge is absent. The lack of awareness of the prior knowledge of the audience parallels young children's lack of awareness of the rules of pragmatics.

Pragmatics are the social conventions that adults use to communicate effectively with others. For instance, some pragmatic rules include introducing yourself to a new person before starting a conversation, taking turns during conversations, and making sure that a story is given closure. A typical display of lack of pragmatic skills is when a child interrupts others during a conversation or abruptly changes the subject. Children develop the use of pragmatic rules throughout elementary school (Owens, 1996). When such skills are lacking, teachers should help children become aware of the need to apply these rules, especially if other students become irritated or annoyed or classroom activities are disrupted. When you read Chapter 11, you will learn that a good opportunity for an elementary school teacher to start instructing about how to appropriately communicate with others is when the classroom rules are set during the first week of classes. In general, all language skills (i.e., semantics, syntax, comprehension, oral communication) are best fostered when students are provided with many opportunities to engage in complex and diverse social interactions (Penner, 1987; Rice, 1986).

Pragmatics

Social conventions used to communicate effectively with others.

On the other hand, merely listening passively to others' conversations, such as watching television, has very little effect on language development (Snow, Corno, & Jackson, 1996). Classroom Tips: Strategies to Foster Language Development summarizes the main linguistic characteristics for different-grade students and corresponding teaching strategies.

CLASSROOM TIPS

Strategies to Foster Language Development

Grade	Linguistic Characteristics	Classroom Tips
K–2	Vocabulary of 8,000–14,000 words by age 6.	Read age-appropriate stories to enhance vocabulary.
	Mastery of sounding (exceptions may be *th, dr, sl*, and *str*).	Correct innaccurate use of words.
	Reliance on order of words and context in comprehension.	Question students for comprehension.
	Literal message interpretation.	Ask students to tell stories to their peers.
	Listening comprehension equals sitting and listening.	Ask students to rephrase ideas in their own words.
	Overgeneralization and undergeneralization.	Reinforce pragmatic conversation rules.
	Increasing ability to tell stories.	
	Basic use of pragmatic rules.	
3–5	Increasing vocabulary.	Use group discussions.
	Mastery of sounding by age 9.	Ask students to develop stories.
	Increasing awareness of grammatically correct sentences.	If articulation problems exist, consult with speech pathologist.
	Increasing awareness of listeners' prior knowledge and pragmatic rules.	Teach irregular word forms.
	Some struggling with language irregularities (i.e. verbs).	Encourage language creativity.
	Linguistic creativity (e.g., rhymes, poems)	
6–8	Vocabulary of approximately 50,000 words at age 12. Difficulty with connectives (e.g., *but, yet, although*).	Ask students to read books that introduce new vocabulary, including domain-specific vocabulary (e.g., biology, astronomy).
	Ability to understand complex sentences. Ability to understand beyond literal expressions.	Use debates to promote comprehension and conversational skills.
	Increasing ability with abstract language. Increasing metalinguistic awareness.	Ask students to rephrase the meaning of proverbs, analogies, and metaphors.
9–12	Vocabulary of approximately 80,000 words by age 12.	Extend vocabulary to many different disciplines.
	Mastery of many syntax principles.	Help students make more sophisticated distinctions between words.
	Mastery of connectives.	Present sentences with multiple clauses.
	Ability to understand figurative language without hints.	Have students read poetry, novels, and fiction.
	Creative writing.	Encourage creative writing.

Bilingualism and Second-Language Acquisition

Although there is much agreement that there may be a sensitive period for language learning, experts are not convinced that there is also a sensitive period for acquiring a second language (Hakuta, 2001; Hakuta, Bialystok, & Wiley, 2003; Merzenich, 2001). Evidence exists, however, that the earlier a person is exposed to a second language, the more likely the person is to master correct pronunciation and complex grammatical constructions in the second language, especially when the first and second languages are very different from each other (Neville & Bavelier, 2001). For example, when preschool immigrants from Asia tried to learn English, they were able to gain better syntax skills than elementary-grade immigrants, and adolescent immigrants gained greater linguistic competence than adult immigrants (Johnson & Newport, 1989).

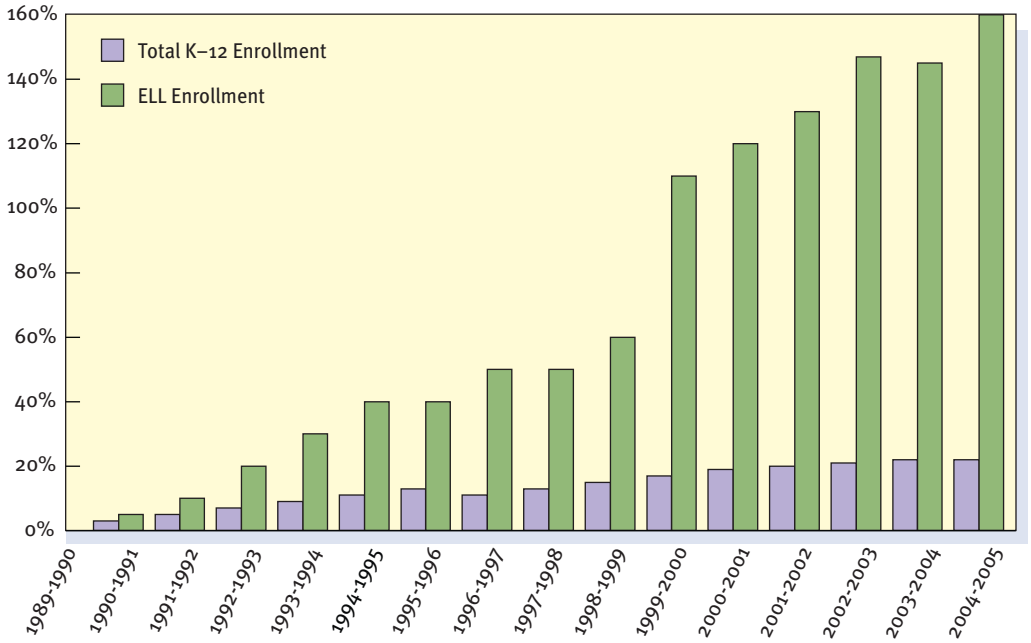


FIGURE 3.11 Relative growth in ELL enrollment and total enrollment in U.S. schools from 1989 to 2005.

Learning a second language is becoming increasingly important. As globalization advances, the adult workplace will offer many more opportunities to those who know one or more languages in addition to their native tongue. As you probably recall from Chapter 1, the number of bilingual students in the United States classrooms has been increasing significantly over the past years. Bilingual students are those that regularly use two languages in their everyday life (Grosjean, 1992). Some bilingual children come from families where both English and a different home language are spoken (e.g., Spanish, Vietnamese), whereas others have learned a native language and later learned English as their families emigrated to the United States.

Recent national surveys reporting the number of English language learners (ELLs) enrolled in elementary and secondary schools show that the number of ELL students in U.S. schools has more than doubled over a period of fifteen years, with ELL enrollment having increased at nearly seven times the rate of total student enrollment. Figure 3.11 shows the relative growth in ELL enrollment and total enrollment in U. S. schools from 1989 to 2005 as reported by the National Clearinghouse for English Language Acquisition and Language Instruction Educational Programs (NCELA, 2007).

Other facts related to the ELL population in the United States that are relevant to the classroom teacher include the following (Kids Count, 2007):

- There are over 430 different languages spoken by ELLs in the United States.
- The most common home language spoken by ELLs is Spanish, accounting for 81.5% of the ELL student population.
- About 60% of the parents of children in immigrant families have difficulty speaking English.
- About 20% of children in immigrant families have difficulty speaking English.
- About 27% of children under age 18 live in linguistically isolated households (households in which no person 14 years of age or over speaks English very well).

Research shows that learning two languages simultaneously during childhood generally results in high proficiency in both the classroom language (English) and the home language (Lanza, 1992; Reich, 1986). The more proficient students are in their first language, the faster they develop proficiency in a second language (Cummins, 1994). Research also shows that being bilingual may have cognitive advantages. For instance, when children are fluent in two languages, they tend to perform better on high-order tasks such as intelligence and creativity tests and they demonstrate greater metalinguistic awareness (Bialystok, 2001; Diaz & Kingler, 1991; Garcia, 1994; Moran & Hakuta, 1995).



Laura Dwight Photography

What are some advantages of being fluent in two or more languages?

The many advantages of second-language learning and bilingualism encourage promoting bilingualism in all students to enhance not only cognitive and language skills but also better communication and interaction among culturally and linguistically diverse students. One way to achieve these goals is through bilingual education programs. Recall from Chapter 2 that bilingual education consists of using two languages as the medium of instruction and can be implemented in many different ways (e.g., transitional bilingual education, pullout programs, dual-language programs). In these programs, native English speakers and language minority students learn by using both English and minority (or target) languages at separate times during instruction. The advantage of these programs is that they promote bilingual proficiency, high academic achievement, and cross-cultural awareness in all students (Christian, 1996). English-speaking children develop a "foreign language" and non-English-speaking children benefit from having instruction in their home language (Christian, 1996; Lindholm, 1990; Valdes, 1997).

Although you may recall that bilingual education is a controversial topic in education and presents many challenges to the classroom teacher, research indicates that *additive bilingualism*, the addition of a second language that builds on an already well-developed first language, enhances thinking ability (Cummins, 1976; Hakuta, 1986). This type of bilingual education should not be confused with *subtractive* bilingualism, where children who have not fully developed their first language are introduced to the learning of a second language.

LA ARAÑA PEQUEÑITA

La Araña pequeñita
subió, subió, subió.
vino la lluvia
y se la llevó.
Salió el sol
y todo lo secó,
y la araña pequeñita
subió, subió, subió.

The National Literacy Panel on Language-Minority Children and Youth reported ample evidence that language minority students who are literate in their first language are likely to be advantaged in the acquisition of English literacy (August & Shanahan, 2006). Specifically, first-language literacy is positively associated with literacy development in English, including reading, reading comprehension, reading strategies, spelling, and writing (August & Hakuta, 1999; Cuevas, 1997; Roberts, 1994). In addition, literacy skills related to reading decoding have been found to transfer between languages (Bialystock, 1991; Hudelson, 1987; Mace-Matluck, 1982). When additive bilingualism is embraced in the classroom, students' cognitive abilities, self-esteem, and motivation to learn become enhanced as illustrated in the following classroom example (Garcia, 1992; Marsh, Hau, & Kong, 2002; Nieto, 2000; Ricciardelli, 1992).

Mr. Muñoz teaches in an elementary school where the majority of students are Hispanic and bilingual. He incorporates their heritage language into instruction in a variety of ways. "Now we're going to learn how to sing your favorite song, *The Eentsy Weentsy Spider* in Spanish," he announces. "Yay!" The students enthusiastically sing along. "I like that song, Mr. Muñoz," Esperanza says.

Every morning, the kindergartners also count the days of the month in Spanish and English and Mr. Muñoz frequently reads Spanish story books aloud to the class, to improve their vocabulary and pronunciation. He finds that kindergartners actively participate in his lessons and that parents are more involved in homework and supportive of his classroom when he includes students' heritage language.

DIVERSITY IN LANGUAGE DEVELOPMENT

Today's classrooms display a variety of linguistic differences within each age group. Because language development is dependent on the stimulation provided by the environment, children will vary in the size of their vocabulary. For instance, mothers who teach letters to their babies, talk out loud to them, and read books to them regularly and consistently are much more likely to have children with well-developed vocabularies. When parents are consumed by financial or emotional pressures,

CLASSROOM TIPS

Strategies to Help ELLs Develop Conversational and Academic English

Use open-ended questions to assess both types of English proficiency.
Use the ELLs' background knowledge to support their understanding.
Use a variety of contextual supports such as visuals, maps, charts, manipulatives, and pantomiming.
Start by developing conversational English skills.
Practice talking about current news and events.
Combine conversational English with contextual support to teach academic English.
Gradually introduce new content vocabulary in your lessons or units.
Pair less advanced ELLs with more advanced ELLs or English speakers during classroom activities.
Teach strategies to comprehend and analyze challenging texts.
Teach difficult language patterns.
Read to students and with students, especially if no one at home is able to read English.
Provide time for independent reading.
If students are literate in their home language, focus on differences between that language and English.
Provide opportunities to summarize knowledge learned.
Check for comprehension and clarify difficult words and passages.
Give frequent and timely feedback.

linguistic stimulation is much less likely to happen and vocabulary deficits will occur. Vocabulary deficits will be evident by the time children are 3 years old and continue to be present even after entering school, when children are 6 years old (Farkas & Beron, 2004).

English Language Learners

A second source of diversity in language development is that between ELL and non-ELL groups. Typically, students who are identified as ELLs are those who are fluent in their home language but not as fluent in English. However, remember from our discussion about group diversity in Chapter 2 that teachers should always consider diversity within groups to better serve the unique instructional needs of each individual student. For instance, in any classroom, ELLs are likely to come with different levels of home language proficiency and English proficiency, depending on a number of variables such as the number of years lived in the United States, the primary language spoken at home, students' literacy experiences, and the quality of language instruction received in the past.

Moreover, teachers are likely to find differences in the development of conversational versus academic English skills, especially among ELLs. Conversational English is the language of everyday communication in oral and written forms. Some examples are: when students talk to their friends on the playground or in the school bus; when teachers and students have informal face-to-face conversations, and when students go to the book store and read a list of supplies that they need to purchase. ELLs' conversational English may start developing within a few months, but it will likely take a couple of years before students have fully developed conversational English skills in listening, speaking, reading, and writing. Writing is usually the last communicative process in which students attain proficiency.

Academic English is more complex and difficult to develop than conversational English, yet it is the language necessary to succeed in school. It consists of the advanced forms of language that are needed to communicate higher-order thinking processes in formal situations.

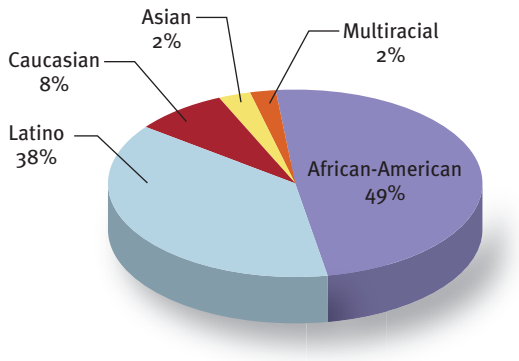
A Case Study: DIVERSITY IN THE CLASSROOM

Language Differences in a Seventh-Grade Classroom

Demographics:
Uplift Middle School, Chicago

85.6 % Students eligible for free and reduced lunch
13.7% Students receive ESL instruction
16.8% Students receive Special Education Services

Racial/Ethnic Groups



Graphic of phonic cards

Front side:



Tag

Back side:

Tag

"The afterschool program is a chance for teachers to work with students who need extra support. It's a safe alternative for kids because instead of being out on the streets they get help with homework and play sports with their friends. I think it's really important for our community," Mr. Gonzales, the afterschool coordinator, explains.

"Oh, I completely agree," Mrs. Atwood replies. Having worked as a high school career counselor and soccer coach in Connecticut, she's a strong proponent of organized afterschool activities. "I'm looking forward to working with students on their reading skills. Some of my seventh graders read on a fourth grade level."

Since Mrs. Atwood started her first year teaching science at Uplift Middle School in Chicago, she's wanted to provide more help for struggling students. In the afterschool program she incorporates partner reading, problem solving, and homework help. She also works one-on-one with students on subjects they find particularly challenging.

A few weeks into the program, Mrs. Atwood realizes that one of the students, Michael, struggles to decode words and write simple paragraphs. Michael is a witty, African-American sixth-grader who is best known by his peers for his drawing skills. His school binders are decorated with elaborate cartoons he's created. Mrs. Atwood chooses to work with him individually on identifying short and long vowels.

The goal of the phonics lesson is for students to read different vowel sounds and group them accordingly. She will begin by showing Michael picture cards of actions with descriptive words at the bottom. First, he will read the word with the help of the picture. Second, he will read the word on the back of the card without the picture. Finally, he will sort the cards by vowel group. Mrs. Atwood knows this is a second-grade-level activity, but she wants to assess his phonics skills before introducing more complex reading strategies.

Michael is reluctant to start and seems to have little confidence in his reading ability. When he tries to read words, he painstakingly sounds them out. She realizes there are large gaps in his phonics knowledge. At one point, Michael looks at several cards in front of him and is obviously confused. The first card is a picture of several children playing a game. One child is reaching out to touch the other. Michael makes several guesses at the word.

"Is it *tap*?" he asks.

"No, try again."

"Maybe *touch*?" he wonders. "It must be *tease*," he states.

"No, that's not the word," she replies. Michael squirms in his chair and waves to his friend across the room, obviously distracted.

"Let's try another card," Mrs. Atwood announces. It is a picture of a woman knocking on the door of a house.

"Hmmm, is it *tap?*" he guesses.

"No," she tells him.

"Maybe *slap?*" Again his descriptions are incorrect and Michael seems frustrated.

"Why don't you try one last card," Mrs. Atwood tells Michael. It is a picture of a caveman pulling a deer carcass behind him.

"Must be *deer*," he says. She can sense his disappointment when she shakes her head.

"Try again," she encourages.

Reluctantly, he guesses "*dead?*" But that is also wrong. Mrs. Atwood wonders why it is so difficult for Michael to read the words.

"Do you want to hear the correct words that represent these pictures?" she asks. He shrugs his shoulders. "Yeah, okay," he replies, and looks away.

"All right," she says, rubbing her hands together with much fanfare. "Let's see. The first card says *tag*, the second, *rap*, and the third, *drag*." Michael gives her a puzzled look but doesn't say anything. "Now, it's your turn to read each word and describe the action, without the help of the picture."

Michael correctly reads most of the words and describes the actions without looking at the pictures. However, to Mrs. Atwood's surprise, when he comes to the three cards they had just discussed, he offers new definitions. He holds up the card *tag*. "You see, my brother gets in trouble when he's caught spray-painting tags on billboards near our apartment."

"Oh, tag graffiti?" she asks.

"Yeah, he's stopped doing that now, though."

Next, he holds up the picture card with the woman knocking on the door and reads *rap*." He explains, "That's the music on 100.3 FM, you know, Kanye West, Talib Kweli, 50 Cent, they're all rappers." Michael pounds out a beat on his desk and Mrs. Atwood smiles.

Next, he points to the card with the caveman pulling the carcass and reads, "*drag*." Okay, you see that's what my mom does outside on the balcony when she comes home from work."

Mrs. Atwood is confused. "What do you mean?" she asks.

"You know," Michael holds an imaginary cigarette to his lips and takes a puff. Then he says slowly, "My–mom–takes–a–drag–on–her–cigarette."

"Oh, I get it," she responds. "Sometimes it feels like we're speaking two different languages."

"Yeah," Michael laughs.

Mrs. Atwood is uncertain about which materials and methods will be most effective for teaching Michael. Based on preliminary assessments, she believes he needs lessons in phonics, vocabulary, fluency, and comprehension. Yet because the after-school program does not provide adequate time for intensive remedial instruction, she decides to work individually with Michael for 20 minutes three times a week. She uses second-grade vocabulary to practice decoding and third-grade-level books to work on fluency and comprehension. As Michael gains greater confidence, she plans to incorporate more complex materials. Her immediate goal is to motivate Michael with the hope that his newfound interest will help him understand his school assignments and may even lead to more independent reading outside of school.

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

REVISITING ISSUES IN EDUCATION

Can brain-based research inform classroom practices?

Points to consider: Brain-based research has provided a window into important learning and development processes. For instance, we now know that the structure and function of the brain is not fixed at birth and that synaptic growth provides the foundation for learning, which will depend on the experiences or environmental stimulus available to the individual (Bruer & Greenough, 2001; Craig, 2003). We also know that the more often a pattern of neural connections is stimulated, the more automatic a skill or memory will become (Buchel et al., 1999), and that high levels of stress hormones in the brain can lead to memory and learning impairments (Jensen, 1998). Advocates of brain-based education claim that these findings can inform educational practice such as the need to provide active learning strategies, deliberate practice opportunities, and a supportive classroom environment that minimizes stress from academic difficulty or peer rejection (Hardiman, 2001). However, critics of brain-based education note that these strategies have been long established by studies of human behavior rather than by brain research (Bruer, 1997; D'Arcangelo, 2000). Although neuroscience may be able to inform classroom practices in the future, today's educational principles are mostly based on the findings of the learning sciences (e.g., cognitive science, educational psychology).

For instance, an ELL student with good conversational English may not necessarily have the academic English proficiency needed to describe causal relationships in words, understand questions requiring him/her to predict what would happen next in a story, or summarize a cooperative group discussion. The development of the vocabulary and grammar that is necessary to understand and express understanding of complex instructional materials may take about five to seven years (Cummins, 2000; Hakuta et al., 2003).

However, it is important to note that students will also learn at different rates. As teachers, we need to identify students' levels of conversational and academic English language development and use a variety of strategies to support the different language development needs of each student. A list of research-based classroom strategies is presented in Classroom Tips: Strategies to Help ELLs Develop Conversational and Academic English (August & Shanahan, 2006; Genesee, Lindholm-Leary, Saunders, & Christian, 2006).

English Dialects

Another source of linguistic diversity in the classroom will come from students who use English dialects, a particular form of English developed by some ethnic or regional groups in the country. Students who speak dialects are more likely to have difficulty reading than those who speak Standard English (Charity, Scarborough, & Griffin, 2004). Because dialects are part of students' identity, negative teacher attitudes toward students' dialects should be avoided (Gollnick & Chinn, 2002). Recall from Chapter 2 that the attitude a teacher displays toward linguistically diverse students shapes how they perceive school and how they are supported (or not) as learners. As teachers, we should balance the need to help all students develop Standard English vocabulary and skills, while encouraging the use of dialects in appropriate contexts, such as informal discussions or creative writing assignments (Gollnick & Chinn, 2002). The previous classroom case depicts how students' dialects may affect language development and teaching.

SUMMARY

- Human development includes physical, cognitive, language, personal, and social changes that appear in a certain order and that remain for a reasonably long period of time. Most experts believe that nature and nurture combine to influence how humans develop. Cognitive development refers to how our minds and mental processes change over time.
- The human brain shows specialization, integration, and lateralization. Brain research suggests that development involves creating and eliminating synaptic connections and that learning experiences can change the brain structure by reorganizing the synaptic networks of the brain.
- This chapter discussed Piagetian, Vygotskian, and information-processing theories of cognitive development. According to Piaget, there are four stages of cognitive development through which people progress between birth and adulthood, namely, sensorimotor, preoperational, concrete operational, and formal operational stages. Piaget argued that humans have a need to organize and adapt to the demands of the physical environment to find equilibrium. Cognitive development results from the interaction of maturation, activity, and social experiences, which help children adjust their existing schemas through the processes of assimilation and accommodation.
- Although Piaget's theory has been criticized for relying on broad, fixed, sequential stages and underestimating children's abilities, it presents important implications for education and has inspired neo-Piagetians' information-processing view of cognitive development. Specifically, neo-Piagetians focus on the kinds of strategies and thinking that are likely to arise as children develop due to gradual increases in their attention, strategies, knowledge, and metacognition.
- According to Vygotsky's sociocultural view of cognitive development, cognitive skills develop through social interactions and the use of language. It is by means of social interactions with more-capable others that children learn the ways of thinking and behaving of their community. Assisted learning takes place within children's zone of proximal development, where they perform new tasks with scaffolding, guided participation, and apprenticeship methods that eventually lead to children's language and cultural internalization.
- Human language includes any spoken, written, or signed system of symbols that people use to communicate with each other. Experts believe that humans are born either with a language acquisition device or a predisposition to learn a language. However, there is also evidence that unless children learn their first language within the sensitive period, language may not develop. In addition, there is evidence that the earlier individuals are exposed to a second language, the more likely they are to master the second language.
- Being fluent in two or more languages is associated with higher intelligence, creativity, and metalinguistic awareness. These findings encourage promoting bilingualism in the 21st-century classroom to enhance cognitive and language skills and better interactions among culturally and linguistically diverse students.

KEY TERMS

accommodation 79
apprenticeship 92
assimilation 79
centration 82
classification 83
conservation 81
cortex 74
critical period 77
egocentricism 83
equilibrium 79
guided participation 92
inner speech 90
internalization 89
language acquisition device (LAD) 98
lateralization 74
mediation 89
neo-Piagetians 95
neurons 75
object permanence 81
overgeneralization 99
phonology 101
pragmatics 101
pretend play 82
scaffolding 91
schemas 79
semantics 99
seriation 84
specialization 73
symbolic thought 82
synapse 76
syntax 100
undergeneralization 99
zone of proximal development (ZPD) 90

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is cognitive development?
2. What is the role of nature and nurture in cognitive development?
3. Describe how a normal brain develops and the relationship between neurons and learning.
4. What are the processes that lead to cognitive growth according to Piaget?
5. What are the main characteristics of learners in each of Piaget's stages?
6. What are some teaching implications of Piaget's cognitive development theory?
7. According to Vygotsky, what are cultural tools and what are their functions?
8. What is the ZPD?
9. What are some examples of scaffolding that you may have experienced?
10. What are similarities and differences between Piagetian, neo-Piagetian, and Vygotskian theories?
11. How does language develop, and what are teaching implications for different student ages?
12. Does having a second language interfere with the development of English skills?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. How does the idea of standards relate to children's cognitive and language abilities? (Chapter 1)
2. Can the current accountability movement help teachers assess students' cognitive growth? (Chapter 1)
3. How would a Piagetian interpret student giftedness? (Chapter 2)
4. What are some classroom strategies that you can use to promote the cognitive development of students with special education needs? (Chapter 2)

A Case Study: PUTTING IT ALL TOGETHER

How Does This Fourth-Grade Classroom Use Development Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions by applying the theories and research discussed in this chapter.

"All fourth-grade scientists, please prepare your science observation journals and be ready to report to lab in one minute," Mr. Chang announces. Students write the date in the upper-right-hand corner of their journals and have their pencils in hand. Mr. Chang's objective is for students to articulate and write clear hypotheses and to introduce the concept of density.

He invites the students to sit by team on the rug in front of the science demonstration table. Students place their journals and pencils in front of them and wait for the demonstration to begin. Mr. Chang has mysteriously covered objects on the table with a cloth. "What's he going to do this time?" Jeremiah giggles in anticipation. Mr. Chang has donned a white lab coat and black-rimmed glasses: "Mr. Archimedes will be demonstrating today's science lesson."

"Shhh," Samantha reminds her teammates. "Remember, Mr. Archimedes only starts when we're listening."

The fourth-graders watch as their teacher dramatically pulls back the cloth on the science demonstration table to unveil a cantaloupe, a grape, and a clear glass bowl filled with water. He holds up the grape and cantaloupe so all students can observe them. "Now turn to your science partner and tell them which fruit you think is heavier." Mr. Chang calls one student, randomly selecting their names out of his jar of Popsicle sticks containing all the fourth-graders' names.

Darius replies, "I know the grape is lighter, because it's smaller, and I've helped my grandma pick out grapes and cantaloupes at the supermarket."

"That's good to recall your personal experiences, Darius, that can help us to understand the new concepts we're learning," Mr. Chang replies.

"Next, fourth-grade scientists, I want you to make a hypothesis about what will happen when we put the cantaloupe and grape into this bowl of water," Mr. Chang continues. "Before we make our hypotheses, I want you to open your journals to our science vocabulary section and remind your partner what it means to make a hypothesis." "Christine, what is a hypothesis?"

"It's when you make a good guess about something," Christine responds.

Mr. Chang encourages her to elaborate: "Can you give us an example?"

Christine answers, "Yeah, I think the cantaloupe will sink when we put it in the water."

"Okay, let's transform Christine's thoughts into the language scientists' use." Mr. Chang continues: "You see, scientists write very specific hypotheses so that they can test and retest them. For example, you wouldn't want your mom to come up with a hypothesis that was too simple, like, 'I think Christine and her brother and sister will get along great if they eat lots and lots of Brussels sprouts for dinner.' You would ask your mom to be more exact. What does she mean by 'getting along' and exactly how many Brussels sprouts does she plan to feed you for dinner? If your hypothesis is unclear, the outcome of your experiment will be confusing and you won't be able to retest your original hypothesis."

Mr. Chang models how to use the scientific vocabulary by writing an example on the wipe board. "If I put a cantaloupe and grape into a bowl of water, then I hypothesize the cantaloupe will sink and the grape will float."

Next, Mr. Chang gives each student a sticky note and asks them to write down a hypothesis for the demonstration, based on the posted exemplar. As students hand in their hypotheses, Mr. Chang organizes them into categories on the board for the class to review. Thirteen students hypothesize the cantaloupe will sink and the grape will float. Five hypothesize both of the fruits will sink.

"Okay, scientists, now that you've all written hypotheses, I want you to carefully observe Mr. Archimedes' demonstration. Today, Mr. Archimedes will conduct the experiment twice. First, he wants you to simply observe what happens. During the second demonstration, he wants you to record what you observe in your science journal."

Mr. Chang inquisitively looks at both fruits as he holds them above the bowl of water. He quickly scans his audience to make sure all eyes are on the experiment. The students are riveted as he gently drops the fruit into the water: "Look, the grape is sinking fast." "Wait, the cantaloupe is staying at the top, even though it's so heavy." "Oh, weird." Mr. Chang performs the demonstration a second time as the students write observations in their science journals.

"Today during your 'Scientists Experiment' time you will practice writing clear hypotheses and recording your observations." Mr. Chang sends the teams to their desks and summons the 'supply masters' from each team to pick up materials. He gives each team a clear plastic container to be filled with water and a bag of objects. Objects include metal washers, toothpicks, Popsicle sticks, plastic straws, an orange, and an apple. He wants his students to be surprised when their experiments don't match their hypotheses. Tomorrow, he wants them to



Karen Knauer/Workbook Stock/Getty Images, Inc.

draw on these experiences when he introduces the concepts of mass and density.

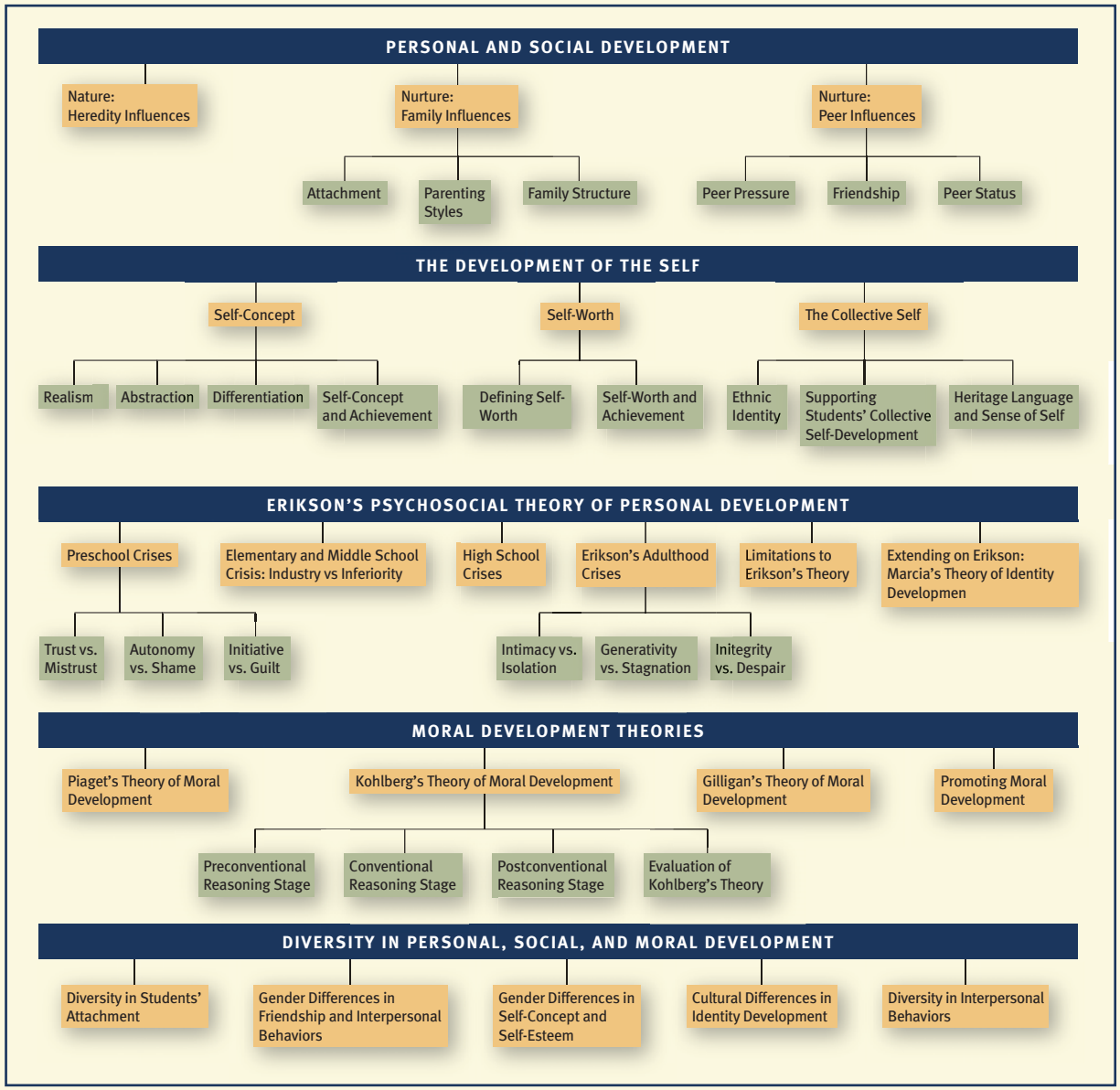
"Okay, time for teams to report out to the class. I'd like to hear your hypotheses and findings," Mr. Chang announces. After the class discussion, Mr. Chang has students respond to two questions: "What surprised you during your experiments? What questions do you still have?" He plans on starting tomorrow's lesson with their responses.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What are some strategies that the teacher used to promote students' cognitive development?
2. Which of the development principles were applied during the lesson and how?
3. To what extent were the theories of Piaget and Vygotsky applied in the lesson?
4. Did the teacher use any strategies to promote students' language skills?
5. Did the teacher demonstrate an awareness of diversity in cognitive development?
6. Evaluate the overall effectiveness of the lesson according to the three development theories that you learned by including both strengths and weaknesses.

4 Personal, Social, and Moral Development



Imagine You Are the Teacher

It's writing workshop in Mr. Laborski's class. He's modeled how to write persuasively and given students an assignment to write a persuasive essay to their parents on a topic of their choice.

Keisha immediately raises her hand. "I can't write," she tells Mr. Laborski. "You know I'm an awful writer," she continues. "I don't even know how to start."

"I have confidence in you, Keisha. I know you can write. Would you like some help brainstorming?" Mr. Laborski asks.

"No, I just can't do it. It seems like everyone else can write, except for me. I'm not any good at this," Keisha complains.

- **What are Keisha's reactions revealing?**
- **What factors may have contributed to Keisha's expressed beliefs?**
- **At what grade level is Keisha likely to be?**
- **What could you do to help Keisha feel more confident in writing workshop?**

Think about how you would respond to these questions as you read through the chapter.



Masterfile

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define personal, social, and moral development.
2. Understand the role of the family and peers on students' development.
3. Define self-concept, self-worth, and collective self and their relationship to academics.
4. Describe the theories of Erikson, Marcia, Piaget, Kohlberg, and Gilligan.
5. Discuss issues of diversity in personal, social, and moral development.
6. Apply personal, social, and moral development principles to classroom scenarios.

Journal Activity — ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Should teachers take into consideration the personal lives of their students?
2. What do students typically worry about when they are in elementary, middle, and high school?
3. Should teachers help students resolve their personal "crises"?
4. How might personal and social development issues interfere with students' learning?
5. Do students change in terms of how they solve moral dilemmas as they grow up?

PERSONAL AND SOCIAL DEVELOPMENT

As you remember from Chapter 1, a successful teacher is one who knows not only about her subject area and pedagogies but also about learning and learner characteristics. Many of the challenges that teachers face today are concerned with understanding students' developmental changes and strategies that can help them grow up in a healthy and functional way (Eisenberg & Fabes, 1998). Part of becoming a reflective practitioner thus requires understanding the processes of personal, social, and moral development.

Personal development is the growth of enduring personality traits that influence the way individuals interact with their environment and others. Social development is the growth of people's ability to interact and get along with others and affects both learning and learning satisfaction (Coolahan, Fantuzzo, Mendez, & McDermott, 2000). Research shows that students who are well developed personally and socially achieve more and enjoy school more than their counterparts (Zins, Bloodworth, Weissberg, & Walberg, 2004). What are the factors that contribute to students' personal and social development? Similar to what you learned about cognitive and language development, there are two forces driving personal and social development: nature and nurture. Let's take a close look at each.

Nature: Heredity Influences

Nature influences personal development by means of the individual's heredity. For example, recall from Chapter 2 that students differ in their personality, or temperament. Some are more gregarious, adventurous, or outgoing than others. Temperament differences are found very early in childhood, and longitudinal studies of adult development show

TABLE 4.1

Eight dimensions of temperament diversity.

TEMPERAMENT DIMENSION	DEFINITION
Sensory threshold	The level of stimulation necessary to produce a response.
Activity level	The level of motor activity in the classroom.
Adaptability	How easily a student adapts to change.
Persistency	The amount of time students continue with an activity despite difficulty or interruptions.
Mood	Students' positive (e.g., happy, pleasant) or negative (i.e., unhappy, cranky) disposition.
Distractibility	Students' level of concentration in the classroom.
Rhythmicity	The level of predictability of students' bodily functions (e.g., appetite, sleep).
Approach/Withdrawal	Students' initial reaction to environmental changes.
Intensity	The level of energy and expressiveness in students' positive or negative responses.

that personality traits are stable, even in the face of changing life circumstances (McCrae, 2002). Have you ever noticed that, despite being raised in almost identical environmental conditions, siblings typically have very different personalities? This phenomenon reflects the role of nature in personal development. Students' temperament will affect how they interact with their academic environment and also affect their academic achievement (Keogh, 2003). Table 4.1 shows nine temperament dimensions that contribute to students' adjustment in school (Kristal, 2005).

Students who are energetic, persistent, and focused and those who develop productive relationships with peers and teachers are more likely to achieve at higher levels at school. On the other hand, there is not an ideal temperament associated with academic success. Although energetic, outgoing, friendly students may be more likely to succeed, teachers can create a safe participatory classroom environment to allow even the quieter students to come out of their shells and shine.

It is also important that teachers recognize their own unique temperament and reflect on how their personality and teaching style affect the daily life in the classroom (Keogh, 2003). Teachers' temperament differences will play out in the classroom by affecting, for instance, the pace of instruction, the choice of classroom activities, and the emotional tone in the room. For instance, Ms. Rector is a gentle, quiet teacher who requires a lot of independent seatwork from her students. While she watches Patrick work, she becomes frequently irritated by his intensity, high activity, and lack of persistence. Last year, Ms. Rector had Patrick's brother, Bill, in her classroom. Unlike Patrick, Bill was quiet and enjoyed working individually for long periods of time. Ms. Rector wonders how two boys from the same family could be so different and secretly wishes Patrick had a personality more like Bill's. However, Ms. Rector fails to consider that her own preference for quiet and individual work may conflict with Patrick's personality. Provided that Patrick is not unreasonably distractible and/or active (which may be signaling an ADD or ADHD exceptionality), he would probably be more likely to succeed if classroom activities were a better fit with his personality. For example, Ms. Rector should examine if Patrick's behavior changes when asked to actively engage in a hands-on project or to work with a group of peers. If Patrick responds very well to these activities, it is likely that his prior behavior was showing a mismatch between his personality and Ms. Rector's teaching style. An important exercise for the teaching practitioner is to reflect on how his/her personality may favor a particular teaching style

CLASSROOM TIPS

Taking into Account Temperament Diversity

Steps	Classroom Tips
1. Recognize temperament patterns.	Observe and keep a record of students' behavior. For example, write down what activities students like and dislike, how different students adjust to new situations, and how long they persist upon difficulty.
2. Consider alternative classroom arrangements.	Based on your observations, arrange the classroom to accommodate the temperament variations of your students. For example, to support highly distractible students, arrange seating so that students have their backs to doors and windows.
3. Provide a variety of classroom activities.	Plan alternatives and choices for all classroom activities whenever possible. For example, provide a mix of hands-on projects and individual seatwork to accommodate students with a variety of activity levels and provide several levels of difficulty to support diversity in students' persistency.
4. Evaluate your curriculum and teaching methods.	Make sure that you regularly reflect on whether what you teach and how you teach are flexible enough to accommodate all student temperaments. For example, you can ask a peer teacher to evaluate whether your curriculum and teaching methods are likely to support a variety of student temperaments. Peer observations can also help you become more aware of biases you may have against certain student traits.
5. Assess your own temperament.	Consider your own temperament and identify the student traits that you prefer. For example, you can make a list of student behaviors that upset you and those that you enjoy. This can help you avoid feeling that students are wrong or difficult just because they behave in ways that are different from your own preferences.
6. Learn from students' parents or caregivers.	Parents can help teachers learn about their child's temperament. For example, when students display a negative mood, teachers should talk to their parents or caregivers to identify if the root of the difficult behavior is based on students' temperament or an environmental stressor. Students who are consistently happy may become unhappy and angry upon finding out that their parents are divorcing.

in order to avoid creating unequal learning opportunities for students with different temperaments. Students are more likely to reach their developmental potential when teachers understand their unique temperaments and create learning environments that respect temperament differences. Classroom Tips: Taking into Account Temperament Diversity presents some suggestions about how to recognize and accommodate a variety of individual personalities in the classroom according to expert Susan Culpepper (2007).

Nurture: Family Influences

A child's personal and social development is not only a matter of heredity; it is also influenced by interactions with others, such as parents, caregivers, and peers. First, let's examine the impact of parents—the effects of attachment, parenting styles, family structure, and parental involvement on a child's personal and social development. Later, we'll look at the influence of peers.

Attachment

A motivation to seek a strong, affectionate bond with another person because of a need for relatedness.

Attachment. The effects of parenting on personal development are hard to overstate. As you will read in more detail in Chapter 9, all infants have a need for relatedness, and this need will motivate children to seek a strong, affectionate bond with their caregivers, also known as **attachment**. Children are more likely to develop into sociable,

independent, and confident individuals in the classroom when they experience the responsive, predictable, and nurturing care of an adult. When children have dysfunctional relationships with their parents, they are likely to have significant adjustment problems as they grow up and are at considerable risk for engaging in antisocial behaviors (Patterson, DeBarsyshe, & Ramsey, 1989).

Students can form attachments to teachers as well. Once a child leaves the home, it is the teacher who provides the child with a secure base from which to explore the world (Bowlby, 1988; Kochanska, Coy, & Murray, 2001). Research shows that children's attachment to day-care or preschool teachers is related to how well they get along with their peers and that a change of teacher or a change in a child's relationship with the teacher is associated with changes in the child's relations with peers (Howes & Hamilton, 1993; Howes, Hamilton, & Matheson, 1994; Howes, Matheson, & Hamilton, 1994). As teachers, we should always establish a consistent positive relationship with our students, especially when we suspect there might be attachment problems at home.

Parenting Styles. **Parenting styles** are also a significant influence on students' personal, social, and moral development.

Parenting Styles

Ways of raising children that differ along dimensions of expectations and responsiveness.

Imagine the following scenario: A teenager asks for permission to go to a party that a classmate, Jimmy, is having while his parents are away on a trip. Jimmy is a well-known partyer who has been suspended from school several times for his outrageous behavior. Consider the following parent responses to the teenager:

- Parent A says: "Absolutely not! If I ever catch you hanging out with Jimmy, you will be grounded!"
- Parent B says: "I don't think it's a good idea. We know that Jimmy gets in trouble all the time and I worry that without his parents at home, things may get out of control."
- Parent C says: "Sure, I think that would be a lot of fun. Just be careful."
- Parent D says: "Whatever!"

Which parent do you think will better support his child's development?

These four responses illustrate four different parenting styles found by research. Parenting styles differ along two important dimensions—expectations and responsiveness. From the combination of different expectations and responsiveness, four styles of parenting have been identified: authoritative, authoritarian, permissive, and uninvolved. For instance, some parents set high expectations whereas others demand very little from their children and rarely try to influence them. In addition, some parents are very responsive, accepting the way their children are and frequently interacting with them, whereas others are unresponsive and tend to either ignore or reject the way their children are. Table 4.2 lists 4 parenting styles with corresponding parent and child characteristics.

As you can see, authoritative parents are most effective for promoting healthy personal development, providing children with the necessary challenge, structure, and support. Authoritative parents are loving and caring, hold high performance standards, explain why behaviors are acceptable or not acceptable, and enforce rules consistently. Children with authoritative parents are confident, willing to take risks, happy, energetic, and likeable. At school, they make friends easily, show self-control and concern about the rights and needs of peers, and exhibit fewer behavioral problems at all developmental stages (Baumrind, 1991; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Lamborn, Mounts, Steinberg, & Dornbusch, 1999; Rohner, 1998). Children from authoritative homes appear to be able to balance external academic demands with their need for autonomy. The benefits of authoritative parenting transcend the boundaries of ethnicity, SES, and family structures (Collins & Steinberg, 2006; Steinberg, Blatt-Eisengart, & Cauffman, 2006).



Laura Dwight Photography

How do authoritative parents promote the healthy personal development of their children?

TABLE 4.2

Parenting styles with corresponding parent and child characteristics and classroom examples.

PARENTING STYLE	PARENT CHARACTERISTICS	CHILD CHARACTERISTICS	CLASSROOM EXAMPLES
Authoritative	Sets high expectations.	Confident and self-controlled.	"Tracy, I'm so pleased. You've turned in your homework every single day this semester," Mr. Ladner says.
	Is highly responsive.	Feels secure, willing to take risks.	"When I go home," Tracy responds, "my parents have me do my chores, my homework, and practice my cello for half an hour. Then I have time to play with my friends. So it's easy; homework is always part of my routine."
	Emphasizes rationale for rules.	Successful at school.	
Authoritarian	Sets high expectations.	Defiant and aggressive.	Mrs. Allen notices that Zachary is easily frustrated in class. "How was your weekend?" she asks him.
	Is unresponsive and detached.	Withdrawn, lacks social skills.	"Bad, as usual," Zachary replies. "I was grounded, so I didn't go anywhere. I don't actually know why I was grounded. Maybe it's because I stayed up too late watching the Red Sox game last week. My parents didn't really tell me why."
	Emphasizes conformity to rules.	Worried about pleasing parents.	
Permissive	Sets low expectations.	Immature.	"I'm concerned about your math grades this semester," Mr. Davidson tells Lucas. "You haven't been turning in your homework."
	Is highly responsive.	Impulsive, lacks self-control	"Well, after school I go to the skateboard park and when I get home, I play my X-box" Lucas replies.
	Emphasizes freedom.	Unmotivated at school.	"You've got to make time for homework," Mr. Davidson says.
			"That's not what my parents say," Lucas responds. "They say it's my life. I don't think they really care much about my homework."
Uninvolved	Sets low expectations.	Disobedient and easily frustrated.	"I'm going to need to call your parents and talk to them about your disruptive behavior," Mrs. Caldwell tells Jeremiah.
	Is unresponsive and detached.	Lacks self-control and long-term goals.	"Go ahead, you can try to call them, but they won't answer. They're not even home. My big sister was with us all weekend," Jeremiah tells his teacher.
		Unsuccessful at school.	

The other three parenting styles are less effective because they fail to combine high expectations and high responsiveness. The authoritarian parent, for instance, is also characterized by setting high expectations. However, a difference with authoritative parents is that the expectations are presented in the form of rigid rules and no rationale is provided for compliance with the rules. When children ask why they should follow the rules, authoritarian parents will usually provide unresponsive answers such as "Because I say so!" Furthermore, in extreme cases, authoritarian parents may resort to physical or emotional abuse in their attempts to control their children. Not surprisingly, children who have authoritarian parents have low self-esteem, grow up with a feeling of unfairness and frustration, and will often rebel against parents or teachers (Maughan & Cichetti, 2002; Nix et al., 1999; Thompson & Wyatt, 1999). Exceptionally, however, an authoritarian parental style may have positive outcomes. This is the case with many African-American and Latino families who live in low-income, dangerous neighborhoods; parents adopt an authoritarian style as an adaptive strategy to keep their children from engaging in antisocial behavior (Harrison-Hale, McLoyd, & Smedley, 2004; McLoyd, Aikens, & Burton, 2006; Roche, Ensminger, & Cherlin, 2007).

There are two types of parents who set low expectations for their children. Permissive parents are emotionally responsive and caring, but they fail to set and maintain a structure with healthy development boundaries, allowing their children to make many of their own decisions. They are lenient, do not require mature behavior, and avoid confrontation (Baumrind, 1991). Children from permissive homes are found to be selfish, unmotivated, impulsive, and disobedient (Baumrind, 1989, 1991; Maccoby & Martin, 1983). Uninvolved parents fail to provide high expectations and are not responsive to their children, who are usually disobedient, easily frustrated, and unsuccessful at school. In extreme cases, uninvolved parenting might entail neglect, which is characterized by parents' failure to attend to the basic needs of the child. Signs of neglect include being frequently absent from school; begging or stealing food or money; lacking needed medical care, dental care, or clothing; and being consistently dirty (DePanfilis, 2006).

Knowledge about the research on parental styles can help teachers better understand students' behavior in the classroom. The last column of Table 4.2 gives some examples of how the four parenting styles may affect the behavior of students in the classroom. As teachers, however, we should be careful to not blame parents for their children's behavior and consider, instead, offering suggestions and resources that may help some parents develop a healthier relationship with their children. In this regard, it is useful to keep in mind that most research on parental styles is correlational, a method that only allows us to conclude that some student characteristics may be *associated with* rather than *caused by* particular parental styles. Remember from Chapter 1 that correlation does not mean causation! Only a few studies show a causal relationship between parental style and children's characteristics, whereas others show the opposite result—that children's characteristics may affect parental style (Collins et al., 2000). Now that we are done reviewing the characteristics of the authoritarian, authoritative, permissive, and uninvolved parental style, can you tell which one corresponds to parent A, B, C, and D in our opening example?

Family Structure. Families can be complex. Many children are raised in divorced families, stepparent families, single-parent families, or families in which both parents work outside the home. Did you know that the United States has the highest percentage of single-parent families among all industrialized countries? Table 4.3 offers some additional statistics about American families (Rainbows, 2007).

Let's take a closer look at children of divorce and the impact of nurture, by parents and teachers, on their development. Children of divorce are

TABLE 4.3

Statistics on families in the United States.

- About one of every four children in the United States will have lived a portion of their lives in a stepfamily by age 18.
- More than two of every three mothers with a child between ages 6 and 17 are in the workforce.
- Approximately 13% of all babies born in the United States are born to adolescent mothers.
- Approximately 30% of U.S. families are headed by a single parent. In 80% of those families, the mother is the sole parent.
- The divorce rate in the United States is the highest in the world.

found to experience substantial distress and have an increased risk for a number of adjustment, achievement, and relationship difficulties (Laumann-Billings & Emery, 2000). For instance, compared with never-divorced families, children of divorce are:

- More aggressive, disobedient, and lacking in self-regulation
- More likely to have relationship problems, such as those with their mothers, fathers, siblings, and peers
- More likely to identify with antisocial peers
- More likely to use alcohol, cigarettes, and drugs; and
- More likely to commence sexual activity earlier, to give birth to a child as a teenager, and to have more pregnancies outside marriage (Burke, McIntosh, & Gridley, 2007).

Nevertheless, remember that these are average findings. The effects of divorce on a child's development are complex and dependent on many factors, such as the child's age, personality, socioeconomic status (SES), support system, and type of custody (Lansford et al., 2006). Furthermore, the influence of school is heightened when children grow up in a divorced family (Hetherington, 2005; Hetherington & Kelley, 2002). For example, elementary school children have the highest achievement levels when both the parenting environment and school environment are authoritative. On the other hand, children of divorce are very unlikely to become adjusted when parents are not authoritative or when the school environment is neglecting and chaotic.

When parents are getting divorced, children who have done well at school begin to show signs of lack of motivation, such as not showing up for school, not completing homework, or not engaging in school activities (Brodkin & Coleman, 1995). Teachers should watch for these abrupt behavior changes, which may also be the result of the marital conflicts that typically precede a divorce or the result of the adjustments that accompany the transition from a single-parent family to a stepfamily (Spruijt & de Goede, 1997). In such cases, it is important to consider increasing the emotional and intellectual support of the child and reaching out to the parents to coordinate efforts to maintain a structured and organized environment. Teachers may also recommend professional help. Some school districts have regular meetings for children of divorce or divorced parents, held by professionals who are trained in this mental health area. Social service agencies also provide a host of support services for families.

Nurture: Peer Influences

"Whasup, Rica?" Pearson calls across the high school playground. Rica walks over to admire the life-size mural he's painting. She's known Pearson since kindergarten

"Dang! It's looken good," Rica says. "Did you paint it yourself?"

ISSUES IN EDUCATION

Should teachers involve parents in their children's education?

Experienced teachers are aware of the importance of parental involvement in achievement (Chira, 1993). On the other hand, many educators and scholars have questioned the idea that involving parents in the schooling of their children is always beneficial (Ogawa, 1998). What are your thoughts about this issue? A response to this question can be found at the end of the chapter.

"No, it's a big group of us, plus that cool art teacher, Ms. Lanning. Seriously, Art Club is the best! You get to design your own project from start to finish. Then you get the materials and go for it. We're planning a photography show next. You should join!" Pearson says passionately.

"Yeah, it sounds cool," Rica says with interest.

"I haven't seen you in a minute, girl, where you been?" Pearson asks.

"I've been chillen' with my older sister's friends," Rica tells him.

"Is that the group that's been up to no good?" Pearson inquires.

"Yeah, . . . sometimes," Rica agrees.

"I'm disappointed, girl. You've got better things to do with your time. I'm telling you, this club is the bomb. We get to use digital cameras next week," Pearson says with excitement.

"Then I think I'll start Monday," Rica commits.

"See you Monday!" Pearson yells across the playground as he dips his brush into the paint.

Peers are a major environmental influence on personal and social development. Research suggests that peers affect personal development in two ways: by communicating attitudes and values and by offering friendship (Betts, Zau, & Rice, 2003; Ryan, 2000). Children and adolescents will communicate attitudes and values by:

- Defining options for leisure time (e.g., riding bikes, having a homework group, smoking cigarettes, going to the mall)
- Defining explicitly or implicitly what behaviors are unacceptable, acceptable, or "cool" (e.g., how to talk, dress, style your hair)
- Reinforcing acceptable behaviors (e.g., peer status and recognition, friendships)
- Punishing unacceptable behaviors (e.g., by means of ridicule, gossip, or ostracism)

According to research, good peer relationships may be necessary for normal development (Howes & Tonyan, 2000; Rubin, Bukowski, & Parker, 2006). For instance, good peer relationships foster the development of a variety of social skills, such as communicating effectively, cooperating, and solving conflicts, and can also provide the emotional support that students need when facing difficult times (Gauvain, 2001; Wentzel, Barry, & Caldwell, 2004).

On the other hand, the development and academic success of students like Rica in the example above are likely to become threatened when peer relationships are associated with unhealthy activities such as delinquency, smoking, and alcohol and drug use. As you will learn in more detail in Chapter 8, the positive and negative influence of peers can be explained through observational learning from peer models and has been demonstrated across a very broad age range (Schunk & Zimmerman, 1997). Next, we discuss how peer pressure, friendship, and peer status exert their influence on students' development.

Peer Pressure. Peer pressure can have a positive or negative effect on development. Many peers will encourage healthy behaviors and attitudes, such as abstaining from drugs and alcohol and being truthful, faithful, and fair. Conversely, others may become a bad influence and promote antisocial behaviors, aggression, and even criminal activities (Berndt, Hawkins, & Jiao, 1999; Espelage, Holt, & Henkel, 2003; Maxwell, 2002).

An example of a positive peer influence from the preceding section is that of Pearson, who encouraged Rica to join the Art Club as an alternative to associating with the group "that's been up to no good." The same applies to the influence of peers in academics. Whereas some peers may encourage academic achievement, others may discourage, or even make fun of, students who are "nerds" or "brainy" and promote unhealthy behaviors such as cheating, cutting class, and skipping school (Berndt, 1999; Bishop,



Steve Coleman/OJOImages/Getty Images

What are the potential effects of peer pressure on students' personal, social, and academic development?

Gelbwasser, Green, & Zuckerman, 2003; Ryan, 2001). Moreover, studies with Latino students have found that some peer groups may discourage their co-ethnic peers from being academically engaged as a way to affirm their ethnic identity in the school context (Portes & Zhou, 1994). For these students "to study hard was to act White" (Portes & Zhou, 1994; p. 19) and to be disloyal to their ethnic group.

In some cases, students will lead "double lives" when their values are in opposition to those of their peers. For example, Sasha might try to do well at school but feign a lack of interest in scholarly activities or show surprise when receiving high grades (Covington, 1992). Teachers should be sensitive to these potential conflicts and help students achieve academic success while maintaining their "image" in front of peers. For example, teachers should be private about students' achievements and discuss the student's academic progress in one-on-one conversations rather than in front of the class.

Although peer pressure is a factor affecting development, its effect will depend on children's background. Most children who acquire a strong set of values and standards from their families will not necessarily discard these in the company of peers (Brown, 1990; Collins et al., 2000; Galambos, Barker, & Almeida, 2003). The influence of peer pressure increases with age and has its greatest effect during junior high school, especially for teenagers who do not have strong emotional bonds to their families (Berndt, Laychak, & Park, 1990; Erwin, 1993; Maxwell, 2002; Urdan & Maehr, 1995).

Friendship. A second way in which peers exert their influence on development is by offering or not offering friendship. Usually, students who are socially accepted and offered friendships are more motivated to learn, achieve at higher levels, have healthier self-concepts, and are happier than those who are not (Gauvain, 2001; Wentzel, 1999). Conversely, peer rejection is usually associated with unhealthy personal development, loneliness and isolation, lower achievement levels, and dropping out of school (Bierman, 2004).

A recent two-year longitudinal study examined the relationship between students' behaviors at school and the existence or lack of friendship at school (Wentzel et al., 2004). The findings showed that sixth-grade students who did not have a friend at school engaged in fewer prosocial behaviors than those who did. Prosocial behavior is regarded as being altruistic, fair, or generally empathetic, such as collaborating, sharing, and helping. Two years later, the "friendless" students were also more emotionally distressed than their eighth-grade peers who had one or more friends.

According to research, friendships are important because they provide companionship, physical support, ego support, and a sense of intimacy/affection (Parker & Asher, 1987). Students who have one or more friends fight less, work more efficiently in groups, and resolve social problems more efficiently than those who lack friends (Johnson & Johnson, 2004; Patrick, Anderman, & Ryan, 2002). However, friendships come in many colors and can be developmentally disadvantageous when the relationship is conflictive or based on coercion. Typically, friendships develop according to the trends listed in Table 4.4.

TABLE 4.4

How friendships develop.

- During preschool and the primary grades, mutual play is the most common friendship activity, with increasing sharing of thoughts and feelings and conflict resolution strategies. This is a time when teachers find it relatively easy to help children who seem isolated by involving them in cooperative activities.
- By middle school, friendships become more stable and children are likely to have a relatively permanent best friend. Children are also more likely to choose same-sex friends who engage in give-and-take (Mitchell, 1990).
- Friendships in high school become very important. Students learn to rely on their friends for emotional support and intimacy as well as for norms regarding social behaviors, such as how to communicate and dress (Berndt, 1996). Moreover, because adolescents are able to think in the abstract, personality qualities such as loyalty and collaboration become increasingly important.

Peer Status. Developmental psychologists have identified five types of peer status: popular, neglected, average, rejected, and controversial (Rubin et al.; Parker, 2006; Wentzel & Battle, 2001). These types are associated with different friendship patterns.

- *Popular children* are those who are liked by most peers and usually nominated as best friend. They listen carefully; communicate openly; are genuine, enthusiastic, and self-confident; and express care for others (Hartup, 1983).
- *Neglected children* may be also likable but are not frequently nominated as best friend by their peers. Note that the word *neglected* in this context refers to being excluded from the popular-children category. Neglected children are typically quiet and shy, and many prefer to have only one or two close friends (Gazelle & Ladd, 2003).
- *Average children* are those who are not ranked by their peers as very popular or unpopular but certainly have friends.
- *Rejected children* are actively disliked by peers and very infrequently nominated as someone's best friend. There are two types of rejected students: rejected-submissive students, who are typically withdrawn to avoid attracting attention, and rejected-aggressive students, who may lose control or act up if teased excessively.
- *Controversial children* are those who are either very disliked or nominated as someone's best friend. They are often the class clowns, likable kids with embarrassing habits (e.g., nose-picking), bullies who instill both fear and loyalty, or rebels who stand up to teachers and talk back.

Rejected children require special attention in the classroom because they are likely to have serious adjustment problems (Ladd, Buhs, & Troop, 2004). Although most rejected children are characterized as being aggressive, impulsive, and disruptive, 10% to 20% of these children are shy and introverted. Regardless of their personality, teachers should try to counteract the negative effects that peer rejection may have on these students and provide a model of acceptance to their peers by being overtly supportive, warm, and attentive (Chang, 2003; Wentzel, 1999). To do so, teachers need to first recognize rejected students by carefully observing their social interactions:

- Does the student lack confidence in social settings?
- How does he/she respond to other students' questions and comments?
- How do other students interact with him/her? Does the student have one friend or reliable playmate?

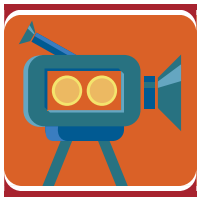
If the student's interactions demonstrate that the student is, in fact, rejected, teachers can start involving the student in a variety of social activities, such as cooperative games and other activities that involve sharing materials and improving empathy among students. Teachers should also model prosocial behavior and acknowledge students' altruistic behavior in the classroom with messages such as "I like the way you volunteered to help Cota pick up her crayons this morning. I can see you really care about your classmates."

Incorporating lessons on friendship into the curriculum can be particularly helpful for younger children. Puppets, skits, and books can engage students in thinking about alternative ways to react to difficult situations. With older children, teachers can discuss friendship individually and recommend strategies for various social settings. Then, with the teacher's guidance, students can create an action plan that will help them practice these new social behaviors.

In addition, there are intervention programs aimed at increasing the social acceptance and self-esteem and decreasing the depression and anxiety of rejected children (DeRosier & Marcus, 2005). These programs usually provide students with anger management and

negotiation strategies and ways to improve their communication and social skills. Teachers should recommend similar interventions for rejected children, especially when aggression and bullying become regular coping mechanisms. When you read Chapter 11, you will learn about specific strategies for dealing with bullies in the classroom.

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Go to your WileyPlus course and view the video of a cooperative learning group. While viewing the video consider how peer status and peer pressure can affect working together in cooperative groups.

THE DEVELOPMENT OF THE SELF

We have discussed the main forces driving students' personal and social development. In this section, we focus on the development of students' self-concept, self-worth, and collective self. These concepts can be thought of as developing schemas (using Piaget's terms) or developing mental models of the self. A mental model of the self includes an individual's knowledge, beliefs, and feelings about who they are, what their existence means, and the goals they set in life. For instance, a response to the following questions reveals an individual's **sense of self**:

Sense of Self

An individual's knowledge, beliefs, and feelings about who they are, what their existence means, and the goals they set in life.

- Who am I?
- What are my strengths and weaknesses?
- Am I a good person?
- Do others like me?
- Am I worthy of others' care, love, and attention?
- What is my mission in life?

Self-Concept

Self-Concept

An individual's self-description of his/her competencies.

Self-concept is an individual's self-description of his/her competencies. Children develop their self-concept gradually. First, language and interactions with others allow toddlers to start developing a sense of self. The recognition of oneself appears just before the age of 2 and is apparent as children start using the words *I, me,* and *mine* (Harter, 1990; Lewis, 1987; Piaget, 1963). Children's self-concept in elementary school is very concrete and descriptive. When asked to define themselves, they will typically refer to their physical qualities and the things that they do, like, and dislike.

By middle school, students' self-concept starts showing psychological characteristics such as personality traits and abilities; by high school, students conceptualize themselves in abstract and differentiated ways, including their unique attributes, ideologies, values, and motivations (Montemayor & Eisen, 1977; Triandis, 1989). In short, the development of self-concept stems from the development of a sense of self and becomes more realistic, abstract, and differentiated over time.

Realism. Young children's self-concept is typically overinflated ("I'm the strongest person in the world." "I'm going to be President."). They believe that they can do almost anything, probably because their parents' messages contribute to this belief. For example, typical parents are likely to tell their children how smart they are. Nevertheless, as children gain new perspectives on their weaknesses and strengths through the more realistic feedback of teachers and social comparisons with their peers, they start constructing more realistic self-concepts (Carlson Jones, 2001; Comstock & Scharrer, 2007; Ruble, 1983; Wood, 1989). Keisha, the student depicted in Imagine You Are the Teacher, is displaying low self-concept in writing. Her comments to Mr. Laborski—"You

know I'm an awful writer" and "It seems like everyone else can write, except for me"—suggest that her self-concept is based, at least in part, on the teacher's feedback and her own comparisons with her peers.

Realism comes along with negativism, as students begin to realize during the late elementary school years that they are indeed not the smartest, fastest, strongest, or prettiest child in the world (Stipek & MacIver, 1989; Weinert & Schneider, 1999; Wigfield et al., 1997). This negativism is clearly illustrated by Keisha, who immediately reacts against Mr. Laborski's writing assignment. Keisha is likely to be in late elementary or middle school, a time where students start developing a realistic sense of their strengths and weaknesses.



FIGURE 4.1 What can students' self-portraits tell us about their self-concept at different grade levels?

Abstraction. Because young children are not yet able to think abstractly, elementary school children will typically focus on their most perceptually salient characteristics when asked to define themselves (e.g., hair and eye color, height, build). Six-year-old Tanya might say, "I'm the short girl with brown curly hair and freckles." By high school, when students can rely on their formal operations, students start considering more abstract qualities of themselves. Sixteen-year-old Daryl might say, "I prefer to describe myself as spiritual rather than religious." The ability to think beyond concrete physical characteristics when defining ourselves is illustrated in Figure 4.1., which shows the self-portrait of a sixth-grade student that uses words within the artwork to describe her personal values and traits. This artwork was the result of an art lesson entitled "What Do I Value? Values Self-Portrait Painting" developed by Tammy Morin from Virginia.

Differentiation. Although children's self-concepts during preschool are very general and undifferentiated, by the time they reach high school they have formed complex, differentiated self-concepts for a variety of domains (Harter, 1990; Marsh & Ayotte, 2003; Marsh & O'Neill, 1984; Montemayor & Eisen, 1977). By the end of elementary school, children's self-concepts seem to differentiate into at least three domains: social, academic, and physical. Eventually, by the end of high school, research suggests that there may be up to 13 domains of differentiated self-concept: general academic, mathematics, reading, problem solving, artistic abilities, physical ability, appearance, same-sex peer relationships, opposite-sex peer relationships, parental relationships, religion, honesty, and emotionality (Marsh, 1990a; Marsh & O'Neill, 1984; Marsh & Shavelson, 1985; Marsh, Smith, & Barnes, 1983; Vispoel, 1995). Figure 4.2 shows different self-concept types for which there is research support.

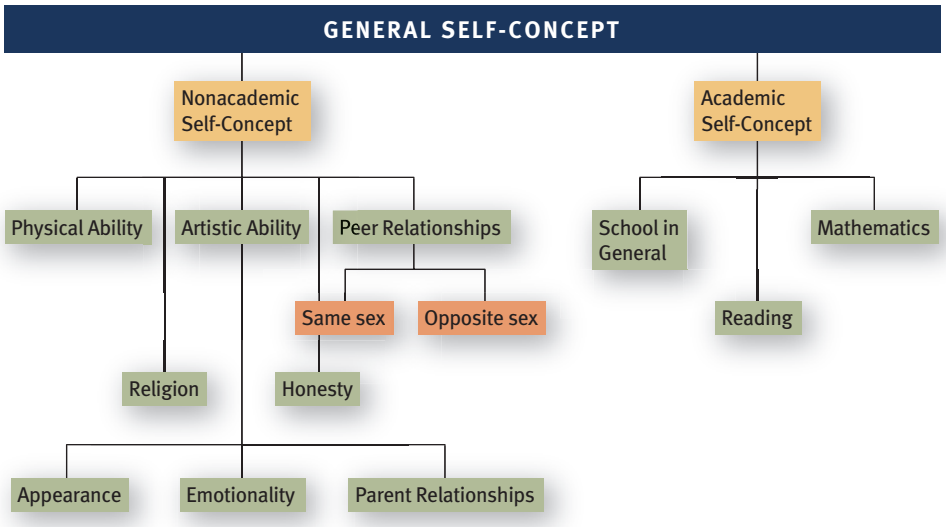


FIGURE 4.2 Different types of self-concept.

Self-Concept and Achievement. Although researchers found that changes in self-concept do not predict students' grade changes (Byrne, 1984), a consistent finding is that domain-specific self-concepts (e.g., math and reading self-concepts) are significantly correlated with students' achievement and motivation in the respective domains. For instance, the higher students' grades in math, the higher students' math self-concept (Marsh, Byrne, & Yeung, 1999; Marsh & Yeung, 1997a), effort on math activities, and choice of math courses (Byrne, 1996; Marsh & Yeung, 1997b).

Recall from Chapter 1 that correlation does not mean causation, which raises the question: Should teachers try to enhance students' self-concept to promote higher achievement? An answer to this question is provided by research. Although trying to bolster students' self-concept by using praise or persuasion has been unsuccessful (Burnett, 1999, 2003), programs that seek to enhance academic aspects of the self-concept (e.g., students' skills in math or reading) have a positive effect on achievement (Marsh & Richards, 1988). When intervention programs increase domain-specific skills, students can recognize their skill improvement and experience an enduring change in their self-concept. Before moving to the next section, go back to Imagine You Are the Teacher and try answering the questions presented at the end of the vignette.

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

Create your own self-portrait incorporating pictures and/or words to depict your differentiated self-concept. Using your self-portrait, discuss with a partner how your self-concept might affect your teaching or how it has affected your learning.

Self-Worth

Unlike self-concept, which is a description of one's academic and nonacademic competencies, self-worth is a global evaluation of oneself (Rosenberg, 1979). Let's begin with a definition of self-worth and then examine the relationship between students' self-worth and achievement.

Self-Worth (or Self-Esteem)

An individual's overall view of himself or herself as a person.

Defining Self-Worth. **Self-worth**, also called *self-esteem*, is an individual's overall view of himself/herself as a person. Our self-worth is based on how others treat us (e.g., acceptance, rejection) and on our own evaluation of competence and achievement in different domains (Harter, 1999). Students tend to have an overall feeling about their self-worth. For example, they might believe that they are good, capable, likable individuals or believe that they are not good, somehow inept, and unworthy. Many students will appraise themselves fairly accurately, which helps them choose appropriate activities and work toward realistic goals (Baumeister, Campbell, Krueger, & Vohs, 2003).

Some students will not have a realistic self-esteem. Students with learning disabilities score significantly lower on measures of self-esteem than equally intelligent students who do not have learning disabilities (Chapman & Boersma, 1991). As you may have guessed, underestimating one's self-worth can work against social and cognitive development because students with lower self-esteem will seek fewer challenges and interactions with others (Assor & Connell, 1992; Phillips & Zimmerman, 1990). On the other hand, some students will overestimate their self-worth, which may communicate a sense of superiority over their peers and lead them to aggression and bullying (Baumeister et al., 2003; Baumeister, Smart, & Boden, 1996).

When you read Chapter 9, you will learn that humanistic psychologists believe that protecting one's self-worth is one of humans' highest priorities in life (Covington, 1992). The strategies to protect self-worth, however, may vary. For instance, one strategy consists of avoiding failure, such as when students refuse to engage in a task, minimize the task's importance, or set very low expectations for their performance (Covington & Mueller, 2001; Urdan & Midgley, 2001).

Another strategy is to hold to their current beliefs despite evidence to the contrary (Sherman & Cohen, 2002). Students will also make excuses to justify their poor performance (Covington, 1992; Urdan & Midgley, 2001) and, in extreme cases, will resort to self-handicapping. **Self-handicapping** occurs as early as fifth grade and consists of undermining one's own chances of success in a task, such as when students expend very little effort on an assignment. Not surprisingly, students who self-handicap achieve at lower levels (Urdan & Midgley, 2001). As you just learned, very young children will not be likely to self-handicap due to the unrealistic optimism that they may have about their competence. Self-handicapping increases the chances of justifying failure and protecting self-worth, especially when students believe that they are unlikely to succeed, no matter what they do (Riggs, 1992; Urdan, Ryan, Anderman, & Gheen, 2002).

Self-Handicapping

Undermining one's own chances of success in a task.

Self-Worth and Achievement. Students with higher self-esteem are more likely to succeed in school, have more positive attitudes toward school, and are more popular with other students (Cauley & Tyler, 1989; Marsh, 1990b; Metcalfe, 1981; Reynolds, 1980). However, similar to the case of self-concept, there is little research showing a clear causal relationship between self-esteem and achievement, and some experts believe that the causal relationship may occur both ways and only under certain conditions (Marsh, 1987; Pintrich & Schunk, 2002). To increase self-esteem, success has to be attributed to the individual rather than to external factors (e.g., luck) and has to happen in a task that is highly valued by the individual (Harter, 1990, 1998, 1999).

Interestingly, research in neurobiology suggests that self-esteem may be rooted in our brain biology. More specifically, studies with humans and nonhuman primates show that fluctuations in the neurotransmitter serotonin play an important role in regulating the level of self-esteem, with higher serotonin levels being associated with higher self-esteem and smoother controlled movements and lower serotonin levels being associated with lower self-esteem and impulsive, uncontrolled, and aggressive behavior (Sylwester, 1997). According to research, positive social feedback can increase our basal serotonin levels and, in turn, our self-esteem (Wright, 1995). This finding suggests that positive feedback in the classroom—by peers and teachers—can be a powerful mechanism to help students develop self-esteem. Keep in mind, however, that praising and positive feedback need to meet certain conditions to effectively support students' self-worth (Dweck, 1999). We will discuss the characteristics of effective feedback and praise in detail in Chapters 9 and 10.

The Collective Self

We defined self-worth as based on an evaluation of individual characteristics alone. However, a growing number of psychologists suggest that there is a collective component in people's self-worth called the collective self. The **collective self** includes individuals' sense of worth of the groups to which they belong, such as their family, peer group, ethnic group, class, or team. A child who joins a sports team at school may feel a new sense of belonging. Thirteen-year-old Erin might say, "Last year, I was kind of a dork. I'd sit around and watch TV or play computer games after school. Now, I'm on Thoreau High's fencing team! My best move is the lunge. Next week we're going to a tournament. I'd like to be a fencing champ in college."

Collective Self

Individuals' sense of worth of the groups to which they belong, such as their family, peer group, ethnic group, class, or team.

Ethnic Identity. Students' ethnic identity is a type of collective self and should be of interest to the multicultural classroom teacher. Students' ethnic identity provides an enduring sense of membership to an ethnic group, along with the attitudes and feelings related to that membership (Phinney, 1996). The indicators of ethnic identity, however, may vary from generation to generation (Phinney, Berry, Sam, & Vedder, 2006). First-generation immigrants are likely to be secure in their identities, and the degree to which they begin to feel American seems to be related to their ability to learn English, develop social relationships outside of their ethnic group, and become culturally competent in the new context. Second-generation individuals are more likely to have ethnic identity when they are able to retain their ethnic language and social networks. For those of the



Lori Adamski Peek/Getty Images

What can teachers do to help students develop their collective self-esteem and ethnic identity?

third and later-generations, their ethnic identity will depend on many factors, such as whether the media discourage or encourage members of their ethnic group to retain their language and culture as well as the immediate contexts where they live (Spencer, 2006).

A positive ethnic identity in adolescence is associated with positive academic and nonacademic behaviors (Lee, 2005). Research also shows that students who are encouraged to explore their ethnic identities and who have adopted positive values from both the dominant culture and their own culture tend to have a clear sense of self (Nieto, 1999).

Supporting Students' Collective Self-Development. Teachers can help students develop their collective selves in many ways. For example, teachers can serve as advisors for student clubs such as the marching band, school newspaper, environmental group, and dance ensemble. Being part of a cultural minority group may present special challenges to developing high self-esteem, as students are often faced with explicit or implicit negative messages about their ethnic identity (Trawick-Smith, 2003). Therefore, special efforts should be made to support students' ethnic identity in the classroom (Spencer & Markstrom-Adams, 1990). One way to do so and help students develop sensitivity toward students from different cultural and ethnic backgrounds is to use the multicultural education strategies discussed in Chapter 2.

The starting point in creating a multicultural classroom is to learn about your students' backgrounds, values, and goals. Teachers should consider participating in associations that are representative of the culture of the community in which they teach. As one teacher explains:

> Because I teach in a school that has a large Asian-American population, I wanted to become involved in the high school's Asian Student Association to learn more about my students. At our regular meetings, students have an opportunity to talk about issues in their lives. Last week, for instance, we had an in-depth discussion about Asian and Asian-American students' unique pressures to succeed. We also get together to enjoy Asian food, movies, and celebrate holidays.

Exploring the ethnic roots of all students and incorporating their heritage into classroom activities can foster self-esteem and promote acceptance by other students (Rotheram-Borus, 1993).

Heritage Language and Sense of Self. As you may recall from our discussion of bilingualism in Chapter 2, using students' heritage language in instruction can also have a positive impact on students' personal and collective self-esteem. As shown by a research study with Inuit children, students who were educated in their heritage language during their first three years of school had more positive personal and collective self-esteem than those who were given instruction in a second language (Wright & Taylor, 1995). Although there is still no consensus among researchers, educators, or policymakers regarding the effectiveness of bilingual education on students' achievement (Abbeduto & Symons, 2008), what seems undisputed is that using students' home language at school can strengthen students' self-worth because it communicates that the language and culture in which it is embedded is a valuable part of their identity.

Cooperative and Community Projects. Another way to strengthen students' collective selves is to promote healthy interactions among students from different backgrounds, such as using cooperative learning activities or community service projects where students need to work together to achieve a common goal. Research finds that when

students from diverse backgrounds work together, they are more likely to accept and value each other (Dovidio & Gaertner, 1999; Oskamp, 2000). Importantly, teachers should foster sensitivity and respect toward each other and help students become aware of their stereotypes. Recall from Chapter 2 that stereotypes are overly simplistic beliefs about people who belong to certain gender, ethnic, or social-class groups and which can lead to prejudice, conflict, and even violence among students (Pitner et al., 2003). The ending Case Study in this chapter will show you how a tenth-grade teacher supported the personal and social development of her students with a method that is aimed at raising stereotype awareness.

ERIKSON'S PSYCHOSOCIAL THEORY OF PERSONAL DEVELOPMENT

In the previous section, we discussed how children's and adolescents' self-concepts develop and become more differentiated over time. In this section, we expand on that knowledge by examining Erikson's (1963, 1968) psychosocial theory of personal development, which explains how individuals develop their selves throughout their lifetime. The term **psychosocial** refers to the interaction between individuals' emotional needs and their social environment.

Psychosocial

The interaction between individuals' emotional needs and their social environment.

Like Piaget's theory of cognitive development (discussed in Chapter 3), Erikson proposed a stage theory. According to Erikson, people go through eight distinctive stages as they grow, with each stage being marked by a psychosocial issue or developmental crisis. At each stage, individuals need to deal with the specific crisis successfully if they are to develop successfully. Although the unsuccessful resolution of the crisis of a previous stage can negatively affect a person's development, Erikson theorized that individuals may still, at later stages, overcome earlier unresolved conflicts. In other words, Erikson's eight-stage theory of personal development assumes that individuals can bounce back and forth between stages in their attempts to resolve their crises. The eight psychosocial crises in developmental order are: trust versus mistrust (infancy years), autonomy versus shame (toddler years), initiative versus guilt (preschool years), industry versus inferiority (elementary school years), identity versus role confusion (adolescence), intimacy versus isolation (young adulthood), generativity versus stagnation (middle-age years), and integrity versus despair (retirement years). Let's examine each one in more detail.

Preschool Crises

Trust versus Mistrust. The first stage of Erikson's psychosocial theory of personal development encompasses birth to about 1 year of age. According to Erikson, children who pass this stage successfully are those who are able to trust that their basic needs will be met by the support of others. This is likely the result of having caregivers who are consistently responsive to infants' needs for food and care, which will develop the feeling that they can depend on the world around them (Thompson, 1998). On the other hand, children who do not resolve the trust crisis will eventually mistrust others and view the world as unsupportive and hostile. Children's trust or mistrust of classmates may be traced to this early stage of personal development.

Autonomy versus Shame. The second psychosocial stage is marked by a period where children are learning to become self-sufficient. For example, between ages 1 and 3 children learn to walk, talk, eat, and use the toilet. Children who pass this stage successfully are those who develop a sense of autonomy, of independence, and of mastery or control over their thoughts, emotions, and behaviors.

According to Erikson, children who do not resolve the autonomy crisis successfully will eventually doubt themselves and develop a sense of shame as a result of their perceived inability to control the environment. At school, children who move successfully through this stage will show high confidence in their academic ability and in their



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How can teachers assess whether preschool children are successfully resolving Erikson's initiative versus guilt stage?

relations with peers, a sense of confidence that can lead to success (Eccles, Wigfield, & Schiefele, 1998). Erikson argued that caregivers need to foster autonomy by presenting children with many opportunities to make their own choices, to feed and dress themselves, and to exert self-control through toilet training.

Initiative versus Guilt. The third psychosocial stage happens approximately between ages 3 and 6 and coincides with children's first experiences at school; it "adds to autonomy the quality of undertaking, planning, and attacking a task for the sake of being active and on the move (Erikson, 1963, p. 255)." During this period, children assert themselves in ways that are considered socially acceptable and learn to take initiative in their dealings with people and tasks. According to Erikson, children who pass this stage successfully are those who find a sense of purpose in life. Children who do not resolve the initiative crisis successfully will be impaired in taking initiative in their lives. At school, successful children will show greater self-regulation and ability to set goals. Caregivers and teachers can promote initiative by presenting many opportunities for children to try new things and assisting children when they engage in activities on their own.

Elementary and Middle School Crisis: Industry versus Inferiority

The fourth stage of Erikson's psychosocial theory of personal development takes place during most of children's elementary and middle school years. At this stage, the child needs to deal with new demands and learn new skills. Consequently, when the new demands or learning requirements are not met, children may develop a sense of inferiority.

Successful passage through this stage involves developing a sense of competence and industriousness in one's work. At school, successful children will demonstrate engagement and industry in schoolwork. To foster industry, caregivers and teachers should encourage children to engage in reasonably challenging activities in order to promote a sense of attainment of success (Dweck, 1999). Once an activity is mastered, children can be given new activities that are progressively more challenging. For example, providing students with a challenging and supportive middle school experience is an important factor in their making a successful transition into high school (Belcher & Hatley, 1994; Mizelle, 1995; Mizelle & Irvin, 2000; Oates, Flores, & Weishew, 1998). In one study, students reported that if their middle school teachers had held them more responsible for their learning and provided them with a more challenging curriculum, their transition to high school would have been eased (Mizelle, 1995). These findings are consistent with those of Oates and her colleagues (1998), who found that students who participated in a community learning project designed to help middle school students develop a sense of responsibility for their own learning and behavior were more successful in their transition into high school than students who had not participated in the project.

High School Crisis: Identity versus Role Confusion

The fifth stage of Erikson's psychosocial theory of personal development happens during adolescence, when teenagers need to find their identity in occupation, gender roles, politics, and religion. During the high school and college years, students tend to start asking universal questions such as "Who am I?" "What will I do with my life?" (Kroger, 2007; Pals, 2006). Adolescents at this stage are trying to figure out who they are, what is important to them, and who they will become as they grow up. It is during this stage that students begin to explore their sexual identity, ranging from heterosexuality to homosexuality.

A challenge of this stage is to try to find an integrated self, merging different aspects (e.g., intellectual, social, sexual, moral) into a unified self (Harter, 1998). Teenagers who pass this stage successfully are those who develop a sense of confidence about themselves. On the other hand, those who do not resolve the identity crisis successfully will remain confused about who they are, what they will become, and what they should do with their lives. To help adolescents move through this difficult stage, adults should show appreciation of as many careers, religions, and ideologies as possible. In the classroom, teachers should create an environment that provides adolescents with opportunities to explore and expand their views of what they can become, such as by having students take on roles as historians, scientists, and authors (Hamman & Hendricks, 2005).



Laura Dwight Photography

How can teachers help middle school children resolve Erikson's industry versus inferiority stage?

In addition, teachers should show tolerance and respect of teenagers' choices and behaviors as they navigate their identity search. According to Erikson, adults should tolerate adolescents' public displays, fluctuations, and experimentation because it is through these activities that they learn future adult roles. Providing a supporting and safe environment is most important when students' identity choices lead to tension, rejection, and even violent behavior from peer groups who may hold strong norms against them (Koppelman & Goodhart, 2005). The following classroom Case Study illustrates the predicament of Mrs. Sunrita, a high school teacher who overhears a group of her students taunt a peer with a homosexual orientation.

Erikson's Adulthood Crises

The last stages of Erikson's psychosocial theory of personal development occur in adulthood and apply to teachers; those teachers who successfully resolve this stage of development are more equipped to provide good role models for students (Parke & O'Neil, 1997).

Intimacy versus Isolation. The sixth psychosocial stage arises when young adults seek intimate relationships with others. Success at this stage will result in the individual's ability to feel nonselfish love, and to develop a deep, affectionate relationship that involves giving and taking or giving without expecting anything in return. Failure at this stage will result in a sense of isolation and the feeling that one is incapable of achieving intimacy with others (Berscheid & Reis, 1998; Sternberg, 1998).

Generativity versus Stagnation. The seventh psychosocial stage takes place during middle adulthood, at a time when individuals have formed a family and need to find ways to satisfy and support themselves and others. Adults who successfully meet this crisis feel a need to nurture their family, share what they have accomplished with younger adults, and engage in child rearing or mentorships (Smetana, 1997). If the crisis is not resolved, adults may develop a sense of stagnation in their lives and feel that they have not made a meaningful contribution to the world. As teachers, adults who succeed at this stage are likely to take pride in their success at helping their students achieve their own goals.

Integrity versus Despair. The last psychosocial stage takes place during late adulthood, as people try to make sense of the lives they led. According to Erikson, people who are satisfied with the choices and decisions made during their lives gain the wisdom that comes along with older age. If the crisis is resolved, they will come to terms with their mistakes (Baltes & Staudinger, 2001). If the crisis is not resolved, adults may develop a sense of despair over their lives and the opportunities lost.

A Case Study: DIVERSITY IN THE CLASSROOM

Issues of Identity in a Ninth-Grade Classroom

During her recess duty, Mrs. Sunrita overhears her ninth-graders as they play basketball.

"Hey, let's see if Lesbo can make the hoop shot," Deneen yells.

"Watch out, Lesbos can play a mean game," Latisha warns.

"She's dribbling down the court, runs in for the shot, and . . . she misses," Allegra comments.

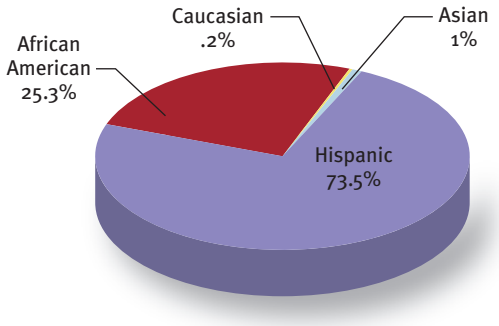
"Lesbo needs more practice," Deneen says, and all three girls laugh. The class bell rings, and the basketball game will begin again tomorrow.

This is Mrs. Sunrita's second year teaching in Compton Unified School District, located southeast of downtown Los Angeles. Compton is notorious for gang violence and as a hotbed of racial tension between Blacks and Latinos. Socioeconomic conditions and Compton's location at the center of Los Angeles's ghettos make crime prevention difficult and positive change a challenge.

Demographics:
An Overview of the Students
Dominguez High School,
Compton Unified School District, Los Angeles

92.4% Students eligible for free and reduced lunch
53% Students qualify for ESL instruction
14.2% Students receive Special Education Services

Racial/Ethnic Groups



The University of California at Irvine's FOCUS program is an initiative that rises to the challenge. In partnership with the school district, the goal of FOCUS is to successfully engage diverse students in high-quality mathematics and science curricula by using a collaborative model for teachers' ongoing professional development. As a FOCUS recruit, Mrs. Sunrita attended a two-week summer intensive training program at the university and participates in after-school and Saturday meetings on a standards-based math curriculum that emphasizes student access and comprehension. She is pleased that FOCUS's assessment and evaluation team has already documented positive results and that her students' level of engagement is improving.

Today, Mrs. Sunrita's primary concern is not the FOCUS curriculum but how to address homophobic language in the school culture. During her lunch break, she discusses the comments she overheard with her colleague, Mr. Fernandez.

"I hear it all the time. They say, 'Oh, don't be so gay' or 'Lesbos can't sit at this table.' This is how I feel about it. These kids will enter the real world soon, and they'll have to deal with it. Yes, it may hurt. But how can we, as teachers, monitor how kids talk to each other? Even if we did, that's how they communicate on the streets. Kids just need to learn how to survive. It's a tough world," Mr. Fernandez concludes.

"I've seen it cause so much pain. I have one student, Jamie, who's ostracized by the girls. I think it's because she wears baggy clothes and has a buzz cut. I guess what I can do is monitor how students talk to each other during class," Mrs. Sunrita thinks aloud.

"Sometimes it's hard to change dynamics between students," Mr. Fernandez cautions.

During group work in her ninth-grade algebra class, Mrs. Sunrita has a chance to observe students' interactions. The goal of the collaborative portion of the lesson is for students to work in groups of three to solve a problem and explain their thinking. As Mrs. Sunrita circulates, most groups are on-task and are using problem-solving strategies to find a solution. She notices that members in Jamie's group are not working together. Deneen and Richard are sitting side-by-side and have started calculations. Jamie, who is sitting across from them, has only underlined the relevant data. Deneen and Richard continue to solve the problem together, while Jamie looks confused. Mrs. Sunrita wonders if she should intervene.

"Looks like you're figuring it out," Mrs. Sunrita encourages. "Remember, this is group work, so please make sure *everyone* understands the problem and *everyone* works to find a solution." She overhears Deneen tell Jamie, "First solve what's in the parenthesis, next the exponents, then multiplication. Got it, Lesbo?" When groups explain their answers to the class, it is obvious Jamie still doesn't understand the correct order of operations.

After class, Mrs. Sunrita asks Jamie to talk with her. "I noticed your group seemed to be having difficulties working together," Mrs. Sunrita begins.

"Yeah, it's always been like that with Deneen and her clique," Jamie says in a matter-of-fact tone.

Entry #22
Compton streets are rough. You don't walk down Varrio Tres' steets or past Palmer Bloc Crips. But you can't really get away, 'cause there's 57 gangs now.
But this place is home to me. It's where we listen to Tupac and do 180° ollies on our skateboards. These clothes are my protection. I tape my chest every morning and buzz my hair, to look like my brothers.
I don't care what girls at school say, you gotta be tough to make it and I've gotta be here to take care of my family. I'm just getting out of this school as fast as I can.

"Would you prefer to work with another group?" Mrs. Sunrita asks.

"I don't really care. I just want to be done with high school and get out of here." Jamie pauses. "My friend Leslie always helps me, but she's in the other algebra class. I've got to go to English. Bye."

Mrs. Sunrita wonders how she could best support Jamie. Should she place her in the other algebra section with her friend? Should she talk to Deneen and her friends? Refer Jamie to the counselor? Talk with the Lesbian, Gay, Bisexual, and Transgender Alliance (LGBTA) advisor? Perhaps contact her parents? She decides to think more about the situation before intervening.

The next day as she reads over the students' math journal responses, she notices that Jamie has written an additional entry, unrelated to algebra.

Mrs. Sunrita has never considered Jamie's clothes and her tough tomboy attitude to be a form of protection, but it makes sense. She's concerned about Jamie's lack of engagement in school, knowing that Latina girls' high school dropout rate is among the highest in the United States. She wonders if family pressures or peer harassment would cause her to start cutting classes.

She wants to see Jamie learn skills that offer her opportunities and career options in the future. She wants to clap as Jamie walks proudly across the graduation stage. With this goal in mind, she writes a letter to the administration voicing her concerns and requesting that a committee be formed to address school culture and dropout prevention.

The letter reads, "My vision is that a committee can help us create a safe learning environment that enhances positive social attitudes and effective interpersonal skills in all students. We can't ignore harassment, intimidation, and bullying. Instead, we need to work together to create a caring supportive school, where students thrive and achieve."

As Mrs. Sunrita watches students shoot hoops during recess, she feels she has made the first step toward positive change.

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

For further information, you can visit
FOCUS (Faculty Outreach Collaborations Uniting Scientists, Students and Schools) at http://focus.web.uci.edu/goals.php

TABLE 4.5

The eight stages in Erikson's psychosocial theory of personal development.

PSYCHOSOCIAL STAGE	AGE	SUCCESSFUL PATTERNS	UNSUCCESSFUL PATTERNS
Trust versus mistrust	Birth to 1 year	Infants believe that the world is a safe and predictable place.	Infants believe that the world is undependable and hostile.
Autonomy versus shame	1 to 3 years	Children develop a sense of independence, mastery, and control.	Children doubt their ability to cope with their environment.
Initiative versus guilt	3 to 6 years	Children develop a sense of control and purpose.	Children feel guilt and lack of purpose.
Industry versus inferiority	6 to 12 years	Children develop a sense of competence at a variety of tasks.	Children develop a feeling of inferiority.
Identity versus role confusion	Adolescence	Adolescents develop a unified sense of who they are and what they want in life.	Adolescents remain confused about who they are and what they want in life.
Intimacy versus isolation	Early adulthood	Young adults learn how to love unselfishly.	Young adults fail to connect with others in a meaningful way and feel isolated.
Generativity versus stagnation	Middle adulthood	Adults develop a sense that they are contributing to the well-being of the next generation.	Adults develop a feeling that their efforts and accomplishments are not transcendent.
Integrity versus despair	Late adulthood	Older adults satisfied with the choices and decisions made during their lives gain the wisdom that comes with older age.	Older adults develop a sense of despair over their lives and the opportunities lost.

Table 4.5 summarizes the eight stages in Erikson's psychosocial theory of personal development with corresponding ages and characteristics for successful or unsuccessful crises resolutions.

Limitations to Erikson's Theory

Although Erikson's theory became very popular in the 1960s and 1970s, since then, developmental psychologists have criticized it based on the following limitations. First, similar to one of the criticisms against Piaget's stage theory of cognitive development, Erikson failed to consider the role of culture in shaping individuals' personal development. For example, mothers from the United States emphasize their preschool children's autonomy significantly more in conversation and social interactions than do Japanese mothers (Dennis, Cole, Zahn-Waxler, & Mizuta, 2002). Second, it has been argued that many, if not most, adolescents fail to successfully find their identity at this developmental stage (Siegel, 1999). Therefore, the fifth psychosocial stage seems too premature in time. Third, experts criticize the idea that the identity crisis precedes the intimacy crisis. Many adolescents, especially females, are more likely to establish a sense of intimacy well before they achieve identity (Kroger, 2007), and young women are concerned with both intimacy and identity issues simultaneously (Sorrell & Montgomery, 2001). In this regard, Carol Gilligan (1993) argued that Erikson's theory reflected the psychosocial development of men more accurately than that of women.

Extending on Erikson: Marcia's Theory of Identity Development

Erikson wrote more about the identity crisis stage than about any of his other psychosocial stages of personal development, which inspired other psychologists to investigate the process of identity search as well. James Marcia, for instance, interviewed adolescents about their occupational, religious, and political choices and found that four different statuses can emerge during the identity crisis (Marcia, 1994, 1999). Each status varies in its ability to produce a healthy outcome. **Identity achievement** is the status that results from having explored realistic options, having made specific choices, and becoming committed to pursuing those choices. Research shows that, contrary to what Erikson argued, identity achievement occurs more often after high school than during high school (Berzonsky & Kuk, 2000; Marcia, 1988).



Laura Dwight

What different statuses are likely to emerge during adolescents' identity crisis, according to Marcia?

Identity diffusion happens when individuals engage in a disorganized examination of different choices and, consequently, fail to make clear choices about their future. If this state persists over time, it is likely to result in apathy and confusion (Berzonsky & Kuk, 2000).

Identity foreclosure occurs when adolescents follow the steps of others, usually parents, without examining any alternative path for their own lives. This state is considered a less successful path to finding identity.

Finally, **moratorium** happens when individuals pause on any identity decision and remain on hold when it comes to exploring alternative choices for their personal development. Identity moratorium may be positive in that it can eventually lead to identity achievement, which is the ultimate state in this crisis. In fact, many adolescents experience both identity moratorium and diffusion before finding their identity. For instance, a student might have this conversation with her high school teacher, "You know, I'm just really unsure of what to do with my life. It seems like there are so many options. I could volunteer internationally, work in my aunt's hotel business, or get a degree in public health. It's kind of overwhelming—I just don't know how to decide," Tanya shares. "I can remember feeling that way when I was a teenager," Ms. Sands responds. "It sounds like you have many opportunities to explore. I always find it helpful to research different possibilities and talk with people who are working in the field. I know you put a lot of effort into everything you do, so I have confidence you'll discover what seems right for you."

Identity Achievement

The identity status that results from having explored realistic options, having made specific choices, and becoming committed to pursuing those choices.

Identity Diffusion

The identity status that results from engaging in a disorganized examination of different choices and consequently failing to make clear choices about one's future which may lead to apathy and confusion.

Identity Foreclosure

The identity status that results from following the steps of others, usually parents, without examining any alternative path for one's own life.

Moratorium

The identity status that results from pausing on any identity decision and remaining on hold when it comes to exploring alternative choices for one's personal development.

MORAL DEVELOPMENT

Students' moral issues range from deciding whether they should cheat on a test or not, to whether they should intervene when a peer is being picked on by others or not, to whether they should help a peer in a cooperative learning activity. Students' moral reasoning will affect how they behave in class, such as how they respect the classroom rules and how they communicate with you and their peers. Furthermore, students' values and views about what is right and what is wrong will be apparent as you engage them in problem-solving and critical thinking activities. In fact, if you were to listen to the daily conversation of your students, you would be amazed about the hundreds of comments and decisions that rely on their making moral judgments. Therefore, having a good understanding of the theory and research on students' moral development should help you make appropriate decisions in the classroom.

Mrs. Carroll teaches a ninth-grade literature class and emphasizes the importance of writing essays. Each week she assigns students a five-paragraph essay on the book they are reading. One week she notices that Natasha and Emily turned in very similar

essays. She wonders if they collaborated on the assignment or if it is a case of Internet plagiarism. Mrs. Carroll encourages students to work together and to use the Internet as a research tool. She's unsure of how to address the issue. Should she question Natasha and Emily about their essays? Should she wait to see if they turn in similar essays again? Should she bring up the issue of plagiarism with the whole class? If you were in Mrs. Carroll's position, what would you decide?

Cheating among undergraduate students has increased significantly over the past 50 years—from approximately 23% of students to as many as 90%—and is even more frequent among high school students (Jensen, Arnett, Feldman, & Cauffman, 2002). Plagiarism from books and articles is one of the three most common types of cheating, along with cheating on tests and on homework. Although cheating will not necessarily reflect the general moral code of a student (Athanasou & Olasehinde, 2002), it can provide an opportunity to discuss ethical issues in the classroom and promote students' moral development.

Piaget's Theory of Moral Development

Julian and Derek are in second grade, and are both 7 years old. During an indoor recess, they were playing a board game together. When Julian took an extra turn, Derek got upset, saying those weren't the rules of the game.

Julian said, "But that's how my sister plays it with me at home. If you land on the star, then you get an extra turn."

Derek, still upset, said, "But those aren't the rules. You can't do it that way. I don't want to play this game with you anymore."

Although Piaget is mostly known for the cognitive development theory that you read about in Chapter 3, he also posed a two-stage theory of children's moral development. In his research, he observed and interviewed children as they played games and asked about ethical rules and other moral issues such as theft, lies, punishment, and justice. According to Piaget, children 10 years of age and younger engage in the first stage of moral development, called **heteronomous morality** (Piaget, 1965/1995). At this stage, children think of rules as set by adults. Therefore, they view rules as externally imposed and not open to negotiation. When children obey rules, it is not because they follow an internal moral code of their own but rather because they want to avoid the consequences of not obeying the rules. Consequently, children at this stage are unable to distinguish between breaking a rule purposefully or accidentally. To a child, it is the amount of damage done that determines how bad something is. Thus, a child who watches another child accidentally break one of his toys will feel that the act was bad because his toy got broken. In our example, Derek and Julian are in the heteronomous morality stage, which explains why Derek conceives of the game rules as unchangeable and removed from the control of people.

Heteronomous Morality

The first stage of moral development characterized by obeying externally imposed rules only to avoid the consequences of not obeying such rules.

Piaget argued that, as children move along the concrete operational stage, they enter the second stage of moral development, called **autonomous morality**. At this developmental point, a child starts perceiving rules as being flexible and subject to negotiation. Children are able to view rules as created cooperatively by people who are equals rather than unilaterally by an authority (At this stage, Julian and Derek might agree to allow the extra turn for landing on a star.). How bad an action is now depends not just on the consequences of such an action but also on the intentions of the actor, and punishment is no longer expected to be automatic. Piaget believed that moral development is facilitated by interactions with peers rather than with caregivers. This is so because peers all have similar power and status and children learn to negotiate rules and settle disagreements as they interact with each other.

Autonomous Morality

The second stage of moral development at which a child starts perceiving rules as being flexible and subject to negotiation.

Kohlberg's Theory of Moral Development

Like Piaget, Lawrence Kohlberg proposed that moral development happens in stages (Kohlberg, 1976, 1986). Unlike Piaget, Kohlberg did not believe that moving to higher cognitive development stages would necessarily mean moving to higher moral development stages. Individuals move from one stage to the next only after having experienced disequilibrium, the cognitive conflict resulting from not being able to explain or solve a problem

using one's current schemas. As individuals become increasingly aware of the weaknesses of their moral reasoning, they begin reasoning at a higher level. As you can see, Kohlberg drew on important aspects of Piaget's theory of cognitive development to produce a stage theory of moral development.

Kohlberg's moral development theory is more comprehensive than Piaget's two-stage theory of moral development, mainly because Kohlberg did not focus just on children but also interviewed adolescents and adults. His method consisted of presenting the interviewed individuals with a set of moral dilemmas and asking them a set of questions about the problem. A typical (and now classic) moral dilemma used by Kohlberg and the questions that the participants answered after reading the dilemma are shown in Table 4.6.

Before reading about the different possible answers that individuals gave to Kohlberg's moral dilemmas, take a few minutes and answer these questions yourself. Once you read about the stages of moral development below, you will be able to assess your own moral development according to Kohlberg's theory.

TABLE 4.6

The classic moral dilemma and questions used in Kohlberg's research.

MORAL DILEMMA

A woman is near death and is suffering from a special kind of cancer. There is only one drug that doctors think might save her. It was recently discovered by a druggist living in the same town as the woman. The drug was expensive to make and the druggist is charging 10 times what the drug cost him to make. The sick woman's husband, Heinz, tries to borrow the money to buy the drug from every place he can think of but he can't raise enough money. He tells the druggist that his wife is dying and asks him to sell it to him cheaper or let him pay later. But the druggist says, "No, I discovered it and I deserve to make money from it." Later, Heinz gets desperate, breaks into the druggist's store, and steals the drug for his wife.

QUESTIONS

- Was Heinz right to steal the drug?
- Is it the husband's duty to steal the drug for his wife?
- Did the druggist have the right to charge as much for the drug? Why or why not?

Based on the different reasons that individuals offered, Kohlberg concluded that moral development has three main levels: preconventional reasoning, conventional reasoning, and postconventional reasoning. Each one of the three levels is subdivided into two stages, resulting in a six-stage theory of moral development. According to Kohlberg, the force that drives moral development is **moral internalization**, the process of gradually incorporating external moral codes as our own internal moral codes.

Moral Internalization

The process of gradually incorporating external moral codes as our own internal moral codes.

Preconventional Reasoning Stage. Individuals who think in terms of **preconventional morality** show no internalization of moral values. Similar to Piaget's heteronomous morality stage, morality in Kohlberg's first level is determined by the consequences of an action rather than by the inherent goodness or badness of the action. According to Kohlberg, children between ages 7 and 10 usually fall in this first level. The first stage within the preconventional level is characterized by individuals' concern with *obedience and punishment*. Authorities are right because punishment arises when they are disobeyed. The second stage within the preconventional stage is characterized by *individualism and exchange*. Individuals realize that different people have different interests or goals, so they feel that rules can be negotiated. At this level, actions are viewed as being right when people get rewarded for those actions.

Preconventional Morality

A moral development level that shows no internalization of moral values; it is determined by the consequences of an action rather than by the inherent goodness or badness of the action.

Conventional Reasoning Stage. At the second level of moral development, individuals think in terms of **conventional morality**. According to Kohlberg, this stage is typical of individuals between 10 and 16 years of age, although many adults reason primarily at the conventional level. At this level, internalization is intermediate in the sense that individuals abide by rules that are believed to be internal, but in reality these rules are essentially the standards of others. Therefore, this level is characterized by conformity to the rules and conventions of society. The first stage in this level is marked by interpersonal conformity. Individuals at this stage meet the expectations of those who are important in their lives. Children will recognize that what is good for a group may have to take precedence over what is good for an individual. This stage is also called *nice girl/good boy* because moral decisions are based on what is approved by others. For example, a student who refrains from cheating because she does not want to disappoint her parents is reasoning at this stage. The second stage in the conventional morality level is called *law and order*.

Conventional Morality

A moral development level at which internalization is intermediate in the sense that individuals abide by rules that are believed to be internal, but in reality these rules are essentially the standards of others.

At this stage, individuals have not lost their concern for others, but they follow laws and rules for their own sake. In the same example above, a student who refrains from cheating because cheating is against the classroom and school rules is reasoning at this stage. Another associated characteristic of this stage is the concern for order. Individuals believe that order must exist to guide behavior and rules provide order and uniformity.

Postconventional Morality

A moral development level at which an individual's internal moral principles may outweigh the rules of society.

Postconventional Reasoning Stage. The third level of moral development, **postconventional morality**, transcends the individual and society levels and focuses on moral principles. Individuals reasoning at this level will follow rules but will also understand that rules sometimes need to be changed or ignored to lead to a fair outcome. At this highest level, moral development is internalized in the sense that an individual's internal moral principles may outweigh the rules of society. For instance, an individual in Heinz's situation may think that he should steal the drug because the value of life outweighs society's rule that stealing from others is wrong. According to Kohlberg, only a small portion of adults older than 20 years of age reach this level.

The first stage in this level is called *social contract*, because it is the stage where moral reasoning is based on socially agreed-upon principles. The U.S. Constitution is an example of this type of contract because it lists the principles agreed upon by the Founding Fathers.

Finally, the sixth stage in Kohlberg's moral development theory is called the *universal principles* stage. At this stage, individuals are committed to universal principles of justice, such as the rights of life, liberty, and justice. Kohlberg believed that very few individuals reach this stage. Therefore, he de-emphasized this stage in his later writings (Kohlberg, 1984). Because many people have questioned the existence of universal principles, this stage may be considered more of an ideal stage of moral development than an actual stage.

Now that you have an idea about the different moral reasoning alternatives and how these correspond to Kohlberg's model of moral development, take a look at Table 4.7 and see where your reasoning about Heinz's dilemma falls among the six stages. The

TABLE 4.7

Characteristics of Kohlberg's stages of moral development and reasoning examples.

LEVEL/STAGE	CHARACTERISTICS	HEINZ DILEMMA REASONING EXAMPLE
Level I/stage 1 Obedience and punishment	Rules are followed because of the threat of punishment.	"Heinz should not steal the drug because he might get caught and thrown in jail."
Level I/stage 2 Individualism and exchange	Rules are followed if they are in the best interest of the individual.	"Heinz should steal the drug because the druggist refused to make a deal that would benefit both parties."
Level II/stage 3 Interpersonal conformity	Rules are followed because individuals try to do what is expected of them.	"Heinz should steal the drug because a good husband needs to take care of his wife."
Level II/stage 4 Law and order	Rules are followed because they are necessary to keep society's order.	"Heinz should not steal the drug because people need to obey laws against theft to keep society in order."
Level III/stage 5 Social contract	Rules are followed because individuals are bound by a social contract.	"Heinz should not steal the drug because people have a social contract against threats to property rights."
Level III/stage 6 Universal principles	Rules are followed when they are consistent with individuals' own ethical principles.	"Heinz should steal the drug because the value of life outweighs the value of any other human right."

third column lists some examples of answers to the question "Should Heinz steal the drug?" Notice that what is important in determining the moral development stage of an individual is the type of *reasoning* displayed rather than the answer itself. In other words, it does not matter if individuals answer yes or no to the question. What matters is the type of rationale articulated for either a yes or no answer.

Evaluation of Kohlberg's Theory. Kohlberg's theory has given valuable insights into the nature and development of children's and adolescents' moral reasoning. For instance, his work shows that children's moral reasoning is not the result of regurgitating adults' moral values and preaching but rather the result of an individual's own beliefs.

In addition, Kohlberg's theory has been tested by research, and many of its assumptions have been supported. For example, research finds that the sequence of moral reasoning proposed by Kohlberg is consistent with people's moral development growth (Boom, Brugman, & van der Heijden, 2001; Colby & Kohlberg, 1984; Snarey, 1995; Stewart & Pascual-Leone, 1992). Research in the classroom shows that engaging students in discussions on controversial topics and moral issues promotes their perspective taking and moral growth (DeVries & Zan, 1996; Power, Higgins, & Kohlberg, 1989; Schlaefli, Rest, & Toma, 1985). For example, Figure 4.3 shows an essay written by a middle school student after engaging in a class discussion about the following moral issue:

> Three of David's classmates have created an offensive website that attacks students and teachers. The principal wants to know who did it, and David is the only one who knows. Should he lie to the principal or betray his classmates?

After our class discussion about the scenario above, write an essay explaining what David should do.

When we talked about this situation in class I was first thinking that the kids have the right to post what they want on the internet because there is free speech. I don't know if the principal has the right to even know about what the other kids are doing outside of school because its their right to. It doesn't seem like David has to tell the principal since the principal doesn't have the right to know.

When we were talking a lot of kids said they would be really angry or sad if things were written about them on the internet. Especially if they were lies. I would be really mad if someone wrote mean things about me on the internet. I guess since there are people from school being talking about on the website then David should probably tell because bad things might be written about him or his friends too. The nicest thing would be for David to tell the principal because then it would stop other people from being made fun of.

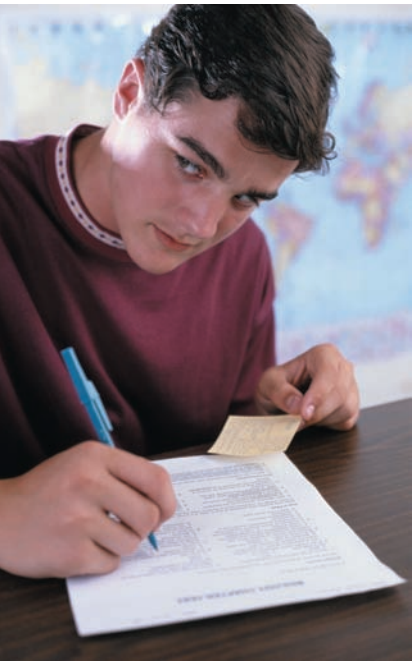
Even though David's friends might be really mad at him I think that he should tell and ask the principal to be confidential so that those kids don't do something mean to him. If David's friends are that mean they aren't good people to be friends with anyway. He would probably make new friends because of all the people he helped.

FIGURE 4.3 **Can you find any evidence of perspective taking and moral growth in this student's essay?**

On the other hand, several limitations to Kohlberg's theory have been raised by contemporary psychologists. First, the scoring of the participants' responses to the moral dilemmas is somewhat subjective, making their interpretation unreliable. This motivated the development of the Defining Issues Test (DIT), which is an alternative, more objective test of Kohlberg's stages of moral development devised by James Rest in 1979 and revised more recently in 1999 (Rest, 1979, Rest, Narvaez, Bebeau, & Thoma, 1999). The newer test (DIT-2) is available through the Center for the Study of Ethical Development (www.centerforthestudyofethicaldevelopment.net). It presents five moral dilemmas followed by a set of moral statements reflecting each one of Kohlberg's stages of moral reasoning. The test-taker task is to rate and rank the statements in terms of their moral importance.

Second, Kohlberg has been criticized for underestimating young children's moral reasoning abilities. Even before starting kindergarten, children will start displaying understandings of what is right and what is wrong.

Third, moral development seems to follow trends rather than progressing systematically through the stages: Individuals may, at any time, show reasoning across more than one stage. For example, a youngster may combine different moral standards, such as protecting his individual interests, abiding by society's rules, and satisfying a significant other, to reason through particular moral situations (Rest et al., 1999). Even when a tendency to apply more abstract moral standards can be found over time, youngsters may occasionally resort to a more primitive moral standard reflective of the early moral development stages (Turiel, 1998).



Photodisc/SUPERSTOCK

According to Kohlberg, at what level of moral development is a student who cheats and then admits it when caught with the purpose of getting off easier?

Finally, Kohlberg's research was conducted mainly with middle-class American males under 17 years of age. Although some researchers have found cross-cultural support of his theory (Snarey, 1985), according to Carol Gilligan (1987, 1993), Kohlberg's theory is biased because it failed to represent the moral reasoning development of females. We consider Gilligan's theory next.

Gilligan's Theory of Moral Development

Many of Kohlberg's studies found that most men progressed to stages 4 and 5 whereas most women "stayed" at stage 3, which suggests that females are morally challenged. Gilligan (1993) believed that existing theories of moral development were gender-biased and proposed an alternative sequence of moral development called the **ethic of care**. While Gilligan and Kohlberg agree that individuals' initial stage of moral development is based on self-interest, Gilligan contended that females move from self-interest to a focus on specific individuals and relationships and then to the highest level of moral reasoning based on principles of responsibility and care for all individuals. She found that the highest level of morality is based on principles of responsibility and care for all people rather than on maintaining justice, as Kohlberg suggested. However, recent research has failed to find consistent significant differences in the moral reasoning of males and females using Kohlberg's procedures (Eisenberg, Martin, & Fabes, 1996; Turiel, 1998). Females are more likely to use a care orientation to moral reasoning, but both males and females can use either a care or justice orientation (Skoe, 1998).

Promoting Moral Development

Many parents, educators, and policymakers believe that today's students lack the moral values possessed by previous generations and cite aggression, violence, and drug abuse as evidence of such decline. A potential solution for this problem is to have moral education programs at school. Although this solution is not without controversy, there have been a few efforts to implement moral education in different forms. For example, *character education* is an instructional approach that involves teaching students basic moral literacy with the goal of preventing them from engaging in unethical behaviors such as lying, cheating, stealing, and harming themselves or others (Lapsley & Narvaez, 2006). Character education requires explicitly teaching moral concepts as related to specific behaviors, engaging in class discussions and role-playing activities, and reinforcing students for proper behaviors (Bennet, 1993; Damon, 1995).

In what ways did Carol Gilligan challenge Kohlberg's moral development theory?



Zuma Press/NewsCom

Another approach to moral education is *values clarification*. According to this view, rather than telling students what their values should be (which is the controversial piece of any moral education program), schools should help students clarify what their values are and understand what the values of others are. In values clarification activities there is never a right or wrong answer. Instead, students are exposed to moral exemplars and community service as well as encouraged to discuss and reflect on different values (Walker, 2002). For instance, Mr. Robb uses values clarification activities in his high school career class because he believes it positively impacts his students' career development. At the beginning of the semester he asks, "What does life/career success mean to you?" Ensuing discussions about values help students identify factors that influence career decisions. Over the course of the semester, they are able to set career goals, based on their values. His student Keith shares:

> When I first started this class, success meant making a lot of money and driving a BMW. But now that I've had time to think about it, success means I'm happy with what I'm doing. I don't actually have to make a ton of money. I want to enjoy my work. So, because I love animals, I've been thinking about becoming a veterinarian. I'll be starting an internship at the animal shelter next month.

Figure 4.4 shows a high school student's response to a values clarification exercise aimed at clarifying personal attitudes and values on listening and understanding opinions different from one's own.

Cognitive moral education is an approach where students typically meet for a semester-long course to discuss a number of moral issues. Following Kohlberg's idea that individuals' moral growth depends on creating cognitive conflict and reflection, the instructor acts as a facilitator of students' discussions. Finally, moral education may be promoted as students engage in *service learning*, where students participate in community activities such as helping in a hospital, shelter, child-care center, or by tutoring special need students (Youniss, 2006).

Research suggests that service learning benefits both students and those who are recipients of their help (Hamilton & Hamilton, 2004). For example, students who engage in service learning are more likely to improve in their grades, motivation, and self-esteem and to become more reflective about society's political organization and moral order (Hamburg, 1997; Johnson, Beebe, Mortimer, & Snyder, 1998; Search Institute, 1995; Youniss, 2006). Service learning is becoming increasingly important in schools that emphasize prosocial behavior (Eisenberg, Fabes, & Spinrad, 2006). Figure 4.5 shows two examples of service learning projects.

Personal, social, and moral development can be fostered through good educational practices. Classroom Tips: Applying Personal, Social, and Moral Development Principles summarizes some principles from this chapter with corresponding classroom applications.

Ethic of Care

The three-step progression in moral reasoning focus from self-interest, to specific individuals and relationships, and finally to principles of responsibility and care for all individuals.

What have you learned about listening and understanding opinions that are different from your own in today's class exercise?

Today in class we wrote down our opinion about an issue we felt strongly about from the presidential debate. We didn't write our name on this paper and then we switched with someone else in the class and it was going to be our job to defend their point of view whether we liked it or not. When I opened up the paper with the position that I had to defend I was annoyed. The person had written that they believed that because of the financial crisis we should cut back the number of social programs. I really disagree with this position and felt frustrated that I had to defend it. I sat for about 10 minutes just kind of being annoyed. But I then I tried really hard to put my own feelings aside and just get the assignment done. Once I did that it was not that hard to think of a few reasons why it would make sense to cut programs so that the country as a whole could get in a better place and eventually help more people when there was actually money. By the time I had to defend this position in front of the class I actually felt okay about it even though I still don't really agree.

By doing this assignment I realized that in those first 10 minutes when I was really mad I wasn't even willing to give the other side a chance. Being emotional about something can be a great thing but it really got in the way of my being open-minded. Another thing I realized was by having to take the other side I understood where people were coming from a little bit more and didn't just dismiss their ideas as stupid. I was really listening instead of immediately judging their argument. I also noticed that this was difficult to do. By doing this exercise I realized that even if I don't agree with another person it's important to really listen because by understanding where another person is coming from maybe it will be easier to try to convince them why I think my opinion is right. I also wouldn't want someone to just not listen to my opinion. I'd want them to give me a chance to explain myself even if they disagreed.

FIGURE 4.4 What are the potential advantages and disadvantages of using values clarification exercises in the classroom?

Water-Quality Improvement Project

10th grade Biology, Pine River High School, Minnesota

Pine River High's biology class tested the water in local Gull Lake and discovered it was polluted. After researching water pollution and ways to reverse it, students developed a five-year plan to clean up Gull Lake. In the first year of the plan, they partnered with the Chamber of Commerce and the state Department of Natural Resources to develop a pamphlet that was distributed to residents at an annual town celebration. Students made videos of the lake, kept water-quality journals, and tracked the pollution sources. They worked with the town council to implement pollution reduction plans and developed a presentation to train residents to test water quality. After two years of hard work, students were able to celebrate cleaner water with town residents.

Weekly Teen Talk Show

Grades 9 through 12:
Civics, Social Studies, and Speech, Tillamook High School, Oregon

In response to negative impressions of teenagers among local residents in Tillamook, high school students launched their own radio talk show to address teen issues in a positive way. The students handled all aspects of production, from planning the topics to hosting the show. Using skills from their civics and social studies classes, the students researched the topics and applied speech skills to convey messages and sustain the on-air forum.

For more information on service learning projects, visit National Youth Leadership Council (www.nylc.org)

FIGURE 4.5 Service learning project examples.

CLASSROOM TIPS

Applying Personal, Social, and Moral Development Principles

Principle	Classroom Tips
Use an authoritative interaction style. Show responsiveness and high expectations for all students and help students understand the reasons for rules.	Clearly communicate and model high expectations for students' behavior and academic work. Provide rubrics and exemplars for assignments to ensure students know expectations. Give students equal opportunities to respond and share their thoughts in class by establishing a random way to call on students. Collaborate with colleagues to define common expectations.
Reward autonomy and initiative. Promote students' personal development by encouraging them to make decisions about their own learning.	Provide clear instruction, guidance, and feedback so students can independently work on assignments and projects. Give students well-defined choices for their assignments. Physically arrange the classroom so materials are organized and easily accessible; provide multiple work spaces so students can collaborate with each other and work individually.
Encourage perspective taking. To promote social development, ask students to analyze the emotions and motivations of others and take their perspective.	Teach a multicultural curriculum that helps students understand what it means to be raised in a different social environment with different cultural values. Encourage students to take the perspective of literary characters and historical figures during writing and reading lessons. Ask open-ended questions to get students thinking about different points of view and encourage them to think of multiple right answers. Motivate students to seek out multiple viewpoints in newspaper articles and on current issues.
Discuss social relationships and personal responsibility. Encourage students to think about the influence of peers and the ways in which classmates should treat one another.	Use role-play and discussions to develop an understanding of the importance of respectful behavior. Incorporate multimedia that encourage students to appreciate people's differences. Role-play situations of peer pressure to teach students how to avoid undesirable situations and negative peer pressure.
Engage students in social problem solving. When conflicts arise, teach students to interpret social cues and guide them to find a solution to the problem.	Facilitate discussions and role-play potential conflicts and possible solutions. Teach students a step-by-step process for solving conflicts that can be applied to real-life situations. Encourage students to participate in the school's peer mediation program. Engage students in service learning projects in the local community.
Monitor patterns of friendship. Be aware of rejected children and help them increase social skills in order to promote peer acceptance and self-esteem.	Closely observe students' social interactions. Incorporate cooperative games, lessons on friendship, and empathy into the curriculum. Meet with students individually to discuss strategies, and create an action plan to improve their social skills. Refer students to the school counselor or psychologist as needed.
Help change the reputation of antisocial students. Peers may continue to reject antisocial students, even after they have made progress in their social skills.	Encourage structured cooperative activities to help the rejected student display the desired social skills. Encourage students to join a school club, sports team, or after-school program. Draw attention to the child's strengths and good qualities in the classroom.
Model the moral and prosocial skills you expect from your students. Modeling is a powerful way to increase the likelihood that students will display the modeled behaviors in the future.	Model appropriate ways to express emotions and help others. Invite guest speakers who are involved in service work to share their experiences with students. Discuss recent newspaper and magazine articles depicting people behaving in moral and prosocial ways.
Engage students in moral discussions. Integrate social and moral dilemmas into the school curriculum to promote moral development.	Include values clarification activities in lessons. Allow time for students to discuss "why" questions about school rules and policies. Facilitate discussion about moral issues raised in the classroom without imposing your own moral ideals.

DIVERSITY IN PERSONAL, SOCIAL, AND MORAL DEVELOPMENT

All students are susceptible to the same developmental principles. For instance, regardless of their cultural background, gender, or ability, all children's development will be affected by biological and environmental influences. However, as a teacher you will need to identify some important diversity factors affecting students' personal, social, and moral development. The following are some examples.

Diversity in Students' Attachment

According to research, students with learning disabilities, emotional disturbances, and mild mental retardation are more likely than their counterparts to report being dissatisfied with their student–teacher relationship (Murray & Greenberg, 2001). Some have argued that this dissatisfaction places these children at risk for socioemotional problems and maladjustment (Culbertson, 1998).

Teachers also report feeling significantly less close to students with learning disabilities, which may aggravate these students' perceived lack of attachment with their teachers (Al-Yagon & Mikulincer, 2004). Students with special needs often have difficulty contributing their part to an emotional relationship. However, when teachers provide special-needs students with high-quality relationships, they are more likely to show significant growth in their social, emotional, and academic adjustment (Murray & Greenberg, 2001).

Even students who do not have special needs vary in the degree to which they are willing to establish a strong personal relationship with their teacher. Some will overtly show an unwillingness to be in a relationship with the teacher and act out by displaying chronic negative attitudes or defiant behaviors (Eisenberg et al., 1997; Gallagher, 2002; Tramontana, Hooper, & Selzer, 1988). Teachers are usually very sensitive to differences in students' openness to attachment. They become less motivated to reach out to students who display negative attitudes and are more likely to show relatedness, support, and sensitivity to students who display positive emotion and classroom engagement (Lay, Waters, & Park, 1989; Skinner & Belmont, 1993).

There is also diversity in parent–child attachment. Although the ideal situation for a teacher is to have a classroom full of students who have loving, high-quality relationships with their caregivers, many circumstances will prevent this. For instance, many children of all grade levels come to school with a history of neglect or abuse and often show delays in their personal, emotional, and social development (Tower, 1996). This situation may be the result of serious financial problems, marital conflict, parent depression, or any condition that challenges parents' ability to take appropriate care of their children. In these cases, children are more likely to perform poorly and be held back a school grade (Trickett & McBride-Chang, 1995).

Gender Differences in Friendship and Interpersonal Behaviors

Boys and girls show different patterns in their friendships. Although most children of both sexes prefer same-sex friendships, boys are more likely to play in groups and to engage in competitive activities, whereas girls are more likely to engage in cooperative activities that they can perform in pairs. In addition, the friendship of adolescent girls goes through three stages (Douvan & Adelson, 1966). From about 11 to 13, girls engage in activities for fun. From about 14 to 16, girls place more emphasis on sharing secrets, especially about other girls and boys. By this time, trust has become especially meaningful and girls may show signs of possessiveness with their female friends.

In later adolescence, girls may begin to transfer to males some of the trust, disclosure of secrets, and possessiveness that they exhibited earlier with their female friends. A distinction between female and male friendships across all ages is that female friendships emphasize emotional closeness and intimacy while male friendships emphasize

achievement and autonomy (Berndt, 1986; Sternberg, 1998). In addition, research indicates that girls tend to reveal more about themselves than boys and are more likely to feel guilt as well as empathy for others' misfortunes (Lippa, 2002; Rose, 2002).

Gender Differences in Self-Concept and Self-Esteem

Evidence for gender differences in academic self-concept comes from studies with samples of students who are mostly European-American. For instance, a recent longitudinal study followed a group of over 600 students from first grade until high school (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). The findings showed that students' perceived competence in math, language arts, and sports diminished over time. In first grade, boys and girls had comparable perceptions of their competence in language arts but girls perceived themselves to be significantly less competent than boys in math and sports. Because the drop in boys' math self-concept over the years was stronger than the drop for girls, by high school, there were no gender differences in math self-concept. Boys' drop in perceived language arts competence was also sharper than girls' drop over time, but they had comparable self-concepts by high school. In sports, boys perceived themselves to have higher competency than girls over the entire 12 years of the study. These findings parallel other research showing that girls tend to perceive themselves as more competent than boys in reading and social activities whereas boys tend to perceive themselves as more competent than girls in math and athletics (Cole, Martin, Peeke, Seroegynski, & Fier, 1999, 2001; Herbert & Stipek, 2005; Wigfield, Byrnes, & Eccles, 2006; Wilgenbusch & Merrell, 1999).

An analysis of gender differences on self-esteem using over 150 samples of students from past research studies revealed that self-esteem decreased for both boys and girls during the transition to junior high. After this point, boys' self-esteem increased dramatically until the end of high school, when their self-esteem was significantly higher than that of girls (Twenge & Campbell, 2001).

Cultural Differences in Identity Development

Erikson and Marcia believed that healthy adolescence may include a moratorium period, when young adults search for an appropriate identity while avoiding firm commitments. Moratoriums are especially important to adolescents in socially diverse urban societies, which present them with a complexity of options. The goal of adolescents' identity search is to emerge with a relatively secure sense of self—how they identify their characteristics, abilities, and behaviors (Harter, 1998). In this regard, Western cultures may consider moratorium and identity achievement statuses to reflect greater developmental maturity than identity diffusion or foreclosure (Archer, 1982). On the other hand, in many non-Western cultures, parents, elders, or community leaders may be seen as the appropriate individuals to choose an adolescent's career or spouse. Therefore, in these cases, identity foreclosure may be considered more positively than identity moratorium or identity search (Graf, Mullis, & Mullis, 2008). For example, consider this exchange between a teacher and her high school student: "What do you think you'll end up studying in college?" Mrs. Carter asks Akash. "I'll be going to medical school, that's the tradition in my family, starting with my great grandfather in Calcutta, India," Akash explains. "Do you think you may want to explore different subjects? I've noticed you have an interest in archeology," Mrs. Carter inquires. "You're right, I do like archeology, but for my whole life the plan has been med school. That's just how my family works," Akash replies.

Diversity in Interpersonal Behaviors

Your students' interpersonal behaviors may sometimes be different from your own; try to welcome diversity provided that basic principles of respect and responsibility are maintained in the classroom. For example, Asian-American students are often believed to display deficits in social skills, yet research shows that Asian-American students may

CLASSROOM TIPS

Creating School–Family Community Partnerships

Involvement Type	Classroom Tips
Providing assistance to students' families.	Provide families with information about the importance of family support and child-rearing skills for each grade level. Help school administrators understand families' cultures and backgrounds as well as children's needs and goals.
Communicating effectively with students' families.	Invite parents to meet with you before the schoolyear starts. Share students' progress with weekly summarizing notes. Create a parent–teacher center to discuss ways to collaborate.
Offering opportunities for parent volunteering.	Plan lessons to match parents' skills with classroom needs. Improve schedules and training to increase volunteering.
Including students' families as participants in school decisions.	Invite parents to school conferences. Organize parent–teacher meetings to discuss school and district goals.
Involving students' families in learning activities at home.	Communicate the objectives of assignments and give directions for helping with homework activities. Encourage students to go to their parents for homework help.
Coordinating community collaboration.	Promote knowledge of community businesses, agencies, and colleges. Create opportunities for students and families to collaborate in community projects.

be more likely than other students to forgo opportunities to engage in social interactions with peers because their culture places a higher priority on academics (Reglin & Adams, 1990; Schneider & Lee, 1990).

Recent immigrants to the United States from non-English-speaking countries may also show relatively little interactions with peers when English is the only language used in the classroom (Doyle, 1982). For instance, Mr. Caperton, a high school social studies teacher, asked his colleague to observe his class. After the lesson, Mrs. Sevilmis brings to his attention the fact that the international students were not vocal participants. "What do you suggest?" he asks. "If you want students to feel comfortable voicing a variety of perspectives, you can make sure everyone has a chance to participate," she suggests. "For example, when students make group presentations, insist that every member of the team have a speaking part."

Students will also vary in whether and why they tease other students. Teasing can be playful or good-humored when it causes everyone to smile or laugh, including the student who is being teased. In addition, teasing is acceptable in some cultures, such as in the South Pacific and northern Canada, because it is considered a common way to teach children to handle criticism (Rogoff, 2003).

On the other hand, teachers should be concerned about hurtful teasing among students (e.g., ridicule, name-calling, saying or doing annoying things) because it may negatively affect the personal development of the student being teased. Hurtful teasing may stem from the teaser's need for attention, power, or peer acceptance; from imitating what is modeled at home, by friends, or in the media; or from not understanding differences, such as teasing a peer who is culturally or ethnically different or one who has a learning, physical, or speech exceptionality (Freedman, 2002). Although we cannot control what students will say or do (especially in unstructured settings, where teasing is more likely to occur), as teachers, we should promote tolerance of and appreciation for diversity in the classroom in order to nurture students' compassion and respect for others.

REVISITING ISSUES IN EDUCATION

Should teachers involve parents in their children's education?

Points to consider: In general, high parental involvement is associated with higher achievement and with a number of desirable student outcomes, such as regular attendance, self-esteem, good behavior, and positive attitudes toward school and learning (Allen & Migliore, 2005; Anguiano, 2004; Myers-Walls & Frias, 2007). However, many experts contend that these findings should not be taken to conclude that more parent involvement is always and unconditionally better. For instance, even when parents have considerable education, they need explicit guidance regarding how to become effectively involved in their children's education (Epstein 2005; Epstein & Sheldon, 2006). Furthermore, it has been argued that parental involvement may not be beneficial when the parents attempt to impose their views on controversial issues, such as the inclusion of exceptional students, the effectiveness of whole-language instruction, and how to discipline disruptive students (Abbeduto & Symons, 2008). Taken together, these findings suggest that establishing successful partnerships between schools and families should be a priority. Yet, to ensure that parents effectively foster their children's learning and development, careful consideration should be given to the type of involvement and guidance provided to the parents. For example, expert Joan Epstein (2001, 2005; Epstein & Sheldon, 2006) developed six types of involvement that can lead to an integrated school, family, and community partnership. These are summarized in Classroom Tips: Creating School–Family Community Partnerships. When you read Chapter 11, you will learn about additional strategies for creating effective relationships with parents and involving them in their children's education.

SUMMARY

- Personal development involves the growth of enduring personality traits that influence the way individuals interact with their environment and others. Social development is the growth of people's ability to interact and get along with others. Personal and social development is influenced by heredity and interactions with parents, other adults, and peers. Parents support their children's personal development by providing a structured environment that is both responsive and demanding. Peers affect students' personal development by encouraging certain behaviors, attitudes, and values and offering different types of friendships.
- Self-concept is an individual's mental model of his/her competencies and is developed largely through personal experiences. Self-worth is the general self-evaluation about one's ability to deal effectively with the environment. The collective self includes individuals' sense of worth of the groups to which they belong, such as their family, peer group, ethnic group, class, or team. Teachers can strengthen students' collective selves by supporting student clubs and promoting healthy interactions among students from different backgrounds where students need to work together to achieve a common goal.
- According to Erikson's psychosocial theory, personal and social development occurs in stages, with each stage being marked by a psychosocial challenge or crisis. Positive resolution of the crises from birth through the elementary school years results in students who are trusting, autonomous, willing to take initiative, and industrious. Individuals who resolve later-year crises have strong identities and the ability to achieve intimacy, generativity, and integrity. According to Marcia's theory of identity development, identity moratorium and achievement are healthy personal development states whereas identity diffusion and foreclosure are less healthy.
- Piaget identified two types of moral reasoning in children: heteronomous morality, where rules are inflexible and external, and autonomous reality, where rules are flexible and internal. Kohlberg's theory of moral development is based on

individuals' responses to moral dilemmas. He argued that moral development has three main levels: preconventional reasoning, conventional reasoning, and postconventional reasoning, with each level being subdivided into two stages. According to Kohlberg, the force that drives moral development is internalization, the change from externally controlled behavior to internally controlled behavior. Gilligan criticized Kohlberg's moral development theory for more accurately describing male than female development.

- Studies show differences in students' openness to attachment. Some students, especially those with exceptionalities, will often have difficulty building an emotional relationship with teachers and peers. There is also diversity in parent-child attachment. Although many students have high-quality relationships with their caregivers, others may show delays in their personal, emotional, and social development due to parental neglect or abuse. Other areas of diversity include gender and cultural differences in friendship, interpersonal behaviors, self-concept and self-esteem, and identity formation.

KEY TERMS

attachment 118
autonomous morality 138
collective self 129
conventional morality 139
ethic of care 143
heteronomous morality 138
identity achievement 137
identity diffusion 137
identity foreclosure 137
moral internalization 139
moratorium 137
parenting styles 119
postconventional morality 140
preconventional morality 139
psychosocial 131
self-concept 126
self-handicapping 129
self-worth/self-esteem 128
sense of self 126

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is personal, social, and moral development and what are their main influences?
2. How do different parenting styles relate to students' personal and social growth?
3. What are some strategies for creating school–family–community partnerships?
4. What is the difference between self-worth and self-concept?
5. How can teachers promote students' initiative, industry, and identity?
6. How might Erikson's ideas about psychosocial development relate to Gilligan's ideas about moral development?
7. What are the stages of moral development according to Kohlberg?
8. What kind of instructional activities can you use to support each one of the developmental theories that you learned in this chapter?
9. What are the principles of personal, social, and moral development and how would you apply those principles to your classroom?
10. What are some diversity issues in students' personal, social, and moral development?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. How would you use the information presented in Chapter 1 to help you respond to a parent who reacts against the idea of participating in his/her child's homework activities (Chapter 1)?
2. Asha does very well when classroom activities are well structured and predictable but becomes upset and withdrawn when presented with new, unusual activities. Devise a plan to determine whether Asha's behavior is the result of her personality or an emotional/behavioral disorder (Chapter 2).
3. What connections can you make between social development and Piaget's study of perspective taking (Chapter 3)?
4. How would you relate Erikson's developmental stages to an apprenticeship model of learning (Chapter 3)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This High School Classroom Use Development Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

In preparation for Kinsella High School's new service learning initiative, Ms. Shah wants to raise her tenth-graders' awareness of stereotypes. The Hartford Community Project will place sophomores in an after-school literacy program for elementary school children who have been identified as being at risk. The goals of the program are for elementary school students to develop reading fluency and for sophomores to be involved in mentoring youth in their community. The hope is that the exchange will be mutually beneficial. It will connect young children to older role models and raise high school students' awareness of socioeconomic issues and low student achievement in Hartford.

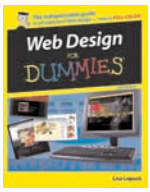
Ms. Shah wants her sophomores to become conscious of stereotypes before assigning them to the mentorship positions. From her own experience, Ms. Shah is aware that a teacher's negative attitudes toward the speech and reading skills of culturally and socially diverse children can affect the teacher's expectations, which in turn can affect students' achievement. Ms. Shah wants the sophomore mentors to hold high expectations for their mentees' reading skills. She believes this introductory lesson will be a nonthreatening way to demonstrate that *all* people hold stereotypes, thereby opening up the topic for an honest discussion in her classroom. Ms. Shah begins the lesson by showing this descriptive table on an overhead:

Grandma Mary, 68	Uncle Jim, 38	Sister Lily, 28	Aunt Nina, 36	Nephew Jeremiah, 13	Stepfather Wong, 46
South Carolina	Las Vegas	Massachusetts	Los Angeles	Detroit	San Francisco
Retired teacher	Harley retailer	Librarian	Actress	Middle school student	Computer software engineer

Next, she gives each of her students a sheet of paper with images of Christmas gifts. "Your assignment is to decide which Christmas gift you would give to each of the people I have described and explain your reasoning."



To:
Because:



To:
Because:



To:
Because:



To:
Because:



To:
Because:



To:
Because:

Students write their choices and explain their reasons. "This is a no-brainer," Mariah tells Cheyenne. Ms. Shah gives them three minutes: "Now that you've filled out your cards, I am going to give you additional information." Ms. Shah displays more detailed descriptions on the overhead:

Grandma Mary, 68	Uncle Jim, 38	Sister Lily, 28	Aunt Nina, 36	Nephew Jeremiah, 13	Stepfather Wong, 46
South Carolina	Las Vegas	Massachusetts	Los Angeles	Detroit	San Francisco
Retired teacher	Harley retailer	Librarian	Actress	Middle school student	Computer software engineer
Has joined a community basketball team	Collects antique clocks	Bought a motorcycle and is taking a road trip	Is starting a website design company	Passion is astronomy	Recently invested in fair trade coffee

"Does this new information change any of your gift decisions? If so, take a minute to make any changes, and then we'll discuss our answers as a class."

After two minutes, Ms. Shah continues. "Turn to the person next to you and tell them your original choice of gifts for Grandma Mary; if your choice changed, explain your reasoning." Students exchange ideas. "Vernon, share your thinking process with us."

"Well," Vernon responds, "at first I assumed Grandma would get the antique clock, because it just fits with an older woman's hobby. I can just imagine a room in her big southern house filled with fancy clocks. Then when I got the new information about her joining the basketball team, I immediately gave her the basketball. It just surprised me. It didn't even cross my mind that she might play basketball."

As the class continues to talk about their thinking processes, a common theme emerges. "I can see how we relied on stereotypes to make our original gift choices, and then when you gave us the new information it was surprising, because it defied our stereotypes," Cheyenne tells the class.

"I think that is an astute reflection," Ms. Shah responds. "You're right. We all hold stereotypes about what people are like. As you found in this exercise, all of us make assumptions about people based on their age, gender, ethnicity, religion, place they live, and profession. In this next exercise, I want to take this discussion one step further. I want you to start to identify and think about stereotypes that are part of our popular culture."

Ms. Shah has taped nine large pieces of butcher paper around the classroom. Each piece of paper has a different heading:

Muslim-Americans	Athletes	Girls	Native Americans	Boys	Immigrants	Gays and Lesbians	African-Americans	Teenagers

Students hand out markers as Ms. Shah explains the objective. "We want to brainstorm common stereotypes about each of these groups of people. You will have one minute at each paper to write down all the words you can think of. Afterwards, we will write a journal entry about what has been written. On your mark, get set, find your first paper, and start to write."

When the students have finished rotating through the topics, Ms. Shah opens the discussion. "Are these stereotypes true? Why or why not?"

"Of course they're not true," Tim says. "Under the 'girls' heading it says 'they're not good at math' I know that's not true, because my sister is a math wiz."

"It's tricky," Nadia adds, "some of them might be true. Like, under the heading 'immigrants,' it says 'they work really hard.' When my family came here from Mexico, my dad worked late, late hours just to pay the rent, so that one is true for me."

Ms. Shah jumps in, "I think you're right Nadia, it is tricky. I think what you have to ask is, would the statement 'they work hard,' be true of *all* immigrants."

"No, probably not," Nadia responds.

Ms. Shah continues, "This is exactly the problem with stereotypes. They're generalizations about whole groups of people. That is why we have to be very careful about the assumptions we make. Like we learned in the Christmas gift exercise, we shouldn't base decisions on stereotypes we may have; we should always dig deeper and find out more information."

Next, she asks the class a follow-up question: "What is the danger of stereotypes?"

"Well, we've been learning in our history class how easily people can believe stereotypes," Tanya shares. "It's an extreme example, but the rise of Nazism is based on stereotypes. The Nazis justified brutality with the idea that Jewish people were inferior to the Aryan race," Tanya shares.

Ms. Shah responds, "Yes, the Holocaust is a tragic example of what can happen when people blindly believe in stereotypes. Tomorrow, we will talk more about the harmful affects of stereotypes and brainstorm strategies for thinking beyond stereotypes." Ms. Shah closes the lesson by posing two questions and asking students to write responses for ten minutes: "Do you fit into any of the categories that were listed? How do stereotypes affect your

life?" When they finish, she tells them that their journal responses will be the discussion starter for tomorrow's lesson.

Over the course of the semester, Ms. Shah is pleased to observe how her sophomores take on their mentorship responsibilities. Nadia tells her, "I never realized how much reading practice kids need. The second-grader I'm mentoring knows how to sound out words. I think she's really starting to understand things."

"That's great, Nadia. How do you think the Hartford Community Project has affected your life?" Ms. Shah asks.

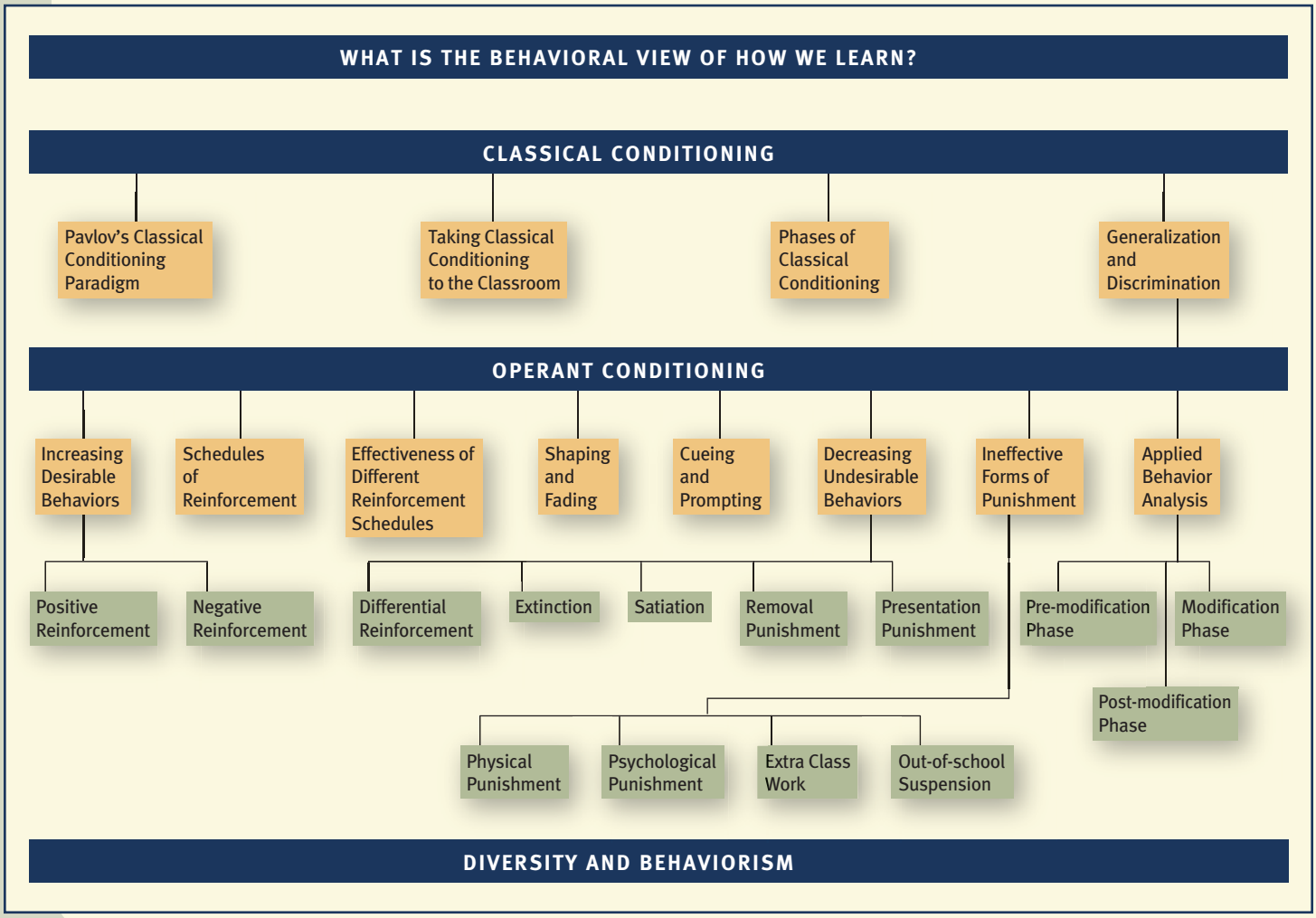
"Well, when I moved here from Mexico in elementary school, it took me a long time to make friends and learn how to read and write in English. Most kids in my classroom thought I was weird and made fun of me every time I tried to talk or read in English. Some even called me burrito-girl, although our family never ate burritos until we came to the United States. The project helped me understand how stereotyping can hurt other people's feelings. I want to help kids so they don't have to go through the same things that I did. Also, it's a lot of fun! Can we do the project next year, too?

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What are some strategies that the teacher used to promote students' personal development?
2. Which of the development principles were applied during the lesson and how?
3. Which of the development theories were most prominent in the lesson?
4. How do you think that the teacher's messages will affect students' self-concept or self-worth?
5. Did the teacher demonstrate an awareness of students' diversity?
6. Evaluate the overall effectiveness of the lesson according to the development theories that you learned by including both strengths and weaknesses.

5 Behavioral Views of Learning



Imagine You Are the Teacher

IT IS THE FIRST DAY of classes and Brian is standing at the door of his classroom, patiently waiting to meet his new teacher and peers. As he looks inside, he marvels at the colorful posters illustrating dinosaurs and the artwork decorating the classroom walls. All of a sudden, he is startled by a screaming voice that shouts "Quiet!!!!!" Brian shakes, takes a step back, and is almost about to cry when his new teacher shows up at the door to greet him. Unfortunately, the teacher's screaming continues as school days go by and now Brian feels scared about his teacher, even when she speaks softly to him.

- **What are Brian's reactions revealing?**
- **How would you explain Brian's feelings towards his teacher?**
- **What could you do to revert Brian's negative feelings?**

Think about how you would respond to these questions as you read through the chapter.

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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define learning according to behaviorism.
2. Describe how classical conditioning works.
3. Distinguish between classic and operant theories in behaviorism.
4. Describe different reinforcement and punishment strategies.
5. Apply behavior analysis and behavioral principles to the classroom.
6. Disouss issues of diversity in classroom behavior.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Why are some students anxious in class?
2. Should teachers provide rewards in order for students to learn and behave in class?
3. Are scheduled quizzes or pop-quizzes more effective to promote studying?
4. Do students learn more when repeatedly praised?
5. Is punishment an effective method to decrease undesirable behaviors?
6. Discuss issues of diversity in classroom behavior?

WHAT IS THE BEHAVIORAL VIEW OF HOW WE LEARN?

Learning

Any relatively permanent change in our thoughts, feelings, or behavior that results from experience.

According to behaviorists, **learning** is any relatively permanent change in our thoughts, feelings, or behavior that results from experience. Learning, therefore, should be distinguished both from *maturation*, which is the result of our genetic programming, and from the short-term changes that result from experience, such as looking up a phone number in the directory and remembering it for a few seconds until we dial it. Learning can be conscious or unconscious (Destrebecqz & Peigneux, 2005), although as teachers we are mostly concerned with students' deliberate and goal-oriented learning in the classroom.

There are several prominent views about how we learn. These include behavioral, cognitive, sociocognitive, and constructivist views of learning. This chapter introduces you to the first view of learning, **behaviorism**, which originated with the work of the American psychologist John B. Watson. In 1913, Watson published an article also known as "The Behaviorist Manifesto," which argued that psychology should be concerned with the study of human behavior rather than with the study of the human mind; therefore, the name behaviorism.

Behaviorism

A perspective that psychology should be concerned with the study of human behavior rather than with the study of the human mind.

According to behaviorism, learning is a relatively enduring change in observable behavior that results from experience. Notice the difference between this definition and the one offered at the beginning of this section. Because changes in people's mental states cannot be observed objectively, behaviorists claimed that the only scientific evidence for learning was the observable changes in behavior. Consequently, they did not consider changes in people's thoughts or beliefs in their definition of learning.

The focus on behavior and the disregard of mental processes led behaviorists to use animals other than humans in their research. Behaviorists assumed that the learning principles derived from observing changes in animal behaviors would apply to humans, even when humans were not the subjects of their experiments. This method and assumption, however, have been strongly criticized. We discuss the limitations of

behaviorist theories in more detail when we introduce cognitive theories of learning in the following chapter.

Once you understand how behaviorist principles work, you can apply them effectively in your classroom—and you'll find many examples in this chapter on how to use behavioral principles in your classroom. Because the focus of behavioral views of learning is on producing desirable behaviors or reducing undesirable behaviors, behavioral principles are most effective in classroom management (Kazden, 2001; Martin & Pear, 2002). The careful use of behavioral learning techniques can help teachers address students' misbehavior and social skill deficits (Bergan & Caldwell, 1995).

Behavioral principles can be applied whenever a teacher is interested in promoting appropriate behaviors (i.e., taking turns, doing homework), skills (i.e., social, motor), or self-regulation (i.e., self-monitoring, self-evaluating), and discouraging inappropriate behaviors (i.e., cheating, lying, fighting).

Let's examine the first theory of behaviorism, known as classical conditioning. This theory looks at the automatic responses we have. For example, if someone pinches your arm, you will probably pull your arm away. How does this type of conditioning apply to the classroom? Keep reading and you'll find out!

Later in the chapter we look at the behaviorist view of learning called operant conditioning. Operant conditioning means that we can set something up in the environment that a person will respond to. A teacher may give a student a gold star for working quietly at her desk. In this case, the student is likely to have a positive response and continue with her good behavior. Now, let's begin with the early behaviorist theory, classical conditioning.

CLASSICAL CONDITIONING

Early behaviorists argued that learning occurs through temporal contiguity, the simultaneous presentation of two events (Guthrie, 1959). A child may learn that when the door bell rings, someone will visit his home. Because the ring of the bell and the presence of the visitor happen close in time, the child learns by association, another term used to describe contiguity. The first behaviorist theory, **classical conditioning**, is a contiguity theory of learning. At the core of the behaviorist perspective is the concept of learning through association. Classical conditioning explains learning as the pairing of automatic responses to new stimuli. Let's see how it works.

Classical Conditioning

A behaviorist learning theory in which individuals learn by association, pairing automatic responses to new stimuli.

Some stimuli, such as a smell, sound, or touch, produce automatic physiological and/or emotional responses. For example, blowing into a person's eye will produce the reflex to close the eye, and the sound of an explosion will likely produce a feeling of fear and a heart rush. In classical conditioning terms, the stimulus is called **unconditioned stimulus** and the automatic response is called **unconditioned response**. The terms are called unconditioned because our organisms are programmed to react in that way automatically, under any condition. At this point, there is no learning yet. It was the Russian psychologist Ivan Pavlov (1955) who discovered how automatic reactions may become associated with nonautomatic responses, leading to the phenomenon of classical conditioning.

Unconditioned Stimulus

A stimulus that produces automatic physiological and/or emotional responses.

Unconditioned Response

The automatic response to an unconditioned stimulus.

Pavlov was conducting research on the physiology of digestion. His work required collecting dogs' saliva samples in a container and measuring the amount of salivation produced when the dogs smelled food. In his research, he had the assistance of a lab technician who was in charge of bringing the food to the dogs. As Pavlov worked with the dogs for several days, he observed a very interesting effect. Just at the sight of the lab technician or even upon the sound of his footsteps, the dogs would start salivating. Pavlov felt that some type of learning had to have occurred if the dogs were salivating before the smell or presence of the food, and developed a simple paradigm for studying classical conditioning, shown in Figure 5.1.

Pavlov's Classical Conditioning Paradigm

The four basic elements of Pavlov's paradigm can be found in many classroom situations and consist of the following elements.

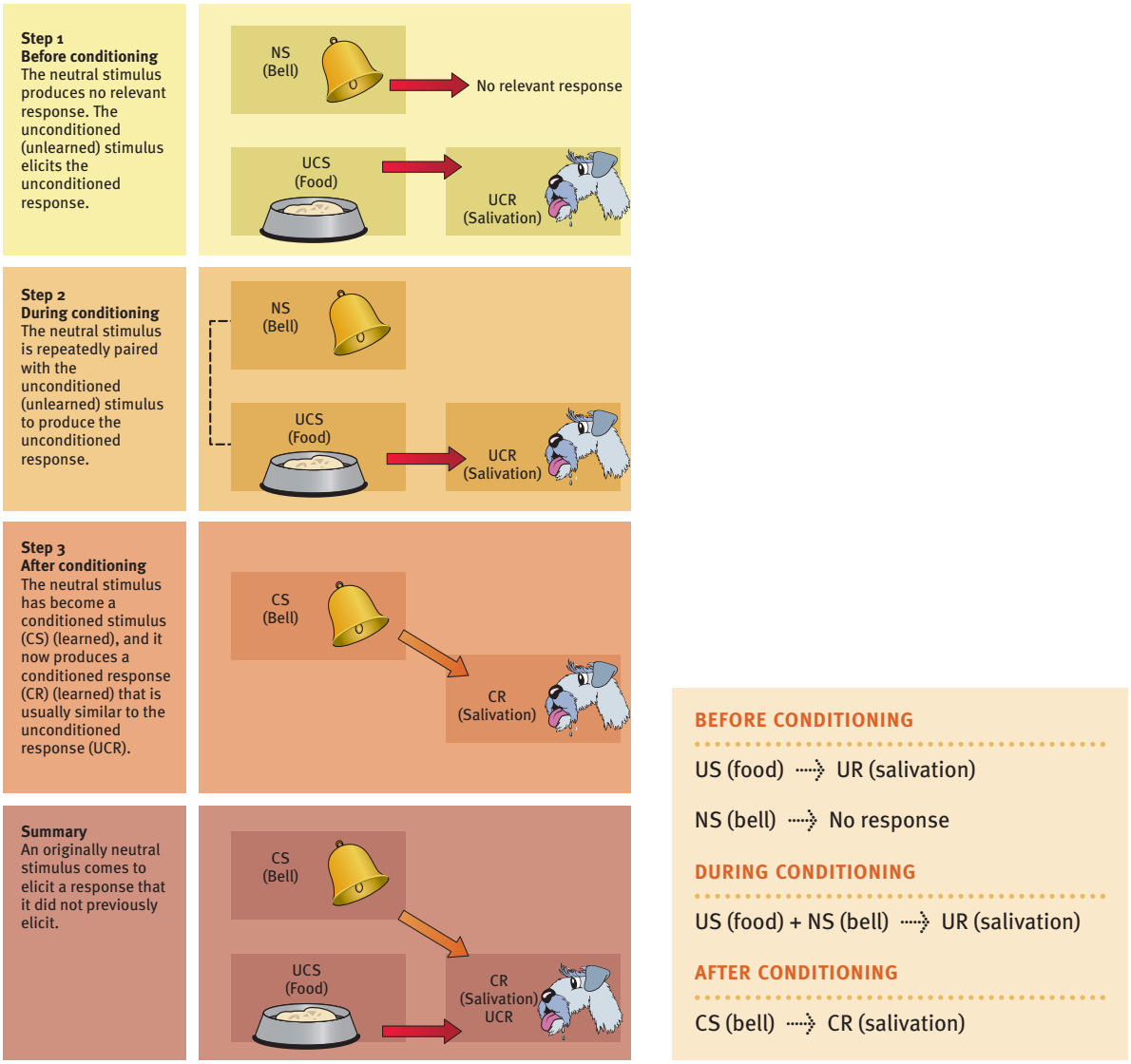


FIGURE 5.1 **Pavlov's paradigm for studying classical conditioning.**
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First, there needs to be a stimulus that elicits a physiological and/or emotional response. This is the unconditioned stimulus. Recall that no conditioning has taken place yet, therefore the name—unconditioned stimulus (US). The US in Pavlov's paradigm is the dog's food.

Second, there should be an automatic physiological and/or emotional response. This is the unconditioned response (UR). The UR in Pavlov's paradigm is the dog's salivation. It is unconditioned because it is a natural response of the organism.

Third, there needs to be a second stimulus, different from the first one that does not have a natural automatic response associated to it. The third element is called the **neutral stimulus (NS)**. In Pavlov's original discovery of the classical conditioning phenomenon, the NS was the lab technician. However, as he studied classical conditioning systematically, he used a bell. After pairing the US and NS repeatedly (presenting the food and the bell simultaneously several times), the US and NS become associated.

Neutral Stimulus

A stimulus that does not have a natural automatic response associated to it.

This association will eventually be so strong that even when the US is absent (i.e., the food) the presence of the NS (i.e., the bell) will elicit the automatic response (i.e., salivation). At this point, the NS is said to have become the **conditioned stimulus (CS)** because it is the stimulus that elicits the response after classical conditioning takes place. Additionally, because the response is the result of the association of US and NS

Conditioned Stimulus

A stimulus that elicits the response after classical conditioning takes place.

rather than from a natural response of the organism, the response is now called **conditioned response (CR)**. As you see, the temporal contiguity of US and NS is essential for classical conditioning to happen.

Conditioned Response

A response that has been learned through classical conditioning.

Taking Classical Conditioning to the Classroom

Let's look at an example of how classical conditioning may happen in the classroom. Using what you have learned from Pavlov's paradigm, you can now provide a good answer to the questions raised in the *Imagine You Are the Teacher* scenario presented in the beginning of this chapter. Before you read the next paragraph, review the short vignette and take a few minutes to interpret the example using the classical conditioning terms US, UR, NS, CS, and CR.

Brian's reactions are revealing a case of classical conditioning. In this scenario, Brian displayed an automatic, natural reaction to a human scream. Therefore, the teacher's scream acts as an unconditioned stimulus and Brian's withdrawal and fear are the unconditioned responses. Brian's response would have probably been the same, regardless of who had screamed. In fact, he did not even know who his teacher was at that point. Had he seen his teacher for the first time under different circumstances, he would have probably reacted very differently. Therefore, his teacher was originally a neutral stimulus.

As the school days go by, Brian witnesses many other occasions where his teacher screams unexpectedly, which makes him feel very insecure and fearful. Eventually, Brian becomes classically conditioned and the mere presence of the teacher, even when she is not screaming, produces the same emotional effects. At this point, the teacher is the conditioned stimulus and Brian's emotional reactions toward her the conditioned response. Figure 5.2 summarizes this classroom scenario using the same model that we used to explain Pavlov's paradigm.

This example illustrates why people sometimes have strong emotional reactions to what might seem to be fairly neutral stimuli. It is not uncommon to find children who have developed anxiety to test taking after having been criticized strongly about past failures (Covington & Omelich, 1987). Originally, the criticism is the unconditioned stimulus that elicits anxiety, the unconditioned response. With time, even when students know that they are well prepared, the mere presence of the test (the conditioned stimulus) may elicit anxiety.

Test anxiety and teacher fear are examples of associating negative emotions to an originally neutral stimulus. When stimuli produce negative emotional responses, they are called **aversive stimuli**. However, classical conditioning can also operate on positive emotions. When a teacher is associated with something that makes us happy, relaxed, or secure, she will also elicit the same positive feelings. Therefore, an implication for the teaching practice is that teachers should create a classroom environment in which the stimuli (including teacher behaviors) are likely to elicit positive emotional responses.

Aversive Stimuli

Stimuli that produce negative emotional responses.

Another implication for the reflective teacher is the need to be aware of classical conditioning in the classroom (Tauber, 1990). Teachers who observe consistent negative emotional reactions from their students need to examine the circumstances that may be triggering such reactions. Sometimes there might be a history of classical conditioning in the students' past that needs to be unveiled. The good news is that even when we suspect that a negative association has been made through classical conditioning, it can be reverted. We discuss possible phases of classical conditioning next.

Get Connected!

ANIMATION ASSIGNMENT. . . Behavioral Views of Learning

Go to your WileyPlus course and watch the animation on classical conditioning. Be prepared to explain how Pavlov's experiment with the dogs relates to classical conditioning. How could classical conditioning influence your teaching methods? How could it affect how students learn? Be prepared to discuss this in your class.



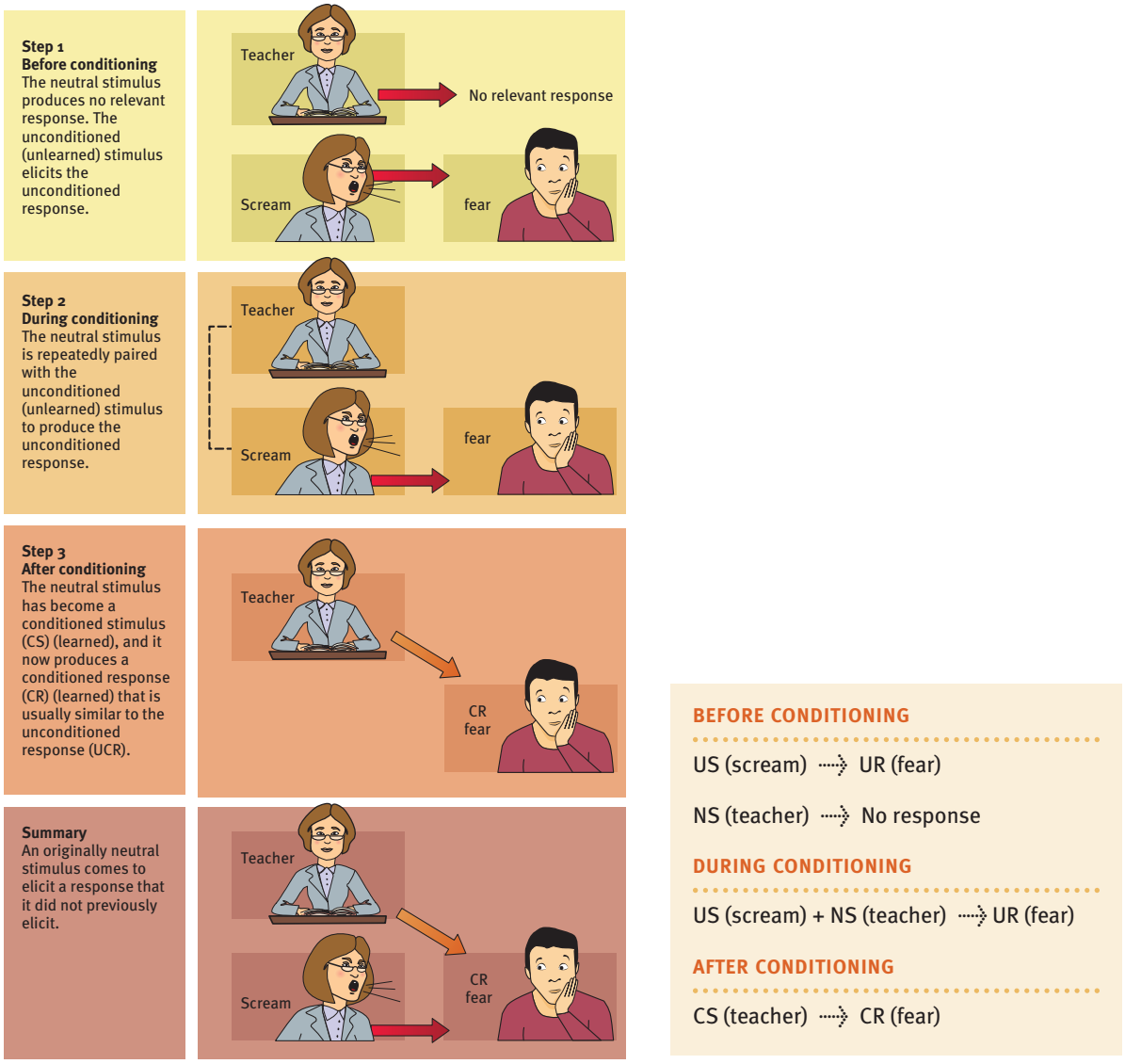


FIGURE 5.2 **Applying Pavlov's paradigm model to classical conditioning in the classroom.**
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Phases of Classical Conditioning

The process of classical conditioning corresponds to the *acquisition phase*, where individuals learn to produce a physiological or emotional response upon the presence of the conditioned stimulus. Imagine now that the conditioned stimulus continues to be presented without the simultaneous presence of the unconditioned stimulus for a period of time. In the case of Pavlov's paradigm, imagine that the dog is presented with the bell for several days, but that the food is never presented when the bell rings. What do you predict would happen? As you probably guessed, the conditioned response (i.e., salivation) will start to diminish and will eventually disappear with time. This phase of classical conditioning is called *extinction phase*.

Remember that negative emotions that are associated by classical conditioning can be changed. Now you know how to change them. If Brian's teacher became aware of the cause of the negative emotions that she is eliciting in her student (i.e., the association of her screaming with her person), she could revert Brian's conditioning. All she needs to do is make sure that she interacts many times with Brian and his classmates with a relaxed and caring attitude. Pretty soon, Brian will start feeling more and more comfortable with his teacher and, eventually, will start making a new positive association between her and his feelings of warmth and security.

However, there is a caveat to this process. Sometimes, when an individual gets a chance to rest after the extinction phase, the presentation of the conditioned stimulus may elicit a strong conditioned response again. This phenomenon is called *spontaneous recovery*. Imagine the following scenario. Sylvia became classically conditioned to feel anxiety when taking a test. Her teacher has been helping her extinguish this learned anxiety by presenting many opportunities to take tests in nonstressful conditions (see *Classroom Tips: Reducing Test Anxiety*). Now imagine that after a whole semester of working at diminishing test anxiety, Sylvia starts feeling at ease when taking a test and, not surprisingly, her performance improves. It is possible, however, that after the summer break when she comes back to school and needs to take her first test she experiences a high level of anxiety again. This would be a case of spontaneous recovery.

When you read Chapter 9, you will learn that test taking is one of the most common sources of academic anxiety, as illustrated by Figure 5.3. To help reduce test anxiety, teachers can use some of the methods listed in *Classroom Tips: Reducing Test Anxiety*.

CLASSROOM TIPS

Reducing Test Anxiety

- Let students know about the conditions and schedule of testing ahead of time.
- Allow students to practice before tests using the same blue books or grading sheets used in the actual tests.
- Allow students to get credit from taking, grading, and correcting practice tests.
- Give students positive and informative feedback.
- Encourage students to do their best during the test.
- Avoid giving negative verbal and nonverbal messages about test taking.
- Help students build the knowledge and skills necessary to develop a sense of competency.

Other methods that can be used to reduce the anxiety originated by many different causes are relaxation techniques (Sapp, 1996) and systematic desensitization (Powell, Symbaluk, & MacDonald, 2005). Systematic desensitization consists of having an anxious individual associate a deep relaxation state with visual images of increasing anxiety-eliciting situations. Imagine a middle-school student who is extremely anxious about reading in front of the class. Applying systematic desensitization to reduce this anxiety would require that the student repeatedly imagines reading to herself on a very relaxing place, such as her home garden. Then, the student may imagine reading to her best friend in the garden.



Photo by Stephen Dagadakis, UW, copyright © Hunter Hoffman UW.

Did you know that desensitization in virtual reality environments can help people overcome their phobia against spiders?

Eventually, the student can imagine being in her garden as she finally reads in front of the class. When desensitization occurs, anxiety feelings become replaced by relaxation feelings (McNeil, 2000). In the mental health profession, this method has been very successful at getting people to overcome their fears or phobias.

Generalization and Discrimination

As Pavlov was studying the classical conditioning process, he realized that sometimes the dogs would salivate when sounds other than the bell were presented. The more bell-like the sound, the more likely the dog was to salivate. This classical conditioning

Teacher Journal

Savanah is a student in my 9th grade Algebra class. Despite the fact that Savanah participates in class and completed all of her assignments thoughtfully during the first two months of school, she has performed very badly on tests. On test days Savanah is visibly distressed. When the class is testing she seems distracted and rarely tries more than a few problems. When I initially approached Savanah to ask her about how she thought her first test had gone she was reluctant to talk to me about it. "I just forgot how to do that stuff," she told me.

I have worked hard to establish a relationship with Savanah during the past few months. I frequently praise her hard work in class and mastery of the material. I have also gotten to know Savanah's interests outside of class.

When she stopped by for homework help this week Savanah confided that she "gets freaked out about tests." "I just blank," she explained. I assured her that I understood her concern and that I would like to help her feel prepared and confident before a test. At the end of our conversation, Savanah agreed to create an action plan with me that outlined some concrete steps to help her address her test anxiety.

Action Plan

At this conference Ms. Kay and Savanah are committed to working together on taking tests confidently.

What's happening now?

I get really nervous during tests. I feel like I can't remember anything.

What would we like to happen?

Not get as nervous and do the problems like I do them in class.

What steps are we going to do together to make it happen?

1. Savanah will meet with Ms. Kay at lunch the week before a test to do several practice tests and then review her answers.

2. Ms. Kay will let Savanah take the test at the desk in the back of the room away from other students.

3. Savanah will make a review sheet as she studies for the test. She will use her review sheet to do the review homework before the test.

4. Savanah can ask for additional time on a test.

Signatures:

Savanah Thompson _____ Ms. Kay

FIGURE 5.3 **Reflective teachers carefully think about how to create classrooms that help anxious students succeed.**

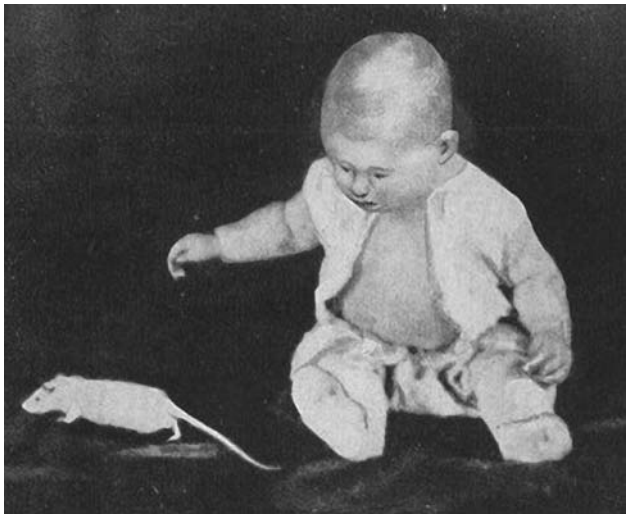
Generalization

The tendency for a new stimulus that is similar to the original stimulus to produce a similar response.

phenomenon is known as **generalization,** the tendency for a new stimulus that is similar to the original stimulus to produce a similar response. Students often display generalization, especially when they are younger.

A famous example of generalization is the classic study of Little Albert, which was conducted by John B. Watson and Rosalie Rayner (Watson & Rayner, 1920). In this study, a toddler (Little Albert) is presented with the following classical conditioning paradigm. First, a white lab rat was shown to the toddler. Little Albert had no emotional response to the rat at this time and was actually quite interested in petting and playing with the small animal. Then, for a set of sessions, the presence of the rat was paired with a very loud noise. Upon the presence of the noise, Little Albert would typically cry and display symptoms of fear.

What is the relation between the behaviorist idea of generalization and Piaget's idea of assimilation?



Watson, John B. 1928. Psychological Care of Infant and Child. New York: W. W. Norton.

Eventually, the mere presence of the rat in the lab elicited Little Albert's fear. Interestingly, the toddler also began fearing other stimuli such as a hamster, a white bunny toy, and even a white fur coat. This study gave evidence for the generalization phenomenon. Clearly, Little Albert's generalization is probably the result of his lack of experience with the similar stimuli.

Recall from Chapter 3 that Piaget argued that children slowly develop schemas for understanding the world through the processes of assimilation and accommodation. Little

Albert may have had the same schema for all the stimuli or may have assimilated the hamster, white bunny toy, and white fur coat to his rat schema.

On the other hand, **discrimination** happens when individuals respond to certain stimuli but not to others (Murphy, Baker, & Fouguet, 2001). If the same experiment had been conducted when Little Albert was older, his fear toward the rat would be much less likely to have generalized to the other presented stimuli. A classroom example of discrimination is the case of a student who has learned to become anxious during a math test but is able to remain relaxed during an English or science test.

Discrimination

The ability to respond to certain stimuli but not to other, similar stimuli.

OPERANT CONDITIONING

Classical conditioning helps explain how people learn to produce involuntary physiological and emotional reactions to certain stimuli. A limitation of classical conditioning, however, is that humans and other animals do not always need a stimulus to produce a response but rather may initiate behaviors on their own or "operate" on the environment to change it in a certain way. These deliberate actions are called *operants,* and the study of how animals learn to operate on their environments led to the second behaviorist view of learning—**operant conditioning**.

Edward Thorndike (1913) and B. F. Skinner (1953) are two psychologists who tested Watson's behaviorist theory in the laboratory and played a major role in the development of operant conditioning theory. Thorndike's research paradigm consisted of placing cats in puzzle boxes and observing their behavior as they tried to escape the box to reach food that was placed outside. To escape, cats had to operate on the box by pulling out a bolt, pressing on a lever, or opening a latch. Cats first would perform a number of random actions such as clawing or thrusting their paws through the box openings.

Operant Conditioning

The study of how animals learn to operate on their environments.

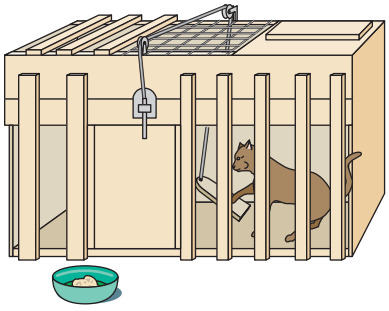
Eventually, the cat would perform the right behavior accidentally and the box door would open. As the cat was returned to the box, it repeated a number of random behaviors until the right behavior was performed. Thorndike observed that on subsequent trials, cats needed to make fewer and fewer random movements before hitting the right behavior. At some point in time, cats had learned to perform the right behavior as soon as they were returned to the experimental box.

Thorndike's research led him to propose the **law of effect**, which states that behaviors that are followed by a positive outcome are strengthened and behaviors that are followed by negative outcomes are weakened. According to Thorndike, successful stimulus-response (S-R) associations become strengthened over time due to the consequences of the organism's actions. When consequences are rewarding (i.e., opening the box and reaching the food in Thorndike's paradigm), the likelihood that the organism will repeat the behavior in the future increases. Conversely, when consequences are negative (i.e., remaining captive inside the box) the likelihood that the organism will repeat the behavior in the future decreases. The main variable for operant conditioning, therefore, is reward or punishment.

Law of Effect

Behaviors that are followed by a positive outcome are strengthened and behaviors that are followed by negative outcomes are weakened.

Skinner (1978; 1968; 1953) expanded on Thorndike's ideas by exploring the type of learning that occurs when voluntary behaviors are controlled by the manipulation of consequences. So, he used the following research paradigm. He presented a hungry rat in a box (called a Skinner box) which contained a bar or lever and a small tray. Similar to Thorndike's paradigm, Skinner placed food outside of the box. A supply of food pellets could be dropped into the tray upon pressing the bar under certain conditions. As the rat presses the lever, it is rewarded with a food pellet. Due to the law of effect, the rat learns to press the lever more frequently after being rewarded. In some cases, Skinner supplied food pellets only under certain conditions (i.e., the rat would get a pellet when the bar was pushed during the sound of a tone). Rats quickly learned how to discriminate between different conditions, as they would diminish the rate of pressing the lever when the tone was not sounded.



Can you explain how a cat might learn to escape a puzzle box using Thorndike's law of effect?

TABLE 5.1

Differences between classical conditioning and operant conditioning.

CLASSICAL CONDITIONING	OPERANT CONDITIONING
The organism's response is involuntary (i.e., automatic physiological or emotional reactions).	The organism's response is voluntary.
Behavior follows stimuli (i.e., fear followed the presentation of the white rate for Little Albert).	Behavior precedes stimuli (i.e., rats press on the lever expecting to be rewarded).
Learning is the process of associating neutral stimuli with unconditioned stimuli (i.e., the white rat was associated with the loud sound in Little Albert's experiment).	Learning is the process of changing one's behavior as a result of the consequences of such behavior.

Rats would also show generalization: when two different but similar tones were sounded, the rat would be equally likely to press the lever. Finally, rats' behavior would become extinguished after pressing on the lever and finding that food pellets were not dispensed any longer.

Skinner argued that behavior is controlled by its consequences and therefore operant conditioning is learning in which behavior changes in frequency or duration as the result of a consequence. You may start noticing some differences between classical and operant conditioning (Table 5.1).

Increasing Desirable Behaviors

Skinner and other operant learning theorists believed that teachers could use contingent reinforcement to change any behavior that they desired in the classroom. According to Skinner, the teacher is a behavioral engineer, who knows about the different types, levels, and schedules of reinforcement in the classroom. A *reinforcer* is a consequence that increases the likelihood of a behavior recurring, and **reinforcement** is the process of applying reinforcers with the goal of increasing that behavior. When a student raises her hand to answer a teacher's question and the teacher acknowledges the student, listens carefully to the answer, and praises the student for her participation, the student is being reinforced. She will be more likely to raise her hand in class in the future.

Reinforcement

The process of applying reinforcers with the goal of increasing that behavior.

A caveat to this general rule is that too much reinforcement may cause an opposite effect and decrease the desirable behavior. This is a case of **satiation**. A teacher who gives too much praise as a reinforcer may inadvertently decrease the likelihood that students will display the target behaviors.

Satiation

When too much reinforcement of a desirable behavior decreases the occurrence of the desirable behavior.

Psychologists distinguish between primary and secondary reinforcers. **Primary reinforcers** provide immediate satisfaction or enjoyment and are directly tied to our most basic needs (i.e., food, water, shelter). **Secondary reinforcers** do not derive their reinforcing power from the satisfaction of biological needs but rather from their association with primary reinforcers. Money is a typical secondary reinforcer because you can buy anything you need (i.e., food, water, shelter) with it. In addition, reinforcement can be classified into two categories: positive and negative.

Primary Reinforcers

Reinforcers that provide immediate satisfaction or enjoyment and which are directly tied to our most basic needs.

Secondary Reinforcers

Reinforcers that derive their reinforcing power from their association with primary reinforcers.

Positive Reinforcement. Positive reinforcement occurs when a stimulus is presented after a behavior and the behavior increases as a result. Therefore, positive reinforcement requires the following four conditions:

1. A desirable behavior is displayed.
2. The reinforcer is temporally contiguous to the behavior.
3. The reinforcer is contingent on the behavior.
4. The reinforcer is a desirable consequence.

In the classroom this means that:

(1) Students need to make an overt response for a teacher to consider reinforcing such response. If students would not do anything, there is nothing to reinforce;

(2) Similar to the temporal contiguity requirement for classical conditioning, the reinforcer needs to be presented immediately after the displayed behavior to increase the likelihood that association between them will occur. Nevertheless, as students grow older, they are able to delay gratification, the act of foregoing smaller immediate reinforcers for larger reinforcers that are expected in the longer term (Green, Fry, & Myerson, 1994; Rotenberg & Mayer, 1990);

(3) The reinforcer should occur *only* when the desired response occurred. If the teacher smiles at students who are well behaved but also smiles when students display chronic misbehaving, the teacher's smile will not become a reinforcer for good behavior;

(4) the right reinforcer for a student is one that is personally meaningful to her or him. Despite the teacher's intention, a student may not respond to a positive reinforcer because he/she may not find that the incentive is important or interesting.

Token Economies. **Token economies** are an example of positive reinforcement in the classroom. A token is something that lacks inherent value but can be used in exchange of things that have inherent value. In the classroom, a teacher that uses a token economy will distribute chips, check marks, gold stars, etc. when students display desirable behaviors (Alberto & Troutman, 2006; Kazdin, 2001). Students can accumulate tokens and eventually cash them in at a later date for a reinforcer. For instance, tokens can be used to buy time working at the computer, reading a favorite book, or playing academic games (Higgins, Williams, & McLaughlin, 2001).

Token Economies

Economies that use tokens, something that lacks inherent value but can be used in exchange of things that have inherent value.

Contingency Contracting

A method that consists of making a written or verbal contract between the teacher and a student, where the student agrees to behave in a mutually acceptable way and the teacher agrees to provide a corresponding, mutually acceptable incentive.

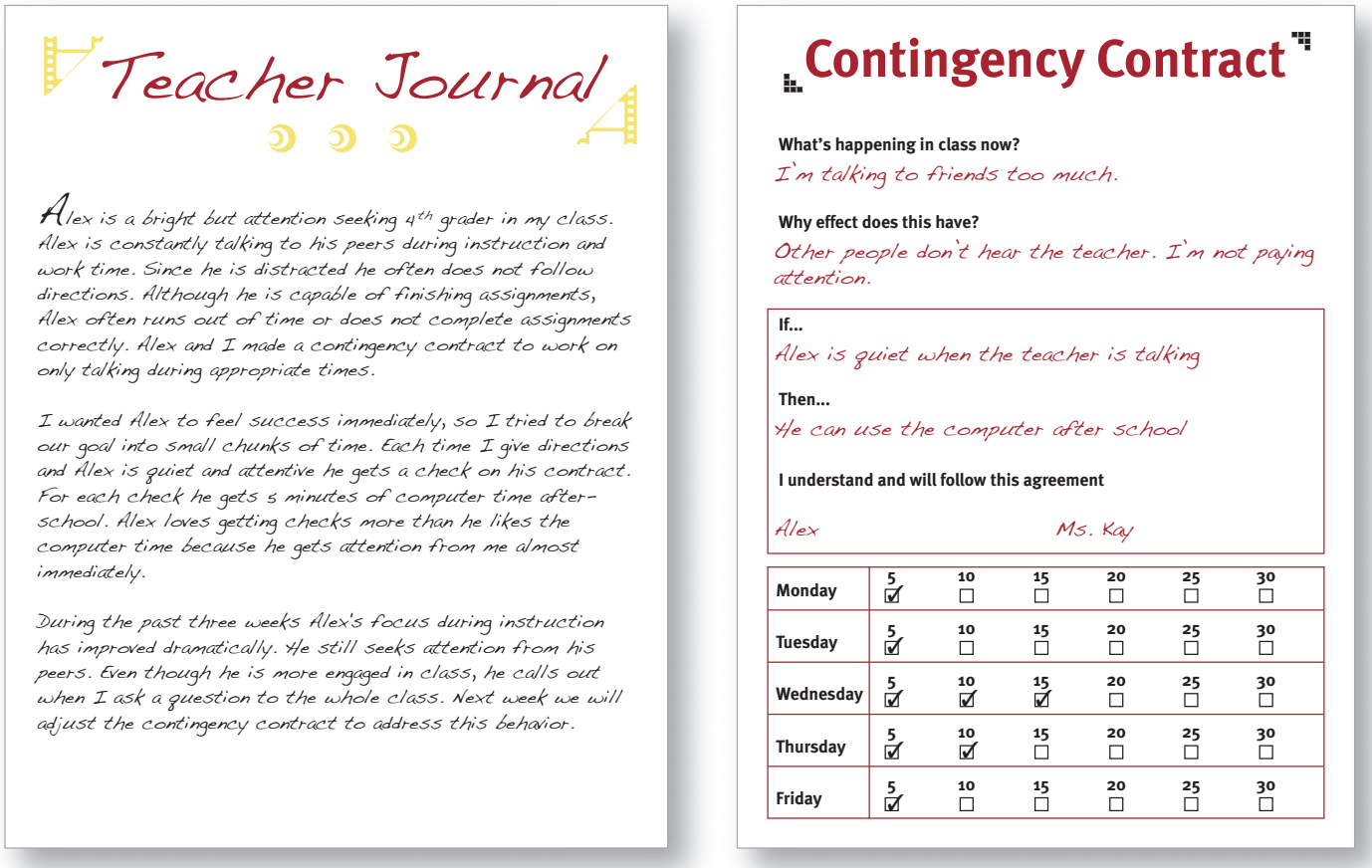
Token economies are motivated by the limitations of other more commonly used positive reinforcers. Some reinforcers such as candy or cookies may lose their value quickly when supplied regularly, and it is not practical to award time to engage in a rewarding activity every time students display a desirable behavior. On the other hand, tokens can always be given immediately after the target behavior and be redeemed for highly rewarding reinforcers later. Research shows that token economies are very effective in improving academic performance in a variety of subject domains (Higgins et al., 2001; Kelhe, Bray, Theodore, Jenson, & Clark, 2000; Naughton & McLaughlin, 1995). Tokens have been used to reward individual students, groups of students, classrooms, and even entire schools (Kelhe et al., 2000). Token economies are also very efficient in reducing disruptive classroom behaviors and being off-task. In these cases, students are given tokens when they are well behaved and engaged in class activities.

What are some conditions that token economies should meet to effectively reinforce desirable behaviors in the classroom?



Mary Kate Denny/PhotoEdit.

Contingency Contracting. Another method that teachers can use to reinforce desirable behaviors is **contingency contracting**. This method consists of making a written or verbal contract between the teacher and a student, where the student agrees to behave in a mutually acceptable way (i.e., work on an assignment for a certain time, practice math problems until mastery is achieved, display social skills) and the teacher agrees to provide a mutually acceptable reinforcement (i.e., a certain grade, tokens, free time). Classroom contracts are typically signed by the teacher and student and may even include the signature of another student as a witness, as shown in Figure 5.4. Similar to token economies, contingency contracts can be drawn up with individual students, groups of students, or the class as a whole and can be set for shorter or longer-term academic goals. An advantage of this method is that it is flexible (i.e., terms can be renegotiated when not working) and likely to promote self-regulation because students participate in setting goals and monitoring and evaluating their performance.



Teacher Journal

Alex is a bright but attention seeking 4th grader in my class. Alex is constantly talking to his peers during instruction and work time. Since he is distracted he often does not follow directions. Although he is capable of finishing assignments, Alex often runs out of time or does not complete assignments correctly. Alex and I made a contingency contract to work on only talking during appropriate times.

I wanted Alex to feel success immediately, so I tried to break our goal into small chunks of time. Each time I give directions and Alex is quiet and attentive he gets a check on his contract. For each check he gets 5 minutes of computer time after-school. Alex loves getting checks more than he likes the computer time because he gets attention from me almost immediately.

During the past three weeks Alex's focus during instruction has improved dramatically. He still seeks attention from his peers. Even though he is more engaged in class, he calls out when I ask a question to the whole class. Next week we will adjust the contingency contract to address this behavior.

Contingency Contract

What's happening in class now?
I'm talking to friends too much.

Why effect does this have?
Other people don't hear the teacher. I'm not paying attention.

If...
Alex is quiet when the teacher is talking

Then...
He can use the computer after school

I understand and will follow this agreement

Alex Ms. Kay

	5	10	15	20	25	30
Monday	☑	☐	☐	☐	☐	☐
Tuesday	☑	☐	☐	☐	☐	☐
Wednesday	☑	☑	☑	☐	☐	☐
Thursday	☑	☑	☐	☐	☐	☐
Friday	☑	☐	☐	☐	☐	☐

FIGURE 5.4 **Based on the teacher's reflections, how effective was this contingency contract in helping achieve learning goals?**

Premack Principle

People have a hierarchy of reinforcers and more preferred activities reinforce less preferred activities.

Other examples of positive school reinforcers are listed on Table 5.2. As you see, there are a variety of positive reinforcers. Some consist of tangible goods (i.e., candy), others consist of social rewards (i.e., praise), yet others consist of desirable activities. This last type of positive rewards originates from the **Premack principle**. David Premack (1959) discovered that people have a hierarchy of reinforcers. According to the Premack principle, more preferred activities reinforce less preferred activities. Suppose you have a student who is fairly motivated to learn; however, engaging in reading is lower in his hierarchy than playing computer games with his best friend at school. A teacher may apply the Premack principle by telling the student that if he engages in reading for half an hour he will get to spend half an hour playing computer games with his best friend at the end of the day. The Premack principle is widely applied not just by educators but in our everyday negotiations with others. In fact, because it is common to hear from grandmothers, "Eat your vegetables and then you can go out to play,"—it has also been called "Grandma's rule" informally.

Negative Reinforcement. Future teachers often have difficulty understanding the idea of negative reinforcement and are likely to confuse this type of reinforcement with punishment, perhaps due to the connotation of the word "negative." However, negative here does not mean *bad* but removal.

Let's carefully examine the characteristics of negative reinforcement. First, you need to remember that negative reinforcement is still a type of reinforcement.

TABLE 5.2

Examples of positive reinforcers in the classroom.

REINFORCER TYPE	EXAMPLE
Positive/Concrete	A teacher gives students stars when reaching a learning standard.
Positive/Concrete	A teacher gives students tokens that they can exchange for goods in the school bookstore when they display good behavior.
Positive/Social	A teacher praises students who take turns in talking during class discussion.
Positive/Social	A teacher nominates a student for the honor roll after the student got an A in a criterion-based test.
Positive/Activity	A teacher allows a student to work on the computer after solving a challenging math problem.
Positive/Activity	A teacher gives students time to do artwork when they followed rules in a cooperative group activity.

Consequently, the effects of negative reinforcement should be the same as those of positive reinforcement: to increase the likelihood of a desirable behavior.

Second, you need to understand the difference between positive and negative reinforcement. In positive reinforcement, the strategy to increase the desirable behavior consists of the *presentation* of a concrete, social, or activity reward. Negative reinforcement consists of *removing* an aversive consequence when the desirable behavior is displayed.

Removing something unwanted is as much as a reward as presenting something valuable and will increase the likelihood that the target behavior increases in time. You may sit on the driver seat of your car and start your car as you listen to an annoying beep because you forgot to put on the seatbelt. Now you are wishing that the annoying sound ceases! What do you do next? If you are like the average driver, you will put on your seatbelt to make the annoying beep stop. This is an example of negative reinforcement because the goal of the car company is to get you to increase the likelihood that you fasten your seat belt (to avoid personal injuries in the case of an accident). How do they reward you for buckling up? By *removing* the unpleasant sound.

How does negative reinforcement work in the classroom? Typically, teachers negatively reinforce their students by removing an unpleasant environmental event when students demonstrate good academic behaviors such as in the following examples:

- Making a final exam optional for students who achieve an average score of 80% or higher on all other tests.
- Dropping students' lowest grade when they submit all classroom assignments on time.
- Removing a stare at a student after he or she starts working at an assignment.

To help you remember that both positive and negative reinforcement increases the likelihood of desirable classroom behaviors (and that negative reinforcement is NOT a form of punishment), you can use Figure 5.5 as a visual aid or mnemonic. When you read Chapter 6 you will learn that mnemonics are strategies to improve memory and which may consist of making verbal or visual associations to new concepts.

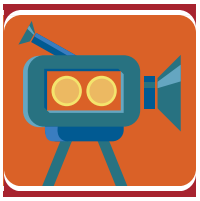


FIGURE 5.5 **Both positive and negative reinforcement methods are aimed at helping students increase desirable academic behaviors.**

You may have noticed that a limitation of negative reinforcement is that it depends on the existence of a pending unpleasant activity that can be later removed to reinforce students. Most of these "less pleasant" classroom activities, however, are part of students' responsibilities, and removing a responsibility may have other unwanted effects. It would not be a good idea to reinforce a student by offering to remove his obligation to clean up his desk at the end of the day unless the teacher herself offers to clean up instead. Therefore, there are fewer opportunities to use negative reinforcers than positive reinforcers.

Inadvertently, teachers may negatively reinforce students to perform *undesirable* behaviors. A student may lie to a teacher by telling her that he feels sick right before a test, to avoid it. If the teacher sends the student to the nurse's office, she may be reinforcing the student's lying behavior because she is removing an aversive stimulus (i.e., the test). Next time a test is given, the student will be likely to lie again. Likewise, imagine that during a class discussion, a teacher asks a student to respond to a question. The student, who would rather avoid answering questions, automatically replies "I don't know." If the teacher, rather than prompting or offering cues to answer the question, lets the student "off the hook" by calling on another student, she may be negatively reinforcing the student's lack of participation. Next time she calls on him, the student will be likely to say "I don't know" again because he knows that this is a good strategy to avoid being on the spot.

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VIDEO CASE ASSIGNMENT. . . Teaching Procedures—Specialist Commentary, Using Recognition vs. Rewards

Go to your WileyPlus course and view the video of Mrs. Petrone's third grade class on the first day of school. Be prepared to discuss the concrete and social positive reinforcers used. Consider additional reasons for not using candy as a reinforcer.

Schedules of Reinforcement

When teachers apply operant conditioning principles in the classroom, they attempt to increase the amount of desirable behaviors through reinforcement and decrease the amount of undesirable behaviors through punishment. Nevertheless, sometimes these methods may not turn out to work as teachers expect. One reason is that the schedules of reinforcement and punishment are not efficient. In this section we review several ways in which you can administer reinforcements and the corresponding effectiveness of each schedule.

A schedule of reinforcement is the frequency with which reinforcement is provided. The schedule that you choose will affect the speed, continuity, and persistence of the behaviors that you are trying to modify. A different schedule of reinforcement is needed when a behavior is first acquired and when a behavior has already been acquired but you want your students to maintain it.

Continuous Reinforcement

A reinforcement schedule in which reinforcement (either positive or negative) is provided after every occurrence of the target behavior.

A **continuous reinforcement** schedule is one in which reinforcement (either positive or negative) is provided after every occurrence of the target behavior. Continuous reinforcement is especially helpful when you are trying to teach your students a new behavior. If a teacher is trying to teach young children to focus on her when she is talking to the class, the teacher can provide reinforcement (i.e., smile) every time the child makes eye contact with the teacher.

Intermittent Reinforcement

A reinforcement schedule in which reinforcement is provided only after some occurrences of the target behavior.

An **intermittent reinforcement** schedule is one in which reinforcement is provided only after some occurrences of the target behavior. Intermittent reinforcement is especially helpful when you are trying to have your students maintain an already acquired behavior. If students have already learned that they need to focus on the teacher when she is talking, the teacher can help maintain this desirable behavior by praising the students for their attention every now and then. Intermittent reinforcement schedules can be fixed or variable.

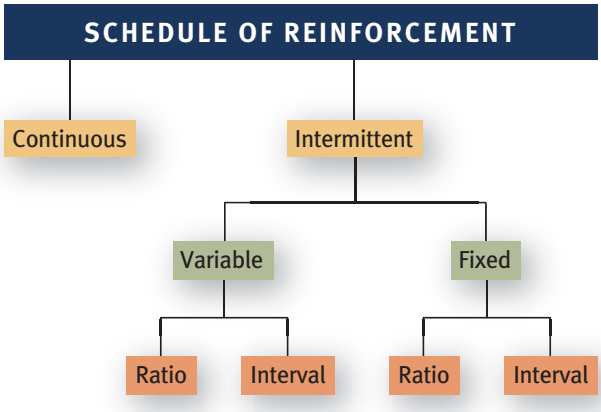


FIGURE 5.6 Different reinforcement schedules.
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A **fixed reinforcement** schedule allows students to predict when the reinforcement will follow the desirable behavior, whereas a **variable reinforcement** schedule is unpredictable.

Both fixed and variable reinforcements may be subdivided into ratio and interval schedules. A **ratio reinforcement** schedule is one where reinforcement occurs after a certain number or proportion of desirable behaviors is performed, whereas an **interval reinforcement** schedule is one where reinforcement is based on the passage of time. Figure 5.6 illustrates the different schedules of reinforcement that teachers can use in their classrooms.

An example of a *fixed-ratio schedule of reinforcement* is the case of a teacher who decides to reward students with extra computer time every time they turn in two complete homework assignments. It is fixed because students are able to predict when they will get the reward, and it is a ratio schedule because it is based on the number of homework assignments. An example of a *fixed-interval schedule of reinforcement* is the typical classroom recess schedule, where students are given breaks after a certain amount of time. This is an example of a fixed schedule because students can predict when they will get their breaks (i.e., the positive reinforcer), and it is interval because reinforcement is based on elapsed time rather than a certain amount of behaviors.

A *variable-ratio schedule of reinforcement* is in place when a teacher picks a different random number every week as the "magic number" of homework assignments that need to be completed to get extra computer time. For instance, one week she may reinforce students who turned in two complete homework assignments and the next week she may reinforce students who turned in four complete homework assignments. It is variable because students can't predict what the "magic number" will be each week, and it is a ratio schedule because it is based on the number of desirable behaviors performed (i.e., complete homework assignments).

Finally, a *variable-interval schedule of reinforcement* happens when a teacher gives students periodic breaks during a long period of seatwork. Students can't predict when the teacher will allow them to take a break (variable schedule), and it is an interval schedule because the teacher reinforces students' desirable behavior after a certain amount of time has elapsed. Table 5.3 provides a summary and example of each type of reinforcement schedule.

Fixed Reinforcement

A reinforcement schedule that allows students to predict when the reinforcement will follow the desirable behavior.

Variable Reinforcement

An unpredictable reinforcement schedule.

Ratio Reinforcement

A reinforcement schedule where reinforcement occurs after a certain number or proportion of desirable behaviors is performed.

Interval Reinforcement

A reinforcement schedule where reinforcement is based on the passage of time.

Effectiveness of Different Reinforcement Schedules

As you can see, teachers have quite a few options when it comes to deciding on a reinforcement schedule. How does a teacher decide which schedule of reinforcement to use? First, continuous rather than intermittent reinforcement schedules are most effective for helping students acquire new behaviors (learning to raise their hand if they want to speak, and giving students a token each time). Once students master a response, intermittent reinforcement works better than continuous reinforcement (giving tokens every other time a student raises her hand to speak).

TABLE 5.3

Summary and example of each type of reinforcement schedule.

TYPE OF REINFORCEMENT	HOW IT WORKS	EXAMPLE
Continuous Reinforcement	Reinforcement is provided at every occurrence of the desired behavior. Effective to teach a new behavior.	The teacher smiles every time a child raises her hand before asking a question.
Intermittent Reinforcement	Reinforcement is provided only after some occurrences of the desired behavior. Effective to maintain an already acquired behavior. Intermittent reinforcement can be variable or fixed.	The physical education teacher allows a class to choose their activity for the day because they have picked up their equipment after every class for the last week.
Intermittent Reinforcement: Fixed	Students can predict when reinforcement will occur.	The music teacher allows the choir to have a free day after every successful concert.
Intermittent Reinforcement: Variable	Students cannot predict when reinforcement will occur.	The teacher rewards students with free reading time whenever she or he considers that they have earned it through effort on their homework.
Ratio Reinforcement	Reinforcement is provided after a certain number of desirable behaviors is performed.	The art teacher allows students to pick their next project after the completion of three assignments.
Interval Reinforcement	Reinforcement is provided after the passage of a certain amount of time.	The Spanish teacher has cultural food days for her classes every nine weeks.
Fixed Ratio	Students can predict that reinforcement will occur (fixed) after they perform a certain number of desirable behaviors (ratio).	The teacher decides to reward students with extra computer time every time they turn in two complete homework assignments.
Fixed Interval	Students can predict that reinforcement will occur (fixed) after a certain amount of time has elapsed (interval).	The teacher allows a student to draw for 15 minutes after every 45 minutes of being on-task.
Variable Ratio	Students cannot predict (variable) the exact number of desirable behaviors (ratio) that is necessary for reinforcement to occur.	The English teacher rewards students with positive phone calls home after every 2–3 essays are completed and turned in on time.
Variable Interval	Students cannot predict (variable) the exact amount of time (interval) that needs to elapse for reinforcement to occur.	The math teacher rewards students with time to play games involving math every 2–4 weeks if the class turns in their homework.

The characteristic of continuous schedules of reinforcement is that the desirable behaviors increase rapidly during reinforcement (as long as the reinforcer is desirable), but once reinforcement stops, students will be likely to stop displaying the desired behavior. This is why continuous schedules need to be followed with intermittent schedules if you would like the student to keep displaying the target behaviors.

Second, students who are on a fixed schedule of reinforcement show less persistence and faster extinction of the desirable behavior than those who are on a variable schedule of reinforcement. That is, when reinforcement stops, students who are on a fixed reinforcement schedule will be much more likely to stop performing the target behavior than those who are on a variable schedule. A teacher who rewards students for mastering five lessons (fixed schedule) by sending a positive letter home will see the number of lessons mastered drop if she stops sending the letters home. On the other hand, if the teacher sends positive letters home after a random number of lessons is mastered (variable schedule) and she suddenly stops sending letters home, the number of lessons mastered is likely to remain high.

Third, of the two variable schedules, ratio and interval, students show the most persistence on variable-interval schedules, which tend to produce slow but steady desirable behaviors because students can't predict when reinforcement will happen. Some teachers use pop-quizzes as variable-interval schedules to promote studying. In this case, the desirable behavior is studying the instructional material and the reinforcers are good grades, which are dispensed as a reward to those who perform the target behavior.

Typically, pop-quizzes produce a steadier pattern of study over time. Instead, when quizzes are predictable, usually presented as fixed interval schedules, students display a stop-start work pattern of studying, characterized by not studying for most of the week and then cramming the material right before the quiz. In sum, if your goal as a teacher is to increase students' persistence on a desirable behavior that has already been acquired, an intermittent-variable-interval schedule is the most effective.

Shaping and Fading

Imagine that you are struggling with Morgan, a first grader who has a very hard time staying seated at her desk during a whole class period. What type of behavioral learning strategy might work for this child? **Shaping** is an operant conditioning method that is used to help students perform a difficult or complex task. It involves teaching new behaviors by reinforcing successive approximations toward the target behavior. For instance, you can shape Morgan's behavior by reinforcing her when she remains quietly seated for 10 minutes. As she displays the desirable behavior, you might give her a happy face sticker. Next, extend the 10 minutes to 15 minutes. When 15 minutes elapse and she has been sitting quietly for the entire time, you reinforce her again. Eventually, you will get Morgan to remain seated at her desk for the whole class period, a behavior that was completely out of her ability when you started the intervention.

Shaping

An operant conditioning method that teaches new behaviors by reinforcing successive approximations towards the target behavior.

Through shaping, teachers can help students gain a variety of complex academic skills and behaviors over time. Imagine the following classroom scenario. Jason's hand goes up as soon as direct instruction is over in math class claiming that he did not understand anything. You realize that the math procedure you are trying to teach is too complex for Jason. At first, you might reward Jason by giving him attention, immediate feedback, and re-teaching the lesson to him. As time goes by, you require Jason to do the first steps alone and help him through the middle or final steps. Eventually, as Jason is required to work independently with less of your attention and immediate feedback, he will be able to do his homework independently. You have successfully shaped Jason's behavior and skills.

A key to deciding whether you should use shaping is considering how complex the target task is compared to students' current level of skills or how big a difference there is between the students' actual behavior and the desirable behavior. The wider the discrepancy, the more reasonable it is to use a shaping method. Shaping behaviors in the classroom requires the following steps (Miltenberger, 2004; Walker, Shea, & Bauer, 2007):

How can teachers use shaping and fading to help students learn new skills?

Steps for Using Shaping in the Classroom

1. Selecting the desirable behavior (child sits quietly at his desk for 30 minutes).
2. Obtaining reliable baseline data (document the amount of time that the child sits quietly at his desk before you start the intervention).
3. Selecting potential reinforcers (keep in mind what may motivate this individual student—a sticker, extra time to play a game, etc.).
4. Reinforcing successive approximations to the target behavior (reinforce each time the child sits quietly at his desk during the different approximations to the goal—10 minutes, 15 minutes, etc.).



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5. Reinforcing the target behavior every time it occurs (use continuous reinforcement when the child sits quietly for the whole period).
6. Reinforcing the target behavior on a variable reinforcement schedule (when you have evidence that the child has reliably acquired the new behavior).

Fading

An operant conditioning method that moves from reinforcing every desirable behavior to reinforcing desirable behaviors every now and then, continuing until the lowest rate of reinforcement that maintains the desirable behavior is found.

As you can see, the shaping process requires diminishing reinforcement over time. This is called **fading**. Similar to shaping, fading occurs through successive approximations, moving from reinforcing every desirable behavior to reinforcing desirable behaviors every now and then. Fading should continue until the lowest rate of reinforcement that maintains the desirable behavior is found.

When the desirable behavior is one that can be monitored at home, such as the case of studying at home, doing homework, etc., shaping can be coordinated with students' parents or caregivers. Home-based reinforcement programs are effective in reducing undesired behaviors and increasing academic performance (Benoit, Edwards, Olmi, Wilczynski, & Mandal, 2001; Mackay, McLaoughlin, Weber, & Derby, 2001). Shaping can be coordinated with students' parents or caregivers to increase the student's likelihood of completing his homework on time.

The value of parent involvement cannot be overstated and will be discussed throughout this book. When enlisting parental support, the teacher's first task is to contact the parents. Talk with both the parents and student and come to an agreement about how they can work together to monitor homework at home. The teacher may create a form that lists the student's homework for each week day and which provides a section for the parent's signature. This form makes the parent aware and personally responsible for ensuring that the student completes homework assignments in a timely fashion. Next, arrange for regular communication, such as sending home a brief assessment of the student's progress. This might include a weekly report with a list of checkmarks indicating if the student was prepared for class, which homework assignments were handed in, and so on.

Depending on the quality of student's performance, parents can then provide appropriate reinforcement or punishment, such as removing a required house chore (negative reinforcement) or taking the student's cell phone away (removal punishment).

Cueing and Prompting

Do you remember in elementary school when the bell rung to alert you that it was time for recess? Were there other times your teachers used cues to let you know what to do next? Ringing bells, flicking lights, or even a teacher's frown are cues that alert students to what behavior is expected. In fact, students are more likely to behave appropriately when given cues that certain behaviors are expected from them (Northup et al., 1995; Shabani et al., 2002; Taylor & Levin, 1998). **Cueing** happens when we use signals to indicate that a certain response is desirable or undesirable. An example of cueing is flicking the classroom lights to remind students that they need to speak quietly to each other when working in groups.

Cueing

Using signals to indicate that a certain response is desirable or undesirable.

Cueing can be verbal, such as when a teacher calls on students' names to signal that they need to stay on task, or nonverbal, such as when a teacher uses body language (i.e., making eye contact, frowning) to let students know that an inappropriate behavior needs to cease (Emmer, 1987; Woolfolk & Brooks, 1985). Even physical proximity may cue students about undesirable behaviors. When teachers move toward misbehaving students and remain in close proximity, students are likely to cease the undesirable behavior (Woolfolk & Brooks, 1985).

Setting Event

The creation of an environment that is conducive to certain target behaviors, where it's the environment rather than verbal or non-verbal behavior that cues the subject to behave in a certain way.

Another cueing method is a **setting event**. In this case, teachers create an environment that is conducive to certain target behaviors. In other words, the environment rather than the teacher's verbal or nonverbal behavior is what cues the student to behave in a certain way. Young children are more likely to display cooperation during free-play time when provided with relatively smaller play areas that have toys available (Brown, Fox, & Brady, 1987; Frost et al., 1998; Martin, Brady, & Williams, 1991).

Some students may need help in learning how to respond to a cue. In this case, teachers can use **prompting**, the presentation of an additional cue following the first cue with the goal of shaping or changing behavior. For example, a literature teacher wants to have small group discussions about the assigned readings throughout the year. At the beginning of the year, she might arrange the desks in groups of four or five to cue the class for the group activity and create a set of very detailed questions to prompt the group discussions. As the year progresses and the class gets used to what is expected in group discussions, the teacher can gradually decrease the amount and detail of the prompting questions. Research suggests that the most effective use of prompts consists of consistently presenting the cue before the prompt and fading the prompt gradually (Becker, Englemann, & Thomas, 1975). This method increases the likelihood that students learn to respond to the cue by itself once the prompt is removed.

Prompting

The presentation of an additional cue following the first cue with the goal of shaping or changing behavior.

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COLLABORATIVE LEARNING ASSIGNMENT



What cues do you remember teachers using for classroom management? At what grades were the cues used and were they effective? Why or why not? Would you consider using the same cues as a teacher? Why or why not? Compare your responses to those of your classmates.

Decreasing Undesirable Behaviors

There are several different strategies that teachers can use to decrease students' undesirable behaviors using operant conditioning principles. Experts recommend considering the following alternatives in order (Alberto & Troutman, 2006).

Differential Reinforcement. Teachers should consider using **differential reinforcement**, reinforcing behaviors that are more appropriate or even incompatible with the undesirable behavior. For instance, students can be reinforced for speaking softly rather than loudly, for walking in the hallways rather than running, or for turning in homework early rather than late.

Differential Reinforcement

Reinforcing behaviors that are more appropriate than or incompatible with the undesirable behavior.

In addition, teachers should carefully examine if they may be unconsciously reinforcing undesirable behaviors. It is not unusual to find that students' inappropriate behaviors are inadvertently maintained by positive reinforcers such as teacher or peer attention. Many students thrive on misbehaving because the consequence of their misbehavior will be getting to stay with the teacher after hours in detention, even when the consequence is viewed as negative for most students.

Extinction. **Extinction** is the gradual disappearance of a learned response. Pavlov discovered extinction when he observed that the dogs that were conditioned to salivate upon the presence of the lab technician stopped salivating after the lab technician repeatedly showed up without food. Extinction can also happen in operant conditioning. For instance, if you suspect that paying attention to Jimmy may be reinforcing his misbehavior, the best strategy is to ignore his undesirable behavior and only pay attention to his desirable behaviors. Eventually, Jimmy will stop displaying the undesirable behavior if your attention was its main reinforcer. Research shows that extinction coupled with differential reinforcement or cueing is very effective in reducing inappropriate behaviors such as whispering, talking, or getting out of seats (Carter, 1994; Geiger, 1997). Overall, try to not focus too much on monitoring what students do wrong and focus instead on what they do right (Maag, 2001).

Extinction

The gradual disappearance of a learned response.

Satiation. Imagine the following scenario. Jim and Lorenzo are the class clowns and start bobbing up and down in their seats. A few students laugh, another student joins in and starts jumping in his seat, then more laughter and more students bobbing in their seats. The teacher says, "I want everyone to continue jumping up and down in your seats. Don't stop." Students initially ignore the teacher, but then she prompts them, "Go ahead, I mean everyone—start jumping up and down. Don't stop." The teacher continues writing information on the board, ignoring the class. After 3–4 minutes, the

Can you think of other classroom examples where the satiation method may be an acceptable way to reduce undesirable behaviors?



Anthony Strack/Gallo Images/Getty Images

students tire of the disruptive activity. Without saying another word about it, the teacher resumes the lesson.

The method used in this scenario is called satiation and consists of encouraging the undesirable behavior until students are not willing to engage in it any more. This method should be used carefully, only when the undesirable behavior does not cause physical or emotional harm to the student or others. Note that the term satiation has two different meanings in behaviorism. The other meaning was discussed in the section Increasing Desirable Behaviors and refers to the psychological state that results from receiving too much reinforcement for a desirable behavior. Here, we use satiation as a behaviorist method to reduce undesirable behaviors instead. Satiation was effective in eliminating students' unusual motions (i.e., pretending they were bouncing imaginary balls in their hands) in a 9th-grade algebra class (Krumboltz & Krumboltz, 1972). Provided that the undesirable behavior does not interfere significantly with the class, this method should be used until students spontaneously stop doing the undesirable behavior, and teachers should try to ignore the behavior in the meantime.

Removal Punishment. If differential reinforcement does not work and it does not seem that you are reinforcing students' inappropriate behavior, then consider a third strategy, removing desirable stimuli. This method is more traditionally known as **removal punishment** because it takes away something that is desirable to students and should not be confused with negative reinforcement, which consists of taking away something that is undesirable to students. The most typical classroom removal punishment methods are time-out, detention, in-school suspension, and response cost.

Removal Punishment

Removing desirable stimuli to try to stop an undesirable behavior.

Time-out involves removing students from the class and physically isolating them from their classmates (Carter, 1994). This method is effective in decreasing a variety of disruptive behaviors, especially when other students' laughter or attention may be acting as reinforcers (Miltenberger, 2004; Pfiffner & Barkley, 1998; Walker et al., 2007). However, time-out is probably one of the most misused operant conditioning strategies and in many cases it actually works as a reinforcer of undesirable behaviors (Alberto & Troutman, 2006; McClowry, 1998). Therefore, it is important to carefully design this strategy. Table 5.4 presents some guidelines for using time-out effectively (Betz, 1994).

Time-out

Removing students from the class and physically isolating them from their classmates.

Detention is similar to time-out but used more frequently with older students. It consists of keeping students in school outside of school hours. Although this method is somewhat controversial (Johnson, 2004), research found it to be effective in reduc-

Detention

Keeping students in school outside of school hours.

Table 5.4

Guidelines for effective use of time-out.

GUIDELINE	EXAMPLES
Clearly explain to students the reason for time-out.	A teacher says "You need to go to the time-out corner so that you can settle down and stop distracting your peers."
Make sure the student is not trying to avoid a more unpleasant situation.	A student may purposefully misbehave to provoke a time-out situation to avoid working on a difficult assignment.
Make sure time-out is punishing rather than rewarding a student.	The time-out area should not have toys or interesting objects and should not allow for the student to communicate with others.
The time-out area should be humane and safe.	Time-out areas should be comfortable, warm, and lit.
Limit the amount of time-out.	Do not forget a student has been placed in time-out and keep the time short, especially for young children.

ing undesirable behaviors (Gootman, 1998). The difference between detention and **in-school suspension** is that in this last method students are placed in a quiet room inside the school building for one or more days to work on the same activities that nonsuspended students are working at under the supervision of an adult.

In-School Suspension

A method where students are placed in a quiet room inside the school building for one or more days to work on the same activities that nonsuspended students are working at, under the supervision of an adult.

Because students are not allowed to interact with their peers while they are suspended, this is another form of removal punishment. Unfortunately, suspension programs have not been examined systematically through controlled research studies. Nevertheless, practitioners report that these programs are often effective in reducing chronic misbehaviors, especially when the supervisor acts as a tutor and part of the activities that students engage in during suspension consist of learning appropriate behaviors and skills (Gootman, 1998; Huff, 1988; Sullivan, 1989).

In **response cost**, a teacher might remove tangible reinforcers and privileges that were previously acquired by the student (Zhou, Goff, & Iwata, 2000). If a teacher has a token economy system in place and a student misbehaves, she may take away tokens as a form of response cost. A teacher who takes away recess time is also using a response cost approach to decrease unwanted behaviors. However, taking away recess time is controversial because students need occasional breaks from school activities to be able to perform well (Pellegrini, Huberty, & Jones, 1995). Overall, response cost is an effective operant conditioning strategy (Reynolds & Kelly, 1997), especially when coupled with reinforcement of appropriate behavior (Iwata & Bailey, 1974; Lentz, 1988; Rapport, Murphy, & Bailey, 1982).

Response Cost

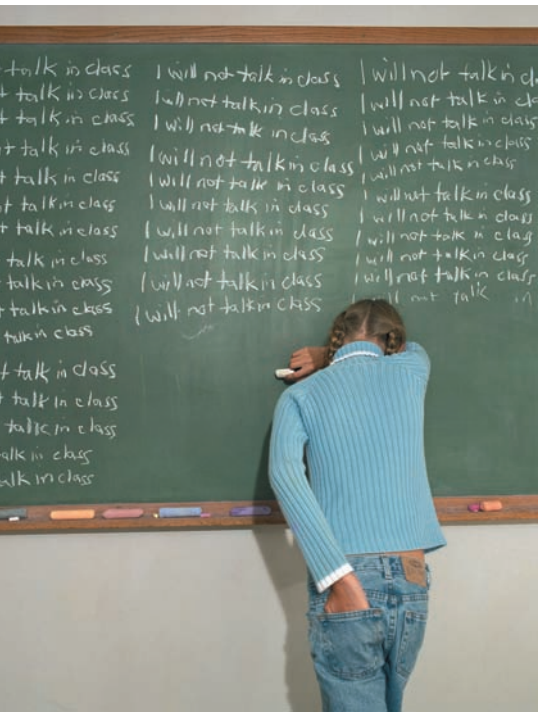
Removing tangible reinforcers and privileges that were previously acquired.

Presentation Punishment. In **presentation punishment**, an aversive stimulus is presented when an undesirable behavior is displayed (such as spanking a child who is misbehaving). This operant conditioning strategy is commonly associated with the word punishment (even though we know that punishment can also be accomplished by removing something desirable). The benefit of presenting punishers is that they produce immediate compliance for most students (Gershoff, 2002). However, compliance is very likely to be temporary and the undesirable behavior is likely to return when the punisher is removed. In fact, the undesirable behavior may increase after presentation punishment. One research study showed that after using spanking to discipline 4- and 5-year-old children, their problem behavior increased rather than decreased over time (McLoyd & Smith, 2002). Therefore, only when the undesirable behavior diminishes after the aversive stimulus is presented can we be sure that presentation punishment occurred.

Presentation Punishment

Presenting an aversive stimulus when an undesirable behavior is displayed.

The most commonly accepted presentation punishment methods used in the classroom consist of desists, verbal reprimands, and logical consequences. Desists are verbal



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When should teachers consider using punishment methods?

or nonverbal messages that teachers send to students to stop an undesirable behavior. The typical example is putting your fingers over your lips signaling "Shh. . ." to communicate that a student needs to be quiet. Desists are effective when administered immediately, briefly, and unemotionally (Emmer et al., 2003; Evertson et al., 2003).

Verbal reprimands or scolding go one step beyond desists because they are less subtle and usually are perceived as unpleasant and punishing by most students (Pfiffner & O'Leary, 1993; Van Houten, Nau, MacKenzie-Keating, Sameoto, & Colavecchia, 1982). Similar to desists, scolding is more effective when it is immediate, brief, and unemotional, but also when the message is communicated in a soft voice and privately (O'Leary, Kuafman, Kass, & Drabman, 1970; Pfiffner & O'Leary, 1993). Being private about scolding students is most important for cultural groups such as Native American and Hispanic American children, who may feel humiliated when reprimanded in public (Fuller, 2001).

Another effective presentation punishment method, imposing **logical consequences**, consists of requesting students to conduct a certain behavior to revert the negative effects of their misconduct. A student who broke another student's game may be required to repair the game or buy a new one, or a student who offended another student may be required to write a letter of apology (see Figure 5.7). The strength of this method is that the punishment is logical; therefore, students are more likely to accept the consequence and learn from the experience. Several research studies support the effectiveness of using logical consequences in the classroom (Dreikurs, 1998; Lyon, 1984; Schloss & Smith, 1998; Wright, 1982). Table 5.5 summarizes the set of acceptable classroom methods for decreasing undesirable behaviors just reviewed.

Logical Consequences

Requesting students to conduct a certain behavior to revert the negative effects of their misconduct.

Experts suggest using removal or presentation punishment methods as a last resort, when attempts to use reinforcement for displaying desirable behaviors have failed. In addition, if teachers decide that punishment is appropriate, they should follow certain guidelines to ensure that punishment will be effective (Parke & Walters, 1967; Walters & Grusec, 1977) and should never use punishment as a means of retaliation. Ten guidelines for effective punishment are summarized in Table 5.6.

Teachers should be aware that punishment may also lead to unexpected negative effects. Punished students are likely to try to escape the negative consequences for their undesirable behavior by finding ways to hide their behavior, such as when a student hits other students when the teacher is not present, to avoid punishment.

Dear Samantha,
I am sorry that I said mean things to you.
I just wasn't thinking and I feel so bad.
I want to apologize for making you
feel sad.
I will never do that again.
Can we still be friends?
Sorry,
Megan

FIGURE 5.7 What are the benefits of using logical consequences to address students' misbehavior?

TABLE 5.5

Acceptable classroom methods for decreasing undesirable behaviors.

METHOD	DEFINITION	EXAMPLES
Differential Reinforcement	Reinforcing behaviors that are more appropriate than the undesirable behavior.	Praising students who tend to run in the hallway every time they are observed walking in the hallway.
Extinction	Stopping inadvertent reinforcement of undesirable behavior.	When students' whispering does not stop despite teacher's attention, the teacher ignores students' whispering.
Satiation	Asking students to continue with the undesirable behavior.	Forcing students who pass personal notes to one another during class to write a one-page personal note every class.
Presentation Punishment	Presenting an aversive consequence when an undesirable behavior is displayed.	Using verbal and nonverbal signals (desists), verbally reprimanding students, or imposing logical consequences upon the display of inappropriate behaviors.

Punishment can also cause other unintended undesirable behaviors, a situation called *backfiring*, such as when a student who is punished for not turning in completed homework starts skipping class rather than doing homework, to avoid being punished. Punishment may also increase aggressive behavior and decrease self-esteem in the student who is being punished. These negative effects are more likely to happen as punishment methods become physically or emotionally harsher.

We discuss punishment methods that are strongly discouraged in the next section. But before moving on, test your understanding about the distinction between positive reinforcement, negative reinforcement, presentation punishment, and removal punishment with the help of Figure 5.8.

TABLE 5.6

Ten guidelines for effective punishment.

- Use school punishment methods that are acceptable according to research.
- Try using removal punishment methods first.
- Specify ahead of time which behavior will be punished and how.
- Punish immediately after the undesirable behavior.
- Punish privately, to avoid embarrassment or humiliation.
- Punish consistently, always after the undesirable behavior is displayed.
- Avoid using punishers that are greater or longer than necessary.
- Explain what behavior is being punished and the reason for punishment.
- Explain that it is the behavior and not the student that is undesirable.
- Model and reinforce desirable alternative behaviors.

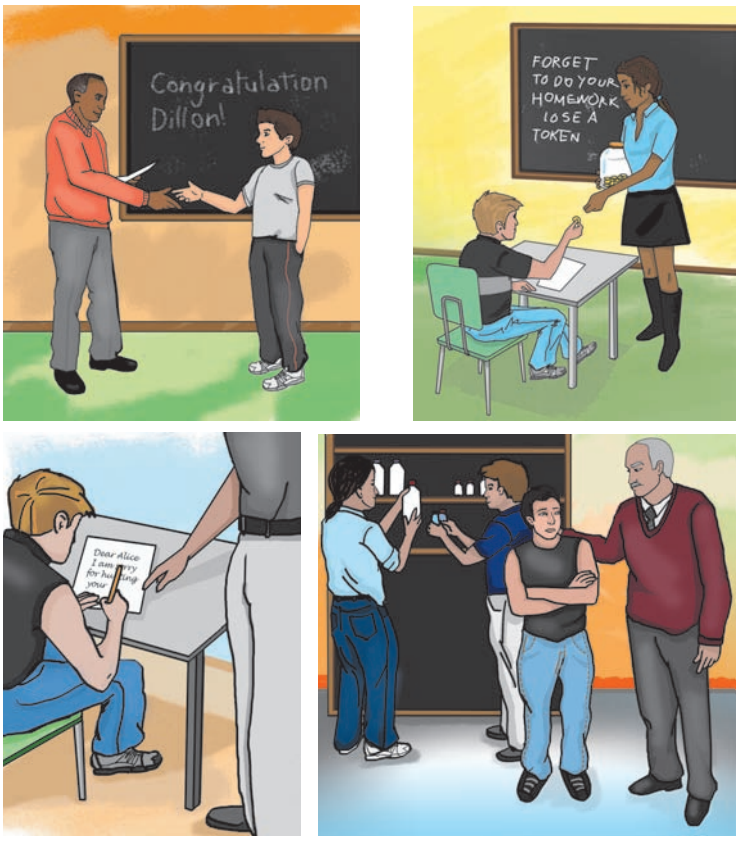


FIGURE 5.8 Can you identify what type of reinforcement/ punishment corresponds to each picture?

Ineffective Forms of Punishment

Careful and appropriate punishment that is based on the guidelines suggested by research can be an effective tool for controlling students' serious misbehavior (Walker, Ramsey, & Gresham, 2004). On the other hand, punishment that is vindictive, malicious, or out of proportion to the seriousness of the offense can only teach students not to perform the undesirable behavior in front of the person who applied the punishment (Alberto & Troutman, 2006). Moreover, studies suggest that some of the most typical punishments used in schools, such as out-of-school suspension and assigning extra class work, can have serious side effects on students' motivation to learn (Kauffman, 2005). Let's take a closer look at some punishment methods that should be avoided.

Physical Punishment. Did you know that over 220,000 children in the 2006–2007 school year were subjected to physical punishment in the United States (U.S. Department of Education, 2006)? Most experts, including the National Association of School Psychologists (NASP), warn against physical punishment for school-age children (Doyle, 1990; NASP, 2006; Robinson, Funk, Beth, & Bush, 2005; Zirpoli, 2008). Due to its potential negative effects, physical punishment is considered illegal in many countries. However, in the United States, 22 states still allow for corporal punishment in schools (U.S. Department of Education, 2006).

Some of the negative effects of corporal punishments have been shown by research in the area of socio-cognitive theories of learning, which you will learn about in Chapter 8. Specifically, research on modeling and aggression indicates that students who are subject to corporal punishment are more likely to demonstrate similar behaviors in the future than those who are not (Bandura, 1986). Other side effects of corporal punishment are that students learn sophisticated ways to avoid getting caught, become defiant, and display strong negative emotions and avoidance toward their teachers (Nilsson & Archer, 1989; Zirpoli, 2008).

Psychological Punishment. Psychological punishment may consist of embarrassing and humiliating the student and generally leads to the same negative effects associated with corporal punishment (Walker, Shea, & Bauer , 2007). Similarly, yelling and screaming are not only very ineffective in reducing undesirable behaviors, but have the added negative effect of presenting students with an out-of-control model to handle stress (Sim & Ong, 2005).

Extra Classwork. Asking students to perform extra classwork is highly discouraged because students learn through classical conditioning to associate negative feelings with classroom activities. This learned emotion is likely to generalize to other assignments or to the school and teachers in general (Baldwin & Baldwin, 2001).

Out-of-School Suspension. Although this method may be appealing to teachers and administrators because the troubled student is removed from school (a case of negative reinforcement for them), out-of-school suspension is not effective in changing students' behavior (Moles, 1990; Nichols, Ludwin, & Iadicola, 1999; Pfiffner & Barkley, 1998). It is likely that students with low motivation and chronic behavioral problems intentionally misbehave to skip school. Removing them from school reduces even further their chances for academic success (Nichols et al., 1999; Skiba & Raison, 1990).

Classroom Tips: How to Use Behaviorist Principles summarizes some principles from this chapter with corresponding classroom examples. You will get a chance to deepen your understanding of behaviorist principles when you read Chapter 11, which discusses strategies for effective classroom management.

CLASSROOM TIPS

How to Use Behaviorist Principles

Principle	Classroom Examples
Avoid negative conditioning. Be aware of situations where negative emotions might be learned through classical conditioning and avoid such situations.	Tim has strong negative feelings about working with others. He tells Ms. Kingly that he hates having to do all the work while his less-involved peers get the same grade that he does. To help Tim change his negative conditioning for groupwork, Ms. Kingly assigns each group member a different role and uses students' self-evaluations of their contributions in her grade scheme, so students do not receive a grade based on the group's product alone.
Help students extinguish past classically conditioned anxiety. Identify events that elicit anxiety in the classroom and help students extinguish such anxiety by pairing positive emotions with the events.	Emma hates speaking in front of the class but has to take a Speech class to graduate. Mrs. Dorner is helping her overcome this anxiety by having her imagine giving her speech in the shower alone, then to her best friend over the phone, then to her parents in the living room, then to Mrs. Dorner in the classroom, and finally to the class.
Avoid inadvertently reinforcing undesirable behaviors. Examine students' behavior patterns to identify when undesirable behaviors are being reinforced or extinguished by the consequences that are established.	Mr. Artesia keeps a behavioral form for every student in class. It includes a description of the undesirable behavior, his intervention, and the result on the student's behavior. In this way he can determine whether his methods are effectively changing students' behavior and decide if changes in his intervention are necessary.
Cue students when they display inappropriate behaviors. When undesirable behaviors are not severe, use small interventions such as cueing to reduce the likelihood of their occurrence.	Catharine likes to dominate most class discussions. Mr. Lesterly discussed with her the need to let others share their opinion. They developed a cue for her to remember to listen to others' ideas before speaking. Now when she starts to dominate a conversation, Mr. Lesterly pulls on his right ear to remind her to listen.
Explain why certain behaviors are not acceptable. When mild, undesirable behaviors are displayed, explain why they are not acceptable and reinforce the display of alternative, acceptable behaviors.	Elyse has difficulty keeping her desk uncluttered. Ms. Miller decides to engage the class in a discussion about the need to have an organized work space to be productive. Soon after, Ms. Miller notices that Elyse's desk is neatly organized. Ms. Miller leaves a sticker note for Elyse praising her improvement.
If punishment is necessary, use it humanely. When undesirable behaviors need to be suppressed quickly, follow the guidelines in Table 5.6 to avoid the negative side effects of punishment.	Mr. Tansley catches Andrea writing an offensive note on another student's backpack with a black marker. He immediately asks Andrea to step into the hallway, reviews in private the classroom rule of respect, and tells Andrea that she will not be allowed to use any of her color markers to draw until she apologizes and repairs the damages to her peer's backpack.
Get help. When misbehaviors continue despite reasonable efforts to extinguish them, seek the help of a school psychologist.	Mrs. Greene had tried everything she could think of to help Joe develop behaviors that would lead to classroom success. She has talked to him in private repeatedly, called his parents to coordinate a solution, consulted with the principal and his former teachers, but nothing has helped. Finally, she talked to Ms. Nannley, the school psychologist, who agreed to meet with Joe to start evaluating his behavior.
Choose from a variety of reinforcement and punishment. Do not assume that typical reinforcers or punishers will have the intended effect on all students. Learn about your students' interests to establish effective consequences.	Mr. Murphy starts each year with an interest survey so that he can learn about his students' reward preferences. The survey asks students to rank how interested they are about a set of possible rewards (i.e., positive call or letter to parents, free time to draw, tokens) and to provide their own ideas about rewards for good work and behavior in the classroom.

Now that you have had a chance to learn about reinforcement and punishment in detail, read the following classroom case and try to solve Mrs. Saltet's dilemma.

A Case Study
DIVERSITY IN THE CLASSROOM

Behavior Differences in a Fourth Grade Classroom

"If you were James, would you choose to live with your awful Aunt Spiker and Aunt Sponge or would you run away?" Mrs. Saltet asks her fourth grade reading group. "Please turn to your partner and tell them what you would do and why." Mrs. Saltet uses one of her favorite books, Ronald Dahl's *James and the Giant Peach*, to encourage students to use higher order thinking skills. "Well, if I was James, I'd try to run away. But I'd be so scared Aunt Spiker and Aunt Sponge would come after me. Also, I don't know where I'd live and what I'd eat, but it'd be better then living with those two hags." "I like how you are relating to the story," Mrs. Saltet encourages. "Now I'd like you to read the second chapter with your partner." As students read, Mrs. Saltet overhears Latoya and Nikki talking and giggling.

Mrs. Saltet doesn't mind if her students occasionally talk with one another, as long as they do so quietly and are able to finish their assigned reading before recess. But Nikki has a habit of talking so much that she doesn't get her work done and, consequently, Mrs. Saltet has her stay in during recess to finish.

Attempting to discourage disruptions in her classroom, Mrs. Saltet has moved Nikki's desk three times in the past two months. First, she placed her next to Keenan, a shy, quiet boy who always did his work. Unfortunately, Keenan began imitating Nikki's behavior and within a few weeks they were talking and laughing during most of the lesson, to the point where Mrs. Saltet had to keep them *both* in at recess to finish their school work.

Then she decided to move Nikki to the other side of the room next to Denise, a new girl in class. Nikki was a positive influence on Denise, providing much needed friendship and demonstrating how to engage in friendly small talk with her peers. But soon, like Keenan, Denise became so engrossed in her conversations with Nikki that her class work began to suffer. Finally, Mrs. Saltet placed Nikki in the front of the room next to Jason, who is blind, hoping she could become a 'helper' by describing book illustrations. Yet, it became increasingly clear that Nikki had difficulty keeping her mind on schoolwork no matter whom she was sitting next to, and, furthermore, she was disrupting her classmates' learning.

"I'm just not sure what I should do. It feels like I've tried everything," Mrs. Saltet confides to her colleague, Mrs. Spanne. "I redirect Nikki's off-task behavior, model good work-habits, keep her in from recess, value her verbal contributions to class discussions, and I've even tried to call her mother with no success. I am afraid Nikki is not getting any work done and is falling behind her classmates."

"I know, sometimes it feels as if nothing's going to work for some of these kids," Mrs. Spanne replies. "I'd suggest being very consistent. *Every* time Nikki disrupts class, keep her in for recess. Soon, she'll realize you're serious, and she'll start focusing during class because she'd rather be playing with her friends. That technique really works well for my students. They rarely miss recess now. You could also try keeping her in detention. That might really change her behavior." "Thanks, I'll give it a try," Mrs. Saltet agrees and vows that she'll be more consistent.

The following week, every time Nikki is disruptive during class Mrs. Saltet keeps her in for recess. She also gives her clear, consistent reminders, "Nikki, listen, it's math now, not a time to chat with your friends. Please finish these two division problems." But the cues do not seem to change her behavior. On Friday afternoon Mrs. Saltet tells her calmly and firmly, "Nikki, I've already asked you many times to stop interrupting when I'm trying to explain the homework. If you don't listen carefully now, I will have to explain it to you in after school detention." "Okay, okay," she responds and quietly writes in her journal for the next 10 minutes.

Demographics:

An overview of the students

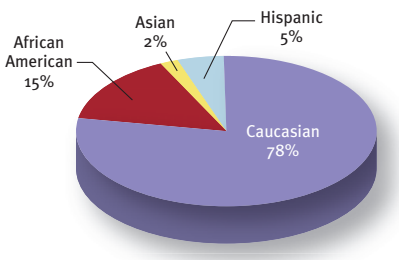
Lincoln Elementary, Iowa

9.3% Students eligible for free and reduced lunch

2.6% Students receive ESL instruction

10.1% Students receive Special Education Services

Racial/Ethnic Groups



"I think you're right," Mrs. Saltet tells Mrs. Spanne. "Nikki needs consistent follow through and doesn't seem to like the idea of staying in detention, so I think this will be an effective consequence." But, to Mrs. Saltet's disappointment, Nikki's behavior deteriorates the following week. She is in detention three times and misses four recesses. A staff member also reports finding Nikki in the hall during math period stuffing paper towels into the water fountain to squirt her friends.

"Her behavior seems to be escalating," Mrs. Saltet tells Mrs. Spanne over lunch. "I don't know why, but missing recesses and detention just doesn't seem to faze her. It is strange. The same consequences worked for other students in my class."

"Have you tried positive reinforcement?" Mrs. Spanne asks.

"I'm afraid to try something drastically different now," Mrs. Saltet replies. "But, you're right, it might help."

"Also, have you asked Nikki if she can help find a solution?" "No, I suppose asking her wouldn't hurt. We've got to come up with a plan." Mrs. Saltet says with determination.

The next morning Mrs. Saltet takes Nikki aside before school starts. Unsure of how to begin their conversation she says, "I need your help to solve the problems you've been having in class. Nikki averts her eyes. "You miss an awful lot of recesses. Wouldn't you rather be playing with your friends?" Mrs. Saltet probes.

"I don't know," She says glumly. "It seems like I've always missed recess, ever since first grade. I don't care that much about it."

"Hmm, do you have friends you like to play with?" Mrs. Saltet asks.

"Yeah. I've got plenty of friends," Nikki says defensively.

"Well, can you help me think of a solution? I don't want you to fall behind in school and miss out on things that are important to you. I'm sure you'd rather be at home with your family than in detention," Mrs. Saltet reasons. "Remember last Friday how much writing you did in your journal when you were focused?"

"Usually, everybody's working, even my big sister. Friday is Mom's day off." Nikki explains.

Mrs. Saltet pauses. "I see. Perhaps we can enroll you in the after school activities program. You can play soccer, basketball, and read. You could have lots of fun."

"Yeah, my friend Latoya stays for that," she says, perking up.

"Now, we'll need to find a way for you to stay on task and complete your work during class. I'd like to meet with you again tomorrow morning so we can talk about a solution. Nikki, I know we can solve this together," concludes Mrs. Saltet, patting her on the shoulder.

Reference

Dahl, R. (1961). *James and the Giant Peach.* New York: Penguin Books.

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment, and why?

STEP 2: Evaluation

Evaluate the teacher's decision making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in Step 1, and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in Step 1, and why?

TABLE 5.7

Steps in applied behavior analysis.

PRE-MODIFICATION PHASE
Identify the classroom problem.
Identify target behaviors and antecedents.
Gather baseline data.
Devise an action plan.
MODIFICATION PHASE
Apply the action plan.
Document changes in behavior.
Evaluate effectiveness.
Move to post-modification if plan was not successful.
POST-MODIFICATION PHASE
Consider changes in the plan.
Document changes in behavior.
Evaluate effectiveness.

Applied Behavior Analysis

In this section we consider a systematic approach to applying operant conditioning principles to modify student behavior known as **applied behavior analysis (ABA)**. Table 5.7 shows the three phases to ABA: a pre-modification phase, a modification phase, and a post-modification phase (Bergan & Caldwell, 1995).

Pre-modification Phase. The pre-modification phase is challenging in that it requires observing and reflecting on students' behaviors before applying any specific consequences to modify the behavior. Part of this reflective activity will consist of trying to identify the **antecedents** that trigger the target behavior. Antecedents include the contextual conditions that are typically present when students display the behavior you wish to modify. You may notice that a student has a tendency to move away from his seat when he is assigned to work in collaborative learning activities but not when he is participating in whole class activities. In this case, you successfully identified that collaborative activities are an antecedent of the undesirable behavior. Many misbehaviors are triggered when teachers require students to engage in tasks that are too difficult or unpleasant (McComas et al., 2003; Van Camp et al., 2000). In our example, the student may not feel comfortable with some of his peer members or may not believe that he can learn from group activities. A goal of the pre-modification activity is to gain a better understanding of why the antecedents may be producing the undesirable behavior. Sometimes, a slight change in the environmental conditions around the misbehavior (i.e., changing the members of the group, showing the student how working with the help of peers can promote his own learning) will end the misbehavior. At the pre-modification phase, teachers should not only document antecedents, but also baseline data regarding how often the target behavior happens. Once antecedents have been identified and baseline data has been documented, teachers can create a concrete action plan. By the end of the pre-modification phase, teachers should have identified the following relationship:

Antecedents ⇢ Target Behavior ⇢ Consequences

Applied Behavior Analysis

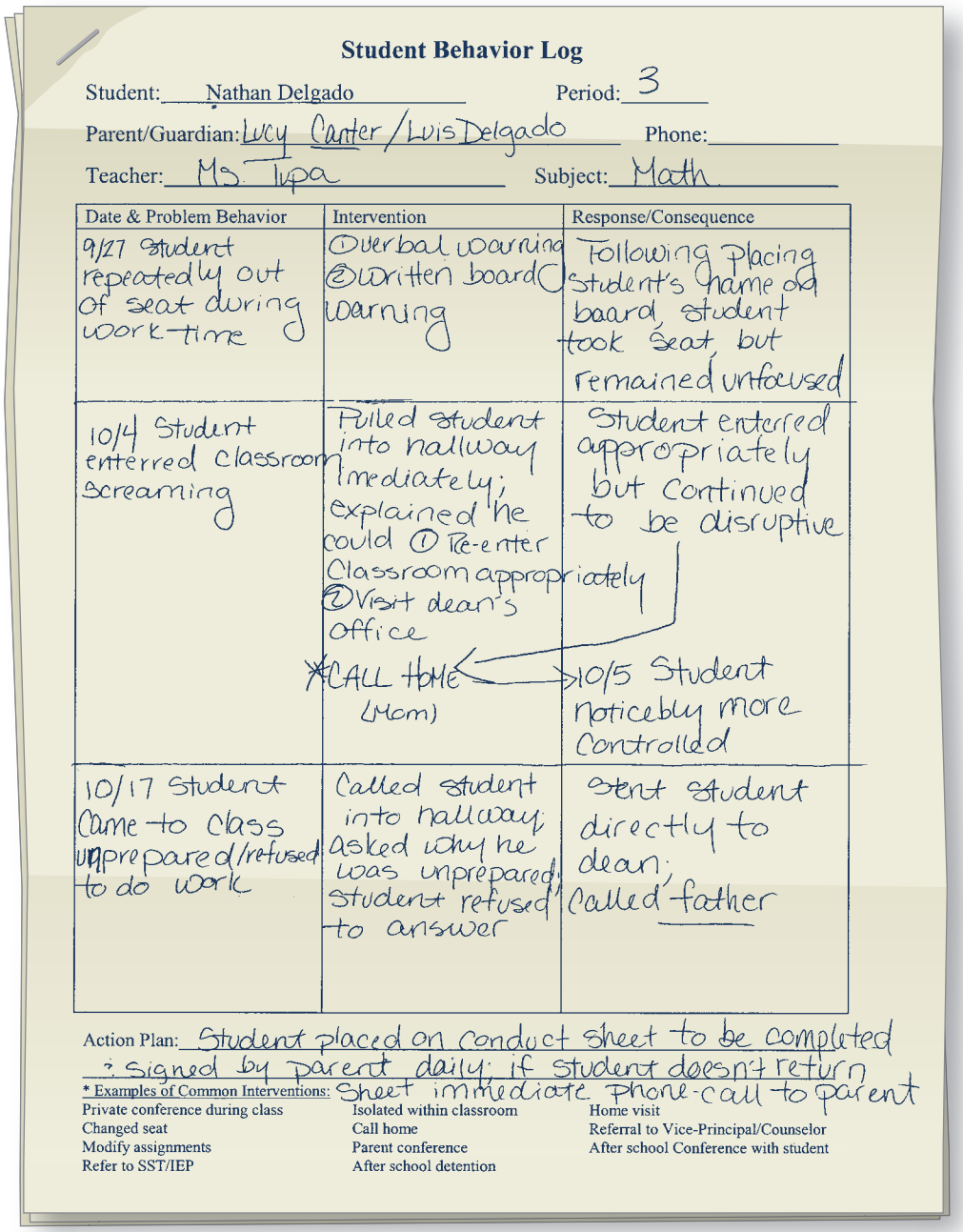
A systematic approach to applying operant conditioning principles to modify student behavior.

Antecedents

Conditions that trigger target behavior.

Modification Phase. During the modification phase, the action plan is implemented and special care needs to be taken to document how the student responds to the action plan's consequences (see Figure 5.9). The last step in the modification phase consists of comparing the baseline data with the data collected during the modification phase, to establish the effectiveness of the plan. If the intervention is successful, there should be an abrupt change in students' behavior. Successful interventions do not require a post-modification phase. The intervention may be discontinued when the teacher considers that the change in behavior is enduring and that the problem that motivated the ABA has been successfully resolved. However, it is usually a good idea to follow-up on behavior modification by periodically checking the student's behavior.

Post-modification Phase. If the student's behavior does not change significantly after the intervention, a reevaluation of the action plan and appropriate changes to the plan need to be made during the post-modification phase. Once these changes take place,



Student Behavior Log

Student: Nathan Delgado Period: 3

Parent/Guardian: Lucy Carter / Luis Delgado Phone:

Teacher: Ms. Tapa Subject: Math

Date & Problem Behavior	Intervention	Response/Consequence
9/27 Student repeated ly out of seat during work-time	① Verbal warning ② Written board warning	Following Placing student's name on baard, student took seat, but remained unfocused
10/4 Student entered classroom screaming	Pulled student into hallway immediately; explained he could ① Re-enter classroom appropriately ② Visit dean's office *CALL HOME (Mom)	Student entered appropriately but continued to be disruptive → 10/5 Student noticeably more controlled
10/17 Student came to class unprepared/refused to do work	Called student into hallway, asked why he was unprepared; student refused to answer	Sent student directly to dean; called father

Action Plan: Student placed on conduct sheet to be completed & signed by parent daily; if student doesn't return sheet immediate phone-call to parent

* Examples of Common Interventions:

Private conference during class	Isolated within classroom	Home visit
Changed seat	Call home	Referral to Vice-Principal/Counselor
Modify assignments	Parent conference	After school Conference with student
Refer to SST/IEP	After school detention	

FIGURE 5.9 **Based on this behavior log, do you think that the teacher's intervention was effective in changing her student's behavior?**

teachers should again engage in the same steps taken during the modification phase by documenting any changes in behavior and evaluating the effectiveness of the new plan. This process may continue until a solution is found. Teachers should consult with a school psychologist when they feel that they have exhausted alternative strategies and no strategy seems to work.

ABA is based on the assumptions that behavior problems are the result of past and present environmental conditions and that modifying these conditions will promote more productive responses. ABA can lead to significant improvements in academic performance and classroom behaviors (Elliott & Busse, 1991; Guglielmo & Shick, 2001) and is also a very common method used with students with exceptionalities (Heward, 2006).

ISSUES IN EDUCATION

Should teachers provide rewards to promote long-term learning?

After reading about the many studies that found support for using operant conditioning in the classroom, you may think that a positive answer to this question is obvious. However, some experts claim that rewards can only control students' behavior in the short term. What do you think about this argument? A response to this question can be found at the end of the chapter.

DIVERSITY AND BEHAVIORISM

All individuals respond to reinforcers and punishers. This is the universal dimension of behaviorist principles. However, as illustrated by the *Diversity in the Classroom* Case Study, the effectiveness of specific rewards and deterrents of undesirable behavior can be influenced by students' individual differences, such as their interests, needs, values, and goals. These factors will largely determine whether or not a gold star, a pat on the back, a tangible reward, or self-satisfaction will motivate a student to increase a desirable behavior. Because the values that an individual carries are part of his or her cultural background, culturally diverse students are likely to respond differently to some behaviorist consequences than mainstream students. Students from collectivistic cultures (in which cooperation and group success are valued higher than competition and individual success), are less likely to respond positively to individual praise as compared to receiving praise for group or team success (Fuller, 2001).

Boys and girls may also experience consequences differently. In one study, more than 1500 eighth grade students in the United States were given a survey that asked them to select which punishment would be most effective in making them improve on bad behavior in school. Although the majority of boys selected being reprimanded loudly in front of the class as the most effective punishment, the majority of girls selected being reprimanded softly instead (Casteel, 1997).



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Behaviorist strategies have been very successful at helping shape the behavior of students with exceptionalities.



Rewards for a Job Well Done

Please rank your choice of rewards in order from 1 to 5

(1 = reward I want most, 5 = reward I want least)

2 Candy bar of my choosing

1 Automatic 100 on a homework assignment
*you must complete the assignment to qualify ☺

3 Extra 20 minutes of independent reading/writing/drawing time

4 Lunch in the classroom while watching a movie

5 Other idea

we could have more recess time.

FIGURE 5.10 **Did any of your past teachers give you a similar survey before deciding on how to reinforce your good work or behavior in class?**

Remember that research on group differences (i.e., cultural groups, gender groups) can only give teachers an idea about the average finding among the group members and that the results need to be carefully interpreted so that stereotyping and overgeneralization do not occur. As teachers, we should try to learn as much as we can about each student so that we can more effectively apply behaviorist methods. Figure 5.10 shows a classroom survey that was developed for this purpose.

In addition, because individual students had unique experiences in their lives, you will find a diversity of behavior patterns in the classroom. Specifically, students' behaviors and responses will depend on how teachers, parents, peers, and other influential individuals reinforced some behaviors and discouraged others in the past. For example, Gina learned that working hard at homework assignments meant she received good grades. But Roberto learned that completing homework is a waste of his time because his teachers never graded the homework. As teachers, we should learn as much as possible about our students' background and experiences to better understand their behavior and serve their unique needs.

Knowing that Roberto's behavior was learned by past experiences at school rather than assuming that his behavior is a sign of a "problem" (i.e., laziness, lack of intrinsic motivation) can help the teacher find the best solution to help him succeed academically. The teacher can consistently check on his homework, return his work with informational feedback, and give him credit for his work. These reinforcements are not only likely to increase the likelihood that Roberto completes his homework but also likely to promote a positive attitude toward school.

The particular characteristics of students with special needs discussed in Chapter 2 will also need to be taken into consideration when applying behaviorist strategies. Although experts disagree about whether these strategies should be applied to promote better academic behaviors, behaviorist techniques have been found to be particularly

REVISITING ISSUES IN EDUCATION

Should Teachers Provide Rewards to Promote Long-Term Learning?

Points to consider: Applying behaviorist principles can be very effective, especially for young children and students with special needs (Duncan, Kemple, & Smith, 2000; Remington, 1996). The benefits of behaviorist methods are particularly effective for classroom management purposes (Alberto & Troutman, 2006). Yet, many theorists and practitioners have raised concerns about using rewards to promote students' learning. Some believe that rewards are too controlling and eventually become ineffective in the long run (Kohn, 1993; Wolfgang, 2000). Students may perform tasks because they are promised a reward; however, once the reward is removed, they are not likely to make a commitment of their own to learn (Bracey, 1994). In addition, experts in motivation argue that when students are already intrinsically motivated (they are motivated to learn for its own sake), the presence of rewards can decrease their interest or engagement in learning (Deci, Koestner, & Ryan, 1999, 2001; Swanson, 1995). A student who enjoys solving math problems may find that her enjoyment diminishes when required to complete so many problems to earn a reward.

According to a third, eclectic, view, rewards can be effective when used wisely. Rewards can be effective in promoting long-term learning when students' initial interest is lacking. Once students start developing mastery in a domain, the reinforcing power of rewards is replaced by intrinsic motivation to learn (Chance, 1992). This idea has been implemented by some school districts, which offer high school students incentives for attendance only, to entice them to participate and hopefully become truly interested in school and learning (Phillips, 1995).

Another clever method that teachers can use is a combination of goal setting and self-rewards as students make progress toward those goals. This method is effective in two ways. First, the rewards are not externally determined; therefore, they will be necessarily more meaningful to students than those offered by the teacher. Second, students learn to become more self-regulated as they take control of their own learning (Chance, 1993). Students' sense of autonomy and self-determination can be a powerful motivation force in the classroom.

We will revisit the relationship between rewards and motivation to learn in Chapter 9. For now, keep in mind that, similar to the case of other learning theories, the effective application of behaviorist principles will depend on the critical judgment of the teacher.

effective to address the classroom management issues of students with exceptionalities (Utley, Rotatori, & Obiakor, 2003).

Classroom diversity presents a special challenge for beginning teachers who may have a different background than her students.

When the discrepancy between teacher expectations and student behavior is seen as a deficit, teachers may inadvertently send the message that there is something wrong about the student that needs to be corrected. This idea was supported by a recent ethnographic study in an urban elementary school, where the demographic makeup shows the typical discrepancy between student and teacher cultural and socioeconomic background (Langhout, 2005). Specifically, a combination of classroom observations and interviews showed that teachers assumed that all children in their class came from dysfunctional families and were therefore "out of control." Consequently, they spent a great deal of time getting children to "behave." Students were given no formal say or voice in defining appropriate and inappropriate behaviors and were punished when any deviations to tightly controlled behavior occurred. A notable finding is that several students found creative verbal and nonverbal ways to make their personal identities more visible and resist the classroom constraints. These findings emphasize the need to reflect on our assumptions and biases and learn about our students' back-

ground both directly, by building parent and community relationships, and indirectly, by doing research to better interpret and explain behavior diversity (Curran, 2003; Norris, 2003).

Situating individual student behavior within their social and cultural context can help bring new meaning to their behaviors. Unfortunately, compared to other research areas, there is very little known about the relationship between diversity and the effective use of behavioral principles (Brown, Shriberg, & Wang, 2007; Iwamasa & Smith, 1996; Levesque, 2007). Much more research is needed in this area to inform teacher decision making.

SUMMARY

- Behavioral learning theories define learning as a relatively enduring change in observable behavior that occurs as a result of experience. Early classical behaviorist research on learning studied the effects of presenting stimuli on reflexive behaviors. Pavlov contributed to the idea of classical conditioning, in which an originally neutral stimuli (NS) becomes a conditioned stimuli (CS) that evokes conditioned responses (CR) due to its temporal contiguity with an unconditioned stimuli (US) that triggers similar unconditioned responses (UR).
- The process of classical conditioning includes the acquisition phase, where individuals learn to produce a response upon the presence of the CS; the extinction phase, in which individuals fail to produce a CR due to the repeated presentation of a CS in the absence of the US; and sometimes a recovery phase, in which after a rest period following the extinction phase, the sudden presentation of the CS may elicit a CR again. Generalization happens when a person learns a response to a particular stimulus and then makes the same response to similar stimuli, and discrimination occurs when a person learns a response to a particular stimulus but does not generalize the response to other similar stimuli.
- Thorndike and Skinner played a major role in the development of operant conditioning theory. Operant conditioning focuses on how voluntary behaviors are strengthened or weakened by the consequences that follow them. According to Thorndike's law of effect, positive and negative reinforcement strengthen behaviors whereas presentation and removal punishment weaken behaviors. Once a desired behavior is established, it can be maintained by supplying reinforcement on an intermittent schedule.
- The five basic reinforcement schedules are continuous, fixed interval, variable interval, fixed ratio, and variable ratio. Complex skills can be learned by reinforcing successive approximations to the target behavior and ignoring non-approximate behaviors, a process called shaping.
- Other applications of behaviorist principles in the classroom are fading, cueing prompting, and applied behavior analysis, which includes a pre-modification phase, a modification phase, and a post-modification phase to systematically modify student behavior.
- Students will display a diversity of behavior patterns in the classroom and will respond to reinforcers and punishers differently, depending on their gender, cultural and socioeconomic background, and their particular interests, needs, and goals. Therefore, teachers should continuously reflect on their assumptions and expectations when applying behaviorist principles.

KEY TERMS

antecedents 182
applied behavior analysis 182
aversive stimuli 159
behaviorism 156
classical conditioning 157
conditioned response 159
conditioned stimulus 158
contingency contracting 165
continuous reinforcement 168
cueing 172
detention 175
differential reinforcement 173
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TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. According to behaviorist theory, how is learning defined?
2. How does classical conditioning occur?
3. What are generalization and discrimination?
4. How do classical and operant conditioning theories differ?
5. What are some methods to increase desirable behaviors?
6. In what ways can you use the Premack principle in your classroom?
7. How can reinforcement schedules be classified and what is the effectiveness of each?
8. How are these concepts alike and different: shaping, fading, cueing, prompting?
9. What are acceptable and unacceptable methods to decrease undesirable behaviors?
10. When and how would you use applied behavioral analysis in your classroom?
11. Why is diversity important when applying behaviorist principles?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay.

- How was your first response different from your new response?
- Were your beliefs consistent with behaviorist theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. Design an action research study to test the effect of a token economy system in your classroom. (Chapter 1)
2. Using the classical conditioning paradigm, explain how students may develop test anxiety with the current emphasis on standardized testing. (Chapter 1)
3. How are contingency contracts and IEPs alike and different from each other? (Chapter 2)
4. What types of individual differences are most important to consider when evaluating the effectiveness of operant conditioning methods and why? (Chapter 2)
5. How would you relate Vygotsky's zone of proximal development to the following operant conditioning concepts: shaping, cueing, and prompting? (Chapter 3)
6. Do you think that Piaget would have encouraged any behavioral methods in the classroom? Why or why not? (Chapter 3)
7. Take a look at Table 5.6 and explain which punishment guidelines might be especially important for self-worth development. (Chapter 4)

A Case Study
PUTTING IT ALL TOGETHER

How Does This High School Classroom Use Behavioral Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in the chapter.

The high school's technology instructor, Mr. Trujillo, is pleased with the new computer lab. He can now teach typing skills to the Technology I students and video editing to students in TV/Video classes. Mr. Trujillo's goal is to teach the freshman in Tech I basic typing skills as quickly as possible and then start teaching them Publisher and PowerPoint. However, during the past few class sessions, Mr. Trujillo has observed a number of students lagging behind. Their typing skills are not improving as quickly as he had anticipated. He frequently notices students using the 'hunt and peck' technique rather than standard typing. He also discovered three students playing Internet games rather than completing the typing program during last week's class.

Considering it is almost halfway through the semester, Mr. Trujillo feels that he needs to come up with a method to help his Tech I students stay on-task and improve their skills. He also wants to acknowledge students who have mastered the intermediate typing level. With these goals in mind, Mr. Trujillo draws a chart on the board before the students enter the computer lab.

Meet your Typing Goals!

TYPING LEVEL	EXPLORATORY COMPUTER TIME
Beginning	5 Minutes Exploratory Time
Intermediate	10 Minutes Exploratory Time
Advanced	15 Minutes Exploratory Time
Complete	Entire Class period Exploratory Time

"Good afternoon everyone," Mr. Trujillo greets the class as they start up their computers. "Let me have your attention for a moment, before you begin typing today."

"Ahhh? Come on, we just want to get started, get this whole typing thing over with," Amanda says. "Yeah, that's right," Derek chimes in.

"I realize you feel frustrated," Mr. Trujillo responds in a calm voice. "Today, I want to share with you all something that I think will help you meet your typing goals. The good news is that seven students have already mastered the intermediate level. However, many of you are still struggling at the beginning steps. Last week I observed some of you reverting back to the 'hunt and peck' typing technique. Why do you think that concerns me?"

"Well, when we have better jobs than now we won't be able to just use hunt and peck because we'll need to type really fast," Kira responds. "If we keep practicing hunt and peck it will be harder and harder to learn the right way to type."

"Kira, I'm glad you made the connection between our typing class and your life after high school. Typing is an important skill that you'll use in your education after high school as well as in higher paying jobs. You know, I'm really excited thinking about the day when you no longer need to work on typing skills and we can learn exciting computer programs together, like Publisher and PowerPoint. Learning both these programs, as well as typing, are skills that you can put in your resume to help you get better opportunities in education or the job market."

"Mr. Trujillo, you've been saying that since the first day of class, and look, here it is, we are half way through the semester and still doing the same old same old. I'm tired of this!" Derek despondently replies.

"Well, let me explain what I have in mind," Mr. Trujillo continues. "Every day at the end of class, depending on your typing level, you will receive 'exploratory time' to start learning these new programs. You can see on the chart how many minutes you'll be given each class period. For example, if you're at an intermediate level, you'll have ten minutes of exploratory time."

"Hey, that's not fair. What about everybody who came into this class already good at typing? You're going to give them free computer time just because they're better at typing? That just not right."

Mr. Trujillo responds, "You all entered this Technology class at similar levels. I see this system as a way to recognize dedicated students who have put a lot of time and effort into their typing skills. You all need to learn how to type at some point, and the faster you learn the better it will be for all of us. Then I can start teaching you the programs I've been referring to all semester."

"Well, I don't think it's fair, and who cares about five minutes of computer time anyways. I'll just use the computer after school for as long as I want. I don't really care about any systems you think up." Derek smirks.

"Derek, if you still feel upset about this issue, I would be happy to meet with you privately after class to continue this discussion. Right now, we're going to get down to work," Mr. Trujillo replies in a firm voice. "All right class, you may begin

your typing program and I will be coming around to observe your typing and answer any questions."

The students quietly begin to type as Mr. Trujillo circulates through the lab to monitor their progress. After sitting for 5 minutes in front of the blank computer screen, Derek also begins to type. As Mr. Trujillo scans the room he is relieved to see students focused and using standard typing rather than the 'hunt and peck' technique.

Mr. Trujillo sets a clock at the front of the classroom, so students will know when they can start their exploratory time. He also hands out a simple guide so students can independently practice Publisher and PowerPoint.

At the end of the lesson Mr. Trujillo asks, "How did typing go for you today?" "O.K." "Same as usual." "A little better." The response is mixed, but Mr. Trujillo is pleased with the on-task, focused behavior he observed during class. "Don't forget to practice over the weekend!" "You're kidding, right?" Chris asks. "No, I'm not kidding. Practice is very important," Mr. Trujillo replies as he dismisses the class for the day.

APPLICATION AND REFLECTION QUESTIONS

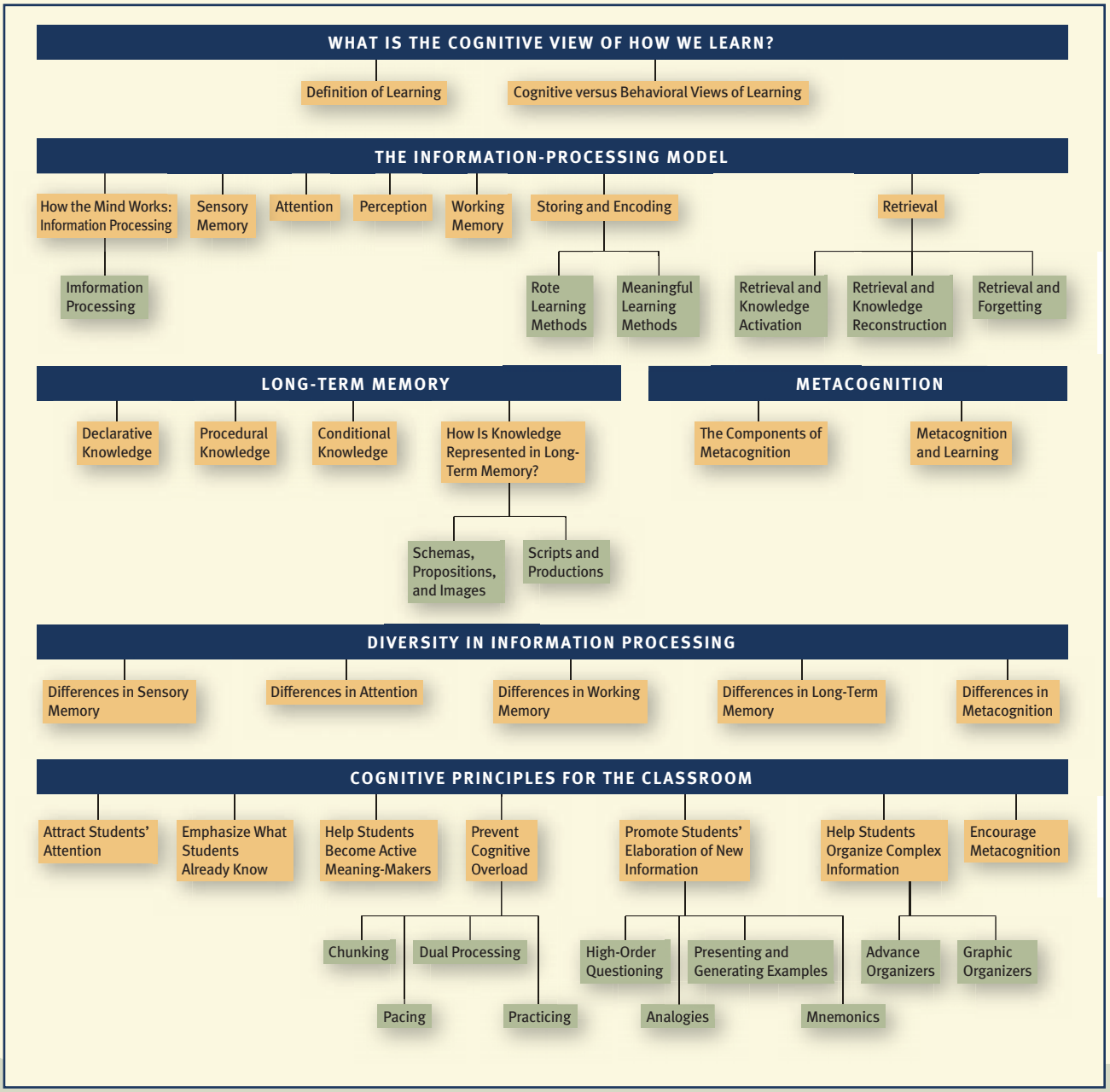
Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What are some strategies that the teacher used to increase desirable behaviors?
2. What are some strategies that the teacher used to decrease undesirable behaviors?
3. Which of the behaviorist principles were applied during the lesson, and how?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to the chapter content by including both strengths and weaknesses.



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6 Cognitive Views of Learning



Imagine You Are the Teacher

Ms. Calvin starts her physical science class by reviewing what students had learned the day before on Newton's laws of motion.

"Who can explain one of the three laws of motion we discussed yesterday? Alex, do you want to give it a try?" Ms. Calvin prompts.

Alex responds, "Hmmm . . . Sorry, Ms. Calvin, but I don't remember much. You went too fast talk'n all crazy about stuff I don't know. I don't even know who this Newton guy is beyond an apple fell on his head. I do remember that!"

Cate adds, "You also said something about cars, but I don't remember the three laws. I quit listening after a few minutes—you were making my head hurt with all those formulas. Letters meaning numbers, that's crazy! I can't even remember what the letters stood for."

Although a little disappointed, Ms. Calvin insists, "You all can do better than that. We did talk about an apple falling and cars, but didn't you learn about inertia, forces, vectors, mass, acceleration, opposite reactions? Does any of this ring a bell?"

- Why is Alex having difficulty remembering yesterday's lesson?
- What are Cate's feelings revealing?
- What could you do to help your students learn the topic?

Think about how you would respond to these questions as you read through the chapter.



Con Tanasiuk/Design Pics/©Corbis

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define learning according to cognitive theory.
2. Describe the information-processing model.
3. Explain declarative, procedural, and conditional knowledge in long-term memory.
4. Explain metacognition and its relationship to learning.
5. Discuss the role of diversity in information processing.
6. Describe classroom applications of cognitive learning theory.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. How do students learn new information?
2. Should teachers use rote learning methods in the classroom?
3. What is the role of practice in learning?
4. Why do students sometimes forget what they have learned?
5. What is metacognition and why is it important to learning?

WHAT IS THE COGNITIVE VIEW OF HOW WE LEARN?

In the previous chapter, we discussed learning from a behavioral point of view. As you remember, behavioral learning theories define learning as a relatively enduring change in *observable behavior* that occurs as a result of the interaction of an individual with the environment. The focus of behavioral views of learning is on producing desirable behaviors or reducing undesirable behaviors.

A limitation of behavioral views of learning is that they neglect the need to understand learners' mental processes. Although classical and operant conditioning have a powerful influence in learning, educational psychologists became frustrated with the limitations of behaviorist theories and methods, which could not explain the complexities of human cognition, such as how language develops and how meaningful learning occurs. This frustration combined with the emergence of computers (which provided a useful metaphor for modeling human cognition) gave rise to cognitive psychology and cognitive views of learning. However, no single event can be claimed to have started the cognitive era. It was the combined work of several influential psychologists since the late 1950s that launched the development of cognitive approaches to learning (Ausubel, 1960; Bruner, Goodnow, & Austin, 1956; Chomsky, 1957; Miller, 1956).

Definition of Learning

Cognitive views of learning are characterized by their focus on the changes in thought that are involved in learning. They emphasize the mental processes underlying the processing of new information, such as paying attention to an explanation, interpreting a graph, or relating new concepts to prior knowledge. Due to this emphasis, cognitive theory defines learning as a relatively enduring change in *mental structures* that occurs as a result of the interaction of an individual with the environment.

Unlike behaviorists, cognitive psychologists argue that learning takes place in the mind; therefore, behavior is of interest not in itself but rather as a way to infer whether and how students' mental structures have changed. Although changing the way that students think may result in behavioral change, this is not necessary according to cognitive views of learning. Imagine that a student in your class does not know what a mammal is. He does have experience with mammals (e.g., humans, dogs, cats) but he lacks this concept in his mental structures and, consequently, is unable to distinguish between mammals and other animals. Now imagine that you teach him about the characteristics of mammals. Although the student's mental structures change after your lesson, his behavior may not change until he is called on to use this new information in a certain task, such as classifying a list of animals based on the definition of mammal that he just learned.

Cognitive versus Behavioral Views of Learning

Another contrast between cognitive and behavioral learning theories is that, according to cognitive theory, different individuals will construct different understandings, even when they interact with identical environmental conditions. Unlike in behaviorist views of learning, individual differences play a fundamental role in helping teachers understand how and what each individual student may learn. Imagine that you are teaching how to add and subtract integers to your fifth-graders. Susan and Miriam are sitting at the same table, listening carefully to your explanation. Because both students learned in the same instructional environment, a behaviorist view of learning would predict that they both experienced the same learning. However, after instruction, you watch them try to solve some practice problems and realize that Susan is slowly figuring out the solution to even the hardest problems whereas Miriam is struggling with the idea of subtracting two negative numbers.

A cognitive view of learning suggests that you look into students' individual differences to help explain the different learning outcomes. Perhaps you know that compared to Susan, Miriam does not have enough prior knowledge to be able to quickly grasp the new arithmetic procedure you are trying to teach. Therefore, she probably needs more practice with natural numbers before she can master the addition and subtraction of integers. For behaviorists, individual differences only reflect differences in students' past conditioning, reinforcement, and punishment; they are not taken into consideration to understand new learning.

Finally, the research methods used by cognitive and behavioral psychologists also differ. Behavioral psychologists attempted to derive general principles of learning by conducting controlled laboratory experiments with animals other than humans. You probably recall from the previous chapter that Thorndike's research paradigm consisted of placing cats in puzzle boxes and observing their behavior as they tried to escape the box to reach food that was placed outside.

What are some factors that can help explain why students may construct different understandings from the same environmental conditions?



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On the other hand, cognitive psychologists have used a much wider range of research methods to study learning, including methods that require students to describe their own mental processes during learning. These methods (e.g., introspection, think-aloud protocols) were not considered to be scientific by behaviorist psychologists but are essential to cognitive psychologists due to their focus on individual changes in mental structures. Table 6.1 summarizes the main differences between the behaviorist and cognitive views of learning.

Why is it important to compare and contrast different learning theories? Because the goal of teaching is to promote learning, it is important that you have a theory of learning to guide your decisions about the type of instructional environment you will need to create to reach this goal. Your idea of what constitutes learning will affect the kind of activities you choose, whether you consider individual differences in

TABLE 6.1

Behaviorist versus cognitive views of learning.

	BEHAVIORIST VIEW	COGNITIVE VIEW
DEFINITION OF LEARNING	A relatively enduring change in observable behavior that occurs as a result of an individual's interaction with the environment.	A relatively enduring change in mental structures that occurs as a result of an individual's interaction with the environment.
FOCUS	Producing desirable behaviors or reducing undesirable behaviors.	Promoting growth in students' mental structures.
INDIVIDUAL DIFFERENCES	Reflect differences in students' past conditioning, reinforcement, and punishment.	Play a fundamental role in understanding how students construct new knowledge or acquire new skills.
METHODS	Controlled laboratory experiments conducted with animals other than humans and examining only observable behavior.	Varied research methods conducted with a diversity of humans examining observable behavior and mental states.



Purestock/Getty Images

What are models and when are they most useful to promote students' learning?

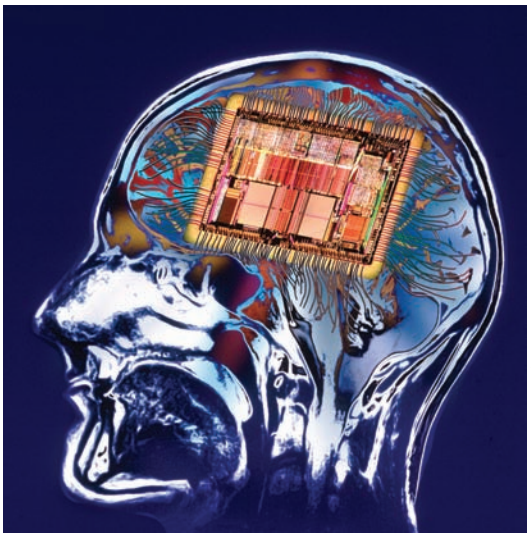
instruction, or how you assess your students' learning. A teacher who has a behaviorist view of learning will probably be less likely to adapt instruction to students' individual differences, will focus on the use of rewards and punishment to shape students' behavior, and will measure students' learning with product-oriented assessments.

A teacher who has a cognitive view of learning will be likely to adapt instruction to individual students' needs, such as providing more or less scaffolding depending on their prior knowledge, and to examine students' thinking processes by using open-ended questions that require students to explain their reasoning and strategies.

THE INFORMATION-PROCESSING MODEL

In this section, we examine a model of how the mind processes information, which is a popular cognitive approach to understanding how people acquire, store, and recall new information. You are probably familiar with airplane models, anatomy models of the human body, or chemistry models of atoms. A model is a human-made, concrete representation of a complex system that can be used to guide the understanding of the real system that is being modeled. Models are particularly useful when representing phenomena that are invisible to our eyes or hard to visualize. The human mind has been compared to a "black box" because, unfortunately, it is impossible to open up our heads and "see" how we think. A model of the human mind, however, helps us see the mind in action.

FIGURE 6.1 The brain-as-a-computer metaphor.



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How the Mind Works: Information Processing

The information-processing model is the classic model used by cognitive psychologists to explain cognition and learning (Atkinson & Schiffrin, 1968; Newell & Simon, 1972). Why is it called the information-processing model? The name comes from using the computer as a metaphor to understand the human mind. The human mind is analogous to a computer in that new information can be input, processed, stored, and later retrieved (see Figure 6.1). When you use a word-

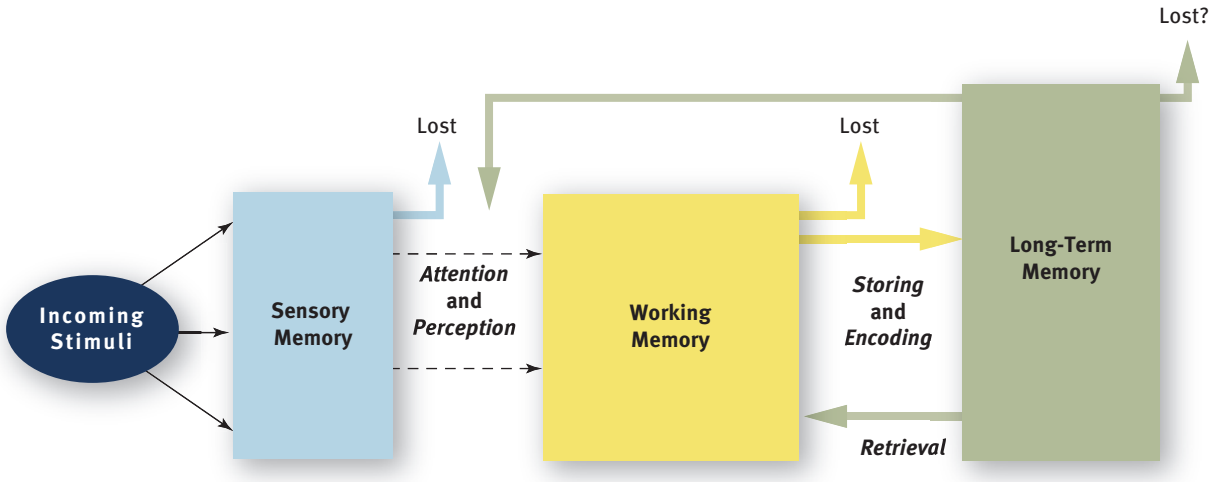


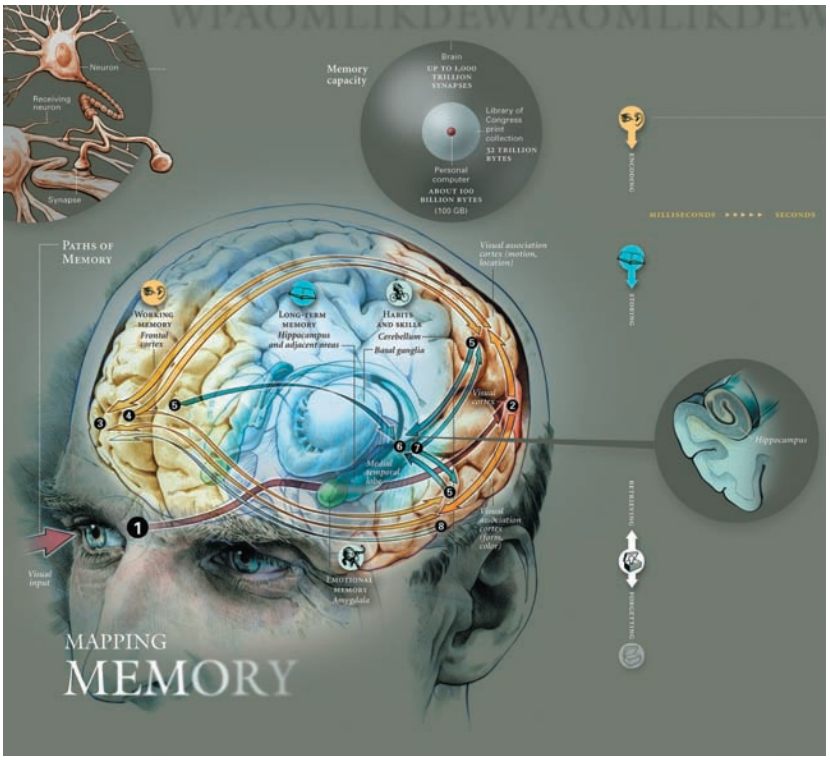
FIGURE 6.2A The information-processing model.

processing program, the computer receives your input (i.e., the keystrokes from the keyboard), processes the information (i.e., translation of keystrokes into words), and stores the processed information (i.e., the storage of the document as an electronic file). The stored information can later be retrieved when needed (i.e., opening the electronic file to print the document). Likewise, the human mind receives information from the environment (i.e., students listen to the explanation of a teacher), processes the information (i.e., students make sense of the teacher's explanation), stores the new information in memory (i.e., students integrate the explanation with their prior knowledge), and retrieves the information when needed (i.e., when taking a test).

Figure 6.2A represents the relationships among the parts of the information-processing model. The memory systems are represented by the blue, yellow, and green boxes, and the cognitive processes are represented by the bold *italic* words in the model.

The three memory systems are repositories that hold information, and the cognitive processes are mental activities that can be performed on new information. Trying to identify all the information-processing components simultaneously may be a little overwhelming, so let's break down the model and take a look at each of the information-processing components in more detail. Once you have read the whole chapter, you will be able to explain the complex relationships shown in this model.

FIGURE 6.2B The classic model used by cognitive psychologists to explain cognition and learning; the name comes from using the computer as a metaphor to understand the human mind, where the human mind is analogous to a computer in that new information can be input, processed, stored, and later retrieved.



Sensory Memory

Imagine a learner sitting in a classroom environment. The incoming stimuli may consist of the spoken words of the teacher, written words and numbers on the board, the feeling of manipulatives, the taste of a piece of gum in his mouth, the smell of lunch from the school's cafeteria, the sounds from the environment, and so on. How does the learner start processing the multiple stimuli from the environment?

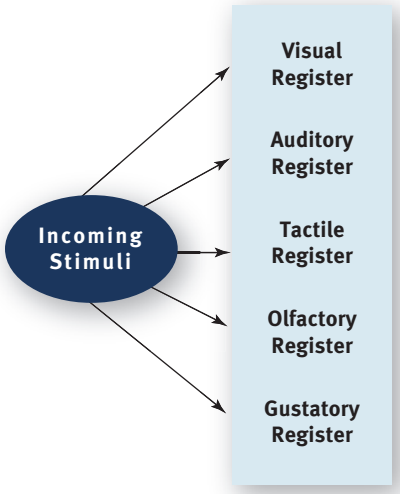


FIGURE 6.3 A model of sensory memory.

As can be seen in Figure 6.3, the sensory memory system is what first comes into contact with the external environment. This memory system is composed of a set of registers for each one of the human senses: visual, auditory, tactile, gustatory, and olfactory. The function of each *sensory register* is to hold the information from the environment in its "raw" or unprocessed form. In other words, images, sounds, smells, and any other environmental stimuli are being registered by our senses but we have not yet consciously processed these stimuli for meaning.

Sensory memory is the information store that briefly holds stimuli from the environment until they can be processed (Neisser, 1967). Before the learner can start making sense of a written word on the board, his visual register needs to hold the image of the word in his sensory memory. A similar phenomenon happens with the other senses. Before the learner can give meaning to the spoken words of his teacher, he has to hold the sound of the spoken words in his auditory register as an "echo" (Deutsch, 1987). What is held in sensory memory is basically a copy of objects and events in the world (Leahey & Harris, 1997) so that later in the process meaning can be made from the sensory information. As you can see from Figure 6.2A, sensory memory holds the raw information long enough so that we can attend to it, perceive it, and move it to working memory, the next memory system in the model.

Sensory Memory

The information store that briefly holds stimuli from the environment until they can be processed.

What is the capacity of sensory memory? Cognitive psychologists argue that everything your body senses is stored in sensory memory, which suggests that sensory memory has a very large capacity. However, research shows that once the stimuli are removed (e.g., written words are erased from sight or the sound of spoken words is gone), they remain in the corresponding registers only for a very brief period of time (Cowan, 1995). In other words, we can hold any information that comes through our senses in sensory memory, but this unprocessed information is rapidly lost. This is illustrated by the "lost" arrow in the upper-right corner of the sensory memory box in Figure 6.2A. In order to process the information that is stored in the sensory registers, we need to move it to working memory. This happens through the attention and perception processes that are described next.

Some students with autism spectrum disorders may become overstimulated by normal levels of sensory input. For instance, these students may react to normal environmental sounds or touch as if they caused them physical pain.



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Attention

What is attention and why do students need to be reminded to engage in this cognitive process? **Attention** can be defined as the process of allocating cognitive resources to a stimulus or task at hand (Bruning, Schraw, Norby, & Ronning, 2004). Attention is a selective process by nature because the amount of cognitive resources in the brain are limited (Mangels, Piction, & Craik, 2001). In other words, we can focus our attention on only so many things at one time (Anderson, 2005). This is why teachers need to gain and maintain students' attention to achieve their learning goals. Otherwise, students are likely to become distracted by the many irrelevant stimuli in the classroom environment.

Imagine the following scenario. Mr. Crespo is teaching his kindergarten students a lesson on gross motor skills. To this end, he assigns each student to a previously marked area on the playground and asks them to explore different ways to move between two points. After a few minutes of watching students explore movement by running, skipping, and crab crawling back and forth, Mr. Crespo whistles three times. Once students make eye contact with him, he asks them to explain how they moved their body.

Attention typically requires conscious effort, such as when learners focus on certain information because it is important for achieving their goals. First, Mr. Crespo directs students' attention by providing each student with a marked space and engaging them in an exploration activity. Second, he provides an auditory cue (the whistling) to redirect his students' attention to the class discussion.

Attention, however, may also shift automatically when external events become salient. For example, Jerome is very focused, conducting an experiment to test the levels of glu-

cose in a cracker for his science assignment. All of a sudden—"Boom!" The sound of an explosion automatically shifts his attention to the back of the classroom. Unpredictable stimuli like this explosion will automatically distract people from the task at hand. This is why it is important to provide learners with a predictable and safe classroom environment.

How limited is attention? To answer this question, it is important to first distinguish between automatic and conscious processing (Schneider & Schiffrin, 1977). *Automatic* processing occurs when an individual has sufficiently practiced a procedure to allow for the procedure to happen with minimal use of his/her cognitive resources. For example, Kayla focuses on using new vocabulary words correctly in sentences rather than on forming the actual letters of the words because she practiced letter formation until it became automatic.



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What is the relationship among practice, automaticity, and learning?

Humans can attend to more than one automatic task simultaneously. Even if you are not a professional driver, if you have been driving your car for quite a while from home to school, you can probably drive and simultaneously drink a cup of coffee and listen to the radio. However, the limitations of attention become clear when one of these automatic tasks presents an unexpected outcome. In our example, imagine that the route you usually take to school is blocked. You will probably need to focus all your attention on driving, and you will most likely stop the other two tasks (drinking coffee and listening to the radio) until you have surmounted the problem in the road. Because you don't have an automatic procedure in place for driving a different route, you need to switch from automatic processing to conscious processing in order to get to your destination. *Conscious* processing is extremely demanding of cognitive resources and, for this very reason, will require your full attention. Automatic processing, on the other hand, requires minimal attention.

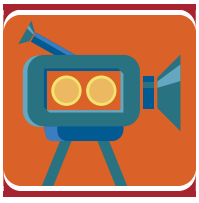
Attention

The process of allocating cognitive resources to a stimulus or task at hand.

The distinction between automatic and conscious processing is essential for understanding why the same instructional activity might seem more effortful or difficult for some students than for others (Sweller, 1999). For instance, unlike Carla, Jenny is not yet able to read automatically. Because the process of decoding takes a significant amount of Jenny's attentional resources, she will not be able to understand the meaning of the words as well as Carla, whose reading skills are already automatic (Samuels, 1988; Stanovich, 2000). As Jenny continues to practice reading, the cognitive demands to accomplish this task will diminish, allowing her to better engage in higher cognitive tasks such as reading comprehension. Thus, teachers should encourage practice to help students achieve automatic processing in skills. As procedures become automatic, students can use their limited attentional resources to learn new information or skills.

Get Connected!

VIDEO CASE ASSIGNMENT. . . View a Teaching Example 1: Guiding Student Learning (Tab 1)



Go to your WileyPlus course and view the video. While watching the video, think about skills that you can perform with automaticity. Be prepared to discuss how practice contributed to your current level of performance.

Perception

Perception is defined as the cognitive process that gives meaning to sensory input. Once attention is devoted to certain stimuli, perception is the process that interprets the stimuli based on our prior knowledge or long-term memory. Take a look at Figure 6.4. What do you see? Do you see an old woman or a young woman?

Perception

The cognitive process that gives meaning to sensory input.

This image is a classic stimulus used in basic research on human perception (Leeper, 1935). When people are asked to report what the image is depicting, 65% describe the image as that of a young woman and 35% as that of an old woman. Of course, there is no right or wrong interpretation of this figure. The figure is ambiguous and may entertain both interpretations.



FIGURE 6.4 A perception exercise.

Source: Journal of Genetic Psychology, 46, 41-75, 1935. Reprinted with permission of the Helen Dwight Reid Educational Foundation. Published by Heldref Publications, 1319 Eighteenth St., NW, Washington, DC 20036–1802. Copyright © 1935.

The fact that different people may perceive different things from the same picture demonstrates that the process of making sense is subjective. In fact, research in perception shows that what we see, hear, smell, taste, and feel depends on our personal memories and experiences (Mandler, 1984).

In the case of Figure 6.4, you may have perceived a younger or older woman, depending on how consistent the picture is with younger or older women in your culture or past experience. For most people, it is very hard to see the "other woman"; only after specific features have been pointed out (i.e., the nose, the ear) are they able to find the alternative interpretation to the picture. The effect of prior knowledge on perception is illustrated by the top-down arrow from long-term memory to the attention and perception processes in Figure 6.2A.

In addition, our perception of new information is affected by the context in which the new information is presented. Take the case of Figure 6.5.

In a famous study by Bugelski and Alampay (1961), a group of people were shown the top row of the drawings (including human faces) and a second group of people were shown the bottom row of the drawings (including various animals). When asked to identify the last drawing of each row, people who saw the top row were much more likely to see a bald man, and those who saw the bottom row were much more likely to see a rat. This simple experiment demonstrates the powerful effect of context on perception. Because perception is highly influenced by prior knowledge and context, teachers should never take for granted what students will perceive.

Checking on students' perception of new information is essential to learning. You can ask open-ended questions during instruction to see if students were able to identify essential information or check that they have an accurate and complete interpretation of the information that you presented. The more diverse your classroom, the more important it is to ensure that all students perceive the instructional materials as intended.

Working Memory

Working Memory

The memory system of the information processing model where information that has been attended to and perceived is held temporarily and processed.

Look again at Figure 6.2A and locate the working memory box in the figure. As you see, **working memory** is the second memory system of the information-processing model and can be defined as the place where information is processed for meaning. Note that information comes into working memory from two directions.

First, a portion of the information held in the sensory registers is moved to working memory after the cognitive processes of attention and perception. Second, information held in long-term memory can be retrieved and stored in working memory for



FIGURE 6.5 The role of context in perception.

further processing. For example, as the teacher reads "O Captain! My Captain," a Walt Whitman poem about Abraham Lincoln, Johnny remembers images of Lincoln from a movie that the class watched last week. This example shows that Johnny's working memory is holding both the auditory information that was processed through his sensory registers (the words in "O Captain! My Captain" spoken by the teacher) and the visual information that was stored in his long-term memory (the images of Lincoln from the movie he saw last week).

Originally, theorists conceived working memory only as a temporary storage for new information and referred to this memory system as **short-term memory**. Modern theories, however, prefer the term *working memory* because more recent research has discovered that, in addition to storage, this memory system is equipped with a central executive component whose function is to "work" with the information that is being held.

Short-Term Memory

A memory system that works as temporary storage for new information.

A current working memory model includes the following three components illustrated in Figure 6.6 (Baddeley, 2001):

- The visuospatial sketchpad (VSSP)
- The phonological loop (PL), also known as the articulatory loop
- The central executive (CE)

The function of the VSSP is to hold visual and spatial information for further processing; the function of the PL is to hold words and sounds for further processing; and the CE is in charge of focusing attention, organizing new information, integrating new information with prior knowledge, controlling complex voluntary tasks, and inhibiting inappropriate thoughts and actions (Baddeley, 2001; Carlson & Moses, 2001; Kimberg, D'Esposito, & Farah, 1997). The VSSP and PL are also called slave systems because their function is to hold information for the CE to manipulate.

Let's see how the three components of working memory look in the classroom. If a student is learning how to calculate the area of a rhombus, he may first hold a picture of a rectangle in his VSSP. The CE may manipulate this image by slanting the opposite sides of the rectangle and forming a rhombus figure. The PL will hold the spoken words of the teacher as she talks about the formula for calculating the area of the rhombus, and the CE may then manipulate the words that are being held in the PL by selecting what is most important in the message and taking notes.

Maintenance Rehearsal

Refreshing the information held in the phonological loop by repeating it to yourself.

What is the capacity of working memory? According to research, adults are able to hold seven plus or minus two unrelated bits of information in working memory at any one time (Miller, 1956). This means that the range of working memory capacity is between five and nine bits of information, depending on each individual. A *bit* is a unit of meaningful information and depends on an individual's prior knowledge. For instance, for a student who is starting to spell words, a bit might be only a letter, but for a student whose spelling has become automatic, a bit might be an entire word.

In addition to capacity limitations, the duration of information in working memory is also extremely limited, ranging from 15 to 30 seconds. To experience firsthand this limitation, try calling directory assistance for a new phone number. How long can you hold the number in working memory before it is lost? Unless you write down the number on a piece of paper or you repeat the number to yourself over and over, it will take only a few seconds to disappear from your memory. Writing the number on paper and repeating the number are strategies to overcome the limitation in working memory duration. In the first case, you are storing the number in an external piece of memory (the paper). In the second case, you are using **maintenance rehearsal**: You keep refreshing the information held in your PL by repeating it to yourself. Maintenance rehearsal is represented by the curved arrow in the working memory box in Figure 6.6.

In terms of the computer metaphor, humans' working memory is analogous to the computer's random access memory (RAM). Unless information that is held in working memory is encoded in a meaningful way in our long-term memory (i.e., saved in the computer's hard drive), it is lost and unrecoverable. This is illustrated by the "lost" arrow in the working memory box in Figure 6.2A.

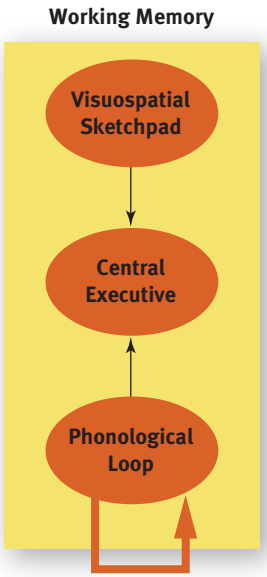


FIGURE 6.6 **A working memory model.**
Source: Baddeley (2001).

An important observation that can be made from Figure 6.2A is that all cognitive processes happen in working memory. This is because working memory is where thinking occurs. Thus, a distinctive characteristic of working memory is that it is the "conscious" part of our information-processing system. Not surprisingly, working memory capacity has been found to predict retention, long-term learning, and performance in various comprehension and reasoning tasks (Hambrick, Kane, & Engle, 2005; Linderholm & van der Broek, 2002). Moreover, it has been argued that working memory capacity may be equivalent to Spearman's *g* factor of intelligence (see Chapter 2 for a description of Spearman's intelligence theory), because it is more related to learning than any other cognitive factor or ability (Ackerman, Beier, & Boyle, 2005; Kyllonen, 2001).

Storing and Encoding

Holding information in working memory is a necessary but not sufficient condition to warrant learning. In this section, we focus on two cognitive processes by which information gets from working memory into long-term memory: storing and encoding (see corresponding arrow in Figure 6.2A). How much students learn will depend on the kind of mental processes they apply to the information that is being held in working memory. **Storing** is the cognitive process by which a copy of new information is saved into long-term memory. However, most of the new information that is held in working memory is subject to some type of modification before being stored in long-term memory. Even when you read the same story to all the students in your classroom, each student is likely to give different interpretations to the story and relate the characters and events to their unique experiences. **Encoding** is the cognitive process by which new information is elaborated or organized and saved into long-term memory. To better understand the differences between storing and encoding new information, let's distinguish between rote learning and meaningful learning methods.

Storing

The cognitive process by which a copy of new information is saved into long-term memory.

Encoding

The cognitive process by which new information is elaborated or organized and saved into long-term memory.

Rote Learning

Being able to remember something, yet, what is remembered has no meaning attached to it.

Rote Learning Methods. Students experience **rote learning** when they are able to remember something, yet what they remember has no meaning attached to it. Rote learning is the result of merely storing new information and can be achieved with rehearsal, repeating information over and over for a long period of time, either mentally or aloud. Usually, rehearsal leads to a long-term memory effect. You may be able to sing the words of a song that you rote-memorized at a very early age. But it's not until years later that you are able to think about the words and understand their meaning. Although repetition and drill can be thought of as rehearsal methods, they should not be confused with the maintenance rehearsal strategy that we discussed earlier. Unlike maintenance rehearsal, where information is lost as soon as rehearsal ends, the practice of repeating information over long periods of time will result in a memory of the repeated information, even if the new information is not meaningful.

ISSUES IN EDUCATION

Should teachers use rote learning methods in the classroom?

Many educators believe that there is no need to have students rote-memorize information because information learned by rote can also be learned in more meaningful ways. What do you think about this argument? A response to this question can be found at the end of the chapter.

A characteristic of rote learning methods is that how much you remember depends on how much time you spend practicing the information to be learned. The more you practice, the better you will be able to retrieve the practiced information from your long-term memory. In this regard, educational psychologists distinguish between *distributed practice* (i.e., learning that is spaced out over several sessions) and *massed practice* (i.e., learning that is crammed at one time). Research in the area of vocabulary learning shows that distributed practice is much more efficient than massed practice (Bahrick & Phelps, 1987). Likewise, breaking material down into smaller units and practicing them a little at a time is found to be more efficient than trying to commit all the material to memory at once (Crawford & Baine, 1992). In general, distributed practice has been found to improve retention of information (Mumford, Constanza, & Baughann,1994; Shany, 1995). Massed practice may allow for faster initial learning, but for most kinds of learning, distributed practice promotes deeper and longer-lasting learning (Dempster, 1989; Willingham, 2002).



Erik Dreyer/Stone/Getty Images

Based on what you know about distributed and massed practice, what type of practice should students use to prepare for a test?

Meaningful Learning Methods. Students experience **meaningful learning** when they make connections between new information and their prior knowledge. Therefore, meaningful learning requires students to encode rather than merely store new information into long-term memory. Meaningful learning is more efficient than rote learning, especially when students can relate ideas to themselves (Anderson, 1995; Ausubel, Novak, & Hanesian, 1978; Bransford & Johnson, 1972). Unlike rote learning methods, which focus on repeating information without altering its original form, meaningful learning methods are aimed at expanding on the original information by associating it with other information held in students' long-term memory (Gagné, Yekovich, & Yekovich, 1993).

Meaningful Learning

Making connections between new information and prior knowledge.

There are two methods for encoding information in meaningful ways: elaboration and organization. With **elaboration** methods, students use their prior knowledge to expand on a new idea, thereby storing more information than what was originally presented to them. Students encode information in meaningful ways when they actively use information stored in long-term memory to add details to new information, clarify the meaning of a new idea, make inferences, construct visual images, and create analogies (King, 1992). When students use elaboration in their encoding of information, their retrieval of information is enhanced (Terry, 2003). However, elaboration techniques are not used spontaneously and therefore need to be taught, especially to younger learners (Schneider & Pressley, 1997).

Elaboration

Using one's prior knowledge to expand on a new idea, thereby storing more information than what was originally presented.

The second method for encoding information meaningfully is organization, which is most useful when the information to be encoded is complex and interrelated. **Organization** consists of providing an orderly structure to multiple pieces of information; it can range from "chunking" information with similar characteristics (i.e., categorizing items) to creating a visual representation of all the most relevant concepts to be learned with corresponding links to other concepts (e.g., concept maps). In one study, researchers investigated the effects of chunking on learning (Bower, Clark, Lesgold, & Winzenz 1969). Students were asked to learn four lists of words in two conditions. Some students received the words in a random order (e.g., *cat, kitchen, sunflower, rose, dog, bath*) and others received the words organized in hierarchies (e.g., *cat, dog, kitchen, bath, rose, sunflower*). Guess which group remembered more words? Not surprisingly, students who were given the organized words recalled more than twice as many words as their counterparts. Providing students with organized instructional materials helps them encode the new information.

Organization

Providing an orderly structure to multiple pieces of information.

Table 6.2 summarizes what you have learned about storing and encoding information with rehearsal, elaboration, and organization methods.

Just as prior knowledge affects perception, it also affects the degree to which students encode new information. The more background knowledge a student has, the

TABLE 6.2

How students store and encode information in long-term memory.

METHOD	EXAMPLES	LEARNING OUTCOME
Rehearsal Repeating new information for a long period of time, either mentally or aloud, without changing it.	Repeating a definition verbatim. Rewriting a mathematical formula. Rehearsing multiplication tables aloud.	Relatively ineffective rote learning occurs: Storage is slow and effortful.
Elaboration Using prior knowledge to expand on a new idea.	Answering high-order questions. Generating examples. Using analogical thinking. Creating mnemonics.	Effective meaningful learning occurs when new associations are relevant and appropriate.
Organization Imposing order and connections on new information.	Preceding lessons with outlines. Presenting concept maps. Presenting hierarchical structures.	Effective meaningful learning occurs when organizational structure provides relevant associations and it is well learned.

more room for meaningful learning there is because students will be more likely to find a relationship between new information and something already stored in their long-term memory. For instance, it is likely that Alex was having difficulty remembering the laws of Newton in *Imagine You Are the Teacher* because he did not have enough prior knowledge to understand and meaningfully encode the lesson, as illustrated by his words "You went too fast talk'n all crazy about stuff I don't know." To better understand the relationship between students' prior knowledge and learning, read the classroom case on p. 206 and try to solve Mr. Cohen's dilemma.

Retrieval

Retrieval

Pulling information from long-term memory into working memory.

Let's turn to the last of the cognitive processes in the information-processing model, retrieval. Go back to Figure 6.2A and locate the retrieval process in the diagram. As you see, **retrieval** is the opposite process to storing and encoding and consists of pulling information from our long-term memory into our working memory. Retrieval can be conscious or automatic. An example of conscious retrieval happens when students are taking an exam, because they need to consciously look for information from long-term memory. Other times, retrieving information from long-term memory is automatic, such as when students remember regular classroom procedures, such as writing their name on an assignment, without the need to be reminded.

A second distinction can be made between recognition and recall. *Recognition* is a form of retrieval that works by recognizing that we have seen something before. This occurs in multiple-choice tests, where students simply need to recognize a right answer from a set of distracters. On the other hand, *recall* is a form of retrieval that requires generating information without any cues. Responding to an open-ended essay question is an example of recall. Most students feel that recall is harder than recognition.

Retrieval and Knowledge Activation. Although the amount of information in our long-term memory is huge, we never retrieve more than a few pieces of information at any one time. As you learned from our discussion on working memory, the amount

of information that can be held in working memory is extremely limited; therefore, we only retrieve what is really useful to accomplish our goals. The mechanism at work when we retrieve information from long-term memory has been called knowledge activation. It is likely that reading the question "What are the limitations of the three memory systems according to the information-processing model?" will activate the information that you have learned about the three memory systems in this chapter. Therefore, *knowledge activation* is the process of becoming aware of information in long-term memory and usually spreads from one idea to other ideas that are related to the original one, as illustrated by the following classroom example.

Mrs. Teling started her earth science lesson by asking her fifth-graders, "What conditions do you think are necessary to sustain life?"

Sam replied, "I think life needs water because when we went on vacation and nobody was at home to water the plants, they all died."

Renee continued, "I saw a show yesterday about the moon, and they said there was no water there. Is that why nobody lives on the moon?"

"We don't live on the moon because there is too much rock. We saw moon rocks when we went to the space museum last year," Vince answered.

Retrieval and Knowledge Reconstruction. If knowledge activation does not find the information we are trying to retrieve, we are either unable to come up with an answer (i.e., the feeling of "I don't know") or we might come up with an answer through *knowledge reconstruction*, a mental process that uses the information we have stored in long-term memory to construct a reasonable answer (Koriat, Goldsmith, & Pansky, 2000). As you will read later on in this chapter, one of the principles underlying cognitive views of learning is that students are active meaning-makers, which is consistent with the idea that students use their prior knowledge and experiences to find answers to questions, even when the answer to the question has not been stored or encoded before. For instance, Mr. Roberts, an English teacher, starts his lesson on informative essays by asking "What parts do you think should be included in an informative essay?"

Sandy quickly responds, "I don't know; we haven't written one yet."

Mr. Robert replies, "Let's see, what parts did we include in a persuasive essay?"

Tim answers, "Well, we had to have a title that had something to do with our main point. Oh, and we had to have a main topic with supporting paragraphs and a conclusion. I think it would be the same for the informative essay. Right?"

Sandy adds, "Yeah, except that when you inform someone, you are telling them something. I think in an informative essay we are telling someone something with facts instead of telling them our opinion."

An advantage of memory reconstruction is that students develop new understandings and skills by changing their mental structures over time. Also, reconstructive memory is very efficient. Rather than remembering the entirety of a memory event, we only need to remember key elements of the event. Later, at retrieval, when key elements are being activated, we can put them together to reconstruct the event (Greene, 1992).

Now let's experiment with reconstruction. Take a few minutes to read the story in Figure 6.7, then retell the story to a classmate or write down your recollection of the story.

FIGURE 6.7 "The War of the Ghosts" story. Can you reconstruct this story accurately from memory?

One night two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war cries and they thought: "Maybe this is a war party." They escaped to the shore and hid behind a log. Now canoes came up, and they heard the noise of paddles and saw one canoe coming up to them. There were five men in the canoe, and they said: "What do you think? We wish to take you along. We are going up the river to make war on the people."

One of the young men said: "I have no arrows."

"Arrows are in the canoe," they said.

"I will not go along. I might be killed. My relatives do not know where I have gone. But you, " he said, turning to the other, "may go with them."

So one of the young men went, but the other returned home. And the warriors went up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say: "Quick, let us go home: That Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac and the young man went ashore to his house and made a fire. And he told everybody and said: "Behold, I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."

He told it all, and then he became quiet. When the sun rose, he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried. He was dead.

24

A Case Study: DIVERSITY IN THE CLASSROOM

Prior Knowledge Differences in an Eleventh-Grade Classroom

"See you at the fair this weekend," Mrs. Williams says as she leaves school on Friday.

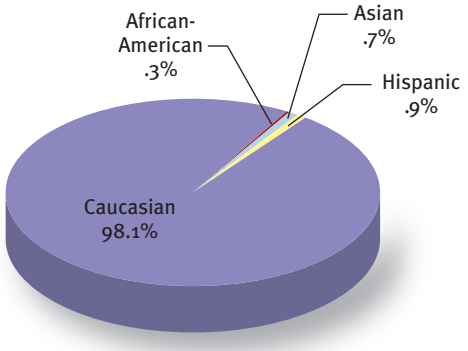
"Yeah, I'm looking forward to old-time banjo picking and hickory smoked barbecue," Mr. Cohen replies. As a Teach Kentucky recruit from Yale University, he's quickly adjusting to life in Mount Olivet, population 294. He's eager to learn Appalachian traditions and connect with members of the tight-knit community. Having grown up in Manhattan, teaching eleventh-grade English literature at Mount Olivet High is the perfect opportunity to experience rural America.

Demographics:

An overview of the students
Mount Olivet High School
Mount Olivet, Kentucky

77.1 % Students eligible for free and reduced lunch
.2 % Students qualify for ESL instruction
11.3 % Students receive Special Education Services

Racial/Ethnic Groups



Mr. Cohen is particularly excited about introducing his students to a variety of genres by diverse authors. In addition to classics such as *Hamlet* and *The Scarlet Letter*, they will read Chinua Achebe's *Things Fall Apart*, Leslie Marmon Silko's *Ceremony*, Sandra Cisneros's *House on Mango Street*, and an anthology of poems by Iraq War veterans. Mr. Cohen's goal is for students to make connections between literature and their own experiences. He hopes these connections will make the classics relevant and meaningful for today's adolescents. When Mr. Cohen realizes the high school's world and American history classes will not be covering World War II, he decides to introduce the Holocaust through literature. He chooses the autobiographical memoir *Night*, which describes Elie Wiesel's experiences as a 12-year-old boy imprisoned in German concentration camps.

To familiarize students with Jewish traditions, he selects a short story about a girl, Bina, celebrating Rosh Hashanah with her family in New York City. Mr. Cohen begins by reading an excerpt aloud to the class,

> Bina sits in synagogue squashed between her sleepy older sisters and waits for Rabbi Elad to blow the Shofar horn. This year, as the ram horn punctuates the prayers, she elbows her sisters in the ribs. Their eyes pop open, startled. She laughs, knowing they can't do anything, because they're not supposed to talk until they've heard all one hundred Shofar blasts.

Next, students meet in their literary groups to discuss a series of questions about the story. Afterwards, Mr. Cohen invites them to share. "Why do you think Bina looks forward to the High Holy Days?" he asks.

"She likes kneading challah bread dough for her grandma," John begins.

"And dipping challah and apples into honey, to bless the New Year," Carla adds. "It's when the whole family gathers together."

"Good, I like how you're paying attention to details," Mr. Cohen encourages. He's pleased students seem to understand Jewish traditions. "Tonight's homework is to read Chapter I of *Night*."

The next day, Mr. Cohen asks Mary's group to begin by sharing their thoughts on yesterday's short story. Mary gives him a confused look, then scans over the story and asks, "What's a synagogue anyways?"

"Oh, I'm sorry, I thought you all knew that term," Mr. Cohen replies. "It's a Jewish house of worship."

"Hmm, aren't those only in Israel? I've seen guys with long beards and black hats praying on TV. I can't imagine them doing that in America, though," Mary explains.

"Yeah, especially blowing a ram's horn. Now that's weird!" Angie adds.

"What's it called? A sofa?" Kevin asks. "I thought that's the thing you sit on in your living room." Students laugh.

"I've never heard of anyone dipping bread and apples into honey. Yuck! What will people think of next?" Angie comments.

Mr. Cohen is perplexed and unsure of how to respond. He had assumed students were familiar with Jewish traditions. Yesterday, it seemed they understood the story and could relate to Bina's experiences. Today, he realizes some students have very little background knowledge on the subject and some hold stereotypical ideas about Judaism.

He explains to the class, "Jewish people have been practicing their faith for thousands of years, all over the world—in Europe, Israel, America, even in China. I know religious practices may seem weird if you haven't studied them, but that's why we're reading a diverse selection of literature."

After class, Mr. Cohen wonders what he should do next. Should he continue teaching *Night* or should he stick to literature that conforms to students' existing background knowledge? Mr. Cohen feels compelled to teach *Night*, not only because it is a literary masterpiece that portrays a crucial episode in history but also because he feels a strong connection to the memoir. He decides to discuss it with his colleague over lunch.

"I'm surprised about the kids' stereotypes," Mr. Cohen shares. "Yesterday, when I told them I'm Jewish, one student asked me if my parents were millionaires. I just had to laugh."

"I think when kids grow up in small towns they don't get a lot of exposure to the world. They repeat things they've heard from relatives or seen on TV," Mrs. Williams replies.

"I'm just wondering how to address their misconceptions and biases. How can I teach them about Judaism, World War II, and autobiographical narratives if some students still think all Jews wear beards and yarmulkes?" Mr. Cohen asks.

"Well, I think it's important to introduce your students to new ideas and new ways of thinking. Let's get together after school and do some brainstorming."

References for Diversity Case

Wiesel, E. (1958). *Night*. New York: Hill & Wang.

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his actions.

Guiding Question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

How well did you do at reconstructing the story in Figure 6.7 from memory? You may have experienced some of the disadvantages of memory reconstruction. Sometimes reconstruction leads to misconceptions and errors, as shown by Bartlett's (1932) famous study on reconstruction in memory. In this study, Cambridge University students in England read the unfamiliar Native American story "The War of the Ghosts" (Figure 6.7), and later they were asked to recall the story from memory. Students' reconstructed stories were generally shorter than the original and included concepts and language that were common to the Cambridge student culture but not present in the original story: A seal hunt was typically reconstructed as a fishing trip; the black substance that came out of the Indian's mouth was reconstructed as being blood; and some students reported that the Indian had died of a high fever (a fact that was not part of the original story).

Reconstructed memories of eyewitness testimony are also less than accurate. Loftus and Palmer (1974) reported that eyewitness testimony is highly inaccurate and highly susceptible to changes, depending on how the question is asked at retrieval time. Asking a witness to remember how fast a car was traveling when it *smashed* into another car was found to produce more overestimations of the speed than asking a witness to remember how fast a car was traveling when it *struck* the other car. These findings have direct implications for instruction. Because retrieval is reconstructive in nature (i.e., it requires more than just playing back a memory), teachers should provide a rich variety of cues to ensure that students' retrieval is not relying largely on reconstructing inappropriate knowledge. The better the cues you can provide to help students activate appropriate prior knowledge, the better performance your students will achieve. For example, Ms. Felix started her history class with the following question: "What are three things that you remember about the U.S. Constitution from yesterday's lesson?" Shortly after the class discussion begins, she was astonished that students' answers did not address the main topic of the lesson, the presidential powers granted by the U.S. Constitution. Instead, students responded "The Constitution was old"; "I remember you said it was written by old guys"; and "Isn't the Constitution still in Washington, D.C.?" When Ms. Felix reframed her question to cue students' prior knowledge as "What power does the Constitution grant the U.S. president?" she was pleasantly surprised at how much her students had actually learned.

Retrieval and Forgetting. The information-processing model assumes that part of the information held in sensory memory, working memory, or long-term memory can be lost. This is illustrated by the "lost?" arrow in the long-term memory box in Figure 6.2A. The question mark indicates that there is no agreement at this point about why sometimes information that was encoded in long-term memory is not retrieved.

There are at least three theories to explain retrieval failure. One theory argues that information might *decay* over time. We forget information when activation of the links connecting to the information does not happen for a long period of time. In other words, the "use it or lose it" effect: Forgetting happens when information is not used. The fact that Spanish vocabulary decreases within about three years after a person's last course in Spanish can be explained by the decay theory of forgetting.

The second theory argues that failure to retrieve information from long-term memory is the result of the *interference* of other information with the search for the target information, such as when you want to remember the name of an actress and other names pop into in your head instead. Interference can be explained by cognitive views of learning. Because information is encoded in an organized and connected manner, the larger the amount of information encoded, the more connections there are in your mental structures. Although this is certainly an advantage for any information-processing system, it also has the drawback of creating multiple paths to the information that needs to be retrieved, which makes it more difficult to retrieve and gives a sense that the information has been "lost" from long-term memory. In our example, interference may occur because we are activating the word *actress* and maybe even other relevant keywords such as *blonde*, *name starts with an* A, and so on. If our repertoire of knowledge contains many pieces of information with those keywords, retrieval will be difficult, especially if the name that needs to be retrieved has not been activated in our working memory for a long time.

Finally, according to the cue-dependent theory, forgetting is caused by a lack of effective retrieval cues (Nairne, 2000). For example, a student might fail to retrieve a fact for an exam even when he is certain that he knows the fact. Have you ever experienced this feeling? This phenomenon is called the tip-of-the-tongue (TOT) effect (Brown, 1991). The TOT effect is the feeling of knowing something that cannot be retrieved immediately. Despite the retrieval failure, students have the feeling that the word that they are searching for is at the "tip of their tongue," therefore its name. The cue-dependent theory would claim that, in our example, the student did not forget the information; the information was indeed successfully encoded in his long-term memory. What the student is missing instead is the right address (the cue) to find the information. Once he finds the correct address for the information, retrieval will occur. Before moving to the next topic, look at Figure 6.8 and explain why the student cannot retrieve information according to the three theories we just reviewed.

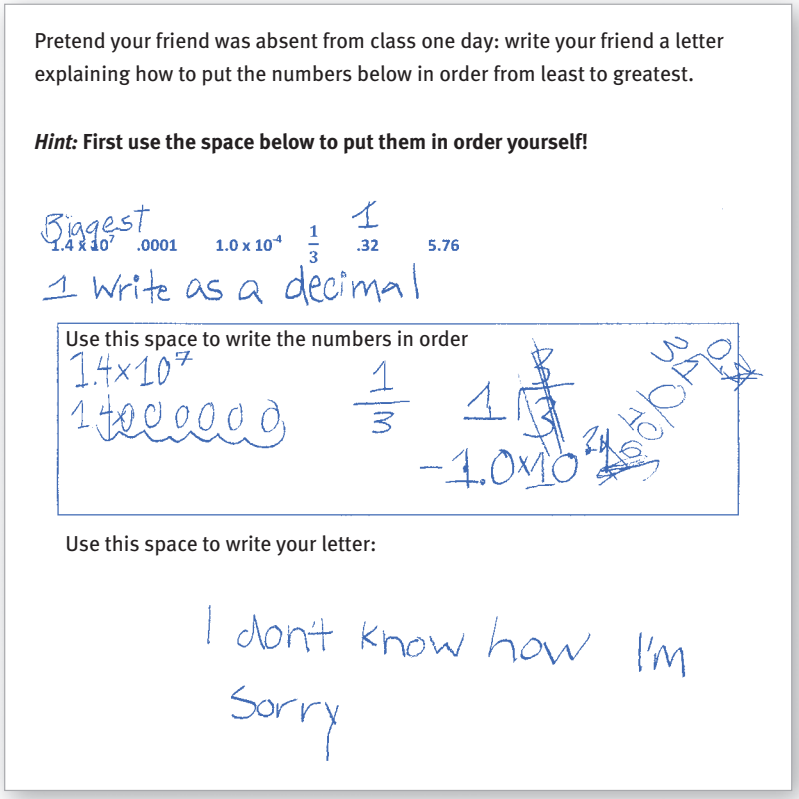


FIGURE 6.8 How might decay, interference, and cue-dependent theories explain why this student cannot retrieve information from long-term memory?

LONG-TERM MEMORY

Now we are ready to take a closer look at the structure of the third memory system in the information-processing model, long-term memory (see Figure 6.2A). In terms of the computer metaphor, our **long-term memory** is analogous to the computer's hard drive, a storage system that can hold large amounts of information for an unlimited amount of time (Schunk, 2008). Unlike the computer hard drive, which usually includes a discrete amount of memory, long-term memory has unlimited capacity. Long-term memory is like a library, with millions of organized entries that can be retrieved into working memory for reference and use (Schacter, 2000).

Long-Term Memory

A storage system that can hold large amounts of information for an unlimited amount of time.

Keep in mind, however, that the computer metaphor is oversimplistic because it fails to capture the information processing complexity of the human brain. To appreciate this complexity, take a look back at Figure 6.2B. You will see that many of the brain areas that you learned about in Chapter 3 (including those that support human emotions!), become simultaneously involved to make sense of any visual stimuli.

Similar to sensory memory, which includes specialized sensory registers (i.e., visual, auditory, tactile, gustatory, olfactory), and working memory, which includes specialized subsystems (i.e., VVSP, PL, CE), long-term memory can be broken down into different types. Contemporary cognitive psychologists accept the knowledge types shown in Figure 6.9: declarative (divided into semantic and episodic knowledge), procedural, and conditional knowledge (Anderson, 1993; Howe, 2000; McKoon & Ratcliff, 1986; Squire, 1987; Tulving, 2002).

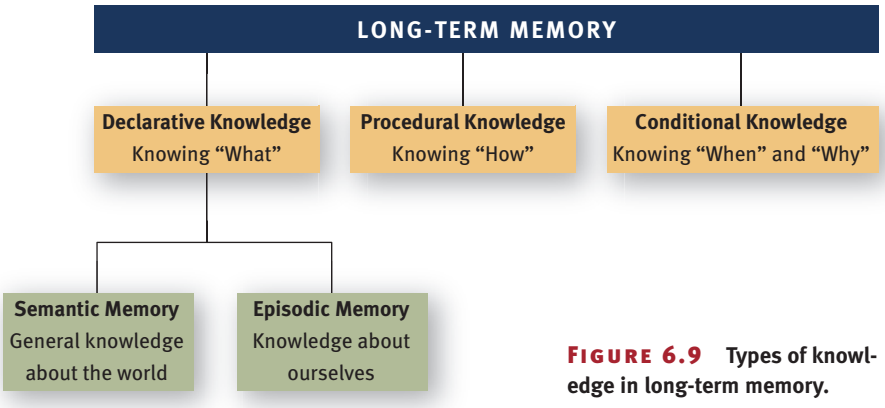


FIGURE 6.9 Types of knowledge in long-term memory.

Declarative Knowledge

Declarative Knowledge

A type of knowledge can be subdivided into two specialized memories: *semantic memory* or general knowledge about the world, and *episodic memory* or knowledge about our own life experiences.

Declarative knowledge can be defined as knowing "what." This type of knowledge can be subdivided into two specialized memories:

- *Semantic memory,* or general knowledge about the world (e.g., specific facts, definitions, principles)
- *Episodic memory,* or knowledge about our own life experiences (e.g., events, places, times, and circumstances), also known as autobiographical knowledge

A characteristic of declarative knowledge is its availability to our consciousness. A student consciously retrieves information from semantic memory (the first of the two declarative knowledge types) when he needs to provide an answer to the following questions:

- What is a lemon?
- Why are plants green?
- Who is the president of the United States?
- What is the difference between a square and a rectangle?

Semantic memory includes knowledge learned at school (i.e., formal education) and knowledge learned outside of school (i.e., informal knowledge).

In a similar fashion, retrieval from episodic memory (the second of the two declarative knowledge types) happens when you need to provide an answer to the following questions:

- What did the professor say about working memory capacity yesterday?
- What school did you attend when you were a fourth-grader?
- Who did you have dinner with yesterday?
- How old were you when your little sister was born?

Procedural Knowledge

Procedural Knowledge

The knowledge of how to perform tasks.

Procedural knowledge has been defined as "knowing how," our knowledge of how to perform tasks. A characteristic of procedural knowledge is that, unlike declarative knowledge, we are not able to consciously retrieve this information from long-term memory. This characteristic makes procedural knowledge difficult or impossible to verbalize; therefore, it has also been called *implicit memory* (Schacter, 2000). A student uses his procedural knowledge when engaging in an automatic task. An example would be typing an essay on a computer, provided that typing has been practiced for so long that it has become an automatic procedure and the student does not need to consciously control it any longer.



Procedural knowledge manifests itself during performance, such as when students demonstrate their mastery of motor or manual skills.

Laura Dwight Photography

Conditional Knowledge

Conditional knowledge is "knowing when and why" to apply declarative and procedural knowledge. It takes students' conditional knowledge to determine when to apply an appropriate math procedure (e.g., addition, subtraction, division, multiplication) to solve story problems. Conditional knowledge will allow a student to answer the following questions:

- Should I use multiplication or division to solve this problem?
- Should I take this street or that street to go to school?
- What strategies should I use to study for this exam?

Not having appropriate conditional knowledge may impede solving a problem or may lead a student to apply a wrong procedure to solve a problem. Conditional knowledge is difficult to acquire. Most students acquire declarative and procedural knowledge, but higher-order cognitive skills are needed to help them decide when and why such knowledge should be used (Bruning et al., 2004).

Conditional Knowledge

Knowing when and why to apply declarative and procedural knowledge.

Knowing about the different types of knowledge has instructional implications because different types of knowledge are learned differently. Declarative knowledge involves items of information being linked to each other. Consequently, teachers should expect to see how their students' knowledge becomes richer and more cohesive in structure if learning is occurring.

Procedural knowledge involves a set of automated actions that lead to successful task performance; therefore, teachers should notice that their students are displaying more efficient performance (i.e., faster and more accurate) as their procedures become more automatic.

Conditional knowledge involves knowing when and why to apply well-learned declarative and procedural knowledge. Thus, teachers should notice that their students understand the relative nature of knowledge, which requires adapting what is known to particular conditions and contexts.

Now that we finished reviewing long-term memory, take a few minutes to compare and contrast the three memory systems that you learned about. Then look at Table 6.3, which summarizes the characteristics of each system.

How Is Knowledge Represented in Long-Term Memory?

Next, we will review different ways in which knowledge might be represented in our long-term memory. Knowledge representations are also known as mental representations (Von Eckardt, 1999). **Mental representations** preserve the information that we encode in long-term memory and can be operated on by a variety of mental processes (McNamara, 1994). For example, you can activate a mental representation of your bedroom (which you have stored in your long-term memory) and apply a mental process to the generated picture in your head by imagining how your bedroom would look if you moved the furniture around. Experts believe that declarative and procedural knowledge are represented differently in our minds. Let's take a look at some theories of knowledge representation.

Mental Representations

Ways in which information might be encoded in long-term memory and which can be operated on by a variety of mental processes.

Schemas, Propositions, and Images. One way in which cognitive psychologists explain how we represent declarative knowledge in long-term memory is derived from schema theory. According to schema theory, people represent knowledge as networks

TABLE 6.3

Main characteristics of three memory systems.

	SENSORY MEMORY	WORKING MEMORY	LONG-TERM MEMORY
CAPACITY	Unlimited	Limited	Unlimited
DURATION	0.5 second in visual register and 3 seconds in auditory register	15–30 seconds	Unlimited
COMPONENTS	Independent sensory registers	Visuospatial sketchpad, phonological loop, and central executive	Declarative, procedural, conditional knowledge
MAIN FUNCTION	Holds "raw" unprocessed information	Consciously processes information	Holds processed information that is constantly restructured

of connected facts and concepts that provide a structure for making sense of new information (Marshall, 1995; Rumelhart, 1984). These structures are called schemas or **schemata**. The schema theory of representation began with Bartlett's (1932) research on people's reconstruction of stories such as the "War of Ghosts." The fact that the Cambridge students in Bartlett's research reconstructed the Indian story with elements of their own culture supports the idea that knowledge is represented as organized schemata that influence what we learn and remember.

Schemata

Networks of connected facts and concepts that provide a structure for making sense of new information.

Additional evidence for schema theory was found in the classical "home buyer" and "burglar" study (Pichert & Anderson, 1977). In this study, two groups of people were presented with an identical video, showing a house from the inside and outside. Prior to viewing the video, one group was asked to imagine that they would be buying the house whereas the other group was asked to imagine that they would be robbing the house. Once the video was over, all participants were asked to recall as much information from the video as they could. The findings of this study showed that the "home buyers" tended to recall more information about the house that was relevant to their perspective, such as the number of bedrooms and bathrooms and the quality of the walls and plumbing. On the other hand, the "burglars" were more likely to remember details relevant to their perspective, such the electronics and musical instruments in the house, the type of bicycle stored in the garage, and so on. In sum, this research supports schema theory by showing that information that fits into an existing schema is more easily understood, learned, and retrieved than information that does not (Anderson & Bower, 1983).

A second way to represent declarative knowledge is through propositional networks. A **proposition** is the smallest unit of meaning and can be thought of as an assertion that is subject to being true or false (Anderson, 2005). For example, the sentences "The cat was chased by the dog" and "The dog chased the cat" represent the same proposition, although the sentences are slightly different; and the sentence "Mary sat on the new sofa" represent two propositions: "Mary sat on the sofa" and "The sofa is new." Similar to the case of schema theory, the idea that declarative knowledge might be represented as a network of connected propositions was suggested by research. In particular, Kintsch (1986, 1988) found evidence that students represent the knowledge gained through reading in ordered lists of propositions. Using propositional analyses, Kintsch and others (1988; Meyer & Rice, 1984) have shown that students take longer time to read texts that include a larger amount of propositions (regardless of number of sentences) and remember propositions rather than verbatim sentences after reading text.

Proposition

The smallest unit of meaning and can be thought of as an assertion that is subject to be true or false.

Finally, some experts believe that declarative knowledge may be represented by **images**, mental representations that keep the same structure or appearance as the original information. Imagery theory is supported by research showing that manipulating an image in one's head (e.g., rotating, scanning) takes approximately the same amount of time as manipulating the actual object. The greater the distance between two landmarks in a map, the longer participants take to scan the distance between the landmarks on both their mental image of the map and the actual map (Kosslyn, 1976; Kosslyn, Ball, & Reiser, 1978). However, imagery theory is still controversial because many psychologists believe that declarative knowledge could be stored as propositional networks and later translated into images within working memory when the information needs to be manipulated (e.g. scanned, rotated). In other words, knowledge may be represented in a nonimage format that includes information about how to construct an image as needed (Reisberg, 2001).

Images

A mental representation that keeps the same structure or appearance as the original information.

Scripts and Productions. Schemata and propositions are ways of representing declarative knowledge. Procedural knowledge can be represented through scripts and production rules. A **script** is a schema representation for a procedure. When tasks are repeated over and over, the procedure involved in accomplishing the task is represented as a complex structure with interconnected elements that are expected to be present every time the procedure is initiated (Schank & Abelson, 1977). Take the case of a restaurant event. A script for this event may include people who are expected to be in the restaurant (e.g., maître d', waiters, cooks), things that are likely to be found in a restaurant (e.g., tables, chairs, silverware, dishes, food), and action sequences that typically happen in a restau-

Script

A schema representation for a procedure.

rant (e.g., waiting to be seated, being seated and presented with a menu, ordering, being served, paying the bill). As you can probably imagine, schemas are highly dependent on prior knowledge and experiences. Therefore, a script for how to behave in a restaurant may be different, depending on the culture of different individuals.

Productions are if/then rules stating an action to be performed and the condition under which such action should be undertaken (Anderson, 1983, 1993). A production rule or production system is thought to be initiated just like a computer program. Once a certain condition exists, it automatically triggers the rules that follow that condition and that are necessary to perform the task. For example, a production system for the procedure of logging onto the Internet may consist of the following two production rules:

Productions

If/then rules stating an action to be performed and the condition under which such action should be undertaken.

If the computer is off, press the button on the upper-right corner of the keyboard.

If the computer is on, click on the shortcut icon for the Internet browser.

Although this example is very simple, similar to propositions, productions for complex procedures can amount to large production systems. Try writing down a production system for a pedestrian who needs to cross a four-way street intersection. You will soon realize how complex the system can become. In addition, you will realize that any procedure encompasses large amounts of declarative and conditional knowledge. It is not possible to create a production system for a pedestrian to cross a street unless the pedestrian has declarative knowledge about stop lights and stop signs and unless the pedestrian has conditional knowledge to establish when not to cross a street, because a car has just run through a red light.

We are done reviewing the information-processing model. Before we continue, take a few minutes to use all the information that you learned to briefly explain each one of the elements in Figure 6.10.

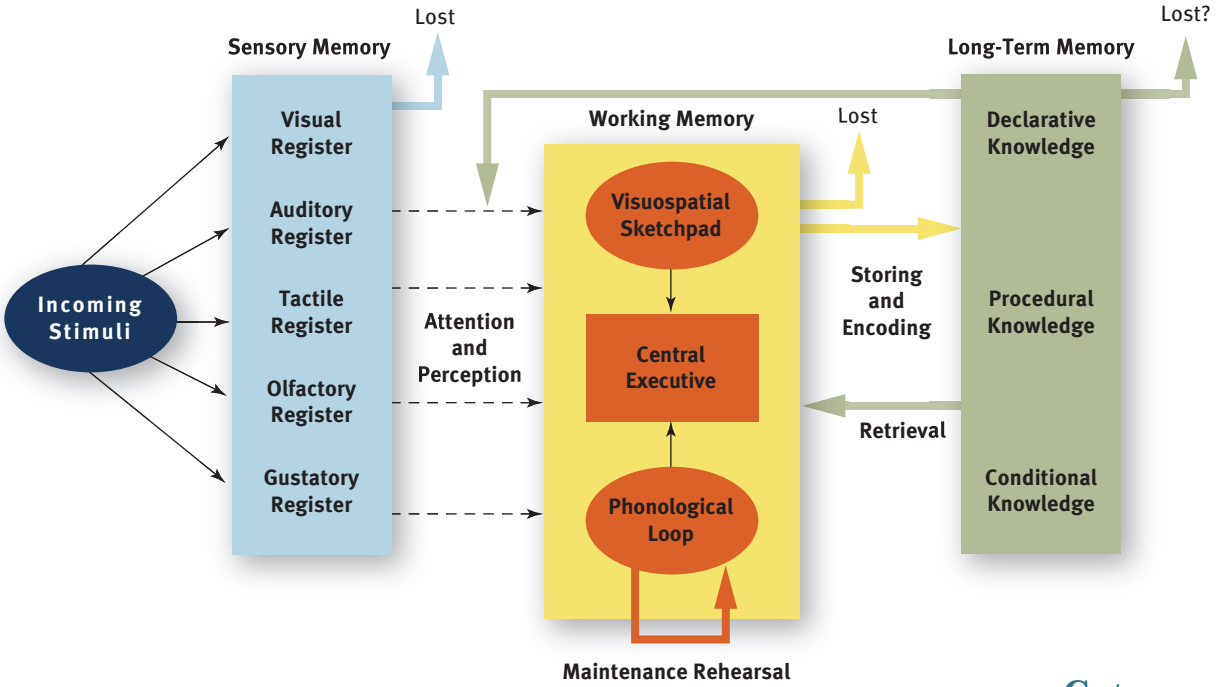


FIGURE 6.10 **Cognitive processes and memory systems according to an information-processing model.**

Get Connected!

ANIMATION ASSIGNMENT. . . Cognitive Views of Learning

Go to your WileyPlus course and watch the animation on enhancing memory. Be prepared to discuss the three-stage memory model and how this influences teaching and learning. How could your understanding of the three-stage memory model influence your selection of learning activities in the classroom? What kind of classroom activities can you use to strengthen students' long-term memory?



METACOGNITION

Metacognition

An individual's cognition about his/her cognition or "knowing about knowing."

When we introduced cognitive views of learning, we defined cognition as the mental processes and structures involved in thinking and learning. Metacognition adds a prefix to *cognition*. The prefix *meta* comes from the Greek and means "about." Thus, **metacognition** is an individual's cognition about his/her cognition, or "knowing about knowing" (Flavell, Miller, & Miller, 2002). Although metacognition was not a component of the traditional information-processing models, it was added more recently, after research established its fundamental role in controlling all cognitive processes (Boekaerts, Pintrich, & Zeidner, 2000).

The Components of Metacognition

Metacognition includes two components: knowledge of cognition and control of cognition (see Figure 6.11).

The first component (knowledge of cognition) is stored in our long-term memory. Specifically, metacognition involves the three knowledge types in our memory: declarative, procedural, and conditional knowledge. A student might know what concepts he learned in pre-algebra and when and where he learned the concepts, which are stored in the semantic and episodic memories within declarative knowledge, respectively. He may also have learned some strategies to solve algebraic expressions, which are part of his procedural knowledge. Finally, he may know when and why to apply specific strategies to solve different problem types, which is part of his conditional knowledge. For instance, he may recognize that the problem $4x^2 + 2x - 9 = ?$ is a second-degree polynomial of the form $ax^2 + bx + c = ?$, which can be solved by applying the formula:



FIGURE 6.11 The two components of metacognition.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Although knowledge about our knowledge is important to learning, this knowledge may not promote further cognitive growth unless the student engages in the second component of metacognition: control of cognition. This is why the most current theoretical developments define metacognition as the strategic application of declarative, procedural, and conditional knowledge to accomplish goals and solve problems (Schunk, 2008).

How do students apply their knowledge about cognition to regulate their learning? There are three essential skills involved in metacognition: planning, regulation, and evaluation (Jacobs & Paris, 1987; Kluwe, 1987). Planning, the first stage in metacognition, involves deciding how much time to spend on a task, what strategies to use, what resources to gather, and so on. Regulation is the process of checking on the progress toward one's goals, such as pacing, reviewing, and selecting appropriate strategies when goals are not being met. Evaluation requires making a judgment about the process and outcome of learning. Students engage in evaluating when they try to answer the questions "Did I accomplish my objective?" "Was the strategy that I chose effective?" "Did I take too much time to learn with this strategy?" "What did I learn from this experience?"

Metacognition includes the ability to know when and why to apply different strategies to study or solve different problem types.



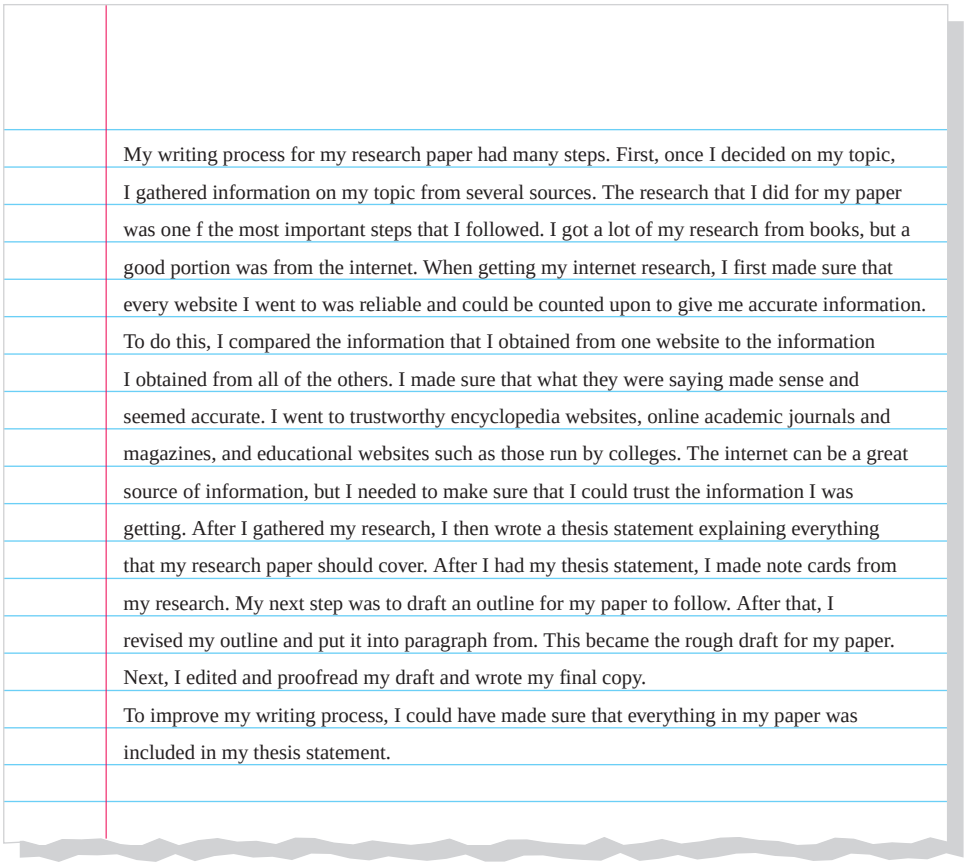
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Metacognition and Learning

Students' control of cognition can significantly improve their cognitive processing and learning (Azevedo, 2007). For instance, Francesca may turn off the TV in her room while doing homework to increase her attention to the task at hand. Additionally, she may promote encoding by creating a mnemonic to help her remember a new list

of terms and practicing the mnemonic until retrieval is automatic. In both examples, Francesca is demonstrating good metacognitive skills because she is showing an awareness of the need to regulate her limited attention and the usefulness of well-practiced strategies in learning.

When metacognitive skills are practiced enough, they can become automatic. Experts in many different fields are shown to plan, monitor, and evaluate their problem solving without being aware of it (Bargh & Chartrand, 1999). In other words, self-regulation typically becomes part of experts' procedural knowledge. However, students are not likely to have automatic metacognitive skills in the classroom, especially young students (see Figure 6.12). Therefore, teachers should keep in mind that engaging in metacognitive processes will be cognitively demanding for most students because it requires using resources from their limited working memory capacity.


My writing process for my research paper had many steps. First, once I decided on my topic, I gathered information on my topic from several sources. The research that I did for my paper was one f the most important steps that I followed. I got a lot of my research from books, but a good portion was from the internet. When getting my internet research, I first made sure that every website I went to was reliable and could be counted upon to give me accurate information. To do this, I compared the information that I obtained from one website to the information I obtained from all of the others. I made sure that what they were saying made sense and seemed accurate. I went to trustworthy encyclopedia websites, online academic journals and magazines, and educational websites such as those run by colleges. The internet can be a great source of information, but I needed to make sure that I could trust the information I was getting. After I gathered my research, I then wrote a thesis statement explaining everything that my research paper should cover. After I had my thesis statement, I made note cards from my research. My next step was to draft an outline for my paper to follow. After that, I revised my outline and put it into paragraph from. This became the rough draft for my paper. Next, I edited and proofread my draft and wrote my final copy.

To improve my writing process, I could have made sure that everything in my paper was included in my thesis statement.

FIGURE 6.12 **Based on what you know about metacognition, would you say that this student has good metacognitive skills?**

Metacognition is a difficult cognitive skill and requires time to develop (Alexander, Carr, & Schwanenflugel, 1995; Brown, 1987). Yet children can be taught strategies for regulating their learning, such as figuring out how much time they will need to study or finding an effective strategy to study or solve a problem (McCormick, 2003). Past studies have found that teaching metacognitive strategies improves students' achievement in math problem solving (Cardelle-Eawar, 1990), writing (Zellemayer, Salomon, Globerson, & Givon, 1991), reading (King, 1992), spelling (Block & Peskowitz, 1990), and many other academic areas (Alexander, Graham, & Harris, 1998; Hattie, Bibbs, & Purdie, 1996).

DIVERSITY IN INFORMATION PROCESSING

The information-processing model was offered as a description of the universal characteristics of humans' cognitive architecture. However, as a future teacher you will need to be aware of some ways in which students differ in the many memory systems and cognitive processes described by the model. The goal of this section is to help you gain awareness about diversity in information processing by summarizing some of these differences.

Differences in Sensory Memory

The average student will have normal functioning of the sensory registers. However, you might occasionally encounter students who have sensory impairments, such as visual and hearing disabilities. Although the severity of the disability will vary, these students are to some degree unable to hold visual and auditory information for further processing. Visual disabilities might range from blindness to poor vision, and hearing disabilities might range from deafness to being hard of hearing. As you read in Chapter 2, when students are not able to make full use of their sensory memory, instruction in the impaired sensory modality needs to be supplemented with instruction in nonimpaired modalities.

In addition, some students with autism spectrum disorders may become overstimulated by normal levels of sensory input. Indication of tactile sensitivity may include avoiding touch or games that involve contact with others; indication of visual sensitivity may include squinting, looking off to one side instead of straight ahead, or becoming agitated in environments where there are too many visual stimuli; and indication of auditory sensitivity may include grimaces upon hearing certain sounds, withdrawal from people who talk loudly, or echolalia (repeating back what is being said). In these cases, teachers need to monitor for sensory overstimulation and consult with school specialists about developing appropriate supports and accommodations.

Differences in Attention

Students differ in their ability to resist distractions. Among children with similar intelligence, those with learning disabilities are less likely to block interference to a learning task (Forness & Kavale, 2000) and students with attention-deficit/hyperactivity disorders (ADHD) are very poor at screening out irrelevant information (Mercer & Pullen, 2005). Recent neuropsychology research suggests that students with ADHD have excessively slow brain-wave activity, which results in a deficit in the brain's inhibitory mechanism (Shin, 2005). The inhibitory mechanism is fundamental in keeping us focused because it represses distracting stimuli from the environment. Students with mental retardation are also characterized by a reduced ability to ignore irrelevant information and focus their attention on relevant information (Kohei, 2006). In all these cases, teachers should be especially careful to keep distracting stimuli to a minimum, capture students' attention before giving instructions or presenting new information, and use the strategies reviewed in Chapter 2 to promote learning.

Differences in Working Memory

A first important individual difference in working memory is developmental. You learned that the capacity of working memory is about seven plus or minus two units of information. The "magic" number seven, however, refers to the working memory capacity of an adult. Research shows that the capacity of young children is significantly lower and increases from age 4 through adolescence (Gathercole, Pickering, Ambridge, & Wearing, 2004).

The reasons for the diminished capacity at an earlier age are still unclear. Although biological reasons should not be discarded, recall from Chapter 4 that neo-Piagetians suggest that young children's seemingly lower capacity is the result of undeveloped strategy use (Case, 1998). Young children do not apply strategies spontaneously, so they need to be taught to rehearse, use visual imagery, and organize information to improve their memory capacity (Siegler, 1998). Once young children learn how to use strategies effectively, they can manipulate larger amounts of information in working memory.

However, teachers will find differences in working memory capacity among older students, with larger working memory associated with higher scores on intelligence tests (Ackerman et al., 2005; Unsworth & Engle, 2005). Students with smaller working memory are associated with a variety of learning and language disorders (Swanson & Sáez, 2003). Students with learning disabilities remember fewer words than their normal counterparts and frequently have deficits in working memory (Reiter, Tucha, & Lange, 2004; Swanson & Siegel, 2001), especially in the PL, which is demonstrated in their difficulty in reading and writing tasks.

In addition, minor gender differences have been reported in tasks that require the use of different working memory components. Recall from Chapter 2 that a large number of studies found no gender differences on intelligence tests, yet certain differences are found when examining different abilities within intelligence tests. Males are better than females on tasks that require transformations in the VSSP component of working

memory, such as performing mental rotation of objects, and females are slightly better than males at tasks that require the manipulation of words, which involve the PL component of working memory (Halpern, 2002).

Differences in Long-Term Memory

Differences in learners' prior knowledge are an extremely important source of individual differences in the classroom. When learners have stronger declarative and procedural knowledge in a domain, they are better able to learn new information in that domain (Alexander, 1997). When students are taught information about baseball and music, those with greater prior knowledge about baseball than about music learned more about baseball, and vice versa (Kuhara-Kojima & Hatano, 1991). Students' cultural and socioeconomic background will also result in prior knowledge differences due to differences in their prior academic and nonacademic experiences. Because prior knowledge acts as a lens through which students view the world and a foundation on which they construct new knowledge, teachers should learn about their students' diverse backgrounds and create meaningful activities that incorporate their prior experiences (Nieto, 2004). This is especially important when teachers' cultural background differs from that of their students (Grant & Gomez, 2001).

In addition, lower proficiency in the English language can hamper information processing despite well-developed experiential and conceptual structures (Durán, 1985; Paciotto, 2000). Linguistic minority students who lack sufficient knowledge in their second language may appear confused and slow at learning, despite good mental capacities and motivational structures (Pascual-Leone & Ijaz, 1989).

Research also shows gender differences in episodic memory and emotionally linked memory. Females typically outperform males on this type of long-term memory (Halpern, 2002; Herlitz & Yonker, 2002). Women show better memory than men for a violent murder (Lindholm & Christianson, 1998); are superior in their recall of autobiographical events, such as childhood memories (Friedman & Pines, 1991); and have fuller and faster recall of childhood memories and emotion-related events (Buckner & Fivush, 1998; Davis, 1999; Seidlitz & Diener, 1998). These findings strongly suggest that females have more efficient person- and emotion-related encoding than males.

Differences in Metacognition

Most of the research in metacognition shows significant developmental differences, with metacognitive skills developing slowly during the school years. Typically, by age 5 or 6, children know that familiar items are easier to understand than unfamiliar ones, that short lists are easier to remember than long ones, that recognition is easier than recall, and that forgetting is more likely to occur as time goes by (Lyon & Flavell, 1993). On the other hand, young children fail to understand that related items are easier to remember than unrelated ones and that remembering the gist of a story is easier than remembering verbatim information; they also have overly optimistic evaluations of their memory skills (Flavell, Friedrichs, & Hoyt, 1970; Kreutzer & Flavell, 1975).

Likewise, research shows that children between kindergarten and sixth grade are unable to monitor their comprehension accurately and are unaware of their own cognition (Baker, 2002). As children grow older, they are more able to determine if they have understood instructions (Markman, 1979) or if they have studied enough to remember a set of items (Flavell et al., 1970). Older students are more aware of the relationship between attention and learning and of the need to focus on relevant materials; they are also better at ignoring distracting stimuli than younger students (Mokhtari & Reichard, 2002).

There is great variability in metacognitive skills, even among students of the same age (Washburn, Smith, & Taglialatela, 2005). Metacognitive ability does not seem to be related to other intellectual abilities (Schunk, 2008; Swanson, 1990). Because having good metacognitive skills can compensate for lower ability, teaching metacognitive skills can be especially helpful to students who are underperformers in school.

COGNITIVE PRINCIPLES FOR THE CLASSROOM

Cognitive psychologists have identified some common principles underlying all cognitive views of learning (Bruning et al., 2004). In this section we summarize cognitive principles of learning with corresponding instructional implications and classroom examples.

Attract Students' Attention

Attention is the starting point of learning. Effective teachers are aware of the relationship between attention and learning and regularly monitor and direct students' attention to what is important in the classroom. This can be done directly, by requesting that students tune out or disregard irrelevant stimuli in the classroom environment, or indirectly, by using methods to attract and maintain students' attention throughout the lesson. Classroom Tips: Increasing Students' Attention lists some strategies and corresponding classroom examples.

Some methods are aimed at directly guiding students' attention to an important topic (verbal and visual signaling), whereas other methods are aimed at increasing attention indirectly by promoting students' curiosity, interest, or personal engagement in a task. Direct attention-getters are useful:

- Cueing students with visual signals
- Highlighting the main steps that students needed to attend to while watching an instructional animation, which helps students' understanding and problem-solving skills (Harp & Mayer, 1998; Mautone & Mayer, 2001; Moreno, 2007).
- Calling students by name, thus increasing attention and achievement (McDougall & Granby, 1996).

Caution must be taken when using interesting materials to attract students' attention, especially if they are young children, as they tend to focus too much on the attention-grabbing aspects of the task rather than on what is important. Although bringing a frozen lobster to class to demonstrate the characteristics of arthropods may be a good attention-getter, some children may focus on nonessential aspects of the demonstration (e.g., the coldness and smell of the lobster, the emotional reactions of their peers)

CLASSROOM TIPS

Increasing Students' Attention

Strategies	Classroom Examples
Verbal signaling	After noticing that Annie's attention is wondering, Ms. Roberts tells the class, "Now listen up and look at the board. What I am writing is very important."
Visual signaling	Mr. Fritz shows his students how to highlight important keywords in a textbook with a color marker to help them focus on the new vocabulary.
Calling student names	Mr. Jones draws students' names from a hat and calls them randomly to answer questions in every learning activity.
Conducting demonstrations	During a lesson about colors, Ms. Lansing gives each of her students a liquid crystal sheet and instructs them to place the sheet in front of their face and report what they see.
Presenting interesting visual materials	Before explaining why lightning occurs, Mr. Cain shows a picture of a football player whose shoes were blown away after a lightning strike.
Creating cognitive conflict	Mrs. Booker starts her lesson on the seasons by asking her students, "Why is it warmer in July in the United States but colder in July in South America?
Raising students' curiosity	In health education class, Ms. Landauer asks, "What are some things that you can do to feel better when you have a cold?"

and fail to learn the concept of arthropod. In a similar fashion, Alex, one of the students portrayed in Imagine You Are the Teacher, was showing the effects of seductive details when he stated, "I don't even know who this Newton guy is beyond an apple fell on his head. I do remember that!" In short, teachers need to be aware of the distractive potential that interesting materials may have and make sure that students are focusing on relevant information rather than on seductive details (Garner, Gillingham, & White, 1989).



Keith Brofsky/Getty Images, Inc.

Can you think of additional ways to attract and maintain students' attention during learning?

Emphasize What Students Already Know

What students already know (i.e., prior knowledge) is the basis on which new learning is built. Typically, people who already know something about a topic are able to learn new information about the topic more effectively than those who do not (Alexander, Kulikowich, & Schulze, 1994; Schneider, 1993). For example, a student with prior knowledge about addition of natural numbers will learn more effectively about multiplication of natural numbers than one who does not have that knowledge base.

Occasionally, students' prior knowledge may also impede or interfere with new learning. This happens when learners make inappropriate connections between new information and prior knowledge, such as in the case of the Cambridge students who read "The War of the Ghosts," or when learners' prior knowledge is at odds with new information, such as in the case of having a misconception or bias (De Lisi & Golbeck, 1999). The instructional implication of this cognitive principle is that teachers should activate students' prior knowledge, to help them make connections with the new information, and assess the quality of this prior knowledge before teaching new concepts.

You will encounter significant differences in students' prior knowledge, depending on the cultural and linguistic background of your students, their socioeconomic status, and their past learning experiences at school. Successful teaching requires providing any relevant background knowledge that students may lack and clarifying any misunderstandings. Classroom Tips: Using Students' Prior Knowledge lists some strategies and classroom examples.

Help Students Become Active Meaning-Makers

In the view of most cognitive theories, meaningful learning is the product of the interaction among what students know, the new information, and what students do as they learn. An active learner is one who engages in mental processes that result in meaningful understanding of the material (Simons, 1993). In other words, active learners

CLASSROOM TIPS

Using Students' Prior Knowledge

Strategies	Classroom Examples
Check students' perceptions of instructional materials.	• To ensure that her students have understood her descriptions of geometric and organic shapes, Mrs. Evans asks them to identify different examples in a collage.
Assess students' prior knowledge with pre-tests and open-ended questions.	• Ms. Jimenez asks her students how the presidential election system works before starting a lesson on elections.
Use schema activators to facilitate connections between new and prior knowledge.	• Before discussing what are appropriate classroom rules, Mr. Bridges asks his students to give examples of how they show respect to their family members and friends.
Anchor new information to students' prior knowledge and experiences.	• Ms. Quilici asks her students to compare the local climate to other global climates during a lesson about temperature.

make rather than *take* information, and meaningful learning is *construction of meaning* rather than *accumulation of knowledge*. Therefore, teachers can improve learning by placing students in the most active role possible during learning.

Note that the cognitive view of active learning focuses on *minds-on* activities rather than *hands-on* activities (Moreno & Mayer, 2005; Schamel & Ayres, 1992). Although teachers are often advised to provide hands-on learning experiences, these activities might fail to promote learning if they are not designed to engage students in the essential processes that occur in working memory. Therefore, teachers need to make sure that students are attending to relevant information and that students' engagement is not only behavioral but also mental.

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

Draw a picture showing the concept of hands-on, minds-on. Add words and symbols to your picture to illustrate what hands-on, minds-on means. Share your picture with the person next to you in class and explain your picture to your classmate.

You will learn more about specific ways to promote cognitive engagement when you read the later chapter on motivation. For now, remember that some ways to promote more active learning consist of taking into consideration students' interests, goals, and needs as well as presenting challenging materials within their zone of proximal development. Due to increasing student diversity, the more you know about your learners, the better equipped you will be to find the best ways to cognitively engage each one in the classroom. Classroom Tips: Promoting Active Learning lists some strategies and classroom examples.

Prevent Cognitive Overload

The information-processing model emphasizes the idea that successful encoding and retrieval depend to a great extent on the amount of cognitive resources spent in the meaningful processing of new information. Therefore, teachers need to be sensitive to the limitations in students' working memory capacity when planning instruction and assessment. When instruction is at a rapid pace or too much information is conveyed to students at any time, working memory capacity can become exhausted and learning may not occur, a case of **cognitive overload** (Sweller, 1999). Recall Imagine You Are the Teacher. In this short dialogue, you may have noticed that both Alex and Cate express their cognitive overload feelings clearly as they tell Ms. Calvin "You went too fast talk'n all crazy about stuff I don't know" and "you were making my head hurt with all those formulas," respectively. Let's take a look at some useful strategies that teachers can use to prevent students' cognitive overload and promote learning.

Cognitive Overload

When working memory capacity becomes exhausted and learning cannot occur.

CLASSROOM TIPS

Promoting Active Learning

Strategies	Classroom Examples
Put students in active rather than passive learning roles.	• Mrs. Bosco asks her students to act out the parts in *Romeo and Juliet*, in addition to reading the play.
Know your learners' interests, goals, and expectations.	• Knowing that many of his students are interested in farming, Mr. Wells teaches area by using examples involving the planting of crops.
Create rich and stimulating learning environments.	• To support children in developing their spoken language skills, Ms. Esposito asks her students to use puppets and props to retell their favorite stories.
Involve students in thinking about what they are doing.	• Mrs. Valone guides her science students as they conduct a series of experiments to discover the properties of light and then asks them turn to their neighbor to share their results.

Chunking. While the number of bits of information that can be processed at any one time in working memory is limited, the size of the bits is not. **Chunking** is the process of combining separate items into larger interconnected units (Miller, 1956). Take five seconds to look at the list of letters below and then try to remember as many letters as you can:

Chunking

The process of combining separate items into larger interconnected units.

ACDEEEFGHIIILMMNNNOOOOPRRSSTT

Clearly, you won't be able to remember the 29 letters because they exceed working memory capacity. Consistent with past research, you will be likely to remember approximately 7 letters instead. Now, take five seconds to read the phrase below and then try to remember it:

THE INFORMATION PROCESSING MODEL

You probably had no problem reading it once and remembering it later, even after the phrase is gone from your sight. Notice that the first 29 letters you tried to remember can be used to make the four-word phrase. Interestingly, although both tasks are identical in that they require you to remember 29 letters, your cognitive load in the second task is significantly lower because the 29 letters were chunked into four meaningful bits of information (i.e., the four words in the phrase), which is well within working memory capacity (Sweller, van Merrienboer, & Paas, 1998).

Dual Processing. Recall that a characteristic of working memory is that it has two independent storage components, one for visual/spatial information (VSSP) and one for words/sounds (PL). **Dual processing** happens when students are asked to combine visual and auditory information (Moreno, 2005). Suppose you are reading a textbook to learn about how engines work. The text includes a written explanation and a graphic illustrating the engine components and relationships between them. You study by reading the text, trying to find the corresponding words in the graphic, and connecting the text with the pictures. Research has shown that learning increases significantly if, instead of reading text, you could listen to an identical explanation while inspecting the graphic (Moreno & Mayer, 1999, 2002). The reason the second learning scenario (spoken words and graphic) is more efficient than the first (written words and graphic) is dual processing: You are using your visual working memory (VSSP) to hold the graphic and your auditory working memory (PL) to hold the spoken words. Likewise, students are found to learn science better when written explanations are presented with simultaneous identical (i.e., redundant) narrated explanations (Moreno & Mayer, 2000). Because the VSSP and PL are independent (i.e., they use different pools of resources), combining them expands your working memory capacity as compared to using only one of these working memory components.

Dual Processing

Combining visual and auditory information.

Pacing. A challenge to students' limited working memory capacity and duration is the processing of complex new information at a fast pace. In this scenario, learners may not have enough time to organize the instructional materials and integrate them with their prior knowledge (Moreno & Mayer, 2007). Although you may need to teach a new concept at an "average" pace to your classroom, it is likely that some of your students will lag behind because they have less prior knowledge than the average student in the class. **Pacing** is a method that allows students with less knowledge to reduce cognitive load by breaking down a larger instructional unit into smaller segments or by allowing students to learn at their own pace. Although pacing in a diverse classroom can be challenging, research in computer-based learning has shown that allowing students to control the pace of instruction significantly improves learning (Mayer & Chandler, 2001; Mayer, Dow, & Mayer, 2003; Moreno, 2007).

Pacing

A method that prevents cognitive overload by breaking down a larger instructional unit into smaller segments or by allowing students to learn at their own pace.

Practicing. A fourth way to prevent cognitive overload is to practice newly acquired knowledge or skills until they become automatic. Recall from our distinction between automatic and conscious processing that automatic processing requires minimal attentional

CLASSROOM TIPS

Preventing Cognitive Overload

Strategies	Classroom Examples
Chunking Combining separate items into larger interconnected units.	• In art class, Mrs. Morales helps her students learn about different techniques for creating perspective by grouping artwork samples into three categories: shading, one-point perspective, and two-point perspectives. • In an English class, Mr. Venaas has his students learn 10 new vocabulary words by grouping words with similar meaning in pairs.
Dual Processing Combining visual representations with auditory explanations.	• Ms. Lopez supplements her narrated explanation of the solar system with a three-dimensional model of the sun, planets, and their orbits. • Mr. Ding has his students listen to an audio version of *Where the Red Fern Grows* as they read along in their own books.
Pacing Breaking down a larger unit into smaller segments or allowing students to learn at their own pace.	• In a reading activity, Ms. Alexander asks comprehension questions to higher-ability students once they have read a paragraph. She asks comprehension questions to lower-ability students after they have read a sentence. • Mr. Deluca teaches new songs by having students learn each verse separately before practicing the entire piece.
Practicing Repeatedly performing skills until they become automatic.	• Mr. Newman has his students practice typewriting before asking them to write essays and letters. • Mrs. Jung asks her students to practice using the laboratory equipment correctly before having them complete chemistry lab activities.

resources (Schneider & Schiffrin, 1977). In other words, once a procedure has become automatic, the central executive does not need to make use of the limited resources in working memory to control its functioning. For example, word processors can be great tools to improve students' writing skills. However, research finds that this is true only when students' word-processing skills are well practiced; otherwise, their writing skills are superior in handwriting (Roblyer, 2006). Similarly, in one study, students who had high computer experience learned faster from a computer-based mathematics game than those who had low computer experience, regardless of prior knowledge in math or ability (Moreno & Durán, 2004). Classroom Tips: Preventing Cognitive Overload summarizes the four strategies reviewed in this section with corresponding examples.

Promote Students' Elaboration of New Information

Recall that elaboration is one of the two methods for encoding information in meaningful ways. Examples of strategies that teachers can use to promote students' elaboration of new information are higher-order questioning as well as presenting and generating examples, analogies, and mnemonics.

High-Order Questioning. Asking *high-order* questions promotes the elaboration of new information in working memory because, in order to answer the question, students need to do the following:

1. Hold the new information in working memory
2. Retrieve relevant prior knowledge from long-term memory
3. Make meaningful connections between the new information and their prior knowledge
4. Produce a coherent response

TABLE 6.4

Samples of high-order questions.

- Use elaborative interrogation (*why?* questions). Here's a question from a botany class: "Why do you think that this plant will not survive under these particular environmental conditions?"
- Ask students to predict future outcomes. Here's a question from a literature class: "How do you think the main character in this novel will react after she finds out that her father is not who she thought he was?"
- Ask students to compare and contrast two learned events, ideas, or formulas. Here's an example from a history class: "What are some similarities between World War I and World War II?"

For instance, Ms. Sung is trying to promote her fourth-grade students' division skills. At the end of the class, she asks the students to write down the steps they would use to solve the problem 236/3. This is a high-order question because students need to hold the new problem in working memory, retrieve their prior knowledge on how to divide integers, and show how they apply the procedure step-by-step to solve the new problem successfully.

High-order questions are usually challenging (i.e., they require the learner to take a much more active role in the meaning-making process) and typically take longer to answer (i.e., at least 10 seconds) than low-order questions. Low-order questions are those which ask students to merely recall verbatim or in their own words material previously read or taught by the teacher; therefore, they promote recall rather than elaboration. See Table 6.4 for examples of high-order questioning methods.

Research confirms that using high-order questioning is an effective way to help students make sense of a new concept (Seifert, 1993; Simpson, Olejnik, Tam, & Suprattathum, 1994). To ensure the effectiveness of high-order questioning, teachers should do the following:

1. Allow a generous amount of **wait time**—the time given to answer a question—especially for younger students and lower-ability students.
2. Revise/rephrase a high-order question if it seems too challenging or if students seem not to understand it.
3. Use redirection and probing as part of classroom questioning.
4. Focus on salient elements of students' responses (i.e., focus on the clarity, accuracy, plausibility, etc. of student responses).
5. Avoid vague and critical feedback (e.g., "That's not right" "I wonder where you got that idea!").

Wait Time

The time given to answer a question.

Presenting and Generating Examples. Mrs. Hickson has just finished demonstrating how water expands when it freezes. Next, she asks her sixth-graders to take a minute to think about examples of this water property in their life experiences.

After a minute, Suzy responds, "Well, last winter our dog's water dish cracked after it snowed and all the water froze."

Timmy asks, "Is that why my mom tells me not to fill the ice cube tray completely with water because it makes the ice hard too get out?"

Mrs. Hickson demonstrated a great approach to helping her students elaborate on new information. She asked them to provide their own examples of a new concept. She could also have given students another example of water expanding and asked whether the example corresponded to the concept they had just learned. Similarly, Pressley, Levin, and McCormick (1980) found that second- and fifth-grade students who were asked to generate examples of sentences using new vocabulary words remembered the words better than those who were presented with the word and its definition. This method is not only an effective way to promote elaboration; it is also a very effective way to assess your students' understanding because it can reveal their misconceptions.

Analogies. After learning about the parts of the cell, Mr. Jackson asks his students to make an analogy between the parts of the cell and things they have in their house.

Elizabeth answers, "Well, the trash cans in the house are like the vacuoles, because they hold all the waste."

Fred replies, "Yeah, and the cell membrane is like the walls and the roof because it holds everything in while protecting it from the outside."

Another effective way to promote meaningful learning is to have students make analogies between a new concept and another known concept (Bulgren, Deshler, Schumaker, & Lenz, 2000; McDaniel & Dannelly, 1996). Teachers can find something in students' prior knowledge that is well understood and that works analogously to something that is unknown. Then students can establish parallel relationships between the known and unknown system (Halpern, Hansen, & Riefer, 1990). As mentioned earlier in this chapter, cognitive views of learning were developed using an analogy between the human mind (unknown system) and the computer (known system). To experience the helpfulness of analogical thinking, take a few minutes and try to solve the following radiation problem, used in past research on problem solving and analogies (Duncker, 1945; Gick & Holyoak, 1983):

> Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient, but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays reach the tumor all at once at a sufficiently high intensity, the tumor will be destroyed.
>
> Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays and at the same time avoid destroying the healthy tissue?

If you lack knowledge about radiation and tumors, as most people do, you will probably have a hard time figuring out a solution to this problem. Now read the following new paragraph and then try to come up with a solution for the radiation problem again:

> A general wishes to capture a fortress located in the center of a country. There are many roads radiating outward from the fortress. All have been mined, so that while small groups of men can pass over the roads safely, any large force will detonate the mines. A full-scale direct attack is therefore impossible. The general's solution is to divide his army into small groups, send each group to the head of a different road, and have the groups converge simultaneously on the fortress.

Were you able to use the information in the fortress problem to help you solve the radiation problem? Typically, although most people can't solve the radiation problem, once they are given the fortress problem, they make a connection between the two. Using analogical thinking, you can conclude that the way to destroy the tumor with the rays and, at the same time, avoid destroying the healthy tissue is to send multiple rays of lower intensity converging in the tumor. In this way, the effects of the multiple low-intensity rays will add up and destroy the tumor, yet the surrounding tissue will be left unharmed.

Mnemonics

Strategies to improve memory by encoding simple information in meaningful ways.

Visualization

Creating mental pictures to help remember information.

Mnemonics. **Mnemonics** are strategies to improve memory, such as having students make verbal or visual associations to new concepts (Leahey & Harris, 1997). Mnemonics are used to encode simple information (e.g., lists of words, procedures, formulas) in meaningful ways. Once the associations between new information and prior knowledge are made, very little effort is needed to rehearse the mnemonic. Therefore, mnemonics are more efficient methods to encode simple information than

rote memory methods. Figure 6.13 offers practical examples of mnemonics to use in the classroom.

All mnemonics help students' encoding via elaboration. New information is associated with familiar words or phrases or through evocative images. Although the value of mnemonics is limited to encoding simple information, they have been successful in a variety of educational settings: alphabet learning (Raschke, Alper, & Eggers, 1999), reading (Solvberg & Valas, 1995), geography (Bednarz, 1995; Wright, 1995), mathematics (Lombardi, 1995), foreign languages (Kasper, 1993; Lu, Webb, & Krus, 1999), and music (Brigham & Brigham, 1998). Mnemonics are especially helpful for students with learning disabilities (Mastropieri, Sweda, & Scruggs, 2000; Uberti, Scruggs, & Mastropieri, 2003).

The last three mnemonics (loci, pegword, and keyword) take advantage of humans' ability to visualize. Images can be very effective in illustrating complex information, especially when multiple visual and spatial relationships are present. Many notable scientists, including Albert Einstein, have reported using **visualization** (creating mental pictures) as an effective thinking and problem-solving tool (Shepard, 1978).

The effectiveness of visualization is dependent on individual learner differences. Encouraging students to use visual imagery to remember verbal information has a greater effect on older students than on younger students (Schneider & Pressley, 1997), and research suggests that people differ in their ability to visualize concepts (Behrmann, 2000; Clark & Paivio, 1991; Kosslyn, 1985).

Help Students Organize Complex Information

The second method to encode information meaningfully is organization. Some examples of strategies that teachers can use to help students organize complex new information are advance organizers and graphic organizers.

Advance Organizers. Teachers can help students encode new information by providing **advance organizers** (Ausubel, 1968; Hinson, 1988; Pagliocca, 1988; Ritchie & Karge, 1996), an organizational structure that is provided before students are asked to learn new complex information. Advance organizers can be as simple as an outline for a book chapter or a heading for text. For instance, try to understand the following passage:

> The procedure is quite simple. First you arrange items into different groups. Of course, one pile may be sufficient, depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step; otherwise, you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many.

Mnemonics

Acronyms
Create a catchy word or expression to help students remember information. The letters of the acronym each represent some other word or expression that is harder to remember. Although acronyms are commonly used as abbreviations (e.g., ASAP stands for "as soon as possible"), they are also useful tools for memorizing new factual information
What's an easy way to remember the steps needed to treat an injury? RICE: **R**est, Ice, **C**ompression, **E**levation

Acrostics
Create a sentence in which the first letter of each word is the first letter of one of the words that you need to memorize.
Every **G**ood **B**oy **D**oes **F**ine: the notes on lines of the treble clef in music
Mother **V**ery **E**asily **M**akes **J**elly **S**andwiches **U**sing **N**o **P**eanut butter: the names of the planets in the solar system, in order with in respect to the sun
Please **E**xcuse **M**y **D**ear **A**unt **S**ally: the order of operations in mathematics—parentheses, exponents, multiply, divide, add, subtract

Loci method
What's the best way to remember a long list of items from the grocery store? You either have to write the items down or rote-memorize them, which takes a lot of effort. The method of loci is especially helpful when taking a test and when the list of items needs to be encoded in long-term memory because we may need to retrieve the items for more than just one occasion.
The word *loci* comes from Latin and means "place." This mnemonic consists of:
- visualizing walking around a familiar place (e.g., your home)
- that has distinctive landmarks (e.g., front door, hallway, living room coach, etc.).

As you imagine walking around this familiar place, visualize each item in your list positioned at each landmark. To recall each word later, imagine you are collecting each item from the landmarks as you make your way through the familiar place. Here's how it works with the list of bones in the human leg:
- a femur bone standing in the front door to your house
- then a patella sitting in the middle of the hallway
- then a tibia sitting on your living room couch
- finally, a fibula laying on top of the dining table

Pegword method
The pegword method requires learning a list of "pegs," from which a list of new information can be "hung." A popular pegword method consists of using the following rhyming pegs to memorize a list of up to 10 items:
One is a bun, Two is a shoe, Three is a tree, Four is a door, Five is a hive,
Six is sticks, Seven is heaven, Eight is a gate, Nine is a pine, Ten is a hen
Once the 10 pegs are memorized, you can remember any list of 10 items or fewer by creating an image or association of the item to be remembered and the respective peg. Let's imagine that a student needs to remember to bring the following items to school: a paint brush, white tempera paint, drawing paper, and scissors. Using the peg method, the student can visualize:
- a paint brush inside a bun, similar to a paint brush sandwich
- a tennis shoe dripping white paint
- paper as leaves in the tree
- a man cutting the edges of a door with scissors

When the pegs are well-learned, the pegword method has been shown to increase students' memory for a list of words (Bugelski, Kidd, & Segmen, 1968), to increase learning written directions (Glover, Harvey, & Corkill, 1988), and to learn the steps in complex procedures (Glover, Timme, Deyloff, Rogers, & Dinnel, 1987).

Keyword method
The keyword mnemonic was originally developed to help students memorize new vocabulary words (Carney & Levin, 2000; Levin, 1993) but has been successfully used to remember the sound and meaning of foreign words as well (Taguchi, 2006; Zhang & Schumm, 2000). It consists of creating two links: an acoustic link and an imagery link. If students need to learn the new word *celerity*, which means "speed," the acoustic link could be *celerity* and the imagery link could be the image of a piece of celery driving a race car. Whenever students encounter the word *celerity* again, the sound of the word should trigger the image of the racing celery and help remind students of the word's meaning. In a similar fashion, if students were learning the Tagalog word *araw*, which means "sun," the acoustic link could be *arrow* and the imagery link could be the image of an arrow hitting the sun (see Figure 6.14).

FIGURE 6.13 Using mnemonics in the classroom.



FIGURE 6.14 The sound of the word *araw* triggers the image of the arrow crossing the sun and is a reminder that the Tagalog word *araw* means "sun."



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How can teachers promote the meaningful encoding of new information?

In the short run this may not seem important, but complications can easily arise. A mistake can be expensive as well. At first, the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then, one can never tell. After the procedure is completed, one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually, they will be used once more and the whole cycle will have to be repeated. However, that is part of life.

What is the passage about? If you are like most people, you were probably having a hard time finding the passage meaningful (Bransford, 1979). Now imagine that I had preceded the paragraph with the title "Washing Clothes." Clearly, this simple advance organizer would have helped you understand the meaning of the text and retrieve the passage from your long-term memory in the future. This is because organization helps encode information in a meaningful way by providing a mental scaffold or structure on which you can anchor the information in the text.

Advance Organizers

Organizational structures that are provided before new complex information is learned.

Each chapter in this book begins with an advance organizer that is a visual outline of the chapter. Outlines facilitate encoding and subsequent retrieval (Ausubel & Fitzgerald, 1962; Ausubel & Youssef, 1963; Mayer, 1979; Meese, 1992; Story, 1998; Thompson, 1998). Advance organizers vary in format (e.g., headings, outlines, tables, charts), but they all share the following characteristics: They are brief, written, presented in advance of the main body of material to be learned, and include a higher level of abstraction than students' current level of cognition (Hinson, 1988). A meta-analysis of 135 advance organizer studies concluded that presenting students with advance organizers greatly improves learning and retention without significantly increasing study time (Luiten, Ames, & Ackerson, 1980).

Graphic Organizers. Graphic organizers convert verbal information into a structured visual display that shows at a glance the key parts of the whole and their relations. Concept maps are graphic organizers that represent relevant concepts as nodes or circles and relationships between concepts as links or lines between nodes. Figure 6.15 shows a concept map created by a teacher to teach the earth's water cycle. The water on the earth and clouds (represented by nodes) are connected to each other by the process of condensation (represented by a link).

Concept maps are useful assessment tools when created by students, provided that concept maps have also been used during instruction (Kinchin, 2000). Because students need to focus their attention on the structure of knowledge to produce a concept map, they can be used to promote and assess their organization of ideas (Rebich & Gautier, 2005).

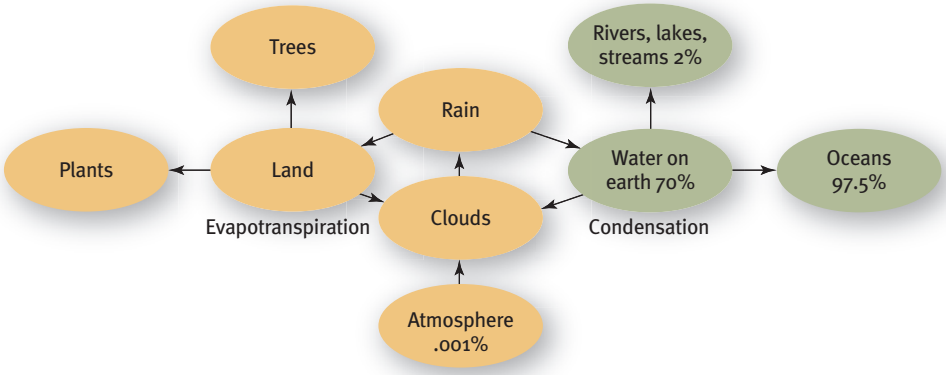
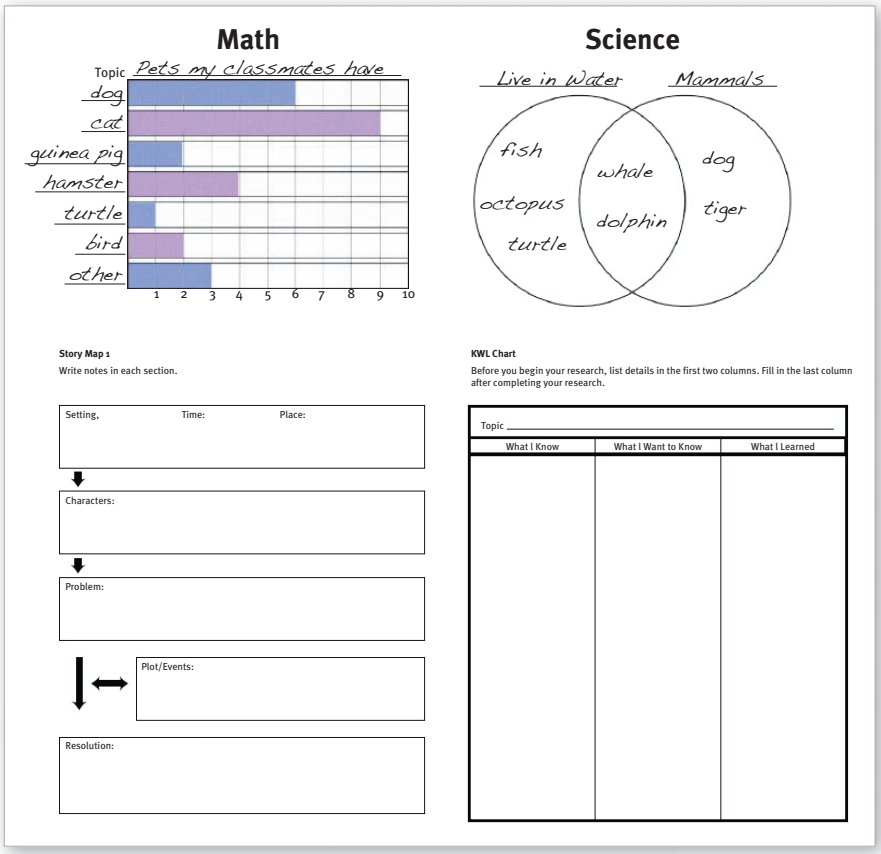


FIGURE 6.15 **A concept map created by a teacher to help students understand the earth's water cycle.**



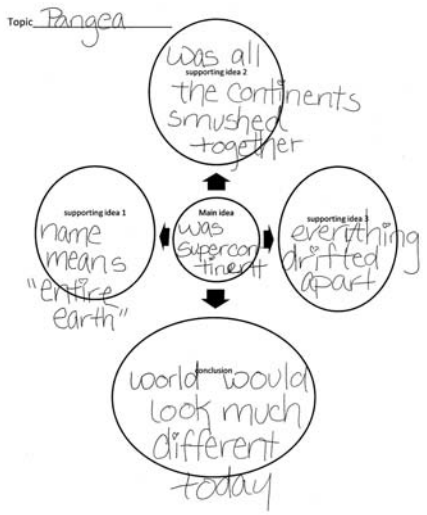


FIGURE 6.16 Graphic organizers are most useful for teaching content with a well-organized structure that may be too complex for or not immediately apparent to students.

Source: "KWL Chart" and "Story Map 1" from the HOUGHTON MIFFLIN HARCOURT EDUCATION PLACE® web site (http://www.eduplace.com/graphicorganizer/pdf/kwl.pdf) (http://www.eduplace.com/graphicorganizer/pdf/storymap1_eng.pdf Copyright © Houghton Mifflin Company. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company. All rights reserved. The graphic organizers may be printed and copied for classroom use. Any other use of the material is strictly prohibited unless written permission is obtained from Houghton Mifflin Harcourt Publishing Company.

Other examples of graphic organizers are mind webs, knowledge maps, diagrams, charts, matrices, flowcharts, and tables. Figure 6.16 shows a few examples of graphic organizers. The one on the bottom right corner of the figure uses the KWL method; students can use the table to list what they *know*, what they *want* to know, and what they *learned*. If you are interested in getting more ideas about graphic organizers, do a search in the Internet and you will find many resources for the classroom that are free for teachers, such as www.eduplace.com/graphicorganizer.

Encourage Metacognition

Developing students' metacognitive abilities is an important educational goal. Although some students acquire self-regulation skills largely on their own, teachers can model metacognition and self-regulation by helping learners set specific goals for themselves and asking learners to keep records of their performance and reflect on their learning in journals or portfolios. In addition, teachers should provide specific criteria to help students self-assess their performance and teach a repertoire of strategies that can be used to improve learning. These methods have been shown to help students gain metacognitive skills (Belfiore & Hornyak, 1998; Eilam, 2001; Morgan, 1985; Perry, 1998). Although metacognition is a high-order cognitive skill, even kindergartners and first-graders can be slowly made aware of their performance and progress with simple questions such as "What did you learn today?" "What are some things that you could not do yesterday and that you can do today?" (Perry, Vandekamp, Mercer, & Nordby, 2002). Classroom Tips: Developing Students' Metacognitive Skills offers useful general strategies to promote metacognition with corresponding classroom examples. In the next chapter, we discuss specific study strategies that can help students monitor and improve their learning.

CLASSROOM TIPS

Developing Students' Metacognitive Skills

Strategies	Classroom Examples
Model metacognition.	• Mr. Bazarra teaches Spanish by saying his strategy use out loud as he translates a sentence.
Help students set, monitor, and evaluate their goals.	• Mrs. Duncan starts Monday's class by having students set a weekly goal and sets aside time on Friday for students to reflect on their progress toward that goal.
Teach metacognitive strategies.	• For every new project, Mr. Hahn asks his students to estimate how much time they will need to complete the project and to create a checklist of tasks that are needed to complete the project.
Encourage and support self-regulation.	• At the end of each unit, Ms. Ortiz has her students write a journal entry explaining what they learned, how they learned, and what they could do to learn more.

REVISITING ISSUES IN EDUCATION

Should teachers use rote learning methods in the classroom?

Points to consider: The belief that there is no need to have students rote-memorize information is supported by a study on learning theatrical lines, which despite being typically learned using repetition methods, are remembered better when actors first understand the meaning or gist of the script (Noice, 1993). In addition, it has been claimed that students' enjoyment is higher with meaningful rather than rote methods of learning (Yuen-Yee & Watkins, 1994) and that using rote methods of learning creates "inert" knowledge in long-term memory (Brown, Collins, & Duguid, 1989). Inert knowledge is information that has been encoded in our memory with no connections to other knowledge; therefore, the likelihood of using or applying inert knowledge to specific contexts becomes very low (Whitehead, 1929).

On the other hand, despite the limitations of rote learning, some educators argue that there is room for encoding information through repetition, such as when students need to learn new vocabulary words in their native or foreign languages (Cook, 1994; Wang, Thomas, & Ouellette, 1992). Additionally, proponents of rote learning believe that memorized facts serve as the building blocks for students' development of higher cognitive skills (Rist, 1992). In sum, as it is usually the case in any two-sided argument, to rote or not to rote is not a relevant educational question. Instead, teachers should try to combine rote memorization techniques to encode information (e.g., drill and repetition) with meaningful learning methods in order to provide students with the advantages of both methods. As you remember from our discussion regarding working memory limitations, practicing skills until they become automatic can be a very effective way to proceduralize knowledge and reduce cognitive load during learning.

SUMMARY

- Cognitive theory defines learning as a relatively enduring change in mental structures that occurs as a result of the interaction of an individual with the environment. Cognitive views of learning typically use an information-processing model to explain how individuals acquire, store, retrieve, and use information.
- The information-processing model uses the computer as a metaphor to understand the human mind and includes three memory systems (sensory memory, short-term or working memory, and long-term memory) and the cognitive processes of attention, perception, storage, encoding, and retrieval.
- Sensory memory holds information in its original form for half a second to three seconds. To be processed further, information needs to be perceived, attended to, and held in working memory, which holds about seven bits of information for an average of 20 seconds.
- Modern working memory theories identify three components: the visuospatial sketchpad, the phonological loop, and the central executive. Despite its limitations in capacity and duration, all conscious processing takes place within working memory. Therefore, working memory capacity may become exhausted (cognitive overload) and learning may not occur when too much information is presented at one time.
- Information can be held in working memory indefinitely by using maintenance rehearsal, which is rote repetition of the information. Information can be stored in long-term memory by using rote methods (rehearsal) or can be encoded in long-term memory with meaningful methods (elaboration, organization), which consist of linking the new information to related information already stored in long-term memory. Retrieval is the opposite process to storing and encoding and consists of pulling information from our long-term memory into our working memory for further processing.
- Long-term memory has unlimited capacity and duration and can be classified as declarative, procedural, or conditional knowledge. Experts believe that different knowledge types are represented differently in our minds. Declarative knowledge can be represented as schemata or propositional networks, procedural knowledge can be represented through scripts and production rules, and conditional knowledge is thought to be attached to the various representations of declarative and procedural knowledge.
- Metacognition is knowledge and beliefs about one's own cognition and the resulting attempts to plan, regulate, and evaluate learning. Teachers can encourage learning by having students make use of metacognitive strategies such as completing self-tests or using journals.
- Information processing is affected by biological differences, such as those stemming from sensory impairments, attention deficits, and the learner's working memory capacity; it is also affected by an individual's cultural and linguistic background, which will affect how instructional materials are perceived and understood.
- Practical uses of cognitive learning theories include attracting students' attention to important information and building on what the learner already knows. Teachers should help students become active meaning-makers and engage them in constructing rather than memorizing information. Students will benefit from teachers who do not cover too much material at once, use strategies to reduce the learners' cognitive overload (e.g., chunking, pacing, practicing), and encourage the development of metacognitive skills.

KEY TERMS

advance organizers 226
attention 199
chunking 221
cognitive overload 220
conditional knowledge 211
declarative knowledge 210
dual processing 221
elaboration 203
encoding 202
images 212
long-term memory 209
maintenance rehearsal 201
meaningful learning 203
mental representations 211
metacognition 214
mnemonics 224
organization 203
pacing 221
perception 199
procedural knowledge 210
productions 213
proposition 212
retrieval 204
rote learning 202
schemata 212
script 212
sensory memory 198
short-term memory 201
storing 202
visualization 224
wait time 223
working memory 200

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. How is cognitive learning different from behavioral views of learning?
2. What are the memory systems according to the information-processing model and what are the characteristics of each?
3. What are the cognitive processes involved in working memory and what is a classroom example of each?
4. How may declarative and procedural knowledge be represented in long-term memory?
5. What is metacognition, how does it develop, and why is it important to learning?
6. Describe the two types of encoding and how they work.
7. Describe some ways in which sensory impairment, gender, and culture play a role in cognitive learning.
8. Offer some practical classroom suggestions involving cognitive learning.

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with cognitive theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. The current accountability movement stresses the need to "know what students know." Using what you learned about cognitive views of learning, present an argument to justify this need (Chapter 1).
2. How might differences in students' socioeconomic status affect learning according to the information-processing model (Chapter 2)?
3. How is information processing related to Piaget's or Vygotsky's cognitive development theories? What specific concepts from each are related (Chapter 3)?
4. Explain why urban schools are challenging contexts to promote personal, social, and moral development in students using the idea of "cognitive load" (Chapter 4).
5. Explain the process of learning social skills using both a cognitive view of learning and a behaviorist view of learning (Chapter 5).

A Case Study: PUTTING IT ALL TOGETHER

How Does This Elementary Classroom Teacher Apply Cognitive Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

The second-graders sit on the carpet next to their reading partners as Mrs. Tanaka shows them the cover of Gary Soto's story *Too Many Tamales*. Mrs. Tanaka teaches in a school where 65% of the students are Hispanic. She considered her students' cultural background when selecting *Too Many Tamales* and hopes they will relate to Maria, the main character. Eight-year-old Maria thinks she has lost her mother's wedding ring while making tamales.

The reading area is an inviting, well-organized area of her classroom. Books are labeled and stored in leveled, easily accessible reading bins. Current issues of *Time for Kids*, *National Geographic Kids*, and the local newspaper line the magazine rack. Exemplars of student writing are prominently displayed above the shelves. Students' reading journals are stored in a bin. Throw pillows are neatly stacked in the corner. A poster of Langston Hughes is displayed under the reading lamp. This is the second-graders favorite area of the classroom. Today, she will have students work on *Too Many Tamales* with their partners.

"Making Text-to-Self Connections" is written across the top of the board. Below the heading is a graphic organizer with two columns: *What the Story Is About* and *What It Reminds Me Of.* Mrs. Tanaka's goal for the lesson is to model how personal connections to books can enhance understanding.

Mrs. Tanaka starts by building on the previous day's vocabulary lesson. Yesterday, Mrs. Tanaka wrote six vocabulary words from *Too Many Tamales* on the right side of the board: *tamale, knead, nudge, confess, interrupt,* and *light*. After their class discussion, she asked students to draw examples of the words, which are now posted on the board. Before she starts reading *Too Many Tamales*, Mrs. Tanaka reviews the vocabulary with a quick exercise.

"I want you to show your partner how you would knead dough." Students squeeze their hands as if kneading a soft lump of dough. "That's right. Make sure you've gotten out all the lumps in your flour." Mrs. Tanaka demonstrates using large hand gestures. "Now, I want you to gently nudge your partner." The students tap each other on the shoulders. "When we come to these vocabulary words in our reading today, we'll see how the author, Gary Soto, uses these words."

Then Mrs. Tanaka starts reading *Too Many Tamales*. She stops after reading, "Maria felt grown-up, wearing her mother's apron. Her mom had even let her wear lipstick and perfume." Mrs. Tanaka closes the page to signal she is thinking about what she has read. "Hmmm, this part of the story reminds me of when I was 8 years old and my grandmother would take me shopping. I remember feeling grown up when my grandma would ask me to read the shopping list. Also, she would curl my hair, which would make me feel special." Next, Mrs. Tanaka marks the page with a sticky note. "On this sticky note I'm going to write 'shopping with grandma' so I am reminded of my connection to the story." After modeling the self-to-text strategy, Mrs. Tanaka wants the second-graders to practice making their own connection.

"Let's talk about *Too Many Tamales*." Mrs. Tanaka refers to the advance organizer on the board titled *What the Story Is About/ What It Reminds Me Of*. "We will be using this chart to help organize our thoughts. First, I want you to turn to your partners and tell them what has happened in the story so far." Mrs. Tanaka gives the students a few minutes to discuss. Then she selects a name from a jar of Popsicle sticks containing the names of all her second-graders. "Niki, what is *Too Many Tamales* about so far?"

"The story is about Maria making tamales with her mom," Niki replies.

Mrs. Tanaka prompts Niki's partner to contribute. "Can you add any details, Lorenzo?"

"Yeah, Maria and her mom are kneading *masa*, just like this." Lorenzo demonstrates kneading with his hands. Mrs. Tanaka writes down their summaries in the chart.

"Does *Too Many Tamales* remind you of something in your life?" Mrs. Tanaka asks. After giving students a moment to think about the question, she calls on Anna to share.

"It reminds me of eating tamales at the fair every summer," Anna responds.

"Those hot, spicy ones?" Jeremy interjects.

"Yeah, I like the chicken ones," Anna continues.

"My aunty makes tamales to sell at basketball games," Tina adds. "You can buy her tamales for two bucks."

Mrs. Tanaka writes down students' connections in the chart and then turns to the class. "Second-graders, you've just been making text-to-self connections. That means that you are connecting the text to your own life experiences. Oh, I almost forgot—I've been using that fancy word *text* again. Let's see—can you point to a text in our classroom?" Students point to the



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magazines, newspapers, books, journals, student writings, and posters in the reading area. Mrs. Tanaka has students briefly share examples of texts they see in the classroom.

As Mrs. Tanaka continues to read *Too Many Tamales*, she pauses to think aloud and models how to write down her connection to the story on a sticky note. She wants to show the second-graders the mental processes she uses when she reads. Midway through the book, she asks students again to summarize what has happened and make connections to their own life. Mrs. Tanaka adds the new student responses on the chart. She believes this explicit instruction of comprehension strategies will help her students as they start to read texts more independently.

The last pages of *Too Many Tamales* describe Maria's fear of confessing to her mother that she has lost her wedding ring. Instead of modeling her own connection, Mrs. Tanaka invites her students to think of one: "I'm going to give you a minute to think about a text-to-self connection, and then we will hear from any volunteers who wish to share."

Lorenzo starts, "It reminds me of a time when I broke the door on my brother's model truck. I felt so bad. I didn't want to tell him, so I tried to super glue it back together. But while I was gluing it, he walked into my room. I tried to hide it under my bed, but he noticed."

"What'd your brother do?" Vincent asks.

"He wasn't too upset actually. We worked on gluing the truck back together."

Mrs. Tanaka is pleased with Lorenzo's thought process. He made a sophisticated connection to the emotions Maria was experiencing in *Too Many Tamales*.

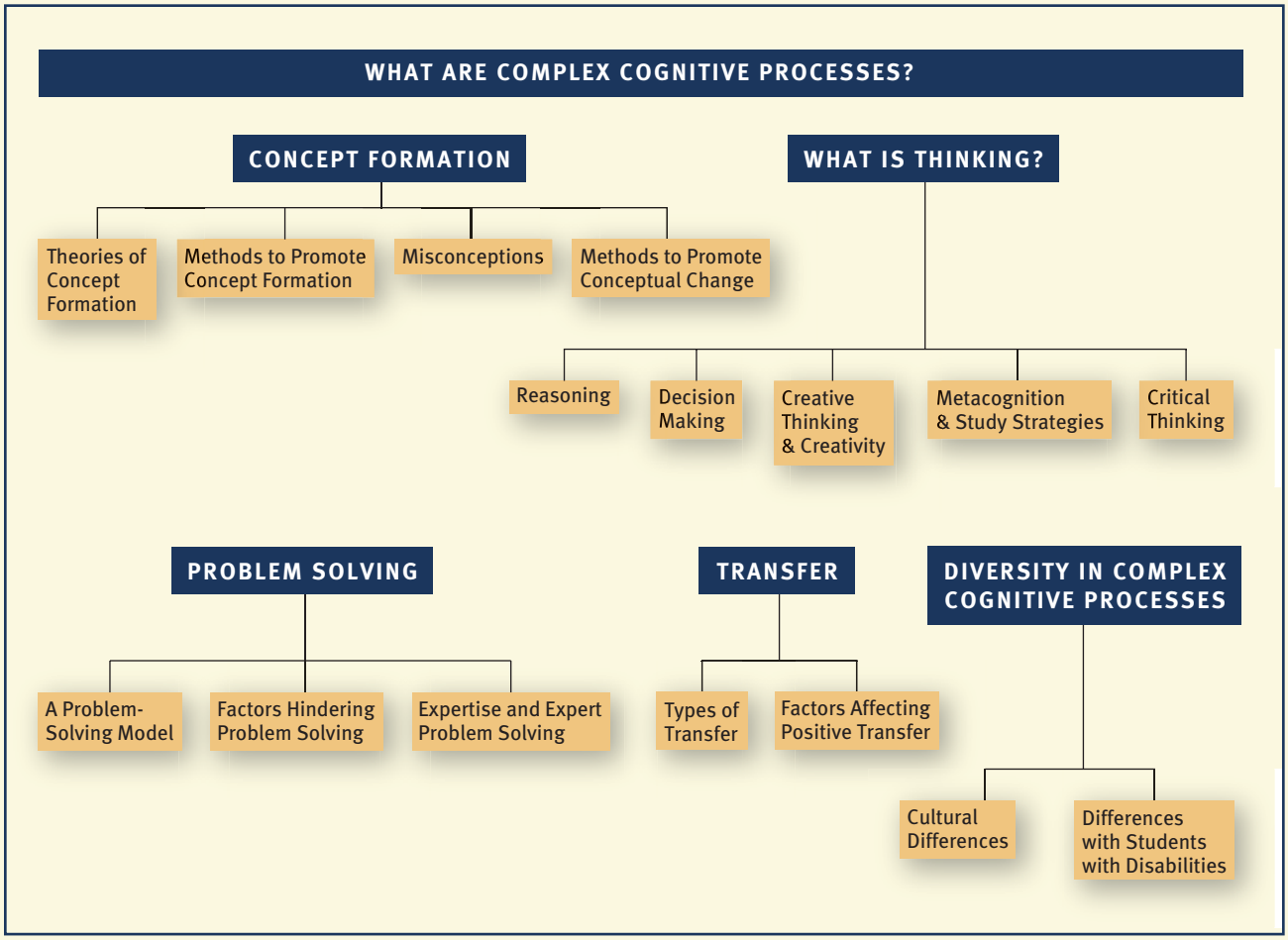
Mrs. Tanaka closes the lesson with journal writing. "During journal time this morning, I want you to write about one of the connections you made to Gary Soto's story, *Too Many Tamales*. You may use the chart on the board to help you remember the story and the connections we made during the lesson. Tomorrow, I will invite you to share your journal response with the class."

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. Which of the cognitive processes from the information-processing model were most prominent in the lesson?
2. What type of knowledge was promoted in the lesson and how?
3. Which of the cognitive principles of learning were applied during the lesson and how?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to the chapter content by including both strengths and weaknesses.

7 Complex Cognitive Processes



Imagine You Are the Teacher

MS. ARCHER ARRANGED HER GEOGRAPHY students in pairs to plan a three-week trip across Africa, spending no more than $10,000 per person. To complete the assignment, students need to list the sites they will visit, provide the history of and a justification for stopping at each site, and write a description of where they will stay and where they will eat. Ms. Archer encouraged her students to use the Internet for research. Kylee and Madison are working together.

"Where should we start?" asks Madison. "Should I just Google Africa and see what pops up?"

"Sure. Wow! That's a lot of sites to look through. Fifteen pages? Maybe we should look up the major airports, so we know where we can fly. Then we can plan what's in between," Kylee responded.

Madison types in a new search and clicks on the first hit. "How about this site? It talks about the airports in Africa."

Kylee responds, "I don't know. Look at all the pop-ups that sprung up when you opened the page. Also, look at all the advertisements. They have nothing to do with Africa, like working from home and earning $5,000 a week. Plus, I don't recognize any of those airlines. Go to the American Airlines website and see if they have African flights. At least we know that company."

"Okay," says Madison. "Let's see. Now we need an arrival city. Maybe we should start in Cairo—that's a big city in the north. Then we can fly home from somewhere in southern Africa like Cape Town and spend our three weeks between the two points."

Laura Dwight Photography



"Doesn't look like they have flights. Let me check with Delta. Okay, it looks like it will work. We can fly to Cairo for $1,500 each," Kylee says. "Wow! It will take over 24 hours! Let's see now if we can fly out of Cape Town."

"Yeah, but its like $3,000 for each of us! Maybe it would be cheaper somewhere else. We only have $10,000 for the three weeks," answered Madison. "Oh look, Johannesburg is only $2,000. Let's do that—then maybe we can go on a safari."

- **What type of thinking are Kylee and Madison showing?**
- **Why are the students having trouble finding the information they need?**
- **What could you do to help your students' thinking?**

Think about how you would respond to these questions as you read through the chapter.

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define complex cognitive processes.
2. Describe theories of concept formation.
3. Apply methods to promote concept formation and conceptual change.
4. Understand the characteristics of different thinking types.
5. Distinguish between expert and novice problem solving.
6. Apply methods that encourage positive transfer of learning.
7. Discuss issues of diversity in complex cognitive processes.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to the following questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Do you think that students should be taught *how* to think?
2. Why are some students resistant to changing their ideas?
3. Can any individual become an expert in a domain? If so, how? If not, why not?
4. How can teachers help students become good problem solvers?
5. Have you had experiences from school that you feel do not transfer to outside of the school? If so, why do you think this happens?

WHAT ARE COMPLEX COGNITIVE PROCESSES?

You may remember from Chapter 6 that cognitive theories explain how students make sense of new information by trying to relate the new information to prior knowledge stored in long-term memory. In this chapter, we go beyond the processes involved in encoding and remembering new information and explore **complex cognitive processes**, which require *using* or *transforming* previously acquired knowledge and skills. For example, students may use prior knowledge and skills to solve a problem, to critically think about a social issue, or to transform prior knowledge into creative works.

Complex Cognitive Processes

Using or transforming previously acquired knowledge and skills.

TABLE 7.1

Bloom's taxonomy of cognitive objectives.

OBJECTIVE	DEFINITION	EXAMPLES
Knowledge	Students will be able to remember relevant factual information.	Memorizing multiplication tables or verb conjugations.
Comprehension	Students will be able to understand new information.	Explaining the meaning of "civil rights" in your own words.
Application	Students will be able to use new information to solve practical problems.	Using formulas learned in math to estimate the amount of water needed to fill a swimming pool.
Analysis	Students will be able to break down complex information into smaller parts and make meaningful connections among the parts.	Comparing and contrasting the civil wars in the United States and in Spain.
Synthesis	Students will be able to combine different pieces of information to create new understandings.	Writing a review paper after reading several research articles on a topic.
Evaluation	Students will be able to make recommendations based on internal and external criteria.	Judging a work of art or providing a peer with feedback about a recent presentation.

How much you as a teacher will focus on lower or higher cognitive processes will depend on your learning objectives, which can range from helping students store and remember new information (i.e., simple cognitive processes) to promoting students' understanding, application, analysis, synthesis, and evaluation skills (i.e., complex cognitive processes). One of the first taxonomies of the processes of thinking and learning was offered by Bloom, Engelhart, Frost, Hill, and Krathwohl in 1956 (see Table 7.1). Similar to other taxonomies, the classification offered by Bloom and colleagues is hierarchical: Higher cognitive processes are dependent on having attained prerequisite knowledge and skills at lower levels (Orlich, Harder, Callahan, Trevisian, & Brown, 2004).

Although Bloom's original taxonomy of cognitive objectives has been used to plan instruction for over 40 years, a recent revision has updated the taxonomy, hoping to add relevance to current standards-based curriculum (Anderson & Krathwohl, 2001). As can be seen in Figure 7.1, the new proposal includes a matrix with 24 cells representing the intersection of four types of knowledge (i.e., factual, conceptual, procedural, metacognitive) and six cognitive processes (i.e., remember, understand, apply, analyze, evaluate, create). Teachers can use this matrix to determine whether the levels of the cognitive processes included in their lessons meet the cognitive objectives set by local, state, and national standards.

In this chapter we focus on cognitive processes that go beyond simply remembering new information. To this end, we start by reviewing the process of concept formation. Second, we focus on different types of thinking, including reasoning; critical,

Cognitive Process

Knowledge Type	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual						
Conceptual						
Procedural						
Metacognitive						

FIGURE 7.1 A revised taxonomy for Bloom's cognitive objectives.

Source: Anderson & Krathwohl (2001).

creative, and strategic thinking; and decision making. Third, we present a review of theories of problem solving and discuss how experts and novices in a domain may differ in this complex mental process. Finally, we examine methods aimed at encouraging the transfer of learning from one particular situation and domain to another.

You may wonder whether students should be taught *how* to think. After all, with or without specific training, everyone can think (Nickerson, 1988). However, many educators and policymakers are concerned with the growing evidence that many students at all education levels are unable to effectively engage in high-order thinking, such as analyzing and evaluating the information learned at school (Ennis, 2000; Grotzer & Perkins, 2000). Effective thinking is becoming more important not only for academic success but also for most jobs and careers, which emphasize problem solving and critical thinking skills (Nickerson, 1994).

The teaching profession is a good example of a career that requires effective thinking. As discussed in Chapter 1, due to the multiple roles of the teacher and the increasing diversity of the student population, teachers can be successful only if they are able to engage in effective decision making, problem solving, and reflective thought.

CONCEPT FORMATION

Concept

A category used to group similar objects, events, ideas, or people.

A **concept** is a category used to group similar objects, events, ideas, or people. Concepts are abstract in that they do not have an existence of their own other than in our mental representations. The usefulness of forming concepts resides in the fact that they help us represent and organize large amounts of information (Mandler, 2004). For example, we can use the concept "chair" when referring to any object that is used for sitting, regardless of whether the chair is made out of metal or wood or whether it has four or three legs. If we did not have the concept of "chair," every time we referred to a particular chair, we would need to explain the characteristics of the object that is used for sitting and would not be able to make any generalizations. Concepts are so fundamental to any thinking process that they have been argued to be the "smallest unit of thought" (Ferrari & Elik, 2003, p. 25).

Theories of Concept Formation

Concept formation is a lifelong process. It results from our direct experience with the environment, with media (e.g., text, TV), and with other people. How do people form concepts? In this section we review three theories that offer a potential answer to this question: rule theory, prototype theory, and exemplar theory.

Rule Theory of Concept Formation. Bruner, Goodnow, and Austin (1956) conducted psychological research on the process of concept formation by using a concept identification task. In a typical experimental study, students are presented with a group of simple objects (e.g., squares, triangles, circles) with different attributes (e.g., size, color), such as a large blue square, a medium green circle, a small green triangle, and so on. The researchers predetermine the rules defining the concept that needs to be discovered by the participants. For example, the researchers may have predetermined the new concept to be "all red objects" or "all objects that are not small," which are relatively simple concepts, or "all objects that are either a triangle or green," which is moderately complex. In the concept identification task, students are first presented with different objects on a screen.

Next, they try to guess the concept by selecting one of the objects as a potential example of the concept. After making the selection, students receive feedback about the correctness of their choice. Based on the feedback, students keep refining their guesses until they feel that they have arrived at the right concept definition.

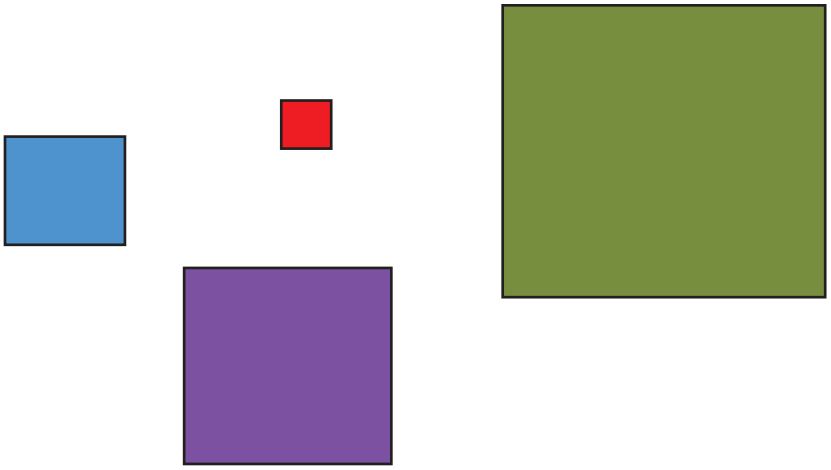


FIGURE 7.2 Examples of the concept "square."

Bruner's research showed that students use different strategies to discover concepts. Some students adopt a *gambling* strategy, in which they vary more than one attribute at a time (e.g., size and color) when choosing potential concept examples. Others adopt a *conservative focusing* strategy, in which they start with a very global hypothesis to be tested (e.g., all green objects) and, after successive trials, narrow down the hypothesis to be more and more specific (e.g., medium green triangles). The researchers also found that students took longer to discover complex concepts (e.g., all objects that are either a triangle or green) than simple concepts (e.g., red objects). Nevertheless, all students in the study were able to figure out the implicit "rules" defining the target concepts, even the most complex ones.

The underlying rules of concepts have also been called *defining features,* the set of attributes that are necessary and sufficient to define a concept (Katz, 1972; Katz & Fodor, 1963). Figure 7.2 shows a set of examples of the concept "square." A square is a geometric figure that has four equal sides joined by right angles. These are the defining features of a square. On the other hand, the color and size of the squares are *nondefining features.* You may change the nondefining features of an object and still have an example of the target concept.

The early work of Bruner and others (Haygood & Bourne, 1965; Neisser & Weene, 1962) suggested that people form new concepts by trying to discover the rules related to the concept attributes. Once discovered, the rules are stored in long-term memory and can later be retrieved whenever there is a need to decide if something is an example of the concept. This is why the theory was called the *rule theory* of concept formation. Bourne (1982) later elaborated on this theory by explaining that rules can be learned either through instruction or by having experience with examples and nonexamples of the concept category. Students can learn the concept "mammal" by examining the attributes of examples (e.g., cats, dogs) and nonexamples (e.g., birds, fish), or they can learn the concept "aerobics" by experiencing different types of exercises in their physical education class, some which are aerobic and some which are anaerobic.

The limitation of the rule theory of concept formation is that it can only explain how simple, unambiguous concepts are formed. The theory, however, does not explain how people form fuzzier or abstract concepts for which a set of rules may not be adequate. Try coming up with the defining features for the concepts "games" or "justice." You will notice that "games" are difficult to define because most games are competitive, leading to a winner, yet some are played in groups for purposes other than winning (e.g., building trust among members). Likewise, you will have difficulty finding a set of rules to define the concept "justice" because whether something is just or not depends on particular cultures and contexts.

Prototype Theory of Concept Formation. The limitations of the rule theory of concept formation motivated researchers to propose and test the prototype theory of concept formation. **Prototypes** are the best representation of a certain category or class (Hampton, 1995). A prototype for a bird for many people who have lived most of their lives in the United States may be a robin. According to prototype theory, people do not discover rules for different concepts but rather construct mental prototypes as they experience the world. Thus, a person who has experienced a vast number of robins will be likely to have a prototypical robin as a representation for the concept "bird."

Prototype

The best representation of a certain category or class.

Prototype theory best explains why we might hesitate to classify examples when they do not show a strong family resemblance to a prototype. For instance, we might hesitate to classify a penguin as a bird because it does not look much like a robin. Therefore, judgments about whether a specific example belongs or does not belong to the category depend on the degree to which the example bears a family resemblance with the prototype stored in our long-term memory (Rosch, 1973, 1978; Rosch & Mervis, 1975). Support for this theory was found by Rosch and colleagues (Rosch & Mervis, 1975), who showed that children learn category memberships for prototypical examples (e.g., robin, bluebird) before they learn less typical examples (e.g., penguin, ostrich). Research suggests that the majority of real-world concepts are structured by typical attributes rather than by rules (Wattenmaker, Dewey, Murphy, & Medin, 1986).

Exemplar Theory of Concept Formation. Many experts find that rule or prototype theories of concept formation are unable to explain all psychological phenomena related to concept formation. None of the theories describes how individuals form and classify abstract concepts, and prototype theory does not explain how individuals form concepts that may not be associated with only one prototype. For example, which one of the following are prototypes of the concept "furniture": desk, love seat, rocker, coffee table, sofa, table, chair? You probably have a good idea of what furniture means, yet you may have a difficult time choosing only one of these examples as the prototype for the concept furniture.

Exemplars

Highly typical examples of a category or class.

An alternative theory is called the exemplar theory of concept formation. **Exemplars** are highly typical examples of a category or class (Barsalou, 2000; Medin, Proffitt, & Schwartz, 2000). Unlike prototypes, which are presumably abstract mental representations constructed from experience, exemplars are real examples experienced by individuals. A prototype for a dog may be represented as a generic golden retriever. Dog exemplars stored in our memory are actual dogs that we have experienced (e.g., Fido, the golden retriever; Foofoo, the poodle; Bernard, the cocker spaniel). According to exemplar theory, when people need to decide whether a certain animal is a dog, rather than comparing the animal with a prototype, they compare the animal to exemplars stored in long-term memory and decide if the animal closely resembles any of them (Ross & Spalding, 1994; Komatsu, 1994).

Exemplar theory best explains how people form ambiguous or abstract concepts such as the concept "games," which may include competitive and noncompetitive exemplars, and the concept "justice," which may include multiple exemplars, each one illustrating fair outcomes in different contexts or situations.

Methods to Promote Concept Formation

Because concepts are the building blocks of cognition, it is most important for teachers to know how to promote concept formation. The reviewed theories of concept formation provide teachers with some guidelines. Prototype theory suggests that children should first learn concepts by having adults show examples that are typical. However, when examples are not typical or are ambiguous, it is best to examine the concept's defining attributes, as suggested by rule theory of concept formation (Schunk, 2000), or to ask students to retrieve exemplars from their memory, as suggested by exemplar theory of concept formation.

In addition to the teaching implications derived from each concept formation theory, cognitive views of learning suggest two additional methods to facilitate concept formation: schema activation and analogical reasoning. **Schema activation** consists of any instructional activity where learners are primed to activate prior knowledge from their long-term memory that is closely related to or representative of the new concept (Derry, 1996; Schallert, 1991). An English teacher might have students brainstorm how to use commas when listing series of words before teaching the use of commas when listing phrases.

Analogical reasoning consists of using examples that are familiar to students and that share similar attributes with the new concept to be learned (Bulgren, Deshler, Schumaker, & Lenz, 2000; McDaniel & Dannelly, 1996). For example, to help students understand the new concept "pulsar" (a rotating neutron that emits radio waves at regular intervals), a teacher may use a lighthouse analogy.

Schema activation and analogical reasoning are important methods for helping students make meaningful connections between new concepts and their prior knowledge. Next, we summarize useful guidelines for teaching new concepts and present additional methods for teaching new concepts in the classroom.



Laura Dwight Photography

Guidelines for Teaching New Concepts. The following components are recommended in any lesson on concept formation (Joyce, Weil, & Calhoun, 2004).

First, activate students' schemas with activities that will prime them to retrieve any relevant examples of the concept from long-term memory. For instance, if the objective of the lesson is to teach the concept "arthropod," teachers can engage students in a discussion about their prior experiences with bugs.

What cognitive principle of learning supports the use of schema activation to teach new concepts?

Second, present students with multiple examples and nonexamples, to help them set the boundaries of the concept. When teaching the concept "arthropod," teachers can present a grasshopper or lobster as examples and a clam or cat as nonexamples.

Third, help students identify defining and nondefining attributes of the concept. Here, you may ask students to identify the common attributes between the examples first, guide them to distinguish between relevant and irrelevant attributes next, and finally engage them in a discussion about whether and why the nonexamples may belong to the arthropod category.

Fourth, teach students the name of the concept, especially if it is unfamiliar to them. You may want to let your students know that the word *arthropod* comes from the two Greek terms: *arthron,* which means "joint," and *pod*, which means "foot."

Fifth, give students a good definition, including a reference to any more general category for the new concept and a statement for the new concept's defining attributes. You could tell your students that arthropods are invertebrate animals (i.e., general category) that have jointed limbs, a segmented body, and an exoskeleton made of chitin (i.e., defining attributes). If students do not know some of the words included in the definition (i.e., *limbs*, *segmented*, *exoskeleton*, *chitin*), you should also explain their meaning carefully and test for their understanding.

Sixth, it is recommended to add visual aids to your lesson such as pictures, diagrams, models, or even a real example that students can manipulate and explore (Mayer, 2001). You are probably familiar with the saying "a picture is worth a thousand words." In one study, adding a picture to a lesson about the concept of light increased

Schema activation

Any instructional activity where students are primed to activate prior knowledge from their long-term memory that is closely related to a new concept to be learned.

Analogical reasoning

Using examples that are familiar to students and which share similar attributes with a new concept to be learned.

60% of students' understanding of the concept (Anderson & Smith, 1987). In our example, showing arthropod pictures or even bringing an actual lobster or grasshopper to the classroom should enhance students' attention, memory, and understanding.

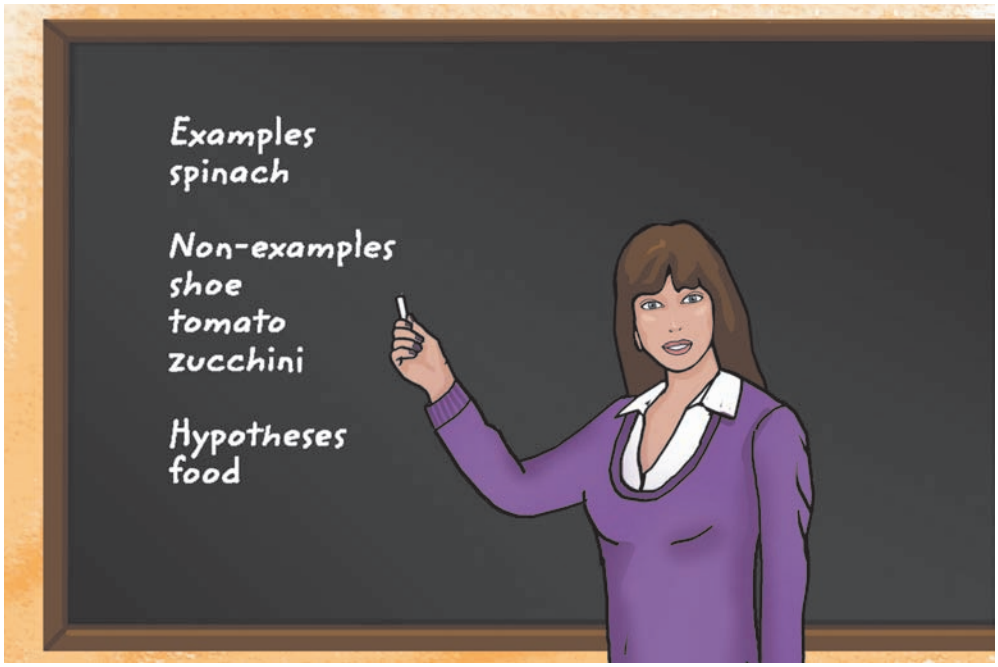
Finally, when teachers know that students lack prior knowledge of a concept either because it is complex or because it is not likely to be part of students' cultural background, it is useful to have students make analogies between the new concept and another known concept. Although students may be likely to have had experience with some arthropods, it might be a good idea to make an analogy between the concept "exoskeleton" and the human skeleton, to facilitate their understanding of this defining attribute. Classroom Tips: How to Help Students Learn New Concepts summarizes the above guidelines with additional classroom examples.

Concept Attainment Model. In this method, the teacher uses a three-stage approach to lead students to discover a new concept (Joyce et al., 2004). If you want students to discover the concept "vegetable," write the titles *Examples* and *Nonexamples* on the board and the words *spinach* and *shoe* in the example and nonexample columns, respectively. Then students can start entertaining hypotheses about the concept in a whole-class discussion. Students may initially think that the concept is "food." You can then add a third column on the board entitled *Hypotheses*, under which you can write the hypotheses offered by students (i.e., *food*).

CLASSROOM TIPS

How to Help Students Learn New Concepts

Guideline	Classroom Examples
Activate students' schemas on related concepts or exemplars of the concept.	Mrs. Jackson reads her students a picture book on the solar system to start the day's lesson on rocky planets.
	In music class, Mr. Anderson asks his students to describe different aspects of Mexican music before learning about the music of South America.
Present students with multiple examples and nonexamples.	During a reading lesson, Ms. Henderson lists words that have silent *e* at the end and words that do not.
	Mrs. Garcia lists examples of democratic governments and nondemocratic governments on the board during her lesson about democracy.
Help students identify defining and nondefining attributes of the concept.	Mr. Reynolds asks his seventh-graders to study an igneous rock and a sedimentary rock and list how they are different.
	In math class, Ms. Francis has her students create a list of attributes of the concept "rectangle."
Teach students the name of the concept.	While studying cloud types, Ms. Schaffer teaches her students the different names of clouds by watching the sky.
	In English class, Mr. Lovell teaches his students the names of the different parts of a sentence.
Give students a good definition, including any more general category for the new concept and the new concept's defining attributes.	Mr. Parks defines *isosceles triangle* for his fourth-graders as a shape with three sides, two of which are the same and one of which is different.
	In art class, Mr. Wilks defines *wash* as a watercolor technique that disguises individual strokes and produces a unified area of color.
Present visual representations such as pictures, diagrams, models, or real examples of the new concept.	Ms. Bollens brings in a variety of plants when teaching about the functions of leaves.
	Mr. Alkinson has his physical science students examine various examples of levers when learning about simple machines.
Have students make analogies between the new concept and another known concept.	Mr. Illison asks his students to make comparisons between the parts of a cell and their house.
	While teaching a unit on racket sports, Mrs. Dixon asks her students to make analogies between badminton and tennis.



What skills are likely to be fostered when using the concept attainment model?

A key to teaching a new concept using this model is to carefully select good examples and nonexamples that can lead students to eventually discover the concept. Good examples are prototypical or should contain all the information necessary to infer the concept to be learned. Good nonexamples are those that you think would likely be confused with the concept you intend to teach. It would be important to add *tomato* and *zucchini* under the *Nonexamples* heading. Tomatoes and zucchinis are fruits but are typically thought of as vegetables. These nonexamples will offer an opportunity for discussing the defining and nondefining attributes of vegetables. The teacher should continue to add examples and nonexamples until students discover the concept and can clearly distinguish and offer examples by themselves. This model engages students in complex cognitive processing through hypothesis generation and testing, as illustrated by the following scenario.

Mrs. Grayson is teaching a math lesson on polygons. In her *Examples* column she has drawn a square, a triangle, and a diamond. In her *Nonexamples* column she has drawn a Y shape, a U shape, and a squiggly line. She asks the students to look at the examples and try to define a polygon.

Sarah raises her hand and says, "I think a polygon is a shape."

Mrs. Grayson asks her to explain what she means by a shape and she answers, "Well, the nonexamples all have ending points and the examples are all closed up."

Mrs. Grayson responds, "Excellent, we call that being a closed figure. We are getting close. But how about circles? They are also closed figures. Is a circle a polygon?" Marilyn replies, "Well polygons must be closed and have sides and points because that is the only difference between a square and a circle."

In sum, the concept attainment model includes the following three stages:

1. Presenting examples and nonexamples so that students can infer the concept to be learned
2. Checking to see if students have understood the concept
3. Having students analyze their thinking strategies—namely, how they generated the different hypotheses about the attributes.

Concept Maps. Concept mapping (as you may recall from Chapter 6) is a visualization and organization technique that consists of constructing maps representing the relationships among concepts (Liu, 2004). Different concepts are visually represented by nodes, and the relationships between the concepts are represented by links. Figure 7.3 shows an example of how a learner may represent the concept "arthropod" using a concept map.

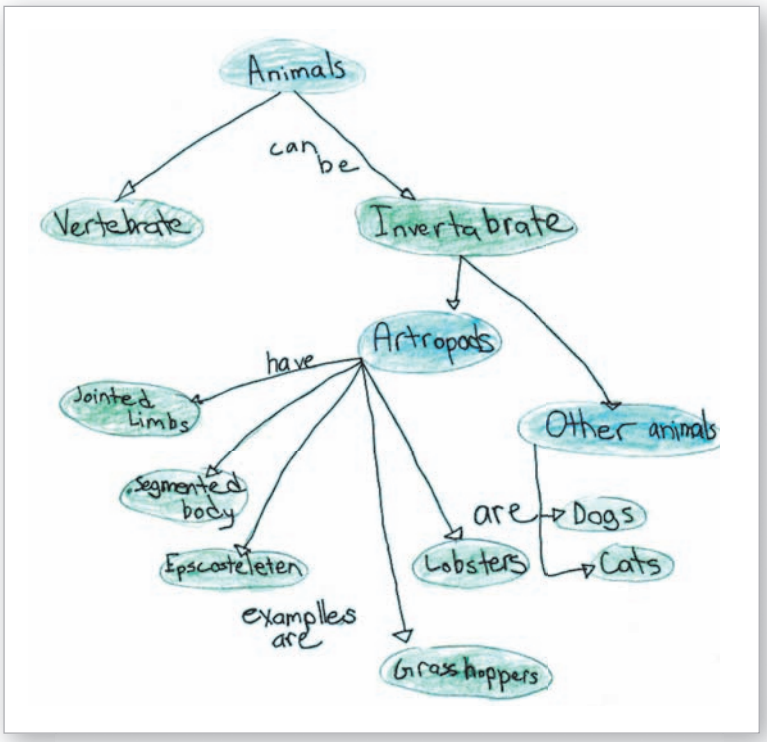


FIGURE 7.3 A student's concept map for the concept "arthropods."

In addition to helping students organize the new information with their prior knowledge, concept maps can be used to assess students' understanding of a concept (Hall, Hall, & Saling, 1999). A teacher who examines the concept map shown in Figure 7.3 can make the following observations:

1. The student did not spell the word "exoskeleton" appropriately, which might suggest the need to review the spelling of the word and also to explain the meaning of the word, to increase the likelihood that the word will be remembered (i.e., *exo* means "outside").
2. The student does not seem to understand the difference between vertebrate and invertebrate animals because dogs and cats are linked to the "invertebrate" node.
3. The student only included the examples given by the teacher, which suggests that the student may have memorized the examples rather than truly understood the concept.

Misconceptions

Misconceptions

Invalid concepts that students construct using their experiences, expectations, beliefs, and emotions.

Naive Theories

Theories that develop without instruction or with very little guidance from more knowledgeable others.

Misconceptions are invalid concepts that students construct using their experiences, expectations, beliefs, and emotions (Dole & Sinatra, 1998). Many students have the misconception that tomatoes are vegetables, probably because they encounter tomatoes next to the vegetables in their experience of going to the supermarket. When children start school, they have already developed their own concepts or theories about the world around them (Reiner, Slotta, Chi, & Resnick, 2000; Wellman & Gelman, 1998). Because these theories develop without instruction or with very little guidance from more knowledgeable others, they are also called **naive theories**, which very often include misconceptions (Vosniadou, 2003). Students' naive physics theories are sometimes revealed in tasks in which they are asked to predict object trajectories, such as predicting what would happen to a moving object that is coming out of a circular tube (many students believe that the object will continue a circular trajectory once it leaves the tube rather than flying off in a straight-line path) or predicting the trajectory of a person who is running off a cliff (many students

believe that the person will continue a short way off the cliff before abruptly falling straight down, as seen in many cartoons).

Some misconceptions are cases of *undergeneralization*, where students have a concept that is too narrow because it fails to include relevant objects or events. K–2 children will often undergeneralize the concept "animal" by including only mammals. Other misconceptions are cases of *overgeneralization*, where students have a concept that is too wide because it includes irrelevant objects or events. Students in grades 3–5 tend to overgeneralize the idea that all living things need to eat food to survive, such as thinking that plants obtain their food or "eat" food through their roots (Barker, 1995).

The origin of misconceptions is believed to be the result of everyday interactions with the world as well as the ways in which the culture and its adult members transmit information (Duschl, Schweingruber, & Shouse, 2007). Some misconceptions arise from inappropriate common expressions about natural phenomena (Duit, 1991; Mintzes, Trowbridge, Arnaudin, & Wandersee, 1991). People say that the sun and moon "rise" and "set," suggesting that it is the sun that moves around the earth rather than the opposite. Children are also likely to learn misconceptions from the media or other people who have misconceptions (Begg, Anas, & Farinacci, 1992). Many adults believe that Africa is a country (it's a continent) and that dinosaurs and humans coexisted (Nehm & Schonfeld, 2007).

Other misconceptions may be the result of drawing analogies between a well-known system and a less well-known one (Inagaki & Hatano, 2006). Children will attribute human properties to less familiar living entities, presumably because this analogy helps them make sense of the behavior of unfamiliar entities (e.g., the plant is droopy because she has no friends).

Regardless of their origin, misconceptions are extremely hard to change (Chi, 2005). Many studies show that merely providing the right explanation does not change students' ways of thinking (Carey, 1986; Chinn & Brewer, 1993). This is actually a misconception that many teachers hold (Alparsian, Tekkaya, & Geban, 2004; Shuell, 1996; Yip, 2004). Telling children that the earth has the shape of a sphere does not change their belief that the earth is a pancake-like flat surface (Vosniadou & Brewer, 1992). Experts argue that misconceptions are hard to change because they make sense to the learner and are likely to be embedded in complex schemas (Sinatra & Pintrich, 2003). Resistance to changing the belief that the earth is flat is probably due to the fact that imagining people walking or standing on a ball is inconsistent with children's everyday experiences. Therefore, when children are simply told that the earth is a sphere without any further explanation, they are likely to construct "dual-earth models" according to which there are either two earths (a flat earth on which people live and a spherical earth in the sky) or one earth that is flat and spherical at the same time (Vosniadou & Brewer, 1992).

What are some methods you could use to find out whether your students have misconceptions?

Students may also have a personal or emotional investment that makes them resist changing their current beliefs (Mason, 2003), they may interpret challenges to their belief system as a threat to their self-worth (Linnenbrink & Pintrich, 2003; Sherman & Cohen, 2002), or they may resist conceptual change because it is against their religion or culture (Hatano & Inagaki, 1996; Southerland & Sinatra, 2003). When learning about the solar system, some younger students may struggle with the idea that the earth rotates around the sun due to their daily experience of the sun "moving" across the sky or their cultural or religious beliefs that the earth is the center of the universe.



Jose Luis Pelaez/Getty Images, Inc.

Methods to Promote Conceptual Change

Conceptual Change

The process of changing a misconception that requires changing existing schemas.

If direct instruction is not sufficient to correct misconceptions, what can teachers do when they encounter misconceptions in the classroom? Changing a misconception requires changing students' schemas, a process that has been called **conceptual change**. For conceptual change to occur, instruction needs to satisfy the following conditions (Chinn & Brewer, 1998; Posner, Strike, Hewson, & Gertzon, 1982; Thorley & Stofflet, 1996):

1. Students need to experience a cognitive conflict between their existing concept and the new concept.
2. The new concept needs to make sense.
3. The new concept should be useful in addressing new problems or situations.

The first condition requires students to become aware of their naive theories and experience a conflict between their preconceptions and the new concept. The second condition requires using cognitive processes that will lead to meaningful encoding, such as the elaboration, organization, and visualization processes discussed in Chapter 6. The third condition requires providing students with opportunities to use the new information to solve new problems, especially authentic problems that allow students to appreciate the usefulness of the new theory. Instruction that satisfies these conditions is effective for students of all ages (Abed-El-Khalick & Akerson, 2004; Havu-Nuutinen, 2005; Opfer & Siegler, 2004). Combining questioning that reveals and challenges existing misconceptions with an activity in which students need to apply their reconstructed concepts to new situations (e.g., hands-on experiments, group discussions) promotes conceptual change (Andre & Windschitl, 2003; Chinn & Malhotra, 2002; Yip, 2004).

Nevertheless, teachers need to be aware that conceptual change may be resisted unless students are motivated to restructure their knowledge. Students are more likely to learn a correct explanation when they have an interest in the topic or when they believe that learning the correct explanation will help them achieve their goals (Sinatra & Pintrich, 2003). In addition, teachers should create a safe environment for learning, where students feel that they can reveal their thoughts without risking damage to their self-worth (Minstrell & Stimpson, 1996; Sherman & Cohen, 2002).

Recent theories and research have identified the important role that students' intentionality can play in the conceptual change process (Hatano & Inagaki, 2003; Sinatra & Pintrich, 2003; Vosniadou, 2003). Because conceptual change is usually a slow and gradual process, it requires students to deliberately put their learning mechanisms to work to be successful. The concepts of "force," "energy," "light," and "heat" or the concept of "photosynthesis" usually require years of instruction before they are completely understood (Vosniadou, 2007). One model that promotes intentional conceptual change is the hypothesis–experiment–instruction (HEI) model devised by Itakura (1986).

The HEI model effectively engages students in the conceptual change process by creating a social environment that favors deliberate and intentional belief revision (Hatano & Inagaki, 1991, 2000, 2003). It consists of presenting students with a multiple-choice problem with conflicting alternatives during a whole-class discussion, some of which addresses common misconceptions held by students. Students then make independent choices about which alternative they consider correct, and teachers arrange small groups that are representative of each hypothesis (hypothesis phase). Next, students' hypotheses are tested by conducting or observing an experiment (experiment phase). During this phase, the teacher acts as a moderator while students attempt to convince others why their hypothesis allows a better explanation than the alternatives. After arguing for their positions, students are asked to vote again (they may change their original hypothesis). Finally, students discuss the reasons that caused them to hold on to or let go of their original hypothesis, and the teacher reveals the correct alternative (instruction phase).

The HEI method has been used in many different domains, including physics, mathematics, and poetry (Hatano & Inagaki, 1991; Inagaki, Hatano, & Morita, 1998; Knapp, 2002). For example, a teacher can ask fifth-grade students if the multiplication of two numbers can ever lead to a smaller number and present the following answer alternatives: (a) yes; (b) no; and (c) only under certain conditions. The teacher can then have students



What conditions for effective conceptual change does the HEI satisfy?

pick one of the three options and defend their answer by providing examples that support their claim. After listening to each others' arguments, students can vote again before watching the teacher's demonstration. Another model that encourages students to confront their own preconceptions and those of their classmates and then work toward resolution is the six-stage conceptual change model (CCM), illustrated in Figure 7.4 (Stepans, 2003).

Classroom Tips: How to Promote Conceptual Change lists strategies for effectively promoting conceptual change with corresponding classroom examples.

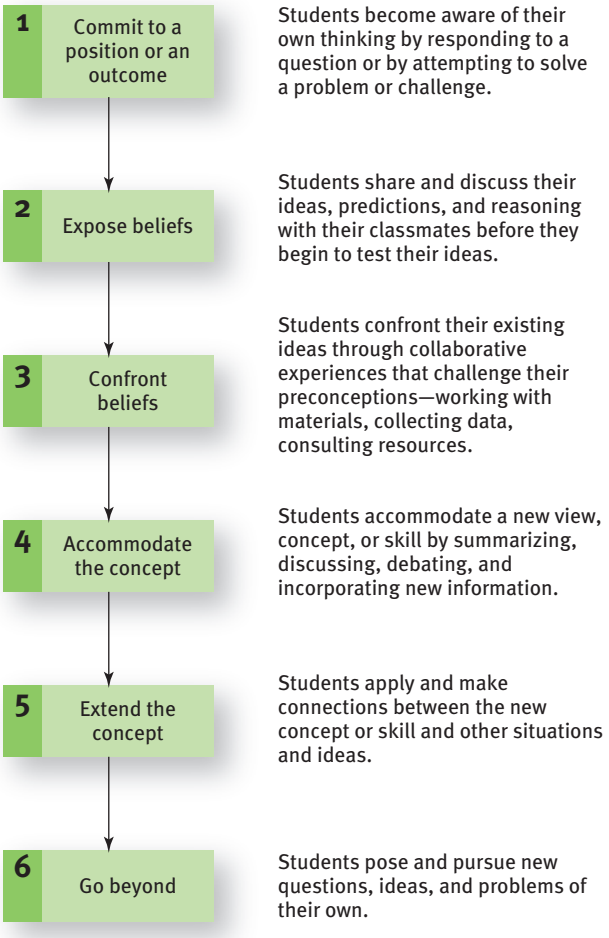


FIGURE 7.4 The conceptual change model.

CLASSROOM TIPS

How to Promote Conceptual Change

Strategies to Promote Conceptual Change	Examples
Help students become aware of their misconceptions.	Ask students to write down their explanations before introducing a new concept and allow them time to compare the two.
	Create essay assignments in which students need to reveal their reasoning in areas of common misconceptions.
Promote cognitive conflict between students' misconceptions and the new concept.	Ask students to conduct experiments in which their misconceptions contradict their results.
	Expose students to situations in which their misconception is unable to explain what they are experiencing.
Use elaboration and organization methods to help students encode the new concept meaningfully.	Provide advance organizers and graphic organizers before presenting new concepts.
	Ask students to elaborate on a new concept by providing their own examples.
Encourage classroom dialogues to help students achieve deeper conceptual understanding.	Ask high-order questions during instruction to encourage deeper understanding.
	Allow students to work in small groups and explain the new concept to each other.
Provide students with opportunities to use the new concept to solve authentic problems.	Use community problems or issues when designing opportunities to apply the new concept.
	Ask students to apply the new concept to problems that relate to their everyday lives.
Show students how the new conceptual understanding is related to their life experiences.	Ask students to write about how or where they experience the new concept outside of school.
	Use examples that students can relate to outside of their school lives.
Create a learning environment in which students feel safe revealing their beliefs.	Model respectful behavior when responding to student's misconceptions.
	Emphasize that diverse perspectives are valuable and that mistakes are necessary for learning to occur.

WHAT IS THINKING?

Thinking is the process of manipulating and transforming information in our working memory. In Chapter 6 we discussed several cognitive processes, including rehearsal, elaboration, organization, visualization, storing, encoding, and retrieval. All these processes are examples of thinking because they are aimed at consciously manipulating or transforming information. Thinking also happens as students learn new concepts in the classroom, which we discussed in the prior sections. In this section, we explore other complex thinking processes, specifically reasoning, decision making, creative thinking, metacognition, and critical thinking.

Reasoning

Reasoning
The process of logically drawing conclusions from evidence.

Reasoning can be defined as the process of logically drawing conclusions from evidence (Sternberg & Ben Zeev, 2001; Wason & Johnson-Laird, 1972). Reasoning is typically classified into deductive and inductive reasoning.

Deductive Reasoning. Deductive reasoning involves deriving specific conclusions from general rules. Therefore, deductive reasoning goes from the general to the specific (Johnson-Laird, 2000) and requires learning a rule and then understanding how

to apply this rule to a particular situation (Kuhn & Franklin, 2006). Examples of deductive reasoning in the classroom abound, especially in math and science. You may teach the formula for solving the area of a rectangle (general rule) so that students can later estimate the amount of carpet necessary to cover your classroom (specific problem), or you may teach Ohm's law (general rule) so that students can later calculate the resistance in an electrical circuit located at the school lab (specific problem).

How can teachers promote deductive reasoning skills? One method consists of presenting students with *syllogisms*, deductive arguments in which a conclusion can be drawn from a set of statements or premises (Braine & O'Brien, 1998; Polk & Newell, 1995; Rips, 1994). Syllogisms can be categorical, linear, or conditional (Sternberg & Ben Zeev, 2001). Following is a classic example of a categorical syllogism:

All men are mortal.
Socrates is a man.
Therefore, Socrates is mortal.

This syllogism includes two premises (the first two sentences) and a conclusion (the last sentence). You might ask your students if the conclusion is valid or if it is false. To answer this question, they will need to use their deductive reasoning skills. The example is categorical because it includes statements about categories (mortal beings and men) from which a conclusion about a specific instance (Socrates) needs to be derived. Figure 7.5 shows how you can visually represent this syllogism with Venn diagrams to demonstrate to your students that the conclusion is valid.

First, you can represent each one of the three terms involved in the syllogism: mortal beings, men, and Socrates. Next, you can represent each one of the premises. Finally, you can combine the two premises into one diagram to see if the resulting picture is consistent with the conclusion "Socrates is mortal." This method not only teaches students how to determine the validity of a logical argument but also teaches them how to use and interpret Venn diagrams. Alternatively, you could replace the conclusion by the question "Is Socrates mortal?"

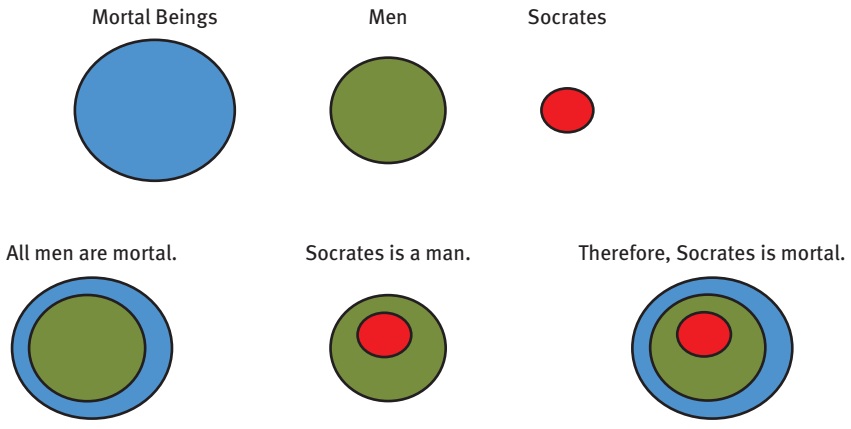


FIGURE 7.5 Using Venn diagrams to represent a categorical syllogism.

Source: From Stepans, J. (2003). Misconceptions and Conceptual Change: An Introduction. Targeting Students' Science Misconceptions: Physical Science Concepts Using the Conceptual Change Model (pp. 1-17). Tampa, FL: Showboard. (new edition, 2008, published by Saiwood Publications).

Now Let's examine an example of a linear syllogism:

Mary is taller than John.
John is taller than Sue.
Sue is taller than Mary.

To promote deductive reasoning, you can ask students to judge the validity of the conclusion (which in this case is false) or, alternatively, you can ask your students to answer the questions "Is Sue taller than Mary?" "Who is the tallest?" Research shows that young children have difficulty with this type of reasoning because they are unable to hold all the premises in their working memory (Bouwmeester, Vermunt, & Sijtsma, 2006). Therefore,

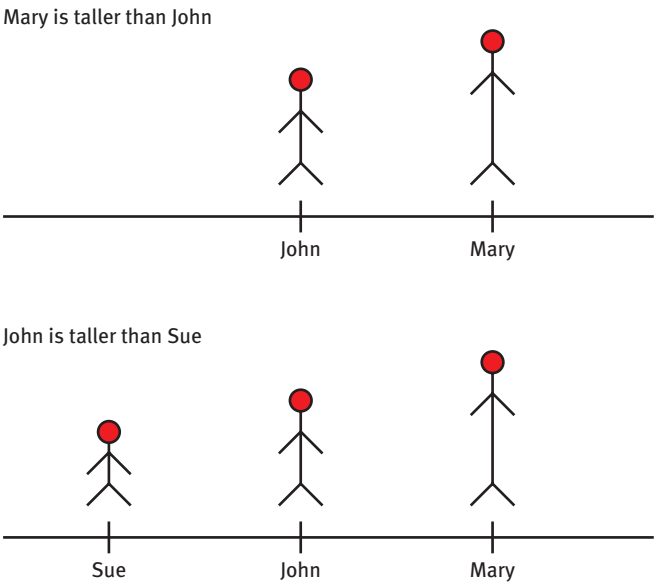


FIGURE 7.6 Using arrays to represent a linear syllogism.

presenting a visual representation should help their thinking process. As you can see in Figure 7.6, linear syllogisms can be represented using arrays. The type of reasoning involved in linear syllogisms is called *transitive* reasoning.

Finally, you can present conditional syllogisms to promote deductive reasoning skills. This type of syllogism involves determining the validity of a deduction based on conditions given in the premises. Take the following example:

If an animal is a dog, then it is a mammal.
Fido is a dog.
Is Fido a mammal?

Students typically make two errors in conditional reasoning. The first one consists of thinking that the conditional clause can be reversed and still hold true. In our example, students are likely to think that "If an animal is a mammal, then it is a dog." The second error consists of thinking that if a conditional clause is true, then the negated clause is also true. In our example, students who make this error will tend to believe that because "If an animal is a dog, then it is a mammal" is a true statement, then the negated statement "If an animal is *not* a dog, then it is *not* a mammal" is also true. Conditional syllogisms are quite complex and also very difficult to represent visually. Consequently, this type of deductive reasoning is probably appropriate only for older students. In general, students' reasoning tends to improve with age, with adolescents being increasingly able to reason deductively (Kuhn & Franklin, 2006).

Inductive Reasoning. Inductive reasoning involves deriving general conclusions about a category based on information from only some of the members of the category. Therefore, inductive reasoning is a type of reasoning that goes in the opposite direction from deductive reasoning, from the specific to the general (Kuhn, 2006; Markman & Gentner, 2001). If you have observed several black pigeons, you are likely to conclude that all pigeons are black by using inductive reasoning. Inductive reasoning cannot be conclusive because we are unable to experience all the pigeons in the world before coming to a conclusion. Imagine that you see a white pigeon for the first time. This new experience will change your prior conclusion that all pigeons are black to allow for the possibility of white pigeons and maybe even pigeons of other colors or patterns that you have not yet experienced.

Inductive reasoning is our natural way to learn about the world because it is based on repeated observation. As we experience the world, we accumulate knowledge in our long-term memory and eventually detect a pattern that allows us to generalize a rule from the multiple observations. However, a potential problem with this type of reasoning is generalizing too quickly. For example, a student who raised his hand twice in the classroom without receiving attention from the teacher may conclude that the teacher will never pay attention to him and consequently stop raising his hand in the future. Many inductive inferences are even based on a single observation, just because two events occur simultaneously (Kuhn, Katz, & Dean, 2004). An individual may conclude that his wife started smoking because one of her co-workers is a smoker; however, this could just be a coincidence. Teachers can promote better inductive reasoning skills by making students aware that their conclusions depend on the quantity and quality of their observations.

Decision Making

Decision Making

The process of evaluating alternative options and making choices among them.

Decision making is the process of evaluating alternative options and making choices among them. As adults, we are constantly required to make decisions in our personal and professional lives. A classic research study found that teachers make as many as

800 decisions per day! (Jackson, 1968). Even answering a student's question requires making a decision about how to respond. Although forming concepts and reasoning are complex processes, decision making can be even more complex because important information about the alternatives to be evaluated may be missing or unreliable (Matlin, 2005); to add to this complexity, we may also have limited knowledge about the consequences of our decisions (Gigerenzer & Selton, 2001).

What are some characteristics of the decision-making process? First, the number of decisions people make seems to increase with time. Whereas children make only a limited number of well-defined decisions, by the time they reach adolescence they need to start making many important decisions that will affect their future lives, such as which course electives they should choose, how much time they should spend studying, which person they should date, and whether they should get a job or go to college (Byrnes, 2005; Jacobs & Klaczynski, 2005; Kuhn & Franklin, 2006; Wigfield, Byrnes, & Eccles, 2006).

Second, the decision-making process becomes more efficient with time, with older adolescents being more competent at making decisions than younger adolescents and younger adolescents being more competent than children (Keating, 1990, 2004). The reason adolescents are more competent at decision making is that they are more likely to generate alternative options, to entertain multiple perspectives, to anticipate the consequences of the alternatives, and to examine the trustworthiness of the information needed to make the decision. A third characteristic of the decision-making process, especially for adolescents, is that better decisions are made when individuals are calm rather than emotionally aroused (Dahl, 2004).

Finally, research has found a variety of thinking flaws affecting people's decision-making process that you are likely to encounter in the classroom (Stanovich, 2004). The following are some examples:

- *Confirmation bias*: the tendency to look for information that confirms rather than refutes our thoughts (Gavetti & Rivkin, 2005)
- *Hindsight bias*: The tendency to falsely report that we accurately predicted an event once the event occurs (Birch, 2005)
- *Overconfidence bias,* the tendency to be more optimistic about alternatives than we would be if we had considered probabilities or past experience (Kahneman & Tversky, 1995)
- *Belief perseverance*: the tendency to hold on to a belief despite the presence of contradictory evidence (Smith, 2005)

Because these thinking flaws are human tendencies, they are likely to be invisible to the decision maker. Teachers can improve students' decision-making skills by examining not only the outcomes of students' decisions but also their thinking process, to ensure that the decisions are not flawed by one of these illogical mechanisms. Students' decision-making skills can improve significantly when they are made aware of these flaws. Table 7.2 lists the four thinking flaws reviewed with corresponding classroom examples.

Creative Thinking and Creativity

Creative Thinking

Generating new ideas, combining ideas in a novel way, or coming up with unique ways to solve problems.

People engage in **creative thinking** when they generate new ideas, combine ideas in a novel way, or come up with unique ways to solve problems. As you recall from Chapter 2, creativity is one of the three facets of human intelligence in Sternberg's triarchic theory of intelligence (Sternberg, 2000). However, intelligence and creativity have been shown to be independent abilities (Taylor, 1976; Torrance, 1976). Although most creative students are found to be highly intelligent as measured by IQ tests, the reverse is not necessarily true. Many students who score high on IQ tests are not highly creative (Sternberg, 2006). Before reading

TABLE 7.2

Thinking flaws and corresponding classroom examples.

THINKING FLAW	EXAMPLES
Confirmation bias	Karen is upset when Mr. Robles gives her a low final grade. She tells Mr. Robles that she has done really well on all the tests and does not understand why her grade is so low. Mr. Robles points out that she needs to look at her overall performance in the class. Although she is doing well on the tests, she did not turn in any homework and received low scores on her last two projects.
Hindsight bias	As part of a science experiment, Ms. Cadden asks her students to write down what they predict will happen if she places a jar over a candle. After performing the experiment, she asks the students to raise their hands if they had offered the right prediction. After observing that all students had raised their hands, Ms. Cadden is very surprised to read the students' answer and find that over half of them did not predict the outcome correctly.
Overconfidence bias	Josh believes he is really good in math. His parents think that Josh is very smart and regularly praise him for all academic work. Josh did not feel he needed to practice the new math skills he learned for the upcoming test. Josh received a failing grade in the test.
Belief perseverance	In health class, Ms. Trenton is surprised. She polled her students before starting a unit on the importance of physical activity. She found that 87% of her students felt that walking back and forth to school was sufficient to stay healthy. After two weeks of explaining the importance of training within certain heart rate zones, she finds that 80% of her class still feel that they can get enough exercise by walking to school.

the next paragraph, take a few minutes to reflect on the following questions: Is creativity something that students either have or do not have? If so, which students are more likely to be creative?

Stereotypes about creativity abound. One of them is the belief that only a select group of individuals has what it takes to be creative (Borland, 2003). People who ascribe to this idea tend to think in terms of "big C" creativity—a genius quality found only in talented individuals such as Mozart and Picasso—rather than in terms of "little c" creativity—an ability that we all have to a certain degree and that can be fostered or hindered, depending on the conditions set by the environment (Beghetto & Kaufman, 2007). As you know, the beliefs that teachers hold will affect their practices and, in turn, students' achievement. This is why we encourage you throughout the book to take a reflective stance about teaching. To see an example of how teachers' beliefs about creativity may show in a classroom, read the case that follows this section and try to solve Mrs. Fleck's dilemma.

As illustrated in the Case Study, creativity may not show across domains. In other words, a student who is very creative in her writing will not necessarily be creative in math, science, or the arts (Runco, 2006). What is still not clear is the degree to which creativity in one or more areas is the result of a predisposition (nature) or the environment (nurture). In terms of nature, some experts argue that creative individuals share common personality traits, such as sensitivity, autonomy, flexibility, the ability to tolerate ambiguity and delay gratification, risk taking, and a playful or childlike tendency (Runco, 2007). On the other hand, the role of nurture in creativity is supported by research in which the home environment and the design of classrooms and schools are found to influence students' creativity (Olszewski-Kubilius, 2003; Runco, 2004). When the instructional environment is stimulating and encourages independent thinking, students are more likely to show creative thinking (Amabile & Hennessey, 1992; Hasirci & Demirkan, 2003).

A necessary condition for creativity is to have considerable knowledge in a domain (Simonton, 2000). For instance, after spending many summers at her grandmother's house in the mountains, Elisa has learned a lot about gardening and the needs of plants.

Now Elisa creates elaborate gardening designs using native plants. Thus, teachers should not expect students to be creative before they have mastered necessary content or skills (Amabile & Hennessey, 1992).

A well-agreed-upon characteristic of creativity is the ability to engage in **divergent thinking**, the generation of many nonstandard answers to a problem or question (Michael, 1999). Divergent thinking is the opposite of convergent thinking, which is the standard way of answering questions and typically assessed by means of conventional intelligent tests. In a creativity test on functional creativity, students are asked to come up with as many uses for a brick as possible (Kim, 2006). A convergent thinker will offer the typical response, that bricks can be used "to build a house," whereas a divergent thinker may respond that bricks can be used "as paperweights" or "to make a sculpture."



Seth Joel/Getty Images, Inc.

How can teachers promote divergent thinking in the classroom?

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT

Divergent thinkers demonstrate fluency (lots of ideas), flexibility (ideas in varied categories), originality (novel ideas), and elaboration (ideas with added details). Try the following creativity exercises keeping those factors in mind. 1. Name many uses for a bottle. 2. Name things that jump and tell why or how they jump. 3. A school district has many used textbooks it needs to discard. What could they do with them? Save your answers to discuss with your classmates.



Divergent Thinking

The generation of many nonstandard answers to a problem or question.

Although creativity has always been a main topic in the arts, it is becoming highly valued in all education subjects. According to the triarchic theory of intelligence, teaching needs to include educational activities that promote creative thinking to support successful intelligence, the basis for school and life achievement (Sternberg, 1997). This idea is also shared by many experts who believe that teachers should promote student creativity as one of their instructional goals (Kaufman & Baer, 2006; Plucker, Beghetto, & Dow, 2004; Runco, 2006). The following are some strategies supported by educational theory and research that you can use to promote students' creative thinking:

- *Create a sense of mastery in the domain.* The groundbreaking examination of creative people conducted by Csikszentmihalyi (1996) showed that the first and foremost characteristic of creative individuals is the mastery of a domain of knowledge or skill. Without mastery in the domain, divergent thinking is not likely to lead to creative products.
- *Create a safe learning environment.* To be creative, students need to feel that they are safe to share their nonstandard ideas with others. To help students take risks and expose their divergent thoughts, make sure that your classroom environment is respectful of all ideas and perspectives and create activities in which students don't need to be evaluated. This is particularly important in the multicultural classroom, which is likely to include diverse students (Nieto, 2001).
- *Create an autonomy-supporting learning environment.* As you will learn in Chapters 9 and 10, students are more motivated in autonomy-supporting classrooms, where teachers give them choices and solicit their input (Deci & Ryan, 2006). In contrast, controlling classrooms send the message that students' opinions are not valued and undermine creative thinking (Amabile, 1993).
- *Encourage brainstorming.* Brainstorming consists of arranging students in groups to share any idea that comes to mind to solve a certain problem (Rickards, 1999; Sternberg & Lubart, 1995). Although solitary brainstorming may help many students generate more ideas than does a group brainstorming (Rickards & deCock, 2003), an advantage of brainstorming in a group is the exposure of students to other perspectives, which can also promote creative thinking.

A Case Study: DIVERSITY IN THE CLASSROOM

Creativity Differences in a Fifth-Grade Classroom

"I've been meaning to tell you how well Carlos is doing in physical education," Ms. Platero tells Mrs. Fleck, his fifth-grade teacher.

"Yesterday, as the class was walking a mile, Carlos said, 'I'll tell the number of footsteps I'm walking in this mile.'

'Are you counting?' I asked him.

'Yeah, well, you don't actually need to count. You see, last night I used my dad's tape measure to figure out my average stride. Then, today, I divided 5,280 feet by my stride to find out how many of my steps equal a mile.'

'Wow, that's impressive. What did you get as an answer?' I asked him.

'2, 212½ footsteps, to be exact,' Carlos told me proudly. He's one smart cookie."

"That's Carlos for you; he's got an answer for everything," Mrs. Fleck replies. "I just wish he'd do more work. Most of the time, he sits in class and seems to zone out. He's a great kid, but he needs to learn good work habits. I've known him since he was a kindergartner, and he's always been that way. His older brother, Estefan, was very attentive in class and always got straight A's. They come from such a nice, hardworking Hispanic family."

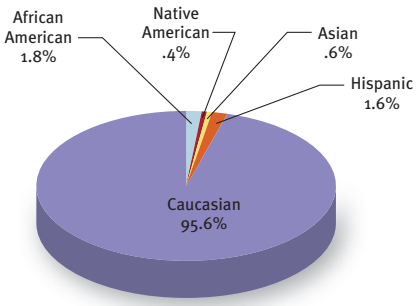
Demographics:
An overview of the students
Birch Point Elementary School
Sagadahoc County, Maine

37.8 % Students eligible for free and reduced lunch

0.4 % Students qualify for ESL instruction

10.6 % Students receive Special Education Services

Racial/Ethnic Groups



Mrs. Fleck has been teaching fifth grade at Birch Point Elementary for 14 years and enjoys getting to know her students' families. She looks forward to visits with former students who stop by her classroom to reminisce about their elementary years. As a veteran teacher, she is the school's on-site testing coordinator and the Parent–Teacher Association's (PTA) events director. She's well respected by colleagues and community members for her leadership and her ability to efficiently accomplish projects.

Her teaching philosophy is to provide students with a strong foundation in the core academic subjects of writing, reading, and math. She has found that when students gain confidence in these subjects, they are successful in middle school and more likely to graduate from high school. In her class, students learn how to organize paragraphs and write concise essays by repeatedly practicing on a variety of topics. When they're reading, they know to first identify the topic, main idea, and supporting details. In math, they complete timed math-facts drills; for problem solving, she guides them through a routine step-by-step process to find solutions until it becomes automatic. Her former students regularly thank her for the academic skills she taught them.

During the October parent–teacher conferences, Mrs. Fleck takes the opportunity to talk frankly with Carlos's parents.

"I've noticed Carlos has a hard time focusing, particularly during math class. Sometimes it seems like he's in his own little world. Don't get me wrong, he usually scores very well on his tests, but I'm concerned about his low level of engagement. Last week, for example, he completed all of Chapter 5 division problems, so I told him to start on Chapter 6 at his own pace, but he quickly lost interest. I'd like to see him improve his work habits. Do you see similar behaviors at home?" she asks his parents.

"Actually," Carlos's father begins, "he has a lot of after-school responsibilities. He walks his younger sister home from day care, makes snacks, and completes his chores around the house. He's a good worker."

"We're just a little confused," Carlos's mother continues. "Every year we hear about how he's distracted, especially during math class, and that he should pay more attention in school. We talk to him about it, but it doesn't seem to make a difference."

"Well, considering Carlos will start middle school next year," Mrs. Fleck responds, "I'd like you to talk with him again, and I'll keep a close eye on his behavior during class."

The following week, the school's art teacher, Mr. Heil, has a chance to talk with Mrs. Fleck during a staff meeting. "The other day, Carlos posed an interesting question to me, he asked, 'You know that new TV advertisement for pain medication?'

'I think so.' I told him.

'Well, on the commercial they say that three out of four doctors recommend the medication. But, you see, they don't tell you how many doctors they surveyed. For example, what if they just asked ten? It's not representative of the number of doctors and patients in the country.'

'You're really thinking, Carlos,' I encouraged him.

'Another thing,' he continued. 'The ad doesn't say why the 25% of doctors *do not* recommend the medication. I mean, what if it's actually dangerous?'

'You should work for the Food and Drug Administration after you graduate from college,' I suggested."

"Yes, that's Carlos," Mrs. Fleck agrees.

"Have you considered referring him to the gifted program?" Mr. Heil asks.

"Hmm." Mrs. Fleck pauses. "You know? It's never even crossed my mind. He rarely completes his work and seems to daydream through most of my lessons. He's just so different from gifted students I've taught in the past—you know, the kids who get straight A's and take on leadership roles in the school."

"Well, when he asks such intriguing questions, it's like a window into his complex thought processes," Mr. Heil explains.

"I just don't understand why he tunes out during class. Even when I give him the opportunity to work ahead at his own pace, he doesn't take the initiative."

"Perhaps he's afraid of appearing different in front of his peers, or maybe he's just bored" Mr. Heil speculates.

"Bored, in my class?" Mrs. Fleck looks surprised and then concurs. "I guess it's a possibility. It's too bad it's already the middle of fifth grade, but it wouldn't hurt to start the gifted referral process. I'll let his parents know."

References for Diversity Case

For further reading, you can visit the National Association for Gifted Children at http://www.nagc.org/

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

- *Model creativity.* In the next chapter you will learn about the powerful learning and motivational effects of modeling, a method in which students learn by observing another individual's behavior (Bandura, 1986). Teachers can foster creativity by modeling their own creative skills and those of others in the classroom.
- *Demonstrate the value of creativity.* To promote creativity, teachers should model their own enthusiasm and value for creative work and design classroom activities in which students are given credit for their creative thinking (Hennessey & Amabile, 1987; Sternberg, 2003).
- *Allow time for creativity.* Creative thinking cannot happen in a rush! Teachers should allow enough time during creative activities to ensure that students are able to relax and play with their thoughts and those of others.

Classroom Tips: How to Promote Creativity in the Classroom provides classroom examples for each strategy that fosters creativity.

Metacognition and Study Strategies

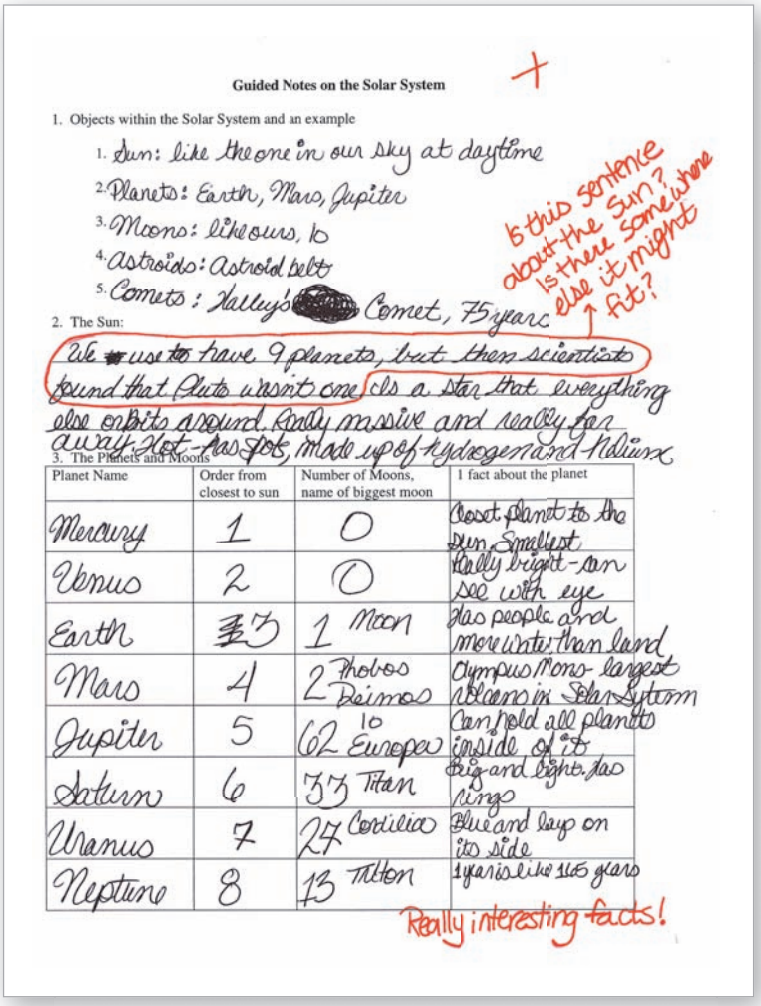
When we discussed cognitive views of learning in Chapter 6, we introduced metacognition, the process of thinking about our own thinking. Metacognition is a complex cognitive process because it requires being aware of what we know and knowing when and why to apply different strategies to achieve learning goals.

Imagine that Alex needs to study for his Spanish final. First, he reviews his notes about sentence structure. Then he practices translation by reading stories in Spanish and writing English summaries. Finally, he makes flashcards for challenging vocabulary words so he can study while waiting to be picked up from soccer practice. Alex is a good example of a self-regulated learner who knows what strategies to use to pass

CLASSROOM TIPS

How to Promote Creativity in the Classroom

Strategies to Promote Creative Thinking	Classroom Examples
Foster the development of mastery in the domain.	Allow students plenty of time to master a domain before asking them to think creatively about the domain.
	Plan lessons so that students can practice the learned knowledge and skills several times over the course of a year, instead of just once.
Create a safe learning environment.	Recognize students' creative work and divergent perspectives.
	Create assignments that will not be evaluated for their content.
Create an autonomy-supporting learning environment.	Give students choices about topics or presentation formats.
	Encourage students to participate in the setting of learning goals.
Encourage brainstorming among students.	Record all ideas during brainstorming sessions without judgment.
	Have students brainstorm alone, then in pairs or small groups, and then as a large group.
Model creativity.	Provide examples of creative work and have students discuss them.
	Bring guest artists, writers, and scientists to the classroom to share their creative products.
Demonstrate the value of creativity.	Use examples of people who were creative and rewarded by society.
	Show exemplar student work where the use of creativity has helped solve a problem.
Allow time for creativity.	When planning the day or lesson, allow plenty of time for the completion of activities so you and your students are not rushed.
	For activities requiring creativity, do not impose tight due dates or deadlines.



Guided Notes on the Solar System

1. Objects within the Solar System and an example
   1. Sun: like the one in our sky at daytime
   2. Planets: Earth, Mars, Jupiter
   3. Moons: like ours, Io
   4. Astroids: Astroid belt
   5. Comets: Halley's Comet, 75 years

Is this sentence about the sun? Is there somewhere else it might fit?

2. The Sun:

We used to have 9 planets, but then scientists found that Pluto wasn't one. Is a star that everything else orbits around. Really massive and really far away. Hot-has fire, made up of hydrogen and helium

3. The Planets and Moons

Planet Name	Order from closest to sun	Number of Moons, name of biggest moon	1 fact about the planet
Mercury	1	0	Closest planet to the sun. Smallest
Venus	2	0	Really bright-can see with eye
Earth	3	1 Moon	Has people and more water than land
Mars	4	2 Phobos Deimos	Olympus Mons-largest volcano in Solar System
Jupiter	5	62 10 Europa	Can hold all planets inside of it
Saturn	6	33 Titan	Big and light. Has rings
Uranus	7	27 Cordelia	Blue and lays on its side
Neptune	8	13 Triton	1 year is like 165 years

Really interesting facts!

FIGURE 7.7 How a teacher might use guided notes to help students develop note-taking skills.

his Spanish test. As you will learn in the next chapter, self-regulated learners are those who engage in systematic efforts to direct their thoughts, feelings, and actions toward the attainment of academic goals (Zimmerman, 2000).

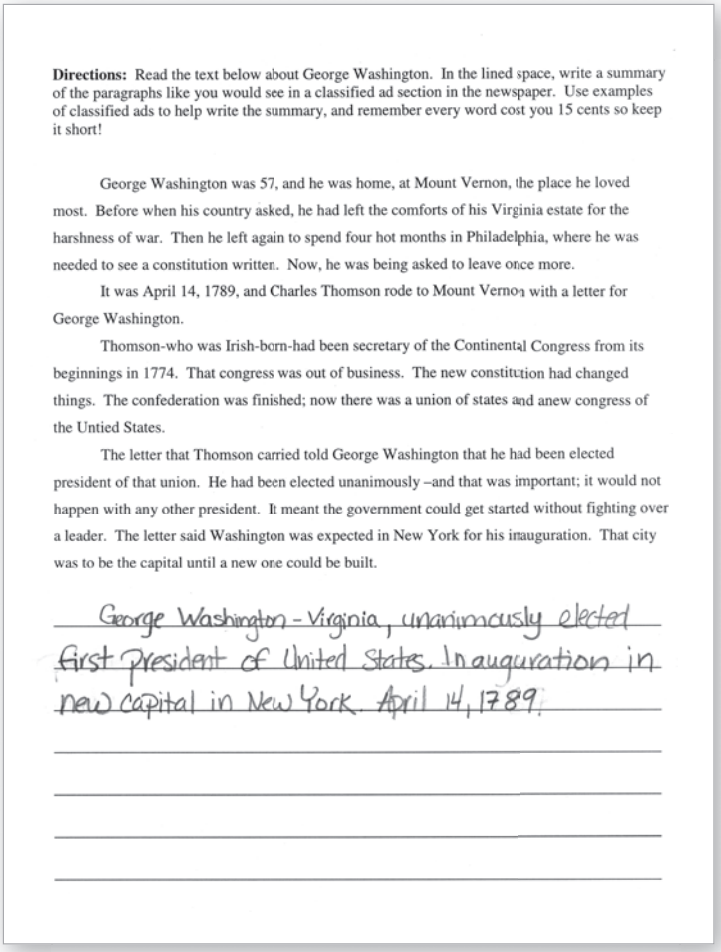
You already learned about strategies to increase memory (e.g., rehearsal), elaboration (e.g., mnemonics, questioning), and organization (e.g., graphic organizers). In this section, we add to this repertoire by reviewing **study strategies**, techniques that students use to increase their understanding of classroom materials, especially verbal materials such as lectures and text.

Study Strategies

Techniques that students use to increase their understanding of classroom materials.

Note Taking. A common study strategy is *note taking*. Although note taking is associated with learning (Igo, Bruning, & McCrudden, 2005), most students are generally poor note takers (Austin, Lee, & Carr, 2004; Titsworth, 2004). One way to help students become better note takers is to present guided notes, handouts that highlight the most important ideas and leave enough space so that students can expand on relevant relationships. Guided notes are particularly helpful for students with disabilities (Hamilton, Seibert, Gardner, & Talbert-Johnson, 2000) but can help all students organize new information, especially if it is complex. Because good note taking takes time to develop, it is important to regularly check students' notes and provide them with informational feedback (see Figure 7.7).

Summarizing. Another study strategy, *summarizing*, is used to help students monitor their comprehension. Summarizing text can prevent students from taking a passive reading approach or getting a false sense of understanding, especially when the text



Directions: Read the text below about George Washington. In the lined space, write a summary of the paragraphs like you would see in a classified ad section in the newspaper. Use examples of classified ads to help write the summary, and remember every word cost you 15 cents so keep it short!

George Washington was 57, and he was home, at Mount Vernon, the place he loved most. Before when his country asked, he had left the comforts of his Virginia estate for the harshness of war. Then he left again to spend four hot months in Philadelphia, where he was needed to see a constitution written. Now, he was being asked to leave once more.

It was April 14, 1789, and Charles Thomson rode to Mount Vernon with a letter for George Washington.

Thomson-who was Irish-born-had been secretary of the Continental Congress from its beginnings in 1774. That congress was out of business. The new constitution had changed things. The confederation was finished; now there was a union of states and anew congress of the Untied States.

The letter that Thomson carried told George Washington that he had been elected president of that union. He had been elected unanimously –and that was important; it would not happen with any other president. It meant the government could get started without fighting over a leader. The letter said Washington was expected in New York for his inauguration. That city was to be the capital until a new one could be built.

George Washington - Virginia, unanimously elected first president of United States. Inauguration in new capital in New York. April 14, 1789.

FIGURE 7.8 **Sample of students' summary activities.**

is easy to read. This strategy entails identifying and listing the main ideas of a text and distinguishing between relevant and irrelevant information (Byrnes, 2001). Like note taking, good summarizing skills are difficult to develop; therefore, they need to be explicitly taught with significant scaffolding.

Teachers should start teaching summarizing skills with short, simple texts and gradually increase the length and complexity of the text to be summarized as students make progress. Studies show that students who are asked to create summaries develop greater understanding and metacognitive skills than those who are not (Franzke, Kintsch, Caccamise, Johnson, & Dooley, 2005; Thiede & Anderson, 2003). Figure 7.8 shows a selection of student summary activities.

SQ4R. A reading comprehension strategy that incorporates the signaling and elaborative interrogation strategies reviewed in Chapter 6 and the summarizing strategy just described is called SQ4R (Richardson & Morgan, 1997). This acronym stands for

Survey—preview the text.
Question—create questions relevant to the text.
Read—actively search for answers to the developed questions.
Recite—answer the elaborative questions in your own words.
Review—summarize the text and make notes on murky parts that may need revision.
Reflect—think about what has been read.

This method can be used individually or in small groups. In the first case, students provide self-explanations of their understandings, a process that is likely to make them aware of inconsistencies and gaps in their thinking (Chi, de Leeuw, Chiu, & LaVancher, 1994; de Bruin, Rikers, & Schmidt, 2006). When used in small groups, this strategy is likely to help students identify misconceptions or errors in others' comprehension (Dunning, Heath, & Suls, 2004). It is recommended that teachers first model how to complete each step of the SQ4R strategy and then engage students in guided practice. Scaffolds such as posters or worksheets can also help students learn how to implement this strategy. Research evaluating this technique, however, is limited (Huber, 2004; Spor & Schneider, 1999). Other variations of this method are SRR (**s**urvey, **r**ead, **r**eview), SQ3R (**s**urvey, **q**uestion, **r**ead, **r**ecite, **r**eview), and PQ4R (**p**review, **q**uestion, **r**ead, **r**ecite, **r**eview, **r**ewrite).

Overall, most experts agree that study strategies should be explicitly taught. Although students may acquire some study strategies without instruction, they are likely to become more strategic and metacognitively aware if the teacher describes the purposes of strategies, models their use, and shows how the use of strategies improves learning (Duffy, 2002; Pressley, 2002).

Critical Thinking

The process of systematically examining available information and coming up with conclusions that are based on evidence.

Critical Thinking

Critical thinking can be defined as the process of systematically examining available information and coming up with conclusions that are based on evidence (Glassner, Weinstock, & Newman, 2005; van Gelder, 2005). Although the debate on whether stu-

dents should be taught *how* to think rather than *what* to think is still open, many educators feel that critical thinking skills should be taught because they are necessary to succeed in our society, which is characterized by diversity and vast amounts of shared information (Halpern, 1998; Kuhn, 1999; Pithers & Soden, 2000). Take a minute to think about the massive amounts of information on the Internet that are just a click away from students—yet much of this information is either unreliable or deceptive. Are students able to distinguish between facts and opinions? Are students capable of identifying bias or propaganda? Can students recognize the implicit assumptions of an argument? In Imagine You Are the Teacher, it is clear that Madison lacks the critical thinking skills that are necessary to distinguish between reliable and unreliable websites.

Due to its complexity, students are not likely to engage in critical thinking spontaneously. In fact, because students will display many of the thinking flaws described in prior sections (e.g., confirmation bias, hindsight bias, overconfidence bias, belief perseverance), they are not likely to challenge the credibility of new information, especially when it is consistent with their existing beliefs (Shermer, 2002; Southerland & Sinatra, 2003; van Gelder, 2005). Only the willingness to think critically and significant practice can lead to the gradual development of critical thinking skills over time (Pillow, 2002). Therefore, most experts believe that critical thinking needs to be explicitly and repeatedly taught in the classroom (Halpern, 2003).

What skills and dispositions are at the core of critical thinking? Nickerson (1988) suggested that critical thinking consists of four elements: motivation, some knowledge about the issue being considered, metacognition, and a set of component skills.

First, critical thinking depends on students' willingness to engage in this complex cognitive process (Pintrich & Schunk, 2002). Willingness to be well informed, inquisitiveness, and self-confidence in one's ability to reason are dispositions that will motivate students to become critical thinkers (Facione, Facione, & Giancarlo, 2000). Furthermore, to become good critical thinkers, students need to be open to challenging their own thoughts, beliefs, and assumptions (van Gelder, 2005). Critical thinking may require students to look for evidence that contradicts their own theories, such as when a student who believes that the world is the result of divine creation investigates principles of evolution.

Second, students need to have some background knowledge about the issue that is being pondered. The more knowledge about the topic an individual has, the better the individual can think about the topic (Nickerson, 1988).

The third element of critical thinking is metacognition. Metacognitive skills are most important for higher-order processes such as critical thinking because they allow learners to reflect on their knowledge, beliefs, and strategies (Kuhn & Dean, 2004).

Lastly, some experts have extended on Nickerson's model by proposing a specific set of component skills, the cognitive processes that are necessary for effective critical thinking. Ennis (1987) identified the 12 critical thinking skills, listed in Table 7.3. Others have organized similar component skills into a smaller set of general skills, including the ability to define issues (i.e., identifying relevant information and assumptions, asking and answering clarification questions), make inferences (i.e., deducing and inducing), and evaluate arguments and evidence (i.e., analyzing, judging, weighing) (Halpern, 1998; Swartz & Perkins, 1990).

As you see, thinking critically requires combining many of the high-order thinking processes described in this chapter. Despite its complexity, even elementary school children can be taught to become better critical thinkers by asking them to provide rationales or supporting evidence for their reasoning,

Table 7.3

Twelve critical thinking skills.

1. Focusing on the issue
2. Analyzing the arguments surrounding the issue
3. Asking and answering clarification questions
4. Judging the credibility of the sources of evidence
5. Observing and judging observation reports
6. Making and judging deductions
7. Making and judging induction
8. Making value judgments
9. Defining terms and judging definitions
10. Identifying assumptions
11. Deciding on possible actions
12. Interacting with others

Source: Ennis (1987).

TABLE 7.4

Halpern's model for teaching critical thinking skills.

1. *Attitude*: Fostering the dispositions that are at the heart of critical thinking, such as the willingness to engage in and persist at a complex task, the habit of questioning assumptions, flexibility, and open-mindedness.
2. *Instruction and practice*: Teaching the component skills that make up critical thinking and having students regularly practice them so that they become familiar and realize the benefit from the investment.
3. *Structure training*: Teaching how to identify the structure in a problem so that when the same structure is encountered in new contexts, students can apply the same reasoning. For instance, Chapter 1 distinguished between correlation and causation (structure training) to help you identify any correlational study (despite its context) and infer appropriate conclusions (correlation does not mean causation).
4. *Metacognition*: Reflecting and thinking about the critical thinking process, such as checking the progress made toward a goal, ensuring accuracy, and making decisions about the use of time and mental effort.

encouraging them to question and challenge ideas they hear and read, and giving them opportunities to discuss controversial issues from several perspectives (Leinhardt & Steele, 2005). Halpern (1998) outlined a model for teaching critical thinking skills that is made up of the four parts shown in Table 7.4.

PROBLEM SOLVING

Remember Ms. Archer from Imagine You Are the Teacher? She asked students to engage in problem solving about planning a trip to Africa because their current situation was different from the final situation they needed to be in. Problems arose when the current state (i.e., not knowing how to plan for a three-week trip to Africa spending not more than $10,000) differed from the desired state (i.e., having a well-planed itinerary that satisfies the monetary restriction). **Problem solving** is the type of thinking people apply to achieve a desired end state that is different from an initial state (Lovett, 2002).

Problem Solving

The type of thinking people apply to achieve a desired end state that is different from an initial state.

Teachers and students face many problem-solving situations in their daily lives. However, not all problems present the same challenges. Some problems are easier to solve because they provide good structure and enough information to solve them (Hayes, 1988). These are called *well-defined problems*. The following algebra problem is well defined: $x + 3 = 9$. The reason this problem is well defined is that the problem solver is given all the necessary information to solve the problem. Although there are a couple of different strategies to use to solve this problem, the result is always the same, $x = 6$. Well-defined problems in the classroom usually fall within the math and science domains.

ISSUES IN EDUCATION

Should critical thinking be embedded in the curriculum or taught with stand-alone programs?

Those who believe that critical thinking skills should be taught in the classroom propose two alternative ways of teaching: by means of a stand-alone program or as an embedded program. Whereas stand-alone programs teach thinking skills independently of the content areas, embedded programs are aimed at teaching how to think within the context of different content areas. Which approach do you think will be more effective and why? A response to this question can be found at the end of the chapter.

On the other hand, *ill-defined problems* are those for which there are not only multiple solution strategies but also more than one acceptable solution (Kitchener, 1983). Take the problem of hunger in the world. It is very likely that people will come up with many different strategies and solutions to solve this problem. Some people may propose to take from the rich and give to the poor. Others may think that this is not a long-term solution and argue for mandatory birth control in poor families. Yet others may feel that none of these solutions are acceptable to their values and propose a world economics plan aimed at generating and sustaining employment for all people.

In the classroom, opportunities to discuss how to solve ill-defined problems typically arise in the social studies domain, but they may also arise in other areas, such as language arts, when students need to figure out how to produce a paper interpreting a literary piece. As you see, learning how to solve problems is an essential skill in all content areas and should help students become strategic and independent problem solvers. Although school often focuses on teaching how to solve well-defined problems, students will face many ill-defined problems in their daily lives. Therefore, it is important to teach students an effective method that can be used to solve both well- and ill-defined problems. Next, we review a problem-solving model that can be applied to both.



Erik Dreyer/Stone/Getty Images, Inc.

Can you explain how social interaction during problem solving might help students think about ill-defined problems?

A Problem-Solving Model

The study of human problem solving dates back to the early 20th century, with the work of Thorndike (1913), Kohler (1929), and Dewey (1910). Edward Thorndike was a behaviorist who played a major role in the development of operant conditioning theory (see Chapter 5). His research paradigm consisted of placing cats in puzzle boxes and observing their behavior as they tried to escape the box to reach food that was placed outside, a problem-solving scenario. Based on his animal research, Thorndike concluded that problem solving consists mostly of trial-and-error attempts that eventually lead to the solution of a problem.

Although Kohler (1929) was not a behaviorist, he also studied problem solving using nonhuman animals. In a typical study, he would place a chimp inside a cage that had a banana suspended from the ceiling beyond the reach of the animal. In addition, Kohler placed a set of wooden crates inside the cage, with the idea of examining whether the chimp would try to use them to help reach the banana. In one occasion, Sultan, one of the most famous chimps used by Kohler, stacked the crates and reached the banana. However, Sultan did not engage in multiple trial-and-error attempts, as Thorndike would have predicted, and had never seen or used crates as a tool before. This led Kohler to the controversial conclusion that Sultan had displayed **insight**, the ability to use reflection to solve problems.

Insight

The ability to use reflection to solve problems.

John Dewey (1910) proposed that problem solving is a deliberate process consisting of the following steps: recognizing the existence of the problem, identifying the nature of the problem, developing hypotheses to solve the problem, testing the different hypotheses, and selecting the most appropriate alternative among the hypotheses. This work set the ground for a general problem-solving model that more contemporary cognitive psychologists and computer scientists have successfully applied to many domains (Anderson, 1993; Hayes, 1988; Newell & Simon, 1972; Simon, 1999). This five-step model is shown in Figure 7.9. Let's examine each step of the model next.

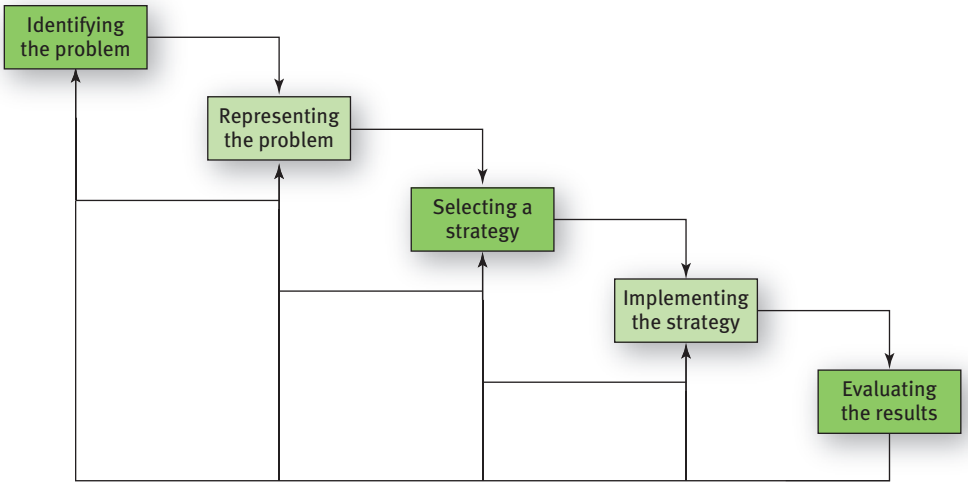


FIGURE 7.9 A general problem-solving model.

Problem Identification. The first step in the problem-solving model consists of identifying the problem. This is a challenging step because it requires first finding the problem, and then analyzing the problem for enough time before committing to a solution too soon (Hayes, 1988). Many students have a tendency to rush to a conclusion when something is not working out (Lan, Repman, & Chyung, 1998). A student who fails an exam may conclude that the teacher did not present a good explanation when, in reality, the problem is that the student was daydreaming in class and not paying sufficient attention to her explanations.

Problem Representation. The second step in problem solving consists of representing the problem in a new form, such as restating the problem in your own words or visually representing the problem with a graph or picture. Take a look at Figure 7.10, which shows three different representations students might use to solve a word problem. As you see, the students used a different representation to make the problem more understandable; one student chose to reword the problem, another student chose to draw a picture, and the third student chose to represent the problem with a graph. Despite these differences, all students were able to solve the problem successfully.

Good problem representations are those that allow students to integrate and organize all the information contained in the problem in a more familiar way, making it easier to solve. Take the Monk's Trip Problem cited by Bruning, Schraw, Norby, and Ronning (2004). Every other day, a monk walks all day long to the top of a mountain to meditate overnight in an isolated monastery. He then walks back the following morning, using the same path but in two-thirds of the time it took him to climb up the mountain. Is there a point on the path that the monk crosses at exactly the same time each day? Take a few minutes to think about an answer before looking at Figure 7.11.

Many people find this problem difficult to solve. However, because the graphic representation shown in Figure 7.11 includes all the relevant problem information simultaneously, it is easy to see at a glance that there is, indeed, one spot that the monk passes at exactly the same time every day. Teaching students how to represent problems helps them in two ways: It increases the meaningfulness of the problem by encouraging them to think about the problem in more familiar ways, and it leaves more space in students' limited working memory, which makes the problem easier to solve.

Strategy Selection. Once a problem is identified and represented, the learner must choose a method to solve the problem. Good problem solvers spend more time planning their strategies than those who are poor problem solvers (Bloom & Broder, 1950;

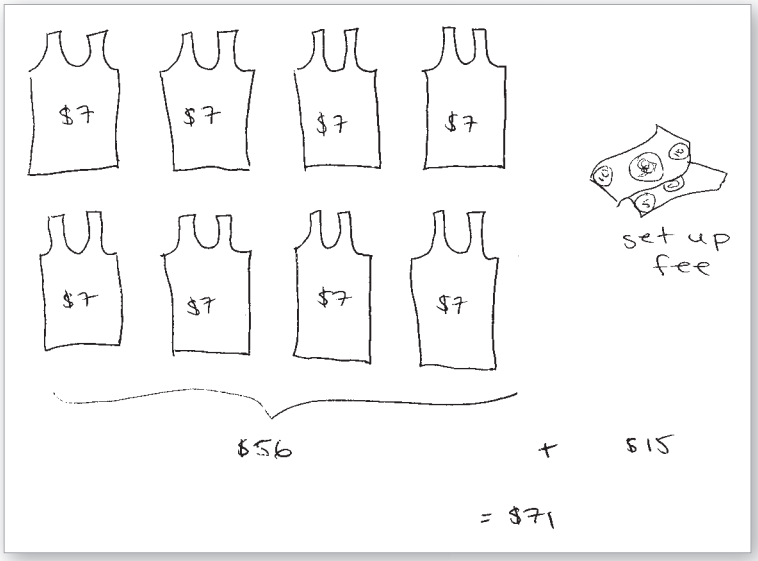
FIGURE 7.10 **How students might use different representations to solve a word problem.**

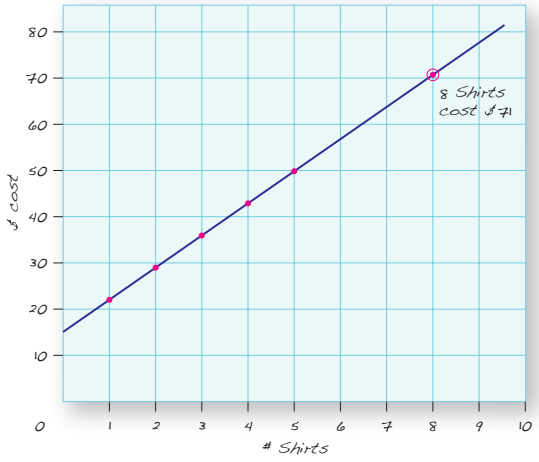
A basketball team wants to get jerseys. They find a company that charges a $15 set-up fee and then $7 to print each jersey. How much will it cost them to make 8 jerseys?

When you add up the price you need to add $15 once. But for the $7 you have to add it 8 times because there are 8 shirts.

price = $15 + $7 + $7 + $7 + $7 + $7 + $7 + $7 + $7

= $71





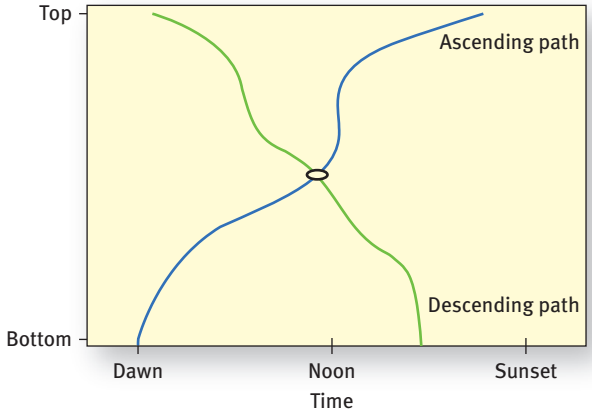
Algorithm

A set of clearly defined steps that lead to a solution for a problem.

Larkin, McDermott, Simon, & Simon, 1980). Teachers also are more successful in their teaching when they carefully plan the strategies to be used during their lessons to meet the diverse needs of the classrooms (Sternberg & Grigorenko, 2000).

There are two types of problem-solving strategies. The first is the **algorithm**, which consists of a set of clearly defined steps that lead to a solution for a problem. Here are some examples of using algorithms: following certain steps to tie your shoes, or using a recipe to make bread, or applying a formula to calculate complex roots for a quartic polynomial. Algorithms are useful when needing to solve well-defined problems and are typically domain-specific, that is, applicable only to a specific subject domain.

FIGURE 7.11 **A graphic representation of the Monk's Trip Problem.**



Heuristics

Informal "rules of thumb" or intuitive methods that may solve a problem but are not guaranteed to do so.

However, when problems are ill defined or when there are no available algorithms to solve a problem, people resort to a variety of **heuristics**, informal "rules of thumb" or intuitive methods that *may* solve a problem but are not guaranteed to do so (Korf, 1999; Simon, 1999). One example is using *means–ends analysis*, where a problem is subdivided into a set of subgoals with the objective of solving each intermediary step toward the solution of the overall problem. For example, to solve a serial circuit problem composed of three circuits, a student may calculate the current flowing through each of the circuits first (i.e., subgoals) and then calculate the total current of the electrical system (i.e., final goal). The advantage of this strategy is that it breaks down a complex problem into simpler problems, reducing cognitive load during problem solving.

Another heuristic is a *working-back strategy*, where the problem solver starts at the end state and moves back to the initial state of the problem. This heuristic presents an advantage when the learner is clear about the goal of the problem but not so clear about the beginning state of the problem. Many math and science textbooks have the answers in the back. When students use the answer to deduce the steps needed to solve the problem, they are using a working-back strategy.

Analogical reasoning, discussed earlier in this chapter, is another heuristic that can be used to solve a new problem. This strategy is useful when people have another, more familiar problem that they know how to solve and there is a similarity between the familiar problem and the new problem. However, teachers should be aware that using analogical reasoning can sometimes lead to wrong solutions. A student who plays baseball regularly and applies an analogy of the moves required to hit the ball to play golf will probably not be very successful.

Trial and error is another common heuristic. It consists of trying alternative courses of actions in no systematic way. If technology students are given a new graphic design program to learn and they randomly click on buttons to see what they do without receiving instruction, they are using trial-and-error heuristics.

Finally, some experts suggest using incubation when all efforts have been made toward solving a problem with no success. *Incubation* consists of temporarily halting any attempts to solve a problem after having engaged in deep reflection about the problem (Wallas, 1926). Because we are not consciously trying to solve the problem, incubation does not seem to be a true strategy (Smith, 1995). Yet students benefit from incubation when they have invested enough time thinking about the problem (Kaplan & Davidson, 1988).

Strategy Implementation. The fourth step in the problem-solving model is implementing a strategy. This step is perhaps the most straightforward aspect of problem solving because, with proper planning in the first three steps, all that is needed to move along the problem-solving process is to carry out the strategy selected in the prior step.

Evaluation. The final step in the problem-solving model consists of evaluating the results. Students evaluate the results of problem solving when they check their work on a math test or proofread an essay for a language arts assignment. Evaluating the problem-solving process and outcome involves thinking about whether the result makes sense and whether it is a good solution to the problem.

Because this step requires the use of metacognitive skills, it is typically difficult for students. In one study on math problem solving, students were likely to produce illogical answers, such as results that included negative amounts of money (Paige & Simon, 1966). Students tend to think that evaluating solutions is unimportant and focus only on the problem-solving *product*. However, most of the improvement in learning how to solve problems is the result of deliberate evaluation of the problem-solving *process* (Baker, 1989; Zimmerman, 1990). Therefore, teachers should help students analyze not only whether the product of their problem solving is correct but also whether their process of finding a solution can be improved.

As illustrated in Figure 7.9, the general problem-solving model is a cycle rather than a linear progression of steps. In other words, as students solve problems they may not use the five steps in the same exact order. Miranda may start representing a word problem and realize that she needs to go back and read it more carefully because she is

unable to find all the information needed to build a good representation. Likewise, if during the evaluation of results Sam realizes that the outcome to his problem does not make sense, he may decide to go back and consider alternative strategies.

A well-known problem-solving model that is similar to the one reviewed in this chapter is called IDEAL (Bransford & Stein, 1993). Each letter of the word represents one of the following problem-solving steps:

Identify problems and opportunities.

Define goals and represent the problem.

Explore possible strategies.

Anticipate the outcomes and act.

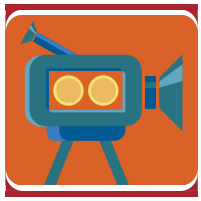
Look back and learn.

Regardless of the model chosen, teachers should provide instruction on the general steps involved in the problem-solving process as students tackle well- and ill-defined problems. Studies investigating the benefits of teaching young students a general problem-solving method have consistently shown large improvements in students' problem-solving skills (Delclos & Harrington, 1991; King, 1991), and using a general problem-solving model to think about classroom cases promotes pre-service teachers' problem-solving transfer (Moreno, Abercrombie, & Booker, 2008). This is why this text provides you with a problem-solving framework to guide your thinking about classroom dilemmas.

Get Connected!

VIDEO CASE ASSIGNMENT. . . View a Teaching Example 1: Guiding Student Learning (Tab 1)

Go to your WileyPlus course and view the video. While watching the video, consider how Mr. Ribeiro utilizes the 5-step general problem-solving model. Be prepared to discuss each step in the model. Also think about how Mr. Ribeiro uses scaffolding throughout the problem solving-process.



Factors Hindering Problem Solving

There are a number of factors that might hinder students' problem solving. One factor is called **cognitive rigidity**, the lack of flexibility in thinking about perspectives that are different from one's own. A type of cognitive rigidity is **functional fixedness**, which occurs when people are unable to think about functions or uses for an object other than those for which the object was originally designed. Duncker (1945) investigated functional fixedness with the paradigm illustrated in Figure 7.12.

Cognitive Rigidity

The lack of flexibility in thinking about perspectives that are different from one's own.

Functional Fixedness

Being unable to think about functions or uses for an object other than those for which the object was originally designed.

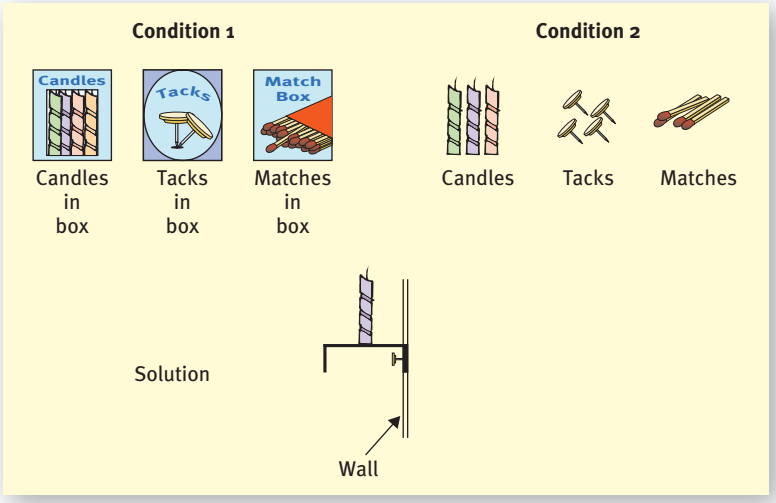


FIGURE 7.12 Duncker's functional fixedness paradigm.

In this study, the experimenter presented the participants with three cardboard boxes and a set of candles, tacks, and matches in two conditions: Some received the candles, tacks, and matches inside their respective boxes (condition 1) and others received the candles, tacks, and matches outside their respective boxes (condition 2). The experimenter then told the participants that they needed to mount a candle on a wall so that the candle could serve as a lamp.

As shown in the figure, the solution required thinking about using one of the boxes to hold the candle, using the matches to melt the candle so that it would stick to the box, and using a tack to attach the box and candle to the wall. Participants in condition 1 were less likely to find the solution than participants in condition 2. This finding led Duncker to conclude that providing the candles, tacks, and matches inside the boxes made the participants in condition 1 become functionally fixated about the boxes. By having the boxes serve the function of containing the different elements, participants were less inclined to use the boxes for a different function, namely, to hold the candle against the wall. Duncker created other paradigms similar to the box problem and found the same pattern of results. Other researchers found similar results using a variety of functional fixedness tasks (Adamson, 1952; Birch & Rabinowitz, 1951).

Response Set (or Mental Set)

The tendency to approach problems in the same way they have been experienced in the past.

Another hindrance to problem solving is called **response set** or **mental set**, the tendency to approach problems in the same way they have been experienced in the past (Luchins, 1942). Evidence for response set has been found in studies using water jar problems, in which students are given three jars of varying sizes and an unlimited water supply and asked to figure out how to obtain a certain amount of water using the jars as containers. Table 7.5 shows a set of eight water jar problems.

In the water jar studies, some participants were asked to solve problems 1 to 8 in order (condition 1) whereas others were asked to start on problems 5 to 8 and then solve problems 1 to 4 (condition 2). You may have noticed that all problems can be solved by using the formula $b - a - 2c$. However, problems 5 to 8 can also be solved by a shorter, more efficient method ($a - c$ or $a + c$). The findings of this study showed that students were much more likely to use the longer strategy with problems 5 to 8 if they were in condition 1, suggesting that habituation to the method used in the first four problems had created a suboptimal solution (Luchins & Luchins, 1950).

TABLE 7.5

Eight water jar problems.

PROBLEM NUMBER	JAR SIZES (*a*, *b*, *c*)			WATER NEEDED	SOLUTION
1	9	42	6	21	42 − 9 − 6 − 6 = 21
2	21	127	3	100	127 − 21 − 3 − 3 = 100
3	14	163	25	99	163 − 25 − 25 − 14 = 99
4	18	43	10	5	43 − 18 − 10 − 10 = 5
5	23	49	3	20	49 − 23 − 3 − 3 = 20
6	15	39	3	18	39 − 15 − 3 − 3 = 18
7	18	48	4	22	48 − 18 − 4 − 4 = 22
8	14	36	8	6	36 − 14 − 8 − 8 = 6

Source: Adapted from Mayer (1992).

In addition to functional fixedness and response set, problem solving can be negatively affected by affective and motivational factors. A student who has good problem-solving skills in algebra but who is very anxious about testing may perform poorly because of test-anxiety. Likewise, a student who does not believe he/she can tackle a problem may not even try to solve the problem, even when the task is well within his/her ability. You will learn methods to help reduce the negative effects that anxiety and low self-efficacy have on students' performance in Chapters 9 and 10, when we discuss the role of affect and motivation in the classroom. Students will not use their problem-solving skills unless they are motivated to do so (Perry, Turner, & Meyer, 2006; Sternberg & Spear-Swerling, 1996). Good problem solvers are motivated and able to control their emotions during the problem-solving process (Barron & Harackiewicz, 2001; Kuhn & Franklin, 2006).

Get Connected!

ANIMATION ASSIGNMENT. . . Complex Cognitive Processes



Go to your WileyPlus course and watch the animation on problem solving. Be prepared to discuss the three steps of problem solving and the common barriers to solving problems. How would you overcome these barriers with your students? Based on the three steps of problem solving discussed in the animation, what kind of classroom activities could you use to help students increase their problem-solving abilities?

Expertise and Expert Problem Solving

Chapter 1 included a discussion of expert teachers. Here, we take the discussion further and look at how experts solve problems. **Experts** are people who have developed extensive knowledge and skills in a particular domain. Therefore, expertise is domain-specific. A computer scientist may feel that she is an expert in programming but may not feel an expert in graphic design, math, or weaving.

Experts

People who have developed extensive knowledge and skills in a particular domain.

Expertise Development. According to research, developing expertise in a domain takes between 5 and 10 years, regardless of the individual's intellectual skills or talent (Ericsson, Charness, Feltovich, & Hoffman, 2006). However, the key to expertise is not merely the amount of time spent in a domain but how this time is spent. Bloom (1985) identified three stages of expertise development:

1. The *early stage* of expertise development is characterized by playful engagement in a very supportive home environment where parents emphasize motivation and effort.
2. The *middle stage* of expertise is when the novice begins to develop the signs of expertise and, with the help of mentors, becomes increasingly more independent and efficient in the domain. Bloom observed that regardless of the domain of expertise, most people who will later be recognized as experts will have engaged in steady practice routines and regular competitive activities and will have received feedback from peers and mentors.
3. In the *late stage* of expertise, peer feedback and interactions become increasingly more important, and a master in the domain of expertise typically plays a crucial role in helping the individual challenge himself and become a true expert.

Researchers who examined the process of expertise development have concluded that what eventually makes someone become an expert in any domain is a long-term commitment coupled with **deliberate practice**. Interestingly, Bloom found that athletes, musicians, and mathematicians alike undergo the same three-stage process for over 10 years before they are recognized experts.

Deliberate Practice

Practicing under the guidance of a skilled mentor who provides informational feedback for a long period of time to become more skilled in a domain.

Also, among the individuals who participated in the study, those who demonstrated signs of "talent" did not necessarily become experts with the passage of time.



©AP/Wide World Photos

How long might this person have taken to develop expertise according to Bloom's research?

In other words, talent—or what some people might view as "innate ability"—was not found to be a sufficient condition for developing expertise. Instead, deliberate practice under the guidance of a skilled mentor who provides informational feedback for a long period of time was the main predictor of expertise development. Talent may help people develop expertise faster. However, without the necessary deliberate practice, the talented soon become outperformed by less talented individuals who commit to mastering the skill. This evidence is consistent with the idea that motivation and perseverance are a necessary condition for learning and attaining eminent performance in any domain (Ericsson, Krampe, & Tesch-Römer, 1993).

Expert Problem Solving. Experts constantly engage in problem solving in their domain of expertise. Consequently, there are important differences in how experts and novices approach every step in the problem-solving model discussed earlier (Hatano & Oura, 2003).

- First, experts often take significantly more time identifying a problem and planning its solution than do novice learners.
- Second, experts in a domain are better at representing problems than novices because they have more sophisticated schemas for the domain, which allow them to chunk large amounts of information into one representation. Novices, on the other hand, lack complex schemas in a domain and tend to see problems in isolated pieces, which can overwhelm them during problem solving.
- Third, experts have a larger repertoire of strategies than novices, which allows them to better select the most appropriate strategy for any particular problem.
- Fourth, experts have proceduralized their strategic knowledge, making the implementation of strategies automatic and more efficient. Novices solve problems more slowly and are much less likely to change strategies during problem solving when they feel that a strategy is not working.
- Finally, experts have better metacognitive skills than novices. They regularly monitor and evaluate the problem-solving process, making them more efficient and effective problem solvers.

Note that the advantage of experts over novices does not reside in a larger working memory capacity but rather in the *more efficient use* of working memory due to their chunked knowledge and automaticity in solving problems (Taconis, Ferguson-Hessler, & Broekkamp, 2001). The research on the characteristics of expert problem solving can inform classroom practices. Specifically, teachers can help students become good problem solvers by using methods that foster the characteristics of experts. Classroom Tips: Helping Students Become Good Problem Solvers offers strategies to promote problem-solving skills with corresponding classroom examples.

TRANSFER

Transfer

The ability to extend what has been learned in one context to new contexts.

Transfer can be broadly defined as the ability to extend what has been learned in one context to new contexts (Bransford, Brown, & Cocking, 1999). An important education challenge is to help students transfer the knowledge and skills learned from one problem to another, from one year in school to another, between school and home, and from school to the workplace.

CLASSROOM TIPS

Helping Students Become Good Problem Solvers

Strategies to Promote Problem-Solving Skills	Classroom Examples
Give students a problem-solving framework to guide their thinking.	Design a lesson specifically around problem-solving strategies and models. Create activities that require students to describe their problem-solving processes as well as find solutions to the problem.
Teach the value of problem solving by presenting problems in real-world settings.	Provide examples of people who were rewarded by society for their problem solving. Create activities that involve problems and challenges faced by the school or community.
Teach students to spend time analyzing problems before attempting a solution.	When designing problem-solving activities, give students a significant amount of time to identify the problem. Lead group discussions with the intent to model and practice analyzing problems.
Promote divergent thinking.	Use social interaction to help students think of different ways to identify and solve problems. Ask students to generate as many different uses as they can for a specific object.
Help students create a plan for the solution.	Teach students about different planning tools, such as flowcharts and lists. Value the planning phase as much as the solution when evaluating students' projects.
Show students how to draw visual representations or translate the problem into simpler forms.	Provide graphic organizers that represent the relevant information of the problem in a visual way. Model how you would break down a complex problem into smaller pieces.
Teach algorithms and heuristics.	Provide ample practice for students to use algorithms and heuristics. Provide a variety of examples where a certain algorithm or heuristic can be used.
Demonstrate that there is more than one way to solve a problem.	Provide examples of problems where several different strategies can provide a solution. Value the use of multiple strategies when evaluating students' problem solving.
Model how to switch strategies when making an error or going down a blind alley.	Model how to use strategies when making a mistake during problem solving. Demonstrate how to switch strategies when one is not working by trying and evaluating alternative strategies.
Teach students how to regularly monitor and evaluate the problem-solving process.	Teach students how to estimate a range in which the answer to a problem may lie when possible. Ask students to reflect in writing about the processes they used during problem solving, where they succeeded, and where they struggled.
Provide scaffolding and informational feedback on all problem-solving steps.	Design worksheets that guide students' problem-solving process in a step-by-step fashion. Conduct one-on-one meetings and provide informational feedback as students think out loud during problem solving.
Emphasize the importance of deliberate practice.	Discuss with students the importance of deliberate practice so they understand why they are being asked to do it. Model the benefits of deliberate practice by providing examples of experts in several domains.



Digital Vision/Getty Images, Inc.

Can you give some examples of how negative transfer might occur in physical education or dance?

Positive Transfer

When using what was learned in the past facilitates learning something new or solving a new problem.

Negative Transfer

When using what was learned in the past hinders new learning or solving new problems.

Types of Transfer

There are different types of transfer. A first distinction can be made between positive and negative transfer. **Positive transfer** occurs when using what was learned in the past facilitates learning something new or solving a new problem. Positive transfer occurs when a student learns French more easily because she has learned Spanish before. Because both languages share a Latin root, learning one of them will facilitate learning the other. In contrast, **negative transfer** occurs when something that was learned in the past hinders new learning or solving new problems. An example of negative transfer is when students think that the number −30 is larger than −10 because they learned that the number 30 is greater than 10 when they studied natural numbers.

Within positive transfer we can distinguish between *general* and *specific* transfer. General transfer refers to the ability to apply what was learned in a specific context or domain to a broad range of contexts and domains. The idea underlying general transfer is that the mind is like a muscle; when exercised with certain subjects, it becomes better prepared to learn any other subject. General transfer would occur if training in chess improved programming skills because both tasks rely on logical reasoning or if the study strategies practiced in one class were applied successfully to a different class. Unfortunately, extensive research conducted since the early 1900s has never found support for general transfer (Thorndike, 1924).

On the other hand, there is evidence for specific transfer, the ability to apply what was learned to a context that is similar to the original learning context. Specific transfer occurs when students learn how to climb ropes and later transfer their learned skills to climbing rocks.

Within specific transfer, a distinction is made between near and far transfer. *Near* transfer happens when the new context in which the knowledge and skills need to be applied is very similar to the context in which the knowledge and skills were developed. If you teach students how to solve probability problems and later on you test them with a set of problems that have different surface characteristics (i.e., cover stories) but that require applying the same principles, you are requiring that students engage in near transfer. When two problems have the same structure they are called *isomorphic* problems (from the Greek: *ison*, meaning "equal," and *morphe,* meaning "shape"). Figure 7.13 shows some examples.

Far transfer happens when a new problem is structurally different from the problems that students learned to solve in the past. If you teach your students how to solve single-column addition and later on ask them to try to solve double-column addition problems for the first time, you are asking them to engage in far transfer. Far transfer is effortful and requires consciously making connections between what was learned in a past situation and a novel situation. A student who has done classroom experiments with plants in different light conditions and decides to put a house plant next to the window after observing that the plant's leaves were turning yellow is engaging in far transfer. The reason this is an example of far transfer is that the student needs to infer the photosynthesis principle from his classroom experience and then apply it to solve a problem in a new context. Unfortunately, most studies show that far transfer occurs very rarely and only if it is explicitly taught (Detterman, 1993; Mayer & Wittrock, 1996).

Factors Affecting Positive Transfer

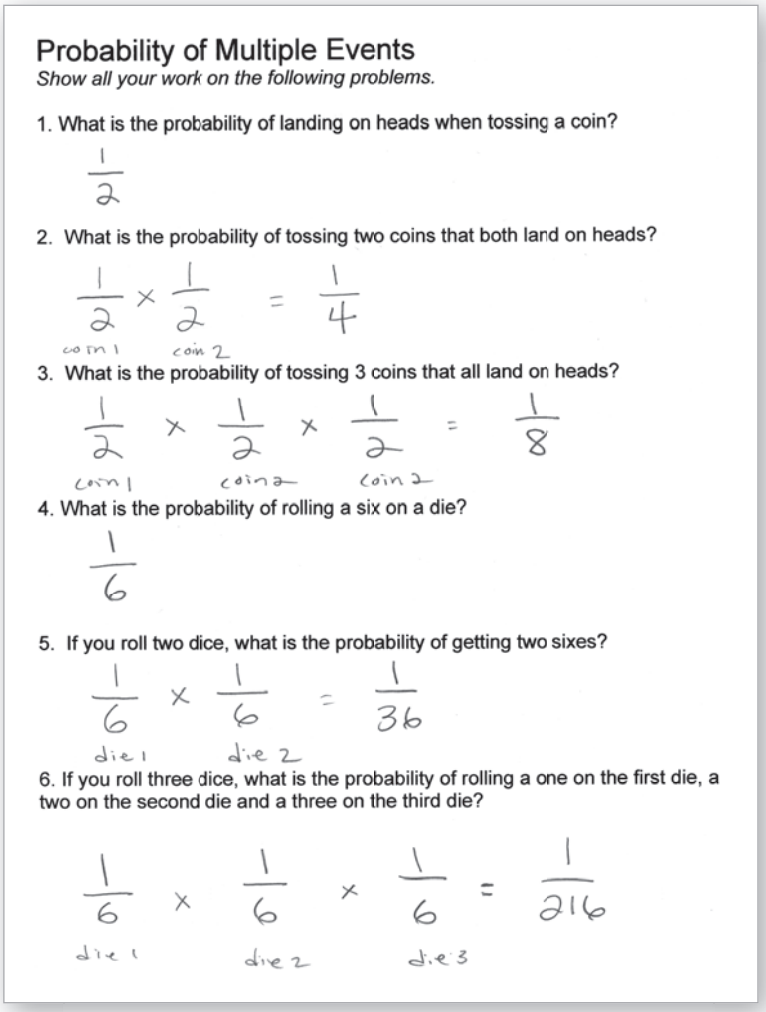
Studies show that the likelihood of transferring knowledge and skills will depend on the following factors:

The level of students' knowledge. The first factor affecting transfer is the level of knowledge acquired. Although this may seem obvious, in many cases the absence of transfer skills can be explained by not having provided students with sufficient opportunities

to deeply learn the knowledge or skills that are to be transferred (Brown, 1990; Chi, 2000).

The meaningfulness of original learning. Recall from Chapter 6 that meaningful encoding of information enhances students' ability to later retrieve that information to solve new problems. If taught with methods that promote the elaboration and organization of new information, students are more likely to connect what they are learning to their prior knowledge and apply it in the future (Bereiter, 1995; Mayer & Wittrock, 1996). Several studies have shown that rote learning does not facilitate transfer (Barnett & Ceci, 2002). Therefore, when transfer is the learning objective, teachers should consider methods that foster deep, abstract understanding of principles rather than emphasizing the rote application of rules triggered by surface similarities among problems. Having students make analogies, such as between body systems that handle waste products and their city's water and sewer system, can encourage deeper understanding.

The similarity between the original and new context. The more similar the original learning context and the new context, the greater the likelihood of transfer (Phye, 2001). Several studies have shown that a skill learned in one context will not automatically transfer to a different context. In one study, a group of homemakers did very well at making supermarket best-buy calculations despite doing poorly on equivalent school-like paper-and-pencil math problems (Lave, 1988). Likewise, as explained in more detail later in the section on diversity in complex cognitive processes, Brazilian street children could perform mathematics when selling coconuts in the street but were unable to answer similar problems presented in a school context (Carraher, Carraher, & Schliemann, 1985).


Probability of Multiple Events

Show all your work on the following problems.

1. What is the probability of landing on heads when tossing a coin?

$\frac{1}{2}$

2. What is the probability of tossing two coins that both land on heads?

$\frac{1}{2}$ (coin 1) $\times \frac{1}{2}$ (coin 2) $= \frac{1}{4}$

3. What is the probability of tossing 3 coins that all land on heads?

$\frac{1}{2}$ (coin 1) $\times \frac{1}{2}$ (coin 2) $\times \frac{1}{2}$ (coin 3) $= \frac{1}{8}$

4. What is the probability of rolling a six on a die?

$\frac{1}{6}$

5. If you roll two dice, what is the probability of getting two sixes?

$\frac{1}{6}$ (die 1) $\times \frac{1}{6}$ (die 2) $= \frac{1}{36}$

6. If you roll three dice, what is the probability of rolling a one on the first die, a two on the second die and a three on the third die?

$\frac{1}{6}$ (die 1) $\times \frac{1}{6}$ (die 2) $\times \frac{1}{6}$ (die 3) $= \frac{1}{216}$

FIGURE 7.13 **A sample of isomorphic problems.**

Therefore, to help students transfer what they learn, instruction needs to be embedded in contexts that are as similar as possible to those in which we expect transfer to occur. If teachers expect students to transfer what they learn at school to practical everyday life situations, then they should provide students with opportunities to use their knowledge and skills in real-world contexts. Using examples of credit card annual percentage rate and monthly payments when teaching about percentage can help students transfer their knowledge and skills to real-world scenarios.

The context of the original learning. Transfer across contexts is especially difficult when learning occurs only in a single context rather than in multiple contexts (Bjork & Richardson-Klavhen, 1989). Although asking students to solve rich contextualized problems can be a very meaningful way of constructing knowledge, instruction should not be centered on too few problems. Students who learn mathematical concepts only in the context of solving a complex case involving planning for a boat trip often fail to transfer the concepts to new situations (Cognition and Technology Group at Vanderbilt, 1997). Therefore, teachers should present problems in a variety of settings. By doing so, we increase the likelihood that students will abstract the underlying concepts and principles in the problems while decreasing

the likelihood that what is learned will be associated only with a certain context (Cox, 1997; Halpern, 1998; Mayer & Wittrock, 1996). Using our prior percentage example, transfer is likely to increase if, in addition to problems on credit card annual percentage rates, the teacher uses problems that require figuring the percent of fat calories in our diets, the price of products on sale, and interpreting sport statistics.

Metacognitive skills. Transfer is also improved when students are more aware of themselves as learners who actively monitor their learning strategies and knowledge. Metacognitive approaches to instruction can increase the degree to which students transfer what is learned to new situations (Bransford et al., 1999; Donovan & Bransford, 2005). Because transfer requires understanding when, where, and why to use new knowledge, metacognitive instruction that focuses on developing students' conditional knowledge is particularly promising.

Transfer instruction. Finally, transfer can be enhanced by explicit instruction on how to transfer skills and knowledge to novel situations. One study showed that third-grade children who were taught the meaning of transfer, and shown how the same type of story problems could be modified using different words, contexts, and numbers, improved significantly their transfer skills (Fuchs et al., 2003).

Another efficient method for achieving the deep, abstract understanding that is necessary for transfer to occur is to give students multiple examples of problems illustrating a central principle where the surface characteristics of problems vary as widely as possible (Lobato, 2006). Classroom Tips: Promoting Positive Transfer presents some research-based strategies with classroom examples.

CLASSROOM TIPS

Promoting Positive Transfer

Strategies to Promote Positive Transfer	Classroom Examples
Present problems in a variety of settings.	Ms. Zamora has students apply the scientific method to answer research questions in biology, physics, earth science, and health education.
	Mr. Grabou asks his second-graders to write complete sentences during math, science, and music time rather than only during language arts class.
Ask students to brainstorm potential applications of classroom topics.	Mr. Storey asks his social studies students to think about modern conflicts that are related to the separation between church and state.
	Ms. Flask leads her second-graders as they make a list of all the different ways in which they use measurement in their daily lives.
Have students apply general principles to real-world contexts.	After reading *Romeo and Juliet,* Mr. Shrive asks his ninth-grade students to come up with contemporary examples where individuals have stood against society's norms.
	Ms. McKennedy concludes her lesson on fractions by asking her students to write in their journals about the potential uses of fractions at home.
Give numerous opportunities to practice skills in different subject matters.	Mr. Bradberry asks his social studies students to make and interpret line graphs that they learned in their math and science classes.
	After teaching a problem-solving framework, Mrs. Long asks her students to apply the framework to solve problems in all school subjects.
Promote the use of metacognitive skills during thinking.	Mrs. Gillium thinks aloud while she models how to identify important facts in a problem.
	When scoring assessments, Mr. Murray equally weights answering correctly and being able to describe what processes were used to solve the problem and why.

DIVERSITY IN COMPLEX COGNITIVE PROCESSES

According to **situated cognition theory** (Brown, Collins, & Duguid, 1989), an individual's context of learning plays a fundamental role in shaping the type of concepts and thinking developed by him/her. Teachers can expect to encounter a variety of worldviews among students, especially if teaching in a multicultural classroom (Southerland & Sinatra, 2003). Students from cultures that believe natural disasters are the consequence of supernatural causes may resist scientifically based explanations. Likewise, students from fundamentalist religions may not easily accept the idea that the earth's species have evolved over a long period of time.

Situated Cognition Theory

The idea that an individual's context of learning plays a fundamental role in shaping the type of concepts and thinking developed by such individual.

Cultural Differences

Students from different cultural backgrounds will bring to the classroom different schemas and scripts (Lipson, 1983; Reynolds, Taylor, Steffensen, Shirey, & Anderson, 1982; Steffensen, Joag-Dev, & Anderson, 1979). Students' ethnic background may affect the ways in which they interpret historical events in which their people participated. European-Americans may refer to the group of western ancestors that migrated across North America as pioneers or settlers, whereas Native Americans may refer to them as foreigners or invaders (Banks, 1991). Research on concept formation also suggests that students of different cultural background may define and categorize concepts in different ways (Lin & Schwanenflugel, 1995; Schwanenflugel & Rey, 1986).

The role of context in thinking is clearly illustrated in a study by Carraher and colleagues (1985). Researchers observed Brazilian children solving simple mathematical problems as they sold coconuts on the street. A 9-year-old child answered a customer's question regarding the price of three coconuts by counting out loud: "40, 80, 120." However, when faced with "3×40" on a formal test, this same child arrived at a result of 70. Similar results were found in a study of child vendors in Lebanon (Jurdak & Shahin, 1999). This research speaks to the *situated* nature of human knowledge and thinking. Children who develop very effective problem-solving strategies within the context of their home or community may have difficulty transferring these skills to solve regular math problems at school (Gay & Cole, 1967). Likewise, students whose past experiences have mainly consisted of using rote strategies to learn will need more practice and scaffolding than others before they start using higher-order strategies during thinking (Eccles, Wigfield, & Schiefele, 1998; Ho, 1994; Purdie & Hattie, 1996).

Another potential source of diversity in thinking lies in students' cultural background. Some cultures respect without questioning the traditional knowledge passed on by their elders; children from these backgrounds are more likely to believe that knowledge is gained through authority figures and an unquestionable attitude that might conflict with some of the critical thinking skills reviewed in this chapter (Delgado-Gaitan, 1994; Qian & Pan, 2002).

Students' cultural knowledge can sometimes support and sometimes conflict with learning in schools (Greenfield & Suzuki, 1998). Consider the following example: To help her students understand fractions, a teacher used (what she believed to be) a commonplace reference, a pumpkin pie. Well into her explanation, an African-American boy asked the teacher, "What is pumpkin pie?" (Tate, 1994). Because the student did not have experience with pumpkin pies (many African-American families eat sweet potato pies for holidays), the pumpkin pie example was likely to interfere with the students' thinking. On the other hand, for students who were familiar with pumpkin pie, the example was likely to promote meaningful learning.

Studies of children's naive biology theories have also revealed strong cross-cultural variations that seem to be related to cultural practices and traditions. Children in non-Western traditional cultures typically have more sophisticated ideas than their Western counterparts about taxonomies, ecology, and what properties are likely to be shared among different animals and plants (Waxman, Medin, & Ross, 2007).

REVISITING ISSUES IN EDUCATION

Should critical thinking be embedded in the curriculum or taught with stand-alone programs?

Points to consider: Because critical thinking is not domain-specific, it can be applied to a variety of subjects. Students use their critical thinking skills when they investigate evidence for the phenomenon of global warming, when they attempt to determine the certainty of a historical event, or when they examine the reliability of different information sources (e.g., advertisements, books, websites) regarding the nutritional value of certain snacks. The case for embedding critical thinking in the curriculum is based on the literature of transfer that you just learned about. Specifically, by giving students the opportunity to practice critical skills in a variety of contexts, students are more likely to transfer the learned skills to new situations (Halpern, 1998, 2003; Weinstein, 2000).

On the other hand, some may argue that integrating critical thinking within a particular domain is not efficient because the instructional time needs to be split between teaching critical thinking skills and the content domain; consequently, neither critical thinking nor the subject matter receives full treatment. Several stand-alone programs have been developed and used in the past to teach critical thinking skills independent of subject area material. Some examples are the Feuerstein Instrumental Enrichment Program (Feuerstein, Hoffman, Jensen, & Rand, 1985), the CoRT Thinking Materials (de Bono, 1973), and the Productive Thinking Program (Covington, Crutchfield, Davies, & Olton, 1974). Because each of these programs focuses on different skills, they promote different types of thinking. According to one survey study, "Specialized courses in critical thinking have generally been successful in promoting this skill" (Williams & Worth, 2001, p. 13).

However, more recent reviews of stand-alone versus integrated critical thinking instruction (Hatcher, 2006; Solon, 2003) indicate that students who learn critical thinking skills with an integrated approach show greater pre- to post-test gains on a variety of standardized critical thinking tests than those who learn with stand-alone critical thinking courses. Although the participants in the reviewed studies were college students, the findings are exciting because they suggest that teachers can promote higher-order thinking skills in their classrooms without the need to rely on the development of specialized classes in critical thinking. The benefits of embedded approaches to critical thinking support the idea that students learn critical thinking skills more meaningfully when they experience the usefulness of the skills for their education. If you are interested in creating, implementing, and evaluating a critical thinking program in your classroom, you can check the guidelines offered by Halpern (2003), Swartz and Perkins (1990), and Keefe and Walberg (1992) and the websites for the National Center for Teaching Thinking (www.nctt.net) and the Critical Thinking Community (www.criticalthinking.org).

Teachers need to draw on students' background differences and show sensitivity and respect toward traditional knowledge, especially when it conflicts with the scientifically based knowledge taught in the classroom. Rather than portraying different concepts and beliefs as misconceptions that need to be remedied, teachers can support students in understanding (but not necessarily accepting) alternative explanations and beliefs (Southerland & Sinatra, 2003).

Differences with Students with Disabilities

Complex cognitive processes are very demanding for students with special needs. These students will be likely to have difficulty with higher-order thinking processes such as strategy use, critical thinking, and transfer (Swanson, 1993; Wong, 1991). Students with mental retardation will struggle to transfer strategies they learn in the classroom to new situations and will need to be explicitly taught when and how to use specific strategies (Campione, Brown, & Bryant, 1985). In general, special-needs students benefit both from watching teachers or peers model the use of study strategies and from guided practice with informational feedback about how effectively they have used the strategies (Ellis & Friend, 1991; Graham & Harris, 1996).

SUMMARY

- Complex cognitive processes are those that require using or transforming previously acquired knowledge and skills, such as when students engage in conceptual change, thinking, and transfer.
- There are at least three theories of concept formation from which instructional implications can be derived: rule, prototype, and exemplar theory. Concepts can be taught by activating students' prior knowledge; presenting students with multiple examples and nonexamples; asking students to identify defining and nondefining attributes of the concept; providing the concept's name, definition, and visual representations; and making analogies between the new concept and another known concept when students lack relevant prior knowledge. When concepts do not have defining attributes, they are best described in terms of prototypes or multiple exemplars.

  Misconceptions are invalid concepts that students construct using their experiences, expectation, beliefs, and emotions, and are extremely hard to change. Conceptual change requires students to experience a cognitive conflict between their existing concept and the new concept and creating experiences that can help actively assimilate the new concept.
- Reasoning can be deductive, which goes from the general to the specific, or inductive, which goes from the specific to the general. Teachers can promote students' reasoning by providing practice with syllogisms and inductions and teaching students to avoid common fallacies.

  Decision making is the process of evaluating alternative options and making choices among them. Teachers can promote effective decision making by providing varied practice with feedback about the outcome and process of students' decisions as well as by making students aware of their thinking flaws.

  Creative thinking is the ability to generate new ideas, combine ideas in a novel way, or come up with unique ways to solve problems and is associated with divergent thinking. Teachers can promote students' creative thinking by creating safe, autonomy-supporting learning environments, encouraging brainstorming, modeling creativity and the value of creativity, and allowing time for developing creative products.

  Metacognition is a complex cognitive process in which students think about their thinking and regulate their learning by using study strategies. Note taking, summarizing, and reading comprehension strategies such as SQ4R can improve learning but need to be explicitly taught and practiced to help students become more strategic and metacognitively aware.

  Critical thinking is the process of systematically examining available information and coming up with conclusions that are based on evidence. It consists of four elements: motivation, knowledge about the issue involved, metacognition, and a set of component skills.
- Problem solving is the type of thinking people apply to achieve a desired end state that is different from an initial state. Functional fixedness, response or mental sets, lack of motivation, or anxiety can all interfere with problem solving. Problems can be well or ill defined. Algorithms are sets of steps that guarantee a solution to a well-defined problem. Heuristics are informal problem-solving strategies such as means–ends analysis, working-back, analogical reasoning, and trial and error. Contemporary problem-solving models include five steps: identifying the problem, representing the problem, selecting a strategy, implementing a strategy, and evaluating the results.

  Expert problem solvers differ from novices primarily by having more and better organized domain knowledge and strategies and by being more efficient at

implementing and changing strategies, taking more time to plan their strategies, and monitoring and evaluating the problem-solving process better than novices. Expertise develops in three stages and takes between 5 and 10 years of commitment and deliberate practice to develop.

- Transfer occurs when previously learned knowledge or skills are applied to novel situations. Transfer can be positive or negative, depending on whether using what was learned in the past facilitates or hinders the new task, respectively. Transfer to new problems that share the same structure is called near transfer; transfer to new problems that have a different underlying structure is called far transfer. Far transfer requires consciously making connections between what was learned in the past and a novel situation.
- Among other factors, diversity in thinking can originate from the context in which thinking takes place, students' background, cultural and individual differences in beliefs, and exceptionalities.

KEY TERMS

algorithm 263
analogical reasoning 241
cognitive rigidity 265
complex cognitive processes 236
concept 238
conceptual change 246
creative thinking 251
critical thinking 258
decision making 250
deliberate practice 267
divergent thinking 253
exemplars 240
experts 267
functional fixedness 265
heuristics 264
insight 261
misconceptions 244
naive theories 244
negative transfer 270
positive transfer 270
problem solving 260
prototype 240
reasoning 248
response/mental set 266
schema activation 241
situated cognition theory 273
study strategies 257
transfer 268

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What are complex cognitive processes?
2. What are concepts and what are some theories about how people form concepts?
3. How many types of thinking did you learn about and how do they differ from each other?
4. What are some study strategies that students can use to improve learning?
5. What skills and dispositions are at the core of critical thinking?
6. What are the steps of the general problem-solving model?
7. What are some obstacles to problem solving?
8. How does expertise develop?
9. What are the differences between expert and novice problem solving?
10. How can teachers promote students' problem-solving skills?
11. What are the different types of transfer and how can teachers support them?
12. How do students differ in complex cognitive processing?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. Take four of the critical thinking skills proposed by Ennis and give an example of how you may use each skill in your teaching practice (Chapter 1).
2. What are some strategies for teaching problem-solving skills to students with learning disabilities (Chapter 2)?
3. How is conceptual change related to Piaget's theory of cognitive development (Chapter 3)?
4. What connections can you make between what you learned about expert thinking and the apprenticeship model of learning (Chapter 3)?
5. Which of the stages in Erikson's theory of psychosocial development may be relevant for the development of decision-making skills (Chapter 4)?
6. Do you think that behaviorist theories of learning can help explain divergent thinking? Why or why not (Chapter 5)?
7. How would you describe the difference between near and far transfer using the information-processing model (Chapter 6)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Middle School Teacher Promote Complex Cognitive Skills?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"What if we used mini-marshmallows to pad the box?" Adriana suggests to her project partner.

"But marshmallows will stick to everything. If we mail our box on a hot day they might melt."

"Hmmm, we still need to think of something to pad our box."

"Hey, how many days will it take for our box to get from Portland, Maine, to Austin, Texas?"

"I don't know; we could call the post office."

"Or look it up online."

"Well, we've got to figure out what padding to use first."

Mr. Kwame's seventh-graders are in the design phase of a month-long problem-solving experience. After completing their textbook chapter on force, he gave his students the task of sending a single Pringle chip through the mail, from Portland to Austin. He coordinates the Pringle Project with a seventh-grade teacher in Austin so students can exchange their packages. The goal is to have students apply their understanding of force, mass, and volume to design a lightweight, low-cost, aesthetically pleasing package that will protect the Pringle during its cross-country journey. Today, Mr. Kwame wants his students to work with their project partners to brainstorm a list of possible shipping materials and to sketch their preliminary design. First, he will model how he wants students to apply their knowledge of force to their designs.

Mr. Kwame has written three tasks on the board for students to complete during today's lesson: *Brainstorm Materials* (10 minutes), *Apply Your Knowledge of Force to Design* (20 minutes), and *Share with Class* (10 minutes). Vocabulary words are written on the board: *force, accelerate, balance, contact, interaction, friction, volume,* and *mass*. Each vocabulary word is defined and illustrated with an example.

Throughout the project, Mr. Kwame has emphasized organization. Project partners have binders in which they keep design sketches, project due dates, the grading rubric, a checklist for self and partner evaluations, and journal entries about the design process. Mr. Kwame gives partners time to organize their binders each week. From experience, he knows the importance of organization and consistent evaluation throughout long-term projects. It helps students develop metacognitive skills.

This year, Mr. Kwame is also a participant in the Pringle Project. He will be designing a package, measuring its volume and mass, calculating its cost, and shipping it to Austin. Mr. Kwame's excitement about his own package design is evident as he models the tasks students will complete. "I have to admit," he begins, "I was visualizing my package design as I was falling asleep last night. Also, I'm always looking at packages. For example, this morning I spent time inspecting an egg carton and wondering if the design could work for a Pringle. I have some great new ideas." The seventh-graders are sitting next to their project partners with their binders open.

Mr. Kwame continues, "There are three tasks to accomplish today. Notice I have estimated the length of time for each task to help you complete all four tasks today. Your first challenge will be brainstorming. I want you and your project partner to make a list of as many packing materials as you can—from cardboard to shredded newspaper. When you're brainstorming, the sky is the limit. You might think of something that people don't typically use as a packing material, like lint from the dryer or corn husks. Write every idea down, because later, when you're constructing your package, these wacky ideas may be the perfect solutions to your engineering problem."

"Before you get started, I will model what I mean by *Apply Your Knowledge of Force to Design*. Today, you're going to get a sneak peek at my design." Mr. Kwame turns over the page in his large flip chart to unveil his latest sketch. *Design Draft One* is written at the top of the page. Packing materials are listed beneath the title. The sketch is a multicolored drawing. "As you can see," Mr. Kwame explains, "It was helpful for me to draw each material I plan to use with a different color. It was a good way for me to keep track of the different materials I need and how I plan to use them."

"Next, I need to explain my thinking process." Mr. Kwame draws an arrow pointing to the cotton balls in his design and writes an explanation: *I used cotton balls as padding because I think this will minimize the impact of the Pringle pushing against the side of the box.* Now he draws an arrow pointing to the rounded cardboard top of his design. "Turn to your design partner and share your ideas about the top of this design. You can refer to the vocabulary words on the board to help you explain your thinking." Mr. Kwame gives the students a minute to discuss.

Dana starts, "I think the top of your design is rounded so the package matches the shape of the Pringle."

Mr. Kwame encourages Dana to apply her knowledge. "How does that relate to what we've learned about force?"

"Well," Dana continues, "if the Pringle can fit perfectly in the package, there will be less friction force."



Jim Cummins/Taxi/Getty Images, Inc.

Her partner, Vincent, adds "You see, the Pringle won't press against the package, so there won't be any friction, and the Pringle will stay in one piece."

Mr. Kwame writes down their explanations. "Yes, I'm hoping there will be very little friction in my design. When you design your own packages today, I want you to think about *why* you choose certain materials and *how* they will affect the Pringle when it is shipped."

"Ready to turn on your engineering minds? Begin by brainstorming a long list of packing materials with your project partner." With Mr. Kwame's cue to begin, the seventh-graders open their binders and start talking with their partners. As he circulates through the room to monitor their progress, he enjoys observing their high level of engagement and the debates about what materials will work best for the longevity of the Pringle.

Mr. Kwame has added two new components to the project to help his students reflect on the learning process. He knows from past experience that students get very excited about opening the boxes when they arrive and evaluating the condition of the Pringle. However, he feels the participants do not exchange enough feedback about what worked and what could be improved in their package design. This year, based on conversations with his colleague in Austin, students will also exchange their design sketches and written explanations. Mr. Kwame believes this will give students the opportunity for analysis and to share the creative process with their peers.

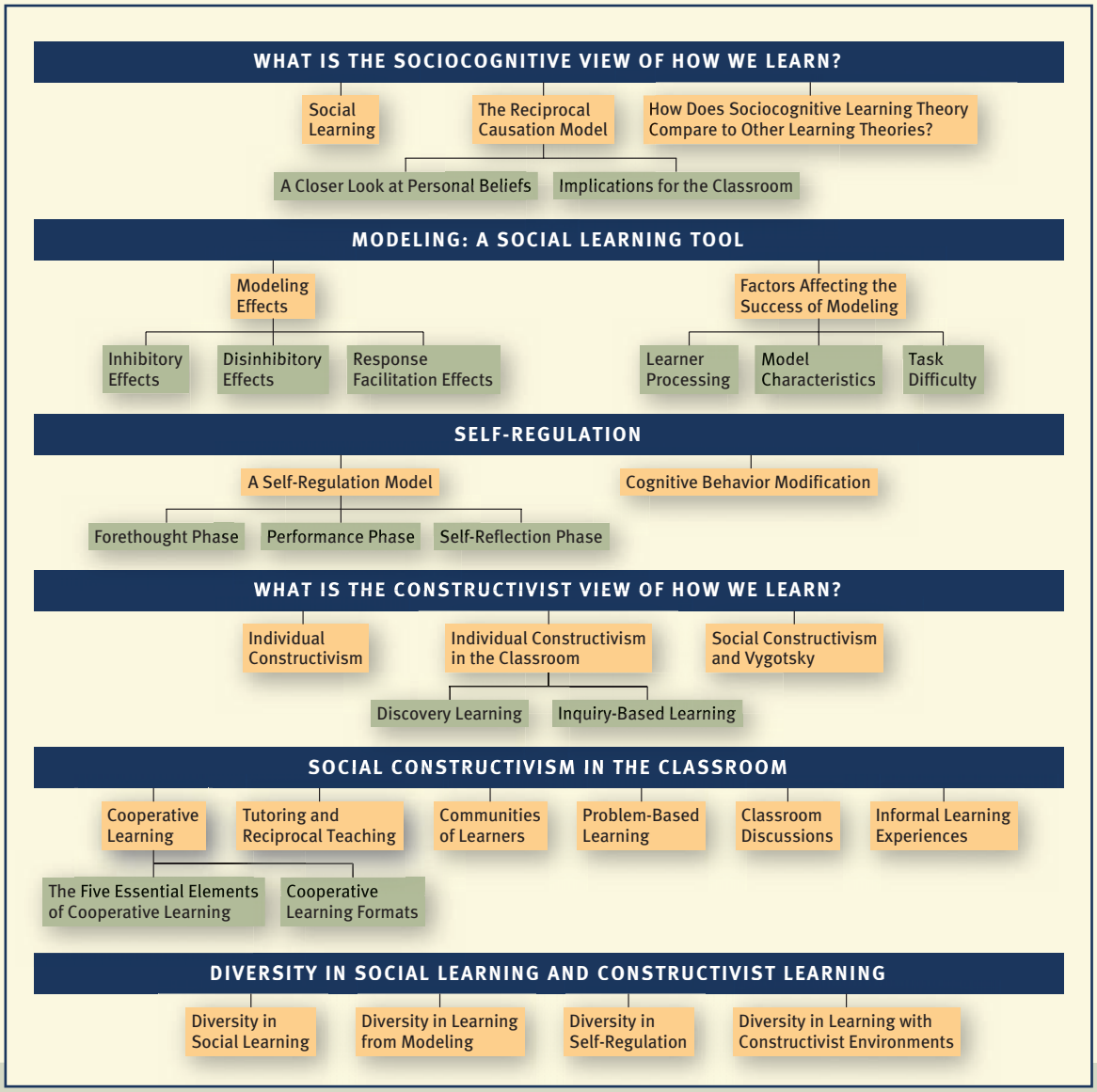
When the packages arrive, Mr. Kwame and his colleague will videotape the students' process of inspecting and opening the packages. Students will first study the original design and compare it to the package, looking for signs of shipping damage. Then they will calculate its volume and mass. Next, they will open the packages to examine the condition of the Pringle. Finally, they will write up their findings to send back to their peers, to provide them with feedback about their design. Mr. Kwame and his colleague hope that this new method will be an exciting way for students to communicate and express their problem-solving ideas.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. Which complex cognitive processes were illustrated in the lesson and how?
2. Which of the following types of transfer were demonstrated in the lesson and how: general, specific, positive, negative, near, far?
3. Was the lesson designed to promote creative thinking? Why or why not?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to the chapter content by including both strengths and weaknesses.

8 Sociocognitive and Constructivist Views of Learning



Imagine You Are the Teacher

MR. BRADLEY IS WITH HIS seventh-grade students in the school library. Students are working in small groups to create a presentation about the culture of an assigned country. Mr. Bradley notices that one group is not making progress, so he decides to observe the group more closely.

"Okay, we only have two more days to get everything we need for our poster. Maybe we should split up. Kendra, you can find stuff about Spanish food. Jackson, you do Spanish painters. Sara, you can look for Spanish music. And I'll do Spanish dance," Danny started the group.

"I don't know anything about Spanish food, and I can't use the library. I told Mr. Bradley I don't like this research stuff," Kendra replied.

"Hey! I don't want to get a bad grade just because Kendra doesn't do her part. If she doesn't work, I won't work either," Jackson said.

Hesitantly, Kendra walked toward a computer station and stared at the Internet search page on the screen. After typing the word "Spain," she clicked on several links, read the results for a few minutes, turned away from the computer, and started walking up and down the rows of books in the library. Then she stopped to read the magazines. By the end of the class, Kendra had nothing to report to her group.

- What are Jackson's feelings revealing?
- Why might Kendra have difficulty completing her assignment?
- What could you do to help this group of students?

Think about how you would respond to these questions as you read through the chapter.



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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define sociocognitive and constructivist learning views.
2. Understand how students' beliefs and expectations affect learning and behavior.
3. Describe the processes of modeling and self-regulation.
4. Define the characteristics of constructivist learning environments.
5. Describe individual constructivism and its classroom applications.
6. Apply social constructivist principles to the classroom.
7. Discuss issues of diversity in social and constructivist learning.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Can students learn by simply observing others? Why or why not?
2. How may students' beliefs or expectations affect their learning?
3. Is cooperative learning helpful to all students? Why or why not?
4. What is self-regulation and what is its role in the classroom?

WHAT IS THE SOCIOCOGNITIVE VIEW OF HOW WE LEARN?

Recall from Chapters 5 and 6, respectively, that behaviorism and cognitive theories define learning as the result of an individual's direct interaction with the environment. Sociocognitive theory adds to our understanding of how we learn by focusing on the type of learning that occurs even when there is no direct interaction with the environment. More specifically, **sociocognitive theory** focuses on learning that is the result of observing others or observing the consequences of the behaviors of others. In the next sections, we take a close look at the main contributions that sociocognitive theory offers to education: the concepts of social learning, reciprocal causation, modeling, and self-regulation. Then we devote the remainder of the chapter to discussing constructivist theories of learning, with an emphasis on social constructivist learning methods.

Sociocognitive Theory

A theory that focuses on learning that is the result of observing others or observing the consequences of the behaviors of others.

Social Learning

Most of us have seen a child say "Thank you" after he watches his mother say "Thank you" to a person who helps put her grocery bags in a cart. Later, the child may say "Thank you" to his mother when she helps him pick up his toys. This child is demonstrating social learning. **Social learning** occurs when people learn from observing the behavior of others. Social learning also occurs from observing the environmental outcomes of the behavior of others (Bandura, 2000). Because social learning is learning from others rather than from direct experience, it is also called indirect learning or *observational learning*.

Social Learning

Learning from observing the behavior of others.

Bandura's Experiment



To examine how children learn from observing different consequences of the same adult behavior, Bandura used three different endings to the film in his research. Some children watched how the aggressive adult was rewarded for the aggressive behavior, a second group of children watched how the adult was punished for the aggressive behavior, and a third group of children watched no consequences for the aggressive behavior.

After watching the film, children in the three groups were allowed to play with a Bobo doll, and their behaviors were observed and classified by the experimenter.

Try to predict Bandura's findings based on what you learned about operant conditioning in Chapter 5: What behaviors do you think that children in each of the three experimental groups were likely to display when left to play with the Bobo doll?

One of the pioneer researchers in social learning is Albert Bandura (1977, 1986). Bandura examined how children learn through observation. In his classic study, Bandura (1965) showed a group of children a film in which an adult was highly aggressive with an inflatable toy called a Bobo doll (Figure 8.1).

Figure 8.1 **Bandura's Bobo doll experiment.**

You may have guessed that children who observed how the aggressive adult was rewarded for displaying aggressive behavior were more likely to display aggressiveness toward the doll than the other children. In addition, you may have guessed that children who observed how the aggressive adult was punished for displaying aggressive behavior were less likely to display aggressiveness toward the doll than the other children. Interestingly, subsequent research showed that children do not even need to see aggressive behavior being rewarded to become more likely to display the modeled behavior. The mere observation of an adult attacking the doll increases the likelihood of children attacking the doll when given the opportunity to interact with the doll afterwards (Bandura, Ross, & Ross, 1963). Based on his results, Bandura concluded that much of what humans learn occurs in social contexts, by observing and imitating others.

The Reciprocal Causation Model

The second tenet of sociocognitive theory is the idea of **reciprocal causation**, a term introduced by Bandura (2006) to refer to the interrelationship between students' environment, their personal beliefs, and their behavior. Let's examine this interrelationship in more detail using the reciprocal causation model shown in Figure 8.2.

Reciprocal Causation

The interrelationship between students' environment, their personal beliefs, and their behavior.

The three components of this model have double-arrow connections to the other components. This represents the idea of reciprocal causation: Students' personal beliefs, behavior, and the environment affect one another. The three components are:

- *Environment* component; includes the social stimuli from others such as parents, teachers, and peers
- *Behavior* component; responses made in any given situation—may be emotional (e.g., anger, pride), physical (e.g., increasing study time, skipping class), or a combination of both
- *Personal* component; beliefs and attitudes that can potentially affect learning, including beliefs about oneself

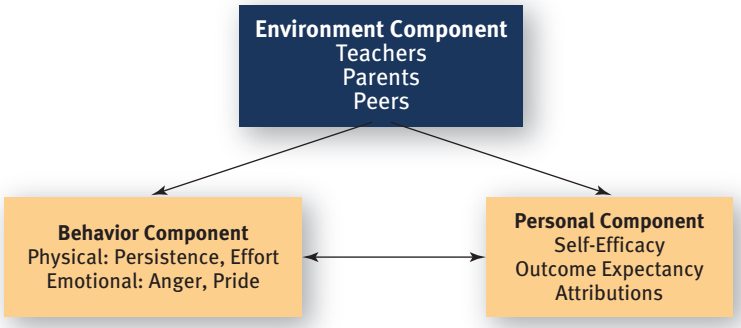


Figure 8.2 **The reciprocal causation model.**



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Think about an academic area in which your self-efficacy is high. How does this self-belief affect your learning and motivation to learn?

Self-Efficacy

The belief about one's capability to perform or achieve a certain goal.

Outcome Expectancy

An individual's belief in a positive relationship between performance and the outcome of such performance.

You probably remember the powerful influence of these social factors on learning from Chapter 4, when we discussed students' personal, moral, and social development. The next section examines in detail one of these three social components—personal beliefs.

A Closer Look at Personal Beliefs: Self-Efficacy and Outcome Expectancy. There are two important personal belief factors in Bandura's reciprocal causation model: self-efficacy and outcome expectancy. **Self-efficacy** can be defined as the belief about one's capability to perform or achieve a certain goal (Bandura, 1993). You will learn in more detail how self-efficacy is related to learning and motivation when you read the next two motivation chapters. Using reciprocal causation terms, when students have high self-efficacy in a domain (personal component), they are more likely to work on challenging problems in that domain and persist in the face of difficulty (behavior component).

Becoming successful with difficult problems (behavior component) increases self-efficacy (personal component) and may cause a teacher to present challenging new problem-solving situations to the student (environment component). In Imagine You Are the Teacher, Kendra's words ("I can't use the library") are probably due to her low self-efficacy about doing research. Therefore, she is less likely to work hard on the group project and persist in the face of difficulty.

The second personal factor of importance in this model is **outcome expectancy**, which is an individual's belief in a positive relationship between performance and the outcome of such performance. Similar to the case of self-efficacy, you will learn more about outcome expectancy when you study the expectancy X value theory of motivation in subsequent chapters. In terms of reciprocal causation, students' positive outcome expectancy (personal component) will motivate them to attempt the behavior in the future (behavior component). In Imagine You Are the Teacher, Jackson is less likely to work on the group project because his outcome expectancy is negatively affected by Kendra's words (he expects a lower grade if Kendra does not do her part). This problem, however, can be remediated. Keep reading and you will learn how to design effective collaborative learning activities when we discuss social constructivist methods later in this chapter.

Now that you are familiar with the reciprocal causation model, read the examples in Figure 8.3 to better understand how the environment, behavior, and personal components of the model may look in the classroom and what happens when students' expectations are not met.

Implications for the Classroom. Several educational implications can be drawn from the reciprocal causation model. First, teachers need to clearly specify the behaviors that are being reinforced or punished so that students construct accurate expectations about the consequences of their future behavior. A teacher can establish the rule "for every homework assignment that is turned in on time, students will receive 5 points toward their grade."

Second, teachers should provide clear feedback for students' specific behaviors so that students can understand the reason for the consequences and adjust their expectations accordingly. Rather than simply giving students their grades for an algebra test, a teacher should explain the relationship between the grade and their performance, with information about how to improve performance in the future.

Third, teachers should be aware of observational learning and make sure that they create an environment where expectations are met *consistently*. To this end, teachers should ensure that the same consequences are applied to any student who displays the same behavior, to avoid the negative consequences of unmet expectations and unequal student treatment.

How reciprocal causation works when students have direct experience with the environment

Carl receives a failing grade on a geography test (environment component). This environmental stimulus may affect Carl's personal beliefs in different ways. For instance, he may think, "I can't do geography" (personal component), which will likely result in putting very little effort into studying in the future (behavior component). If he thinks instead "I should have studied harder" (personal component), he may change his study habits or join a peer study group to better prepare for the next test (behavior component).

However, we can also think about many reciprocal causation examples for observational learning

Marcia observes the teacher giving time-out to Pat, who was caught talking in class to another student about personal matters (environment component). After seeing this event, Marcia's expectations about the relationship between talking in class and punishment are increased (personal component). This change in expectations will, in turn, decrease Marcia's own talking to her friends in class (behavioral component).

What happens when punishment expectations are not met?

Imagine that in our prior example Marcia observes that when Pat talks in class, the teacher never addresses the issue (environment component). Then Marcia's expectations will adjust accordingly: She will not expect any consequences for displaying the same behavior as Pat (personal component), which, in turn, will increase the chance that Marcia will talk to her friends in class (behavioral component). In other words, because the expected punishment did not occur, the undesirable behavior (talking) is reinforced.

What happens when reward expectations are not met?

Now imagine the following scenario: Mrs. Crane emphasizes the need to complete homework and return it in a timely fashion (environment component). Her message may affect students' expectations about the importance of homework (personal component) and eventually increase the likelihood that students will complete homework on time (behavior component). Yet if students' expectations are unmet because Mrs. Crane fails to collect the homework and grade it, those who completed the homework will become less likely to do homework in the future. In other words, the desirable behavior is inadvertently punished because students who display the behavior are not given appropriate credit for their effort.

FIGURE 8.3 Reciprocal causation in the classroom.

Finally, teachers should go beyond the examination of students' behavior and pay attention to their self-belief system as well. The reciprocal causation model suggests that to increase the value and efficiency of observational learning, it might be necessary to foster students' positive self-beliefs and feelings. You will learn more about how teachers can promote students' positive self-beliefs when we discuss sociocognitive motivational theories and classroom applications in upcoming chapters.

How Does Sociocognitive Learning Theory Compare to Other Learning Theories?

Because sociocognitive theory uses the concepts of reinforcement and punishment to explain learning, it is said to have historical roots in behaviorism. Recall from Chapter 5 that consequences (i.e., positive and negative reinforcers; presentation and removal punishment) play a central role in explaining how people learn from a behavioral perspective.

However, as its name implies, the sociocognitive theory of learning also includes important concepts from the cognitive views of learning that you read about in Chapter 6. Specifically, sociocognitive theories define learning as the relatively enduring change in the mental structures of a learner that create the potential to demonstrate different behaviors (Hill, 2002).

Therefore, sociocognitive and cognitive views of learning share a recognition of the relationship between changes in mental structures and learning. Unlike cognitive views of learning, however, sociocognitive views emphasizes social (rather than individual) learning methods.

An important difference between sociocognitive and other learning theories is that behaviorism and cognitive theories consider learning to be the result of an individual's direct interaction with the environment, but sociocognitive theories state that learning can occur even when there is no direct interaction with the environment (i.e., learning by observation). After observing her brother Bruce study hard for an upcoming math exam and getting an A, Terri decides to change her study habits to get an A in her next math test. Terri does not need to actually have had the personal experience of studying hard and getting an A to learn about the relationship between effort and achievement.

According to sociocognitive theory, social learning helps individuals form expectations about the consequences that are likely to result from different behaviors. When an observed behavior (Bruce's hard studying) leads to a positive outcome (getting an A), we are more likely to demonstrate the observed behavior in the future. This is called *vicarious reinforcement*. Likewise, when an observed behavior leads to an aversive outcome, we are less likely to demonstrate the observed behavior. This is called *vicarious punishment*. The process of learning by observing the consequences of another's actions and adjusting behavior accordingly is called **vicarious learning** (Schunk, 2004). In contrast, the term **enactive learning** is used when students learn by experiencing the consequences of their own actions.

Vicarious Learning

The process of learning by observing the consequences of another's actions and adjusting behavior accordingly.

Enactive Learning

Learning by experiencing the consequences of one's own actions.

Another distinctive characteristic of sociocognitive theory is that learning only creates the *potential* to demonstrate different behaviors. The actual demonstration of the new behavior will depend on the learner's beliefs and expectations. In the prior example, despite having learned that studying hard in math can lead to higher grades, Terri may not change her behavior (study habits) if her expectations to succeed are low (because she does not feel competent in math) or if she believes that studying hard will not improve her grade because her math teacher does not like girls.

In sum, compared to behaviorism, a sociocognitive view of learning contributes to our understanding of the role of consequences in learning in the following two ways. First, it expands our understanding of how consequences can be experienced by learners. Rather than considering behavior to be affected only by the direct experience of consequences, Bandura's research showed that behavior can also be affected by observing the reinforcement and punishment received for the modeled behaviors of others.

Second, sociocognitive views of learning reject the behaviorist idea that consequences affect behavior "automatically without conscious involvement" (Bandura, 1977, p. 19) and argue instead that consequences affect behaviors because they create expectations for future behavior. Observing the consequences of other people's behavior provides the observer with information that *can* be used to guide future behavior. It does not automatically determine future behavior. In fact, social learning may be demonstrated by behavior changes immediately, at a later time, or never.

A student who observes a peer get in trouble when caught cheating may use this information to determine whether or how he will cheat in the future. The student may refrain from cheating altogether (to avoid punishment), he may attempt a better cheating method in the future (to reduce the likelihood of detection and, consequently, punishment), or he may repeat the modeled behavior if he believes that this is the only way to succeed in the test and the test is important enough to risk getting caught.

Although sociocognitive theory has helped overcome some of the limitations of behavioral and cognitive views of learning, it does have limitations. As you will read in the next sections, sociocognitive theory does not provide a good explanation for why students may attend to and imitate some models but not others, or for how students learn highly complex tasks (e.g., language development) beyond observation or imitation.

Now that we have examined the three major perspectives on learning, we are ready to summarize their similarities and differences. Table 8.1 shows the three learning views covered in this text. Each view provides valuable yet different insights about stu-

TABLE 8.1

A comparison of behaviorist, cognitive, and sociocognitive views of learning.

	BEHAVIORAL	COGNITIVE	SOCIOCOGNITIVE
Definition	A relatively enduring change in observable behavior that occurs as a result of an individual's interaction with the environment.	A relatively enduring change in mental structures that occurs as a result of an individual's interaction with the environment.	A relatively enduring change in mental structures that creates the potential to demonstrate different behaviors.
Goal	Producing desirable behaviors or reducing undesirable behaviors.	Promoting growth in students' mental structures.	Promoting growth in students' mental structures.
Methods	Controlled laboratory experiments examining only observable behavior.	Varied research methods examining observable behavior and mental states.	Varied research methods examining observable behavior and mental states.
Educational focus	Promoting desirable and productive classroom behaviors.	Promoting effective knowledge construction and skill acquisition.	Promoting effective observational learning.
Source of learning	External, by the environmental stimuli.	Internal, by the learner's cognitive structures and processes.	Both, by the environmental stimuli and the learner's cognition.
The role of consequences	Affect learning when experienced directly by the learner.	Not a major consideration of the theory.	Affect learning when experienced directly or vicariously by the learner.
Diversity: individual differences	Reflect differences in students' past conditioning, reinforcement, and punishment.	Play a fundamental role in understanding how students construct new knowledge or acquire new skills.	Affect how students construct new knowledge, acquire new skills, or create expectations about the consequences of their behavior.

dents' learning and behavior, and each can offer helpful guidelines for teaching practice. In forthcoming chapters, you will revisit behaviorist, cognitive, and sociocognitive theories from the perspective of classroom motivation and management.

Get Connected!

ANIMATION ASSIGNMENT. . . Social Cognitive and Constructivist Views of Learning

Go to your WileyPlus course and watch the animation of students in the classroom who are working on a class project. Be prepared to discuss the differences in students' classroom learning experiences as explained by constructivist and social cognitive theory.



MODELING: A SOCIAL LEARNING TOOL

Modeling consists of the cognitive, affective, and behavioral changes that result from observing others' behaviors and explanations (Schunk, 2004). Modeling is a very powerful social learning tool. Although many of the models from whom we learn are *live models*—real people that we directly observe doing something—we are also affected by *symbolic models*—real and fictional characters that we observe indirectly through the media, by reading stories in books, magazines, and newspapers, or by watching films,

Modeling

The cognitive, affective, and behavioral changes originated from observing others' behaviors and explanations.

videos, animations, and television (Kirsh, 2006). Humans are able to imitate models almost from birth (Collie & Hayne, 1999; Field, Woodson, Greenberg, & Cohen, 1982). Parents will often model behaviors (e.g., eating with utensils, combing one's hair, tying one's shoes) and guide children as they attempt to imitate such behaviors.

Like any type of learning, modeling can teach either valuable lessons or undesirable behaviors. In fact, one of the reasons Bandura's (1977) research in modeling has been so influential is because it provided strong evidence that exposure to violence on television can lead to aggressive behavior by those who watch television. Viewing violent television is also associated with favoring the use of violence to solve problems and becoming less sensitive to and more tolerant of violence (Friedrich-Cofer & Huston, 1986; Huesmann, Lagerspetz, & Eron, 1984). The negative effects of violence modeling are found to persist in the long term (Huesmann, Moise-Titus, Podolski, & Eron, 2003).

On the positive side, studies in a variety of domains show that many positive skills are learned through modeling:

- Reading (Scharlach, 2008)
- Athletic skills (Kitsantas, Zimmerman, & Clearly, 2000; Zimmerman & Kitsantas, 1997)
- Math procedures (Sawyer, Graham, & Harris, 1992; Schunk & Swartz, 1993)
- Moral thinking (Huston, Watkins, & Kunkel, 1989)
- Tolerance (Blanchard, Lilly, & Vaughn, 1991)

Teacher modeling has been found to be particularly efficient in fostering academic skills. Students who observe teachers solve math problems, write essays, or use study strategies are more likely to display the modeled behaviors than those for whom the skills are not modeled (Braaksma, Rijlaarsdam, & van den Bergh, 2002; Braaksma, Rijlaarsdam, van den Bergh, & van Hout-Walters, 2004). Moreover, pre-service teachers who learn by watching model teachers or by reading classroom cases that model quality teaching practices are better able to transfer what they learn to novel classroom scenarios than those who are not presented with such models (Moreno, 2007; Moreno & Ortegano-Layne, 2008; Moreno & Valdez, 2007).

Modeling Effects

Modeling can have a direct performance effect on the observer. By observing models, students learn new behaviors and are more likely to perform those behaviors in the future. Modeling effects can be inhibitory, disinhibitory, and facilitating.

Inhibitory Effects. An *inhibitory* modeling effect occurs when observing the behavior of others strengthens the inhibitions for the same behavior in the observer. Inhibitions are mental restrictions that people place on their behaviors, either for their own benefit or for the benefit of others. Consider a first-grade student named Kylie who observes how the class makes fun of Roger when he volunteers the answer to a question. Kylie becomes inhibited about offering answers to questions. However, not all inhibitory effects in the classroom are negative. A student who typically interrupts other students while they are talking may become inhibited about doing so after watching another student being punished for interrupting an explanation offered by a classmate. According to Bandura (1986), inhibitions can be strengthened by observing others being punished for their behavior.

Disinhibitory Effects. A *disinhibitory* modeling effect occurs when observing the behavior of others weakens the inhibitions for the same behavior in the observer. In this case, the observer anticipated a negative consequence for a behavior, but the

expectations are unmet. What we discussed about unmet expectations in the reciprocal causation model section becomes relevant here. Similar to inhibitory effects, disinhibitory effects can be positive or negative. An example of a positive disinhibitory effect is the case of a student who is uncomfortable talking in public and therefore anxious about a class presentation that she needs to perform in a few weeks. After watching a couple of her peers successfully perform their class presentations, her inhibitions become weakened.

Examples of negative disinhibitory effects typically include cases where students misbehave and get away with no consequences for their undesirable behavior. Students who observe the unpunished behavior (e.g., chirping like a bird when the teacher is facing the board) weaken their own inhibitions to perform the undesirable behavior and are more likely to repeat the behavior in the future. To avoid classroom management problems, teachers should intervene quickly after any undesirable behavior occurs and administer preestablished consequences (Kounin, 1977).

Response Facilitation Effects. Modeling can produce a *response facilitation* effect, which happens when an observer already knows about a certain behavior yet the model's behavior serves as a social cue or reminder to engage in the behavior. Response facilitation does not require observing consequences for the modeled behavior. A student who closes her book and makes eye contact with her teacher after the bell rings, waiting for the teacher to allow students to go to recess, may facilitate the response of her classmates. Merely watching the student's behavior cues other students to follow the same behavior by getting ready for recess.

Factors Affecting the Success of Modeling

According to Bandura (1977), effective modeling includes a motivational component (raising students' expectations that a new skill can be mastered) and a cognitive component (providing rich information about how a skill is actually performed). What are some factors that might affect the motivational and cognitive components of modeling? Experts in this area believe that the effectiveness of modeling depends on three different factors: learner processing, the characteristics of the model, and the difficulty of the task. Let's take a look at each one in detail.

Learner Processing. The likelihood that a behavior will be imitated in the future will depend on whether the learner engages in the following four processes:

(1) *Attention.* First, the learner needs to attend to relevant information from the model to be able to learn from the model. As you now know from having studied the information-processing model, attention is the process of allocating cognitive resources to a stimulus or task at hand and is a necessary condition for moving the information to be learned into working memory. Therefore, teachers should direct students' attention to relevant aspects of what is being modeled to increase the likelihood of learning from observation. Figure 8.4 shows a handout used by a high school teacher to help her students attend to relevant information before reading/watching a play.

(2) *Retention.* Second, the learner needs to remember the observed behavior in order to be able to imitate it in the future. Thus, once the relevant modeled information is attended to and moved into working memory, the learner will need to encode the information by creating a verbal and/or visual representation of the experience in long-term memory. Encoding methods discussed in Chapter 6 become relevant here. Teachers can use elaboration methods (e.g., questioning, mnemonics, analogies) to help students encode and later retrieve the learned information.

FIGURE 8.4 A high school teacher handout created to help students focus on relevant information before reading/watching William Shakespeare's *A Midsummer Night's Dream*.

A Midsummer Night's Dream

Act I

In the opening scene we meet Theseus, the ruler of Athens, who is engaged to Hippolyta. In the first scene we also meet Hermia who is being pursued by Lysander (who she loves) and Demetrius (who her father wants her to marry). Hermia's father, Egeus, tells Hermia that Athenia law dictates that she must marry Demetrius. In response, Hermia and Lysander decide to elope outside of the city of Athens. In the first act we also meet Peter Quince and his cast of amateur actors who are beginning rehearsals for a play that they hope to perform at Theseus and Hippolyta's wedding.

Focus Questions

1.) What are the rules of love in Athens? Who seems to hold the power in the relationships we see in Athens?

2.) What connections do you see between the play the actors will perform and the sets of lovers in Athens?

3.) What are some of the ridiculous things that the actors do and say? What is the meaning/purpose of some of these absurdities?

Act II

In Act II we meet Titania, the Fairy Queen, and Puck, a trickster who works for the Fairy King. The Fairy King and Puck are planning to play a trick on Titania. Puck will use nectar from a flower to make her fall in love with the first person she sees when she awakes. After the Fairy King watches Demetrius and Helena in the woods he decides that Puck should also place the nectar in Demetrius' eyes so that he falls in love with Helena. Puck, however, puts the potion in Lysander's eyes. He awakes at the same time that Helena finds them in the woods. Lysander leaves to pursue Helena. Hermia awakes alone and runs off to find Lysander.

Focus Questions

4.) What differences do you notice about the events and characters' actions in the woods compared to the events and actions in Athens?

5.) What problems does the magic potion cause? What message does this convey about love?

(3) *Production.* Third, the learner needs to convert the mental representations created during encoding to motor activity. Depending on the complexity of the procedure modeled, the learner may experience difficulty trying to reproduce the observed behaviors at first. Therefore, at this stage it is most important to break down the procedure and provide plenty of practice opportunities coupled with informational feedback. In this regard, it is important to think about the processes that are being taught through modeling but that are not readily observable. Imagine that a teacher wants to model the SQ4R reading comprehension strategy discussed in Chapter 7, which includes a series of thought processes (i.e., survey, question, read, recite, review, reflect) that may not be observed directly. In this case, it would be advisable to "think aloud" while demonstrating each step and ask students to verbalize their thought processes aloud as they practice the strategy so that the teacher can provide students with feedback.

(**4**) *Motivation.* Fourth, learners need to be motivated to learn from the model and to reproduce what they learned. Remember that according to sociocognitive theory, students may learn something from observation but decide not to demonstrate what they have learned. To promote motivation, teachers should consider showing students the benefits of what has been modeled and creating a supportive practice environment in which students feel safe about attempting the learned behavior. Classroom Tips: Promoting Effective Model Processing summarizes the four processes reviewed with corresponding classroom examples.

CLASSROOM TIPS

Promoting Effective Model Processing

Process	Classroom Examples
Attention: Allocating cognitive resources to the task at hand and moving relevant information to working memory.	• Carefully manage the amount of new material being presented and break down the information into smaller chunks when possible. • Use advanced organizers and outlines to help students identify key ideas or strategies while taking notes from readings and lectures.
Retention: Creating and storing verbal and/or visual representations of the modeled behavior.	• Make connections between modeled ideas/behaviors and students' prior knowledge. • Present lessons in an organized and sequenced way to encourage effective encoding.
Performance: Reproducing the behaviors demonstrated by the model.	• Allow students ample opportunities to practice skills throughout the year rather than only immediately after the skill is modeled. • Provide students with checklists or rubrics to self-evaluate their performance during practice.
Motivation: Engaging mentally and behaviorally in learning.	• Show the relevance of the modeled behaviors to student's current and future lives by using concrete examples. • Create a learning environment in which all student contributions are valued and students can safely make mistakes.

Model Characteristics. The likelihood that a behavior will be imitated will also depend on the characteristics of the model, the person performing the behavior. According to research, models that display the following characteristics are most effective:

- *Power and prestige.* Learners are more likely to attend to models that appear to have power or prestige in the modeled domain (Bandura, 1986; Sasso & Rude, 1987). Because power and prestige are typically associated with being successful, students will be more likely to attend to, remember, and imitate their behaviors and will be more motivated to engage in learning.
- *Competence.* Competent models are effective because they demonstrate behaviors flawlessly and with great self-efficacy. Therefore, they also model mastery in their domain. Experienced teachers can be very influential with new teachers. This is why, in many teacher education programs, pre-service teachers are paired with a mentor in-service teacher or shown classroom videos depicting expert teachers' practices (Derry, Hmelo-Silver, Nagarajan, Chernobilsky, & Beitzel, 2006; Moreno & Valdez, 2007).
- *Similarity.* Learners are more likely to attend to models that appear to be similar to them. Children may look to their peers to judge the difficulty of the modeled task, and boys and girls may pay special attention to the behaviors of boys and girls, respectively, to judge the appropriateness of a behavior (Schunk, 1987). Students' self-efficacy increases when they learn by observing models that are similar to themselves (Brown & Inouye, 1978). Watching a teacher demonstrate the solution of a math problem may not help a struggling student believe that she can solve similar problems by herself. However, self-efficacy is likely to increase when a student of the same age shows how to solve the problem in front of the class. Peer models are very motivating and, therefore, effective learning tools (Schunk, 2004).



Peter Dazeley/The Image Bank/Getty Images, Inc.

Can you think of other examples in which the similarity between the observer and the model can have a positive learning effect?

- *Coping.* Coping models are those who became very competent in a specific task or domain yet had to struggle along their path to mastery. This type of model is especially influential in developing self-efficacy and may be particularly beneficial for students who are worried about the difficulty of the task or who have a history of learning difficulty in general (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987). Classroom Tips: How to Choose Effective Models summarizes the four model characteristics reviewed with corresponding classroom examples.

Task Difficulty. Finally, it is important to be aware that some behaviors or procedures may be very challenging to some students, either because they are highly complex or because the learner is not familiar with the information conveyed by the model. When the learning objective is to teach a highly complex procedure, teachers should consider using **cognitive modeling** (Meichenbaum, 1977). This type of modeling includes the following six steps:

Cognitive Modeling

A type of modeling that includes the following six steps: explaining why the to-be-learned skill is important; modeling the procedure in its entirety; modeling each one of the procedure steps separately using different contexts; having students practice the procedure steps with guidance; having students practice the entire procedure with guidance; having students practice the entire procedure without guidance.

1. Explaining why the to-be-learned skill is important
2. Modeling the procedure in its entirety
3. Modeling each one of the procedure steps separately using different contexts
4. Having students practice the procedure steps with guidance
5. Having students practice the entire procedure with guidance
6. Having students practice the entire procedure without guidance

As you see, cognitive modeling includes principles of cognitive theories (i.e., minimizing the amount of information that needs to be processed at any time); Vygotskian principles of learning (i.e., scaffolding students as they move along their zone of proximal development); and motivation principles (i.e., increasing engagement by communicating the value of learning). Take the following learning scenario. Ms. Okagaki uses cognitive modeling to help her sixth-grade math students solve word problems using the RQWQCQ method.

CLASSROOM TIPS

How to Choose Effective Models

Model Characteristic	Classroom Examples
Power and prestige: Someone who can model success in addition to the behavior to-be-learned.	Mr. Anderson periodically invites famous artists from the community to show their artwork and discuss their techniques.
	Mrs. Yucitan shows a video of Bill Gates discussing how his problem-solving strategies and creativity have helped enhance his products.
Similarity: Someone who shares salient characteristics with the learner (e.g., age, gender, ethnicity).	Ms. Gutierrez chooses readings from authors and characters whose ethnicities match those of her students.
	Mrs. Walton uses peer tutoring by matching the gender of the tutor and the tutee.
Competence: Someone who can demonstrate behaviors confidently and flawlessly.	Mr. Glassgow asks Tommy to demonstrate how to throw a Frisbee correctly during his Ultimate Frisbee unit because Tommy has been playing on recreation teams for several years.
	Mr. Barraza asks Susan to demonstrate proper sentence formation to the class by talking aloud through her thought processes once she has mastered the skill.
Coping experience: Someone who can model persistence when confronted with a challenge in addition to the behavior to-be-learned.	Mr. Smith invites his former students to talk to his current fifth-graders about how they struggled in middle school but succeeded with the help of the organization skills Mr. Smith taught them.
	Ms. Littlefoot brings in former smokers to talk with her health education students about their health issues and challenges with quitting.

First, she explains the usefulness of the method for solving math, science, and daily life problems.

Second, she demonstrates the method by *reading* the problem, finding the *questions* of the problem, *writing* the important facts of the problem, *questioning* what computations are needed to solve the problem, doing the *computations*, and *questioning* whether the answer seems correct.

Next, she spends a class period modeling each step using different examples and guiding her students as they practice each step as an entire class.

Finally, she ends the unit by giving students the opportunity to practice the entire model as a class, in small groups, and in their homework.

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT



Write a thank you letter to someone who has been a model (either live or symbolic) to you. Include in the letter what influences the model has had on you (including the modeling processes of attention, retention, production, and motivation and also whether the model produced an inhibitory, disinhibitory or response facilitation effect for you), why the model was effective (motivational, behavioral, and cognitive components), and what characteristics of the model were meaningful to you (power and prestige, competence, similarity, coping). Present your letter to the class and discuss and compare with your classmates' letters.

SELF-REGULATION

An implication of the reciprocal causation model is that once students develop a sense of what their capabilities and academic goals are (personal component), they can steer their cognitive and motivation processes (behavioral component) to move from an inferior academic outcome to a better one (environment component). Learners can establish strategies to achieve a personal goal, evaluate their progress toward meeting such a goal, and self-administer reinforcement or punishment, depending on their outcome. A student may set a goal of studying a certain number of pages every night for two weeks before a test. Each night, the student may try to answer review questions that are relevant to the studied pages as a method to self-evaluate progress. If the student is able to give a satisfactory answer to the questions, he may reward himself by going out with his friends. If the student is not able to answer some of the review questions, he may go back and review the questions missed until he feels that he has mastered the content.

Self-regulated learning can be defined as "the ability to control all aspects of one's learning, from advance planning to how one evaluates performance afterward" (Bruning, Schraw, Norby, & Ronning, 2004, p. 117). Educational psychologists and educators alike are increasingly advocating the importance of emphasizing self-regulation in the classroom both to increase learning and to equip students with the tools to educate themselves throughout their lives (Alexander, 2006; Cooper, Horn, & Strahan, 2005). Research supports this idea by showing that high-achieving students are more likely to be self-regulated learners than low-achieving students. Specifically, high-achieving students are able to set more specific learning goals, use more learning strategies, better monitor their learning, and more systematically evaluate their progress toward learning goals than their counterparts (Alexander, 2006; Boekaerts, 2006; Schunk & Zimmerman, 2006; Weinstein, Husman, & Dierking, 2000).

Self-Regulated Learning

The ability to control all aspects of one's learning, from advance planning to evaluating performance afterward.

A Self-Regulation Model

Zimmerman (2000, 2002) developed a model aimed at explaining the phases and categories of the self-regulation cycle (shown in Figure 8.5).

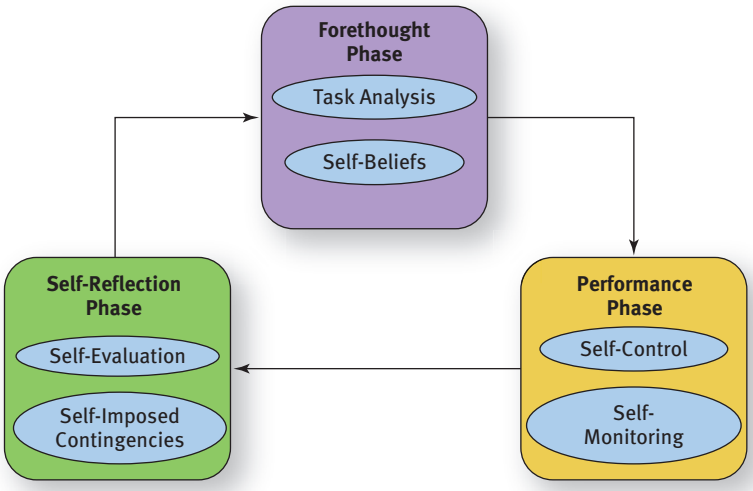
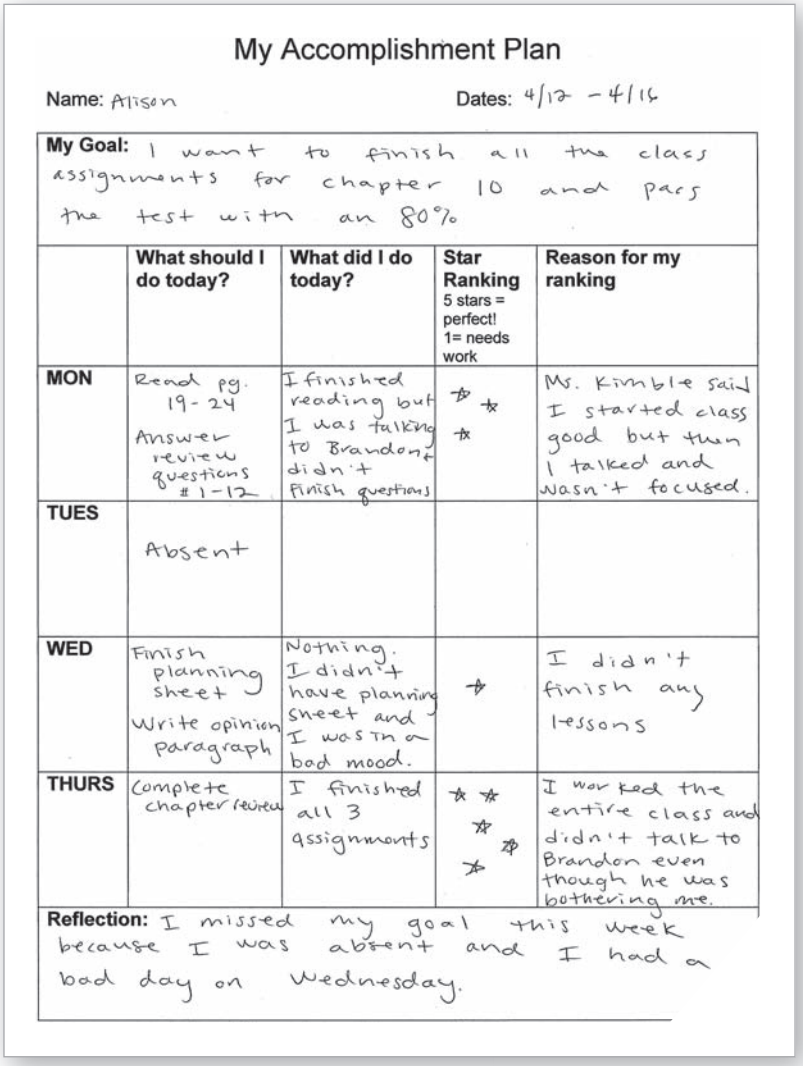


FIGURE 8.5 **Zimmerman's model of the self-regulation cycle.**

Source: This figure was published in *Handbook of Self-Regulation*, B. J. Zimmerman, Attaining self-regulation: A social cognitive perspective, pp. 13–39, Copyright Elsevier 2000.

Task Analysis

Setting goals and devising a strategic plan to accomplish such goals.



My Accomplishment Plan

Name: Alison Dates: 4/12 – 4/16

My Goal: I want to finish all the class assignments for chapter 10 and pass the test with an 80%

	What should I do today?	What did I do today?	Star Ranking 5 stars = perfect! 1= needs work	Reason for my ranking
MON	Read pg. 19-24 Answer review questions #1-12	I finished reading but I was talking to Brandon + didn't finish questions	★★★	Ms. Kimble said I started class good but then I talked and wasn't focused.
TUES	Absent			
WED	Finish planning sheet Write opinion paragraph	Nothing. I didn't have planning sheet and I was in a bad mood.	★	I didn't finish any lessons
THURS	Complete chapter review	I finished all 3 assignments	★★★★★	I worked the entire class and didn't talk to Brandon even though he was bothering me.

Reflection: I missed my goal this week because I was absent and I had a bad day on Wednesday.

FIGURE 8.6 **A form used to help students record their near-term and long-term goals and evaluate their progress toward the long-term goal.**

Forethought Phase. The self-regulation cycle starts with the *forethought phase*, which includes an analysis of the task to be regulated and students' self-beliefs (an example of how a teacher can help students engage in the forethought phase is shown in Figure 8.6). **Task analysis** consists of setting goals and devising a strategic plan to accomplish such goals. In this phase, self-regulated learners establish both their long-term goals and the near-term goals that will provide them with evidence of whether and how they are making progress toward the long-term goals.

However, as you probably remember from the section on problem solving in Chapter 7, having good planning skills is not sufficient to ensure that an individual will actually put those skills to work. This is why the forethought phase includes a motivational component called self-beliefs. Students need to believe that they are capable of accomplishing their plan (i.e., self-efficacy) and have positive outcome expectations about their plan (e.g., prestige, knowledge, wealth). As you see, this self-regulation phase integrates Bandura's personal component from the reciprocal causation model.

Other personal factors that may affect self-regulation are students' intrinsic interest in the task and their goal orientations. You will learn more about interest and goal theories of motivation in forthcoming chapters. For now, keep in mind that having intrinsic interest in a task allows students to persist on the

task, even when there are no external rewards for achievement (Pintrich & Schunk, 2002). Likewise, individuals with a learning orientation are more likely to believe that they can make progress if they put forth effort and are more likely to self-regulate than learners with a performance goal orientation (Midgley, 2001; Pintrich, 2000).

Let's take a look at how a self-regulated student may engage in the forethought stage. Imagine the case of AJ, a fifth-grader in Ms. Jacob's class, who is putting together a project about the southern region of the United States. AJ is excited because he believes that he is good at drawing and is confident that he can design a poster that covers all the necessary information. After reading about the project requirements, he sets up a schedule such that he will work on the project one hour a day after school and three hours on the weekend. This schedule will comfortably allow him to be done by Monday, the due date.

Performance Phase. Next is the *performance phase*, which includes the learner's self-control and self-monitoring. At this stage, the learner focuses on the task, applies the set of strategies laid out in the previous planning phase, and monitors progress by the use of **self-recording** (e.g., writing a journal, keeping logbooks). Figure 8.7 shows an example of a self-observation form that can be used to help elementary students record the estimated amount of time on task during different class periods.

During the self-control process, learners can also use **self-instruction**, a method aimed at reminding themselves about appropriate actions or strategies. Aidan uses self-instruction when he says to himself: "Okay, I know how to solve this problem. First, I need to find the keywords in the problem to find the operation. Let's see, the problem asks me to find out how many cookies Brian and Sergio have *altogether*. So I need to add." Self-instructions are most effective for students who have a tendency to be impulsive or unreflective about their behavior (Bornas & Servera, 1992).

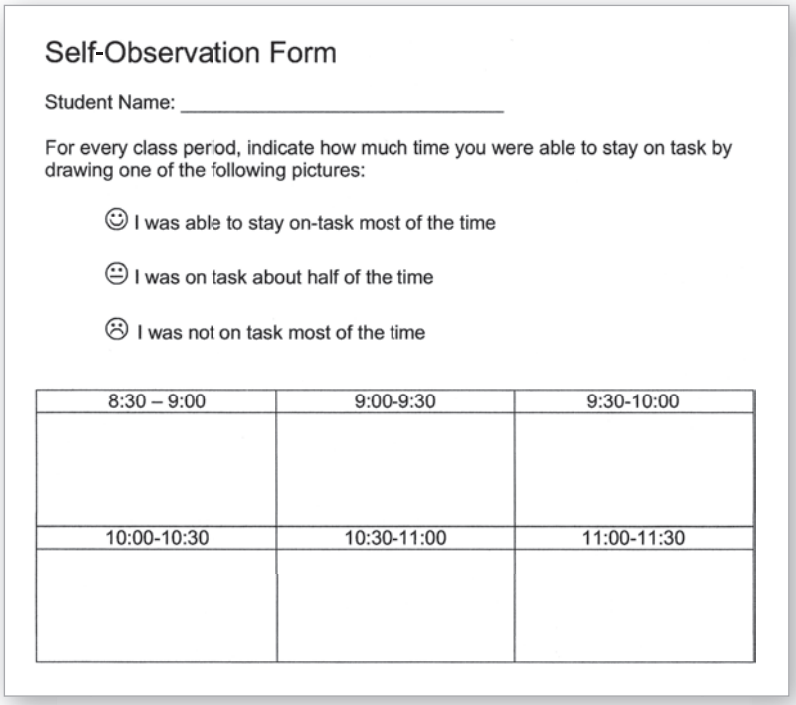
Self-instruction training has been shown to help preschoolers resist temptations and improve performance on intellectual tasks (Fjellstrom, Born, & Baer, 1988), help elementary school children become more reflective about their behaviors (Meichenbaum & Goodman, 1971), help hyperactive children become more reflective (Zentall, 1989), and improve problem-solving ability in students with mental retardation (Graham & Wong, 1993; Meichenbaum & Goodman, 1971).

Self-Recording

Monitoring a process of learning by recording incremental accomplishments.

Self-Instruction

A method aimed at reminding one's self about appropriate actions or strategies.



Self-Observation Form

Student Name: _____

For every class period, indicate how much time you were able to stay on task by drawing one of the following pictures:

☺ I was able to stay on-task most of the time

😐 I was on task about half of the time

☹ I was not on task most of the time

8:30 – 9:00	9:00-9:30	9:30-10:00
10:00-10:30	10:30-11:00	11:00-11:30

FIGURE 8.7 An example of a self-observation form.

Self-Evaluation

Judging if the outcome of one's actions or strategies is acceptable or unacceptable.

Self-Reflection Phase. The last phase of the self-regulatory model is the self-reflection phase, which includes the self-evaluation of one's behavior and self-imposed contingencies. Once the performance phase is over, learners engage in **self-evaluation** by judging whether the outcome is acceptable or unacceptable. This can be done in different ways. One way is to use a mastery criterion—where learners compare their performance with respect to an absolute standard of performance. For example, students can be provided with rubrics describing the performance standards that need to be met to obtain certain grades (such as the one shown in Figure 8.8) and asked to self-evaluate their performance based on the rubric.

In addition, students can self-evaluate by comparing their current performance level to their performance level at the beginning of a cycle. Teachers can ask students to write a reflective self-evaluation based on their progress in a specific topic or skill, using a set of self-evaluation prompts such as: What did you learn? How well did you learn? What are areas where you need to improve? The teacher can later discuss the student's reflections during a one-on-one meeting.

Next is the *self-imposed contingency* stage. After self-evaluating their performance, students will conclude either that they have done a good job accomplishing the goals set at the forethought phase—in which case they can self-impose a positive contingency (i.e., reward)—or that their outcome is suboptimal and needs improvement. In the latter case, adjustments to the original strategic plan may be necessary and learners may even self-impose a negative contingency (i.e., punishment). A student might need to adjust her schedule to increase study time after realizing that the material to be learned is more complex than expected and might decide to cancel a ski trip to make up for lost time.

Rubric for Mural Painting Project

	Excellent! 4	Good 3	Average 2	Needs Improvement 1	No evidence 0
Planning	Extra research was completed. Sketches of initial design ideas are included.	Research planning sheet was complete. Sketches of inital design are included.	Parts of planning sheet or sketches are missing.	Research and/or sketches do not show effort or many pieces were missing.	No evidence
Theme	The mural has a clear theme that is evident throughout the piece. The artist shows the theme in a creative way.	The mural has a clear theme that is evident throughout the piece	The mural has a theme that but may not be evident throughout the entire piece.	A clear theme is not evident.	No evidence
Composition	The piece shows both cohesive-ness and variety. There is a balance of positive and negative space.	The piece shows cohesive-ness and variety. The space is used well.	The piece is cohesive and the space is used well.	There whole space is not used well and/or the piece lacks cohesive-ness.	No evidence
Technique	Correct perspective, shading and painting technique are used. The piece looks professional.	Correct perspective, shading and painting technique are used.	A few mistakes in perspective, shading or painting technique	Many mistakes in perspective, shading or painting technique	No evidence
Creativity	Unique and innovative	Unique	Some elements are unique	Not many unique elements	No evidence
Use of Time	Always focused and on task during class	Focused and on task during class the majority of the time	Sometimes is not focused and on task during class	Often is not focused and on task during class	Rarely is focused and on task during class

Reflection: Using a **blue** pen assess your mural by circling the description that matches your work in each category.

Total self score: _____

Teacher Grade and Comments:

Teacher score: _____

FIGURE 8.8 **An example of a grading rubric to promote students' self-evaluation.**

As students become increasingly self-regulated, they learn to reward or punish themselves either in emotional ways (i.e., feeling proud or feeling guilty, respectively) or in more concrete ways (i.e., rewarding themselves with treats or taking time away from desirable activities, respectively). Self-reinforcement can be as effective as teacher reinforcement in the classroom (Bandura, 1977; Stevenson & Fantuzzo, 1986).

Although the self-regulatory cycle is complex, research shows that teachers can facilitate the development of self-regulatory skills gradually by modeling. Teachers can show students how to plan and manage time effectively, how to pay attention to relevant information in class, how to focus and remain on-task, how to use study strategies and self-instruction, and how to self-assess their learning. Teachers who have among their learning objectives helping students become self-regulated learners reinforce the importance of being active and committed to learning, being responsible for one's behaviors, and being a contributing member of society (Lajoie & Azevedo, 2006; Zimmerman, Bonner, & Kovach, 1996). Classroom Tips: Promoting Self-Regulated Learners summarizes the self-regulatory skills included in Zimmerman's (2002, 2002) model with corresponding classroom examples.



sozaijiten/Datacraft/Getty Images, Inc.

After sticking to a diet for a certain number of days, some people might reward themselves by indulging in an ice cream treat. Can you think of similar self-reward ideas for your students?

Cognitive Behavior Modification

A well-known method to teach self-regulation is called cognitive behavior modification (CBM; Meichenbaum, 1977; Swaggart, 1998). CBM combines principles of behaviorism and cognitive theories to help students control their learning using self-instruction. Meichenbaum (1977) suggested using the following steps in CBM:

(1) *Demonstration.* The teacher uses cognitive modeling to demonstrate how to use instructions while engaged in the task. Missy tends to wander around the class when she is having problems with classroom assignments. Ms. Kingston shows her how to reread the problem or assignment instructions, identify what she knows how to do, identify where she needs help, formulate questions to ask Ms. Kingston, and quietly wait with her hand up for Ms. Kingston's help.

CLASSROOM TIPS

Promoting Self-Regulated Learners

Self-Regulatory Skill	Classroom Examples
Task analysis	Engage students in setting daily, weekly, and longer-term goals and model ways to monitor their progress. Encourage students to regularly reflect on how they made progress toward the goals that they set.
Self-control	Help students reflect on their behaviors and identify cues that preclude them from achieving their goals. Give students concrete strategies to control their behavior to effectively accomplish their goals.
Self-monitoring	Create with your students a strategy to track their progress toward goals, through either journaling or more structured worksheets. Give incentives to students for monitoring their actions or progress toward goals.
Self-evaluation	Allow time within your lesson plans for students to evaluate their progress through reflection. Provide rubrics for projects or essays so that students can evaluate their performance and compare it to your evaluation.
Self-contingencies	Model the value of self-imposed contingencies. Provide opportunities for students to celebrate their accomplishments.

(2) *Performance with adult overt guidance.* The teacher repeats the instructions aloud while the student is engaged in the task. The next time Missy is out of her seat, Ms. Kingston sits down with Missy and walks through the steps from rereading the instructions to raising her hand quietly.

(3) *Performance with overt self-guidance.* The student repeats the instructions aloud while engaged in the task. The next time Missy wanders around the class, Ms. Kingston asks Missy to return to her desk and start the self-instruction process. Shortly after, Missy says to herself, "First, I am going to reread the problem. Well, I know I have to add because it asks for a total. I don't know what to add, so I am going to ask Ms. Kingston to help me figure out what needs to be added. So now I raise my hand for help and wait quietly at my desk."

(4) *Performance with faded self-guidance.* The student whispers the instructions while engaged in the task. Later that week, while Ms. Kingston is helping Jonathan, she hears Missy say under her breath, "Well, I will reread the instructions. I guess I am supposed to write sentences with these words. I already wrote two sentences, but I don't remember the meaning of the last three words. Maybe they are in the book or maybe I should use the dictionary." Ms. Kingston turns to Missy and says, "Missy, you can share this dictionary with Jonathan to find the meaning of any words that you don't remember."

(5) *Performance with covert self-guidance.* The student silently repeats the instructions in his/her mind while engaged in the task. Soon, Ms. Kingston realizes she has not had to remind Missy to stay in her seat for several days. After giving the class a new assignment, she can observe Missy rereading the instructions and writing a list of what she knows and what she doesn't know. Out of the corner of her eye, she sees Missy's hand go into the air. When she walks up, Missy has written two questions for Ms. Kingston.

CBM has been shown to effectively promote self-regulation in the classroom for young children and students with exceptionalities (Robinson, Smith, Miller, & Brownell, 1999; Smith, 2002).

WHAT IS THE CONSTRUCTIVIST VIEW OF HOW WE LEARN?

Sociocognitive learning theories examine how people's thinking and behavior are affected by observing others. Constructivist learning perspectives consider a wider range of social influences, such as those stemming from individuals' culture, history, and direct interaction with others. In addition, constructivist learning theories extend sociocognitive theory by focusing not only on how people construct knowledge *within* themselves but also on how they co-construct knowledge with others. Although *constructivism* is a term used in different ways by philosophers and educators (Phillips, 2000), at the heart of **constructivism** is the idea that students actively construct their knowledge from their personal experiences with others and the environment (Simpson, 2001).

Constructivism

The idea that students actively construct their knowledge from their personal experiences with others and the environment.

Constructivist theories have been very influential in guiding educational practices and curriculum and have become the basis for the standards of teaching developed by education groups such as the National Council of Teachers of Mathematics (NCTM, 2000), the National Council of Teachers of English (NCTE, 1996), the American Association for the Advancement of Science (AAAS, 1993), and the National Research Council (NRC, 1996). In this chapter, we review two constructivist perspectives: individual constructivism and social constructivism.

ISSUES IN EDUCATION

Should classrooms be teacher-centered or learner-centered to promote learning?

Despite the widespread appeal and influence of constructivist learning theories in education, some experts claim that teacher-centered methods can be as effective or more effective than learner-centered methods. What do you think? A response to this question can be found at the end of the chapter.

Individual Constructivism

Individual constructivism, also known as **cognitive constructivism** or psychological constructivism, is largely inspired by the work of Piaget (1954), which we reviewed in Chapter 3. As its name suggests, individual constructivism focuses on how individuals construct knowledge in their minds (Greeno, Collins, & Resnick, 1996; Meter & Stevens, 2000). According to this learning perspective, individuals have a natural tendency to search for understanding as they interact with the environment. Social interactions are not heavily emphasized and are considered to be only one of the mechanisms that facilitate cognitive growth (Palincsar, 1998). A learner's discussion with a teacher or peer may create cognitive conflict, motivating the learner to try to resolve the disequilibrium by individually reconstructing his/her knowledge structures. In Piaget's terms, learners who interact with others and the environment construct knowledge by organizing, assimilating, and accommodating new information in their cognitive structures.

Cognitive Constructivism

A type of constructivism that focuses on how individuals construct knowledge in their minds.

According to this constructivist perspective, the teacher's role should consist of providing instructional materials and supportive learning environments that are conducive to students' individual knowledge construction rather than transmitting their own thoughts and beliefs (DeVries, 1997). This implies the following:

- Relinquishing control of student learning
- Allowing students' interests to drive the process of knowledge construction
- Letting students make intellectual choices for themselves

Due to its focus on individual meaning-making, some experts have referred to Piaget's constructivism as the first wave of *solo* constructivism (De Corte, Greer, & Verschaffel, 1996). The more recent cognitive views of learning that you read about in Chapter 6 are also good examples of individual constructivism. As you probably recall, the information-processing model describes precisely how the human cognitive system takes input from the environment, processes the new information (i.e., selecting, organizing, elaborating), and eventually constructs knowledge by integrating the new information with prior knowledge (Mayer, 2001).

Individual Constructivism in the Classroom

Individual constructivist learning methods are characterized by actively engaging the student in experimentation to develop meaningful understandings. Consequently, individual constructivists are likely to support inductive learning approaches such as discovery- and inquiry-based learning. When teachers apply these methods in the classroom, their role consists of asking thought-provoking questions, allowing enough wait time for students to reflect on the potential answers to the questions, and guiding students' knowledge construction by the use of skilled questioning (Henson, 1996).

Discovery Learning. Jerome Bruner (1961) is well known for proposing the discovery learning method in his paper "The Act of Discovery." **Discovery learning** happens when students are asked to try to find a solution to a problem or an explanation for a phenomenon rather than simply memorize rules and explanations presented by the teacher (Kato, Honda, & Kamii, 2006). An example of discovery learning in math would be to present students who have mastered single-column addition with a set of double-column addition problems and ask them to try to solve the problems before presenting them with a particular rule or strategy (Kamii, 2000). Here is an example of how discovery learning works in this classroom example:

Discovery Learning

Finding a solution to a problem or an explanation for a phenomenon rather than simply memorizing rules and explanations.

1. The teacher writes a double-column addition problem on the board and asks students to raise their hands when they find a way to get the answer.
2. The teacher encourages participation by praising students for raising their hands quietly, gives plenty of wait time until most students have raised their hands, calls on a student, and asks the student to explain his/her way of finding the answer to the problem.

3. Then the teacher writes the answer on the board and asks the rest of the class how many agree with the student's response.
4. For students who agree with the solution, the teacher inquires whether they used a different strategy and asks them to explain the alternative strategy to the rest of the class.
5. For those who disagree with the student's response, the teacher writes their proposed solution on the board and repeats the same process described above until the whole class agrees on one solution to the double-column addition problem.

There are two main types of discovery learning. First, *pure discovery*, which occurs when students are provided only with relevant supportive materials from which they are asked to discover rules or principles and guidance is nonexistent or minimal (Kirschner, Sweller, & Clark, 2006). Although it may be argued that pure discovery facilitates learning by allowing students to explore, manipulate, and test hypotheses (Bruner, 1961; Gagné, 1965; Wittrock, 1966), when students learn with pure-discovery methods, they often become lost and frustrated, and their confusion sometimes leads to misconceptions (Brown & Campione, 1994; Garnett, Garnett, & Hackling, 1995; Mayer, 2004).

Guided Discovery

Finding a solution to a problem or an explanation for a phenomenon with the help of teacher hints and directions.

The second form of discovery is called **guided discovery**, which occurs when the teacher provides hints and directions about how to solve a problem or answer a question to keep students on track. Our example on double-column addition is one of guided discovery because the teacher prompts students to explain their thinking and guides the class discussion until students find a solution to the problem.

Inquiry-Based Learning

A method in which teachers ask students to answer a thought-provoking question or problem and students formulate hypotheses, collect data to test their hypotheses, draw conclusions from their tests, and reflect on the original question and their thinking process.

Another example of guided discovery is the hypothesis–experiment–instruction method discussed in Chapter 7. Recall that in this method, the teacher poses a question that has a few potential answers. Students then offer individual responses to the question, which are tabulated on the board. Once all responses are tabulated, students are encouraged to explain their thinking to one another. During this process, each of the answer alternatives becomes more or less plausible as a consequence of the persuasiveness of students' arguments and students are given the opportunity to change their hypotheses accordingly (hypothesis stage). Next, the teacher conducts an experiment or simulation to demonstrate which of the alternative hypotheses was correct (experiment stage). Finally, the teacher instructs students about the principles underlying the phenomenon (instruction stage). This method is found to promote students' learning and motivation to learn (Hatano & Inagaki, 1991).

Guided discovery is a very efficient learning method. Teachers' direct instruction may take less time than guided discovery; yet, research finds that guided discovery promotes deeper learning than presenting students with the information to be learned (Moreno, Mayer, Spires, & Lester, 2001). Merely transmitting new information fails to encourage learners to actively construct their own understandings. On the other hand, promoting student exploration alone is not sufficient to produce meaningful knowledge construction. Exploration needs to be supplemented with appropriate guidance to help students learn what teachers intend.

FIGURE 8.9 **A screenshot of the *Design-A-Plant* program.**

Source: "With kind permission from Springer Science+Business Media: User Modelling and User Adapted Interaction, Lifelike Pedagogical Agents for Mixed-Initiative Problem Solving in Constructivist Learning Environments, 9, 1999, p. 1–44, James C. Lester, B. Stone, & G. Stelling.



Inquiry-Based Learning. John Dewey (1910) was probably the first educational psychologist to introduce the idea of **inquiry-based learning**, a method in which teachers ask students to answer a thought-provoking question or problem and students formulate hypotheses, collect data to test their hypotheses, draw conclusions from their tests, and reflect on the original question and their thinking process (Lashley, Matczynski, & Rowley, 2002). The role of the teacher in this case is to guide students' thinking and to monitor progress. In the inquiry-based learning program called *Design-A-Plant* (see Figure 8.9), middle school students are asked to learn about the characteristics of

plants that will help them survive in different environments (Lester, Stone, & Stelling, 1999). To this end, learners are presented with a set of plants with different environmental conditions (e.g., heavy rain, low sun, low nutrients in the soil) and start designing the root, stem, and leaves of a hypothetical plant.

A pedagogical agent named Herman tells the learner whether or not the answer is correct. A student may hypothesize that a plant needs deep roots in low-rain environments, to ensure reaching water deep down in the soil. After designing a plant with deep roots and receiving feedback, the student realizes that the plant will actually die in such an environment. Eventually, after conducting several plant design experiments, the student concludes that plants actually need short roots, to soak up any moisture from the surface of the earth. Students who learn with the *Design-A-Plant* program were found to outperform students who received identical information in a traditional textbook format on tests of problem-solving transfer (Moreno et al., 2001), showing the benefits of inquiry over direct instruction on meaningful learning.

Linn and Hsi (2000) reported similar results for a semester-long science course in which students learned science principles by examining situations involving temperature, heat, insulation, and conduction. Students' experiments included comparing the temperature of a metal and wooden desk, investigating whether soup stays warmer in a smaller or larger bowl, and testing whether it is best to use a metal or wooden spoon to stir a pot of boiling noodles. In this inquiry method, students are asked to induce abstract principles from their experiences with familiar objects. High school students who learned with this inquiry-based method outperformed a control group of students on tests of high-level thinking.

A useful guide for teachers who are interested in designing inquiry-based instruction is provided by Magnusson and colleagues (Magnusson & Palincsar, 1995; Palincsar, Magnusson, Marano, Ford, & Brown, 1998). As shown in Figure 8.10, teachers start by identifying a guiding question, such as "Why are plants green?" The main guiding question can also be followed by focus questions, intended to prevent students from getting off-track. An example may be the questions "In which conditions do plants develop yellow leaves?" "In which conditions do plants develop larger leaves?"

Next, students engage in inquiry by gathering information and making hypotheses based on their research. Then students conduct an investigation to test the alternative hypotheses, which can be done by consulting with experts, books, or other evidence (secondhand investigation) or by the students themselves (firsthand investigation). For instance, if students' hypotheses are that (1) plants are green because they get sufficient nutrients from the soil and (2) plants are green because they get sufficient sunlight, they can engage in a set of experiments in which they change the nutrient level and sunlight level of similar plants and observe the effects on the color of their leaves. Finally, students evaluate their hypotheses based on the results of their investigation and can either come up with a good answer to the guiding question or need to reinitiate the inquiry cycle by reframing their hypotheses and gathering more data. At the end of each inquiry cycle, students report their findings to the class.

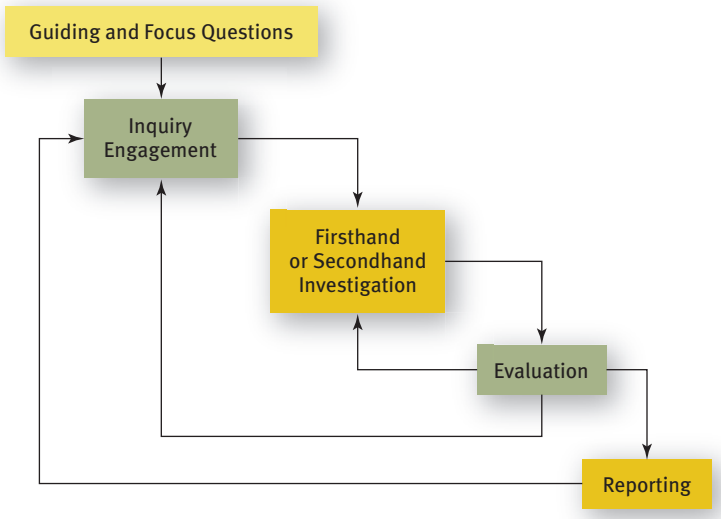


FIGURE 8.10 An inquiry-based learning model.

Source: Reprinted from Teaching and Teacher Education, 14, A. S. Palincsar, S. J. Magnusson, N. Marano, D. Ford, & N. Brown, Designing a community of practice: principles and practices of the GIsML community, p. 15, 1998, with permission from Elsevier.

Inquiry-based learning projects can be carried out in actual school laboratories or in virtual laboratories, using specialized software. The inquiry-based program *VLab* simulates a real experimental setting to support inquiry learning of chemistry concepts (Tsovaltzi, Rummel, Pinkwart, Schever, Harrer, Brown, & McLaren, 2008), and the program *SENSE* allows students to conduct virtual simulations to solve carbon monoxide pollution problems in their school community (Stanton Fraser et al., 2005). These virtual environments enable students to collect their own data using equipment that is similar to that used by scientists (Figure 8.11).

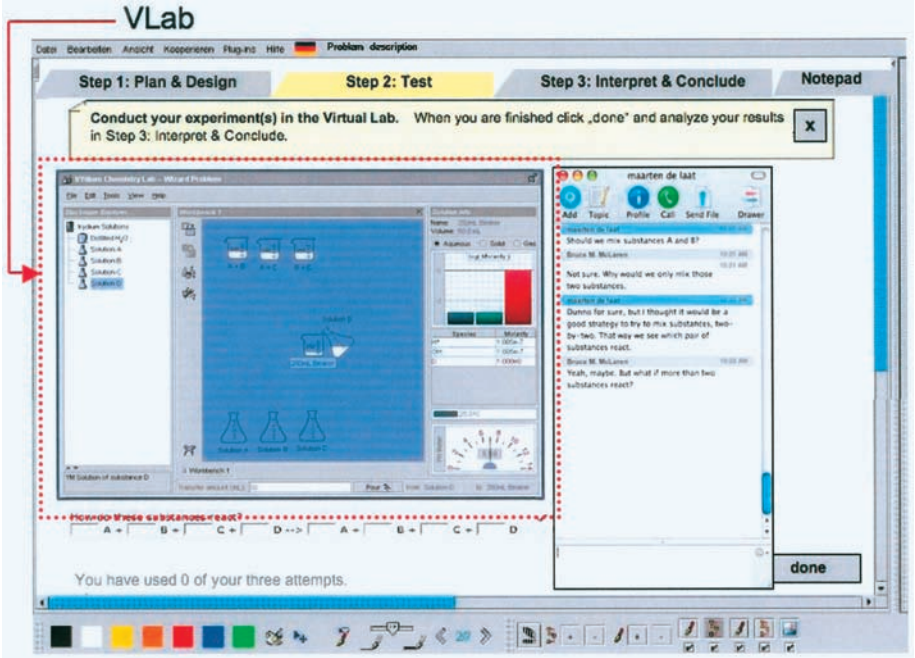


FIGURE 8.11 **A screenshot of the *VLab* inquiry-based environment, including virtual chemical substances, beakers, Bunsen burners, meters, and indicators.**

Source: Reprinted from Proceedings of the Workshop on 'Emerging Technologies for Inquiry Based Learning in Science', AIED-07, B. M. McLaren, N. Rummel, D. Tsovaltzi, I. Braun, O. Scheuer, A. Harrer, & N. Pinkwart, The Cochemex Project: Conceptual chemistry learning through experimentation and adaptive collaboration, pp.36–48, 2007, with permission from IOS Press.

Inquiry-based environments, however, are not just individual constructivist learning tools. Although students can be asked to learn by themselves, many inquiry-based software programs include the guidance of a tutor (Beal, Walles, Arroyo, & Woolf, 2007; du Boulay & Luckin, 2001), and teachers can also have students work collaboratively on a project (Hmelo-Silver, Duncan, & Chinn, 2007). Now that you are acquainted with the characteristics of inquiry learning, you are ready to read the classroom Case Study on p. 304.

Social Constructivism and Vygotsky

Social Constructivism

A type of constructivism where learners share individual perspectives with others to construct understandings together that would not be possible to construct individually.

In contrast to individual constructivism, which is concerned with how individuals develop new knowledge and skills, **social constructivism** emphasizes the role of social context in knowledge construction. According to this learning perspective, learners share individual perspectives with others to construct understandings together that would not be possible to construct individually (Gauvain, 2001).

This idea has also been called *distributed cognition*, which is the distribution of learning across many minds with the goal of drawing on multiple knowledge bases and ideas (Hewitt & Scardamalia, 1998; Kuhn, 2001; Palincsar & Herrenkohl, 1999). When individuals share their ideas with others, they enhance their understanding because they are encouraged to clarify and organize their own ideas, elaborate on what they know, discover flaws in their reasoning, and entertain alternative perspectives that may be as valid as their own.

In addition to these benefits, social constructivists believe that there are other advantages for having learners engage in social interactions, such as promoting their development to higher stages of cognitive and moral development, internalizing the symbolic and material tools of their culture, developing effective interpersonal skills, and becoming more motivated to learn. According to social constructivism, the teacher's role is to facilitate social interactions in order to promote students' knowledge construction and skill development (Fleming & Alexander, 2001). Social learning is said to be the first distinctive characteristic of social constructivist methods.

Social constructivism is largely based on the work of Vygotsky (1978), reviewed in Chapter 3. As you may remember, Vygotsky's constructivist theory is also called sociocultural theory. This is because Vygotsky not only emphasized the facilitative role of social interactions in the learner's cognitive growth but also considered learning to be situated in the learner's culture (Palincsar, 1998). Because learners bring different experiences, values, and knowledge from their home communities, social constructivists expect different students to construct different understandings from the same instructional materials (Rogoff, 2003).

Vygotsky's sociocultural theory has been further developed into situated learning theory, discussed in Chapter 7, which views learning as a phenomenon that cannot be separated from the context in which it occurs (Putnam & Borko, 2000; Rogoff, 1990). Recall the study in which Brazilian street children who were unable to solve simple mathematical problems on a math test successfully solved similar problems as they sold coconuts on the street (Carraher, Carraher, & Schliemann, 1985). These findings speak to the situated nature of learning and suggest that students should be given learning tasks in realistic contexts in which they must solve meaningful problems by using a variety of knowledge and skills. When students are presented with decontextualized learning activities, they are less likely to transfer what they learned to solve real-life problems because they do not see the relationship between the two (Perkins, 1999). Situated learning is said to be the second distinctive characteristic of social constructivist methods.

SOCIAL CONSTRUCTIVISM IN THE CLASSROOM

Social constructivist learning methods are characterized by using realistic problems, emphasizing multiple perspectives, and scaffolding learners through their zone of proximal development. When discussing Vygotsky's sociocultural theory in Chapter 3, we introduced the idea of teacher scaffolding within an apprenticeship model of learning. This section summarizes other social constructivist learning methods not covered in Chapter 3 and explains how scaffolding can also be used in the context of learning from peers. As you will see, many of these methods are good examples of distributed and situated learning.

Cooperative Learning

Social constructivist approaches emphasize the role of collaboration in learning (Bodrova & Leong, 2007; Hyson, Copple, & Jones, 2006). Therefore, one of the suggested teaching methods is **cooperative learning**, where small groups of students work together to make sense of new information or solve a new problem. It is important to note that cooperative learning is also supported by other learning theories:

Cooperative Learning

A method in which small groups work together to make sense of new information or solve a new problem.

- Individualistic constructivism suggests that interactions with teachers and peers can create the disequilibrium that is necessary for students to engage in cognitive growth.
- Cognitive views of learning suggest that group discussions may facilitate the rehearsal, organization, and elaboration processes, as students explain their thoughts to others and listen to new perspectives.
- Sociocognitive theories of learning suggest that cooperative groups can have a powerful influence on social and academic learning due to the motivational force underlying peer modeling and vicarious learning.

Cooperative learning has a long history in education and is becoming increasingly important as we move toward a world characterized by globalization and the need to coordinate efforts toward common goals. Teachers have the choice of structuring classroom activities so that students work individually, compete with each other, or work together. Although competition has been traditionally considered the best alternative to promote motivation and learning, research shows that cooperative learning methods can be superior when carefully designed (Johnson & Johnson, 1995a; Johnson, Johnson, & Smith, 1995). In terms of motivation:

- Students in cooperative learning groups spend significantly more time on-task (Johnson et al., 1995; Slavin, 1995).
- Students in cooperative learning groups are more likely to develop proacademic attitudes, such as feeling that their groupmates are interested in their attending class and working hard (Slavin, 1995).
- Students in cooperative learning groups are more likely to get along with peers from a different race, ethnicity, or socioeconomic status than students in control groups (Johnson & Johnson, 1995a).

A Case Study: DIVERSITY IN THE CLASSROOM

Gender Bias in an Eleventh-Grade Science Classroom

"When you turn on your faucet to brush your teeth in the morning, do you ever wonder, 'Where does my water come from?' or 'Will there always be enough clean water where I live?'" Mrs. Poploski asks her eleventh-grade earth science students. "This semester, we've learned about the water cycle and groundwater supply. Over the next few weeks, we'll be studying our own watershed. We'll be collecting data and entering it into a new computer software program. What's great about the software is that it allows us to simulate how different scenarios would affect our watershed. For example, we can track what would happen if our water supply was contaminated by waste matter from a local company. Or we can trace sources of pollution, such as pesticides from agricultural farms in Baton Rouge. I think you're going to learn a lot."

"Computer simulations are cool," Dylan exclaims.

"Yeah, it sounds like my favorite Nintendo game, *SimCity*, where you get to be the mayor of a city and solve problems. In *SimCity* I'm trying to solve global warming in Rio de Janeiro, 2047," Jeffery explains with enthusiasm.

"Oh, my older brother plays *SimCity*," Ryan adds.

"Well, I'm glad so many students have experience using computer simulations. With this software you'll be able to test your own hypotheses and see how even small changes can affect the whole water cycle. I've also invited two guest speakers from the city's water utility authority, Mr. Cordova and Mr. Archuleta."

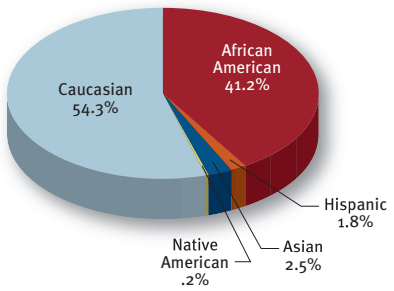
To learn the new software, Mrs. Poploski plans on having her students work in pairs. She hopes this will encourage collaboration and spark ideas. Her goal for the first lesson is to teach students how to manipulate one variable in the simulated watershed environment. She wants them to take notes and then be able to describe the effects of the variable on the watershed. Mrs. Poploski also plans to teach students how to visually represent the results of their simulation using graphs and tables.

At the beginning of the lesson, Mrs. Poploski says, "Raise your hand if you've had experience with computer simulations." Dylan, Jeffery, Ryan, Todd, Martin, Jimmy, Kyle, Oliver, and Abigail volunteer.

"I can't wait to do this," Jeffery interjects.

Demographics:
An overview of the students
LaSalle High School
East Baton Rouge Parish Public Schools, Louisiana
77.6% Students eligible for free and reduced lunch
.5% Students Qualify for ESL instruction
12.3% Students receive Special Education Services

Racial/Ethnic Groups



"It's gonna be sweet," Kyle adds.

"That's great, boys," Mrs. Poploski encourages. "Now, I'd like the rest of you to pair up with one of these students at a computer. It will be your job to take notes on how the watershed changes," she explains.

Next, Mrs. Poploski reviews independent, dependent, and controlled variables. She explains, "In this computer simulation, the independent variable will be the amount of water houses use, and the dependent variable will be the groundwater reserve. We'll observe how people's water use affects groundwater supply."

"I'm not sure I get it," Kirsten says.

"Can anyone help explain what we'll be doing today?" Mrs. Poploski requests.

"I have an example," Dylan offers. "Say, the average household uses 350 gallons of water per day. Now, what if 90 homes conserve water and only use 300 gallons per day? What difference would this have on the groundwater reserve?"

"That's a great example, Dylan. Can you calculate how much water would be saved?" she challenges.

"Let's see, 50 gallons times 90 households would be 4,500 gallons saved," Dylan calculates.

"Wow, what if they conserved water for a year?" Kyle asks with excitement.

"Let me use the computer's calculator," Oliver volunteers. "It's huge! 1,642,500 gallons saved a year, and that's only one neighborhood!"

"Now you're getting it. Kirsten, do you understand?" Mrs. Poploski asks.

"Umm. I guess so," Kirsten responds.

"Well, you'll be working with Oliver today, so I'm sure you'll figure it out together. Kirsten, you can take notes while he changes the variable," Mrs. Poploski explains. "I'd like you to simulate the different scenarios I've posted on the board," she says to the class. "I will circulate through the lab to answer any questions."

Midway through the lesson, the principal, Mrs. La Rochelle, comes to observe.

"We're learning about groundwater supply," Alyssa starts to explain.

"Mrs. La Rochelle, look at this graph," Martin interrupts. "See, this is what would happen to our groundwater reserve if a manufacturing company moved to East Baton Rouge Parish."

Watershed Simulation Assignment:

East Baton Rouge Parish has a population of 429,073 people. Each person uses an average of 122 gallons of water per day. Using computer simulation, what would happen to the groundwater supply over the course of one year if:

(A) each person used 110 gallons of water a day?
(B) East Baton Rouge Parish adds three apartment complexes, housing an additional 550 people?
(C) a manufacturing company moves to East Baton Rouge Parish and uses 1,500 gallons of water per day?

Please display your results using a graph or a table.

I can see the students are very excited about using the new software and many are able to explain the scientific concepts. I have a few questions:

(1) Why ae the majority of the boys using the computer program and the grils taking notes?

(2) Why do the girls seem to be hesitant to share their ideas with the class?

I want to make sure that we are providing a supportive learning environment for both genders. I'm happy to talk to you more about gender-inclusive teaching strategies,

Mrs. La Rochelle,

"Mrs. La Rochelle, how many gallons of water does our high school use?" Oliver asks.

"That's something you could find out by interviewing the school's maintenance supervisor. She conducts a monthly reading of the water meter," Mrs. La Rochelle suggests. "Alyssa was just about to explain what you're learning in class. Go ahead, Alyssa," she prompts.

"That's okay. Someone else can explain it better. I'm just taking notes anyways," Alyssa responds.

"I'd really like to hear about the lesson from you," Mrs. La Rochelle reiterates.

"Well, it's complicated. But what I notice is that if everyone in East Baton Rouge conserved only a few gallons of water a day, it would really add up over a year. Our groundwater supply is limited, because it's only replenished when rainwater seeps down through the soil to the aquifer," she explains.

"That's a great observation, Alyssa. I can see you're really thinking about conservation," Mrs. La Rochelle praises. "I'll visit your class again when you've entered the data on our local watershed."

Before leaving, Mrs. La Rochelle leaves a note with feedback for Mrs. Poploski.

Later that day, Mrs. Poploski meets with Mrs. La Rochelle.

"I'm so glad you came to observe. I didn't even realize most of the boys were using the software and the girls were taking notes. With all the enthusiasm to start the program, I was unaware that the girls were not actively participating. It's so good to have a second set of eyes in the classroom," Mrs. Poploski shares.

"Yes, it's helpful to have someone regularly observe classroom interactions," Mrs. La Rochelle agrees, "especially to pick up on gender biases. I'd be happy to observe over these next few months."

"That would be great. Also, do you know any women involved in local water issues who could be a guest speaker?"

"As a matter of fact, a good friend of mine works for the Water Conservation Commission. Her expertise is gray-water reclamation. I think she'd enjoy sharing her knowledge with the class."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?



Ray Pietro/Photonica/Getty Images, Inc.

In true cooperative learning, group members need to feel that they cannot personally succeed unless the other members of the group also succeed.

In terms of learning, a review of 46 research studies reported that students in cooperative learning groups outscore students who work competitively on problem-solving tasks (Qin, Johnson, & Johnson, 1995). On the other hand, the benefits of cooperative learning are highly dependent on the specific design of the cooperative learning groups and activities (Slavin, 1995).

How should cooperative learning be designed to be effective? There are five basic elements that make cooperation work: positive interdependence, individual accountability, face-to-face interaction, social skills, and group processing (Johnson & Johnson, 1999). Each of these elements is examined in this section. Johnson and Johnson (1999) note that "there is nothing magical about working in a group" (p. 68) and distinguish among cooperative learning groups, traditional classroom learning groups, and pseudo learning groups. In *cooperative learning*, students encourage each other to work together toward a common goal, individual performance is checked regularly, and all students' academic performance is higher than it would be if they had worked individually on the same activity.

In *traditional classroom learning groups*, students are assigned to work in a group but do not encourage each other to work hard toward a common goal. Instead, some members may work extremely hard, whereas others may do the minimum amount of work to get by. In *pseudo learning groups*, students are assigned to work in a group but they have no interest in doing so. Consequently, students' academic performance is likely to be lower than it would be if they had worked individually on the same activity.

The Five Essential Elements of Cooperative Learning. Teachers may create pseudo or traditional classroom learning groups unintentionally. To avoid this potential problem, the following five essential elements are recommended when designing cooperative learning activities:

Positive interdependence. Group members need to feel that they cannot personally succeed unless the other members of the group also succeed. Positive interdependence can be established by creating mutual goals, joint rewards, and complementary roles (Kagan, 1994). Table 8.2 lists 12 potential roles for members in cooperative groups. Teachers can model these roles and later assign them to different group members to increase interdependence and learning.

The type and number of assigned roles will depend on the learners' developmental age and learning objective. Take the case of Mr. Aragon's social studies class, where students work in small groups to present one part of the Bill of Rights. Each group has four members: One is in charge of making sure everyone has an equal opportunity to share their ideas, another is in charge of checking that everyone is learning, a third member keeps track of all ideas generated by the group, and the final member is in charge of identifying one positive contribution from each member of the group.

Individual accountability. To avoid the typical problem in traditional classroom learning groups, where some students do most of the work while others do very little, teachers should have individual assessments in addition to group assessments. In this way, students are held accountable for their own performance and will be more likely to contribute to the goals of the group. For example, in addition to evaluating the entire group on a common project, Ms. Duff has each group member write about what they contributed to the group, what they learned, and how they would improve the project.

TABLE 8.2

Twelve potential roles for cooperative group members.

STUDENT ROLE	DEFINITION
Checker	Makes sure that all members are learning.
Coach	Explains academic content as needed.
Encourager	Encourages reluctant or shy members to participate.
Gatekeeper	Makes sure that no member is dominating the group.
Materials monitor	Prepares and returns materials for the group activity.
Praiser	Recognizes the accomplishments of group members.
Questions monitor	Makes sure that all questions are addressed.
Quiet captain	Makes sure that noise is minimized.
Scribe	Writes down group ideas; summarizes discussions.
Task monitor	Makes sure everyone is on-task at all times.
Time monitor	Keeps track of time and progress.
Presenter	Reports the group findings to the class.

Face-to-face interaction. Interaction is the mechanism by which cooperation works. Clearly, having a group of uninvolved or silent students sit together in the classroom will not lead to increased academic learning. Therefore, effective cooperative learning requires members to actively assist, support, and encourage the efforts of the group. To maximize the likelihood of meaningful and rich interactions, teachers should design their cooperative learning groups to be relatively small and heterogeneous in gender, cultural and language background, and ability. Mr. Markett designs his classroom so that student desks are in groups of four and all group members are facing each other. He then assigns seats so that there are equal numbers of English language learners, boys and girls, and balanced abilities.

Groups of three or four students are found to be especially effective (Hatano & Inagaki, 1991; Lou et al., 1996). In addition, recall from Chapter 2 that, in general, it is recommended to create mixed- rather than same-ability groups (some form of temporary ability grouping can promote learning, especially in the areas of mathematics and reading). The question of whether all students benefit from mixed-ability groups is still not clear. On the one hand, some studies show that both high- and low-ability students benefit from cooperative learning (Stevens & Slavin, 1995; Webb & Palincsar, 1996). On the other hand, a few studies show that high-ability students may not gain and may even lose ground from working in mixed-ability groups (Hogan & Tudge, 1999; Webb, Nemer, & Zuniga, 2002). In addition, high-ability students may dominate discussions and blame those who contributed little to the group efforts when the group does not succeed, and low-ability students may refrain from asking for help or participating (Kumar, Gheen, & Kaplan, 2002; Webb et al., 2002). Therefore, teachers need to carefully monitor the dynamics of mixed-ability groups and make appropriate changes when groups are not working.

Social skills. Perhaps one of the most challenging tasks for a teacher is to teach and monitor students' appropriate use of interpersonal skills when interacting with other group members. These skills are necessary for effective group functioning and will need to be

Name:

Group members:

Group Evaluation

Rate how your group worked together today.

	Strongly disagree	Disagree	Sometimes agree	Agree	Strongly agree
1. My group was on task	1	2	3	4	5
2. My group used reading strategies we learned in class	1	2	3	4	5
3. My group used the academic sentence starters to talk about the story	1	2	3	4	5
4. Everyone in my group helped complete the assignment	1	2	3	4	5
5. Everyone's opinion was respected	1	2	3	4	5
6. Everyone was given a chance to speak	1	2	3	4	5

What do you think your group did very well today?

What do you think your group needs to do differently next time?

FIGURE 8.12 **In which ways might students' reflection on group processing promote the development of self-evaluation skills?**

explicitly taught and practiced before groups are asked to tackle a particular task. A teacher may model group decision making by having the entire class brainstorm ideas while she writes them on a graphic organizer that lists the pros and cons of each idea before having small groups make decisions about their project topics.

Group processing. Finally, effective cooperative learning requires group members to monitor the group processes as they develop. This element serves two purposes. First, it promotes students' self-regulation by fostering an important metacognitive skill—to evaluate and reflect on learning processes and outcomes. Second, it helps students learn about the dynamics of group work and its relationship to learning. A teacher may give students the last five minutes of class to write a brief essay on how their group is making progress toward goals, what they are doing well, and what they need to improve or may provide students with a questionnaire such as the one shown in Figure 8.12, in which students need to rate their group work on a predetermined scale.

Classroom Tips: How to Make Cooperative Learning Work lists the five essential elements of cooperative learning just reviewed with corresponding classroom tips (Johnson & Johnson, 1999).

Teachers report being attracted to cooperative learning because it allows them to teach both academic and social skills. Yet research suggests that very few teachers include the five essential cooperative learning elements that are necessary to ensure the learning of such skills. In one research study, only 1 of 21 teachers reported using the five elements (Antil, Jenkins, Wayne, & Vadasy, 1998), and similar results were found in a study of 216 highly regarded elementary and middle school teachers, whose actual implementation of the five elements was significantly lower than expected (Lopata, Miller, & Miller, 2003). In addition, critics of cooperative learning argue that introverts feel pressured and uncomfortable working with others, high-ability students tend to dominate the group's agenda, socializing is likely to take precedence over learning, and too much responsibility for the material to be learned is placed in students' hands (Randall, 1999).

On the positive side, each of the cooperative learning limitations can be addressed when an effective, prepared teacher uses this method in an appropriate way. Several studies show that incorporating positive interdependence and individual accountability in cooperative learning produces significant learning gains for students in grades 2 to 12 in all subjects and school types (Ellis, 2005; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Slavin, Hurley, & Chamberlain, 2003). When cooperative learning does *not* include the above two elements, no positive effects on learning are found (Klein & Schnackenberg, 2000).

CLASSROOM TIPS

How to Make Cooperative Learning Work

Essential Element	Classroom Tips
Positive interdependence	Ask students to research different aspects of a topic and then teach them to each other (mutual goals).
	Give a reward to all students whose average group quiz scores meet a preset standard (joint rewards).
	Assign a moderator role, a summarizer role, a scribe role, and a checker role to different group members (complementary roles).
Individual accountability	Give individual tests to all group members.
	Let students know that any group member can be called to explain the work of the group.
	Have each group member explain what he/she has learned to another group member or the group as a whole.
Face-to-face interaction	Create groups of two to six members maximum, with fewer members (two to four) for complex activities or activities that need to be completed in short amounts of time.
	Create groups of approximately the same percentage of high and low achievers, boys and girls, and cultural and linguistic backgrounds.
Social skills	Explicitly teach how to make decisions together, communicate with each other, trust each other, and manage conflicts as their arise.
Group processing	Use "check points" during group activities, where students need to stop and reflect on questions such as "How are we doing as a group?" "What is working well?" "What are some things that we may need to change to work better?"

Cooperative Learning Formats. In this section, we examine some of the most well-known cooperative learning formats, including structural approaches, student teams achievement divisions, jigsaw, group investigations, structured controversies, cooperative scripting, and cooperative integrated reading and composition.

Structural approaches. This cooperative learning approach consists of establishing a structure for learning that can be adapted to a variety of tasks (Kagan, 1994). In the think–pair–share structure, students are grouped into pairs before a lesson begins. Then the teacher presents a lesson that may include lecture, demonstrations, and some hands-on activities. Next, the teacher writes a question on the board that requires students to elaborate on the lesson. Each student first thinks about the answer to the question individually and then pairs with a partner to share their answers. Finally, all pairs share their answers with the class in a whole-class discussion.

Student teams achievement divisions (STAD). Slavin and colleagues proposed the STAD method of cooperative learning. In this method, students are arranged into groups of four to six members, with a mix of abilities, backgrounds, and gender. The teacher starts by introducing the group activity to the class as a whole, allowing for questions and discussion. Then students break into groups and study together until all group members are able to individually accomplish the task to be learned. At this time, each group member takes a quiz on the material without the help of any other group member.

Finally, the teacher computes an improvement score for each student and adds individual student improvement scores to get a team improvement score. To obtain individual improvement scores, individual quiz scores are compared to students' own past averages. A teacher may come up with the following grading system: She gives 1 point for each point that the student's quiz score exceeds his/her own past average

up to a maximum of 10 points, she gives 10 points to students who had perfect quizzes, and she does not give improvement scores lower than zero. Groups who get the highest team improvement scores are then rewarded with certificates, recognition in school newsletters, and so on. A year-long study in ninth-grade mathematics showed that students who learned with the STAD method improved significantly more than those who learned with individual learning methods (Slavin & Karweit, 1984).

Jigsaw. This cooperative learning structure was originally proposed in the 1970s by Aronson and colleagues to bring students of different ethnic backgrounds together (Aronson & Bridgeman, 1979). The hope was that giving students equal status in cooperative groups would reduce prejudice. In a jigsaw arrangement, each group member is required to learn part of the material that needs to be learned by the whole group. Different group members become experts in different topics and later teach what they have learned to the rest of the group.

In a more recent version of this model, called *jigsaw II*, the expert members of each cooperative group meet in an expert group to check on their understanding of the topic and decide on how to teach the learned information to their peers. Once students teach their respective content to their group peers, all students are assessed individually and earn points, rewards, or recognition for their respective group (Aronson, 2000). The jigsaw technique is recommended when the information to be learned can be divided equally among group members (Aronson & Patnoe, 1997) or when projects require a wide range of skills and every group member is likely to have something to contribute to the group success (Cohen, 1994; Schofield, 1995). However, a recent study suggests that students may need explicit teaching skills training to be able to effectively teach what they have learned to their peers (Moreno, 2009). Students who learned science in jigsaw groups were less likely to produce elaborative explanations and co-construct knowledge that students who learned in traditional cooperative learning groups. Jigsaw group members also scored significantly lower on a problem-solving posttest than their counterparts.

Group investigations. This approach to cooperative learning combines independent thinking and group work (Sharan & Sharan, 1992). Teachers choose a general topic from the curriculum and split it into subtopics. Students then form their own two- to six-member group, choose a subtopic from the general topic that the entire classroom is studying, break the subtopic into individual tasks, perform the tasks, prepare a group report, and make a presentation about their investigation to the whole class. Research shows that students who participate in group investigations outperform comparable students who participate in whole-class instruction on tests of factual information and transfer (Lazarowitz & Karsenty, 1990; Sharan & Shaulov, 1990).

Structured controversies. Johnson and Johnson (1995b) suggested this cooperative learning method to help students express disagreement, develop argumentation skills, and learn about different perspectives on an issue. In structured controversies, teachers select a controversial issue for which there are at least two very different and controversial positions. Then teachers form groups of four students, which are subdivided into two pairs. One pair of students is asked to take one position about the issue and the other pair is asked to take the opposing position. The goal of the structured controversy is to have students research the assigned position, learn about the issue from the point of view of the assigned position, and prepare a persuasive presentation in which they engage in an open discussion with the members of the opposing position. The pairs then switch positions and present the opposing arguments. Once both pairs have presented both arguments, they come together to develop a report as a group. For structured controversies to be effective, it is important to create an environment of respect and to emphasize that criticisms should not be directed to people but rather to specific arguments.

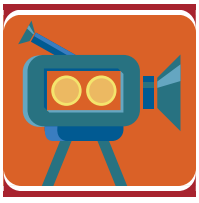
Cooperative scripting. This is a study method in which students work in pairs and take turns verbally summarizing sections of material that need to be learned (O'Donnell & Dansereau, 1992). While one student summarizes a section of the material, the other

student listens carefully and corrects any errors or points out any omissions. Then roles are switched and the process continues until all the material is reviewed. Compared to students who summarize on their own or simply read the material, those who use cooperative scripting learn and remember more of the academic material, with the larger learning gains happening for the sections where students summarize rather than listen to their partners (O'Donnell, 2000).

Cooperative Integrated Reading and Composition (CIRC). CIRC is a comprehensive program for teaching literacy in the upper elementary grades. In this method, students form four-member groups that engage in reading; summarizing; predicting; writing; and practicing spelling, decoding, and vocabulary use. Additionally, they may engage in the production of a group book by writing drafts, editing each other's work, making revisions, and preparing the final draft for publication. Students who used the CIRC program improved their scores on standardized reading and language tests (Stevens, Madden, Slavin, & Farnish, 1987; Stevens & Slavin, 1995).

Get Connected!

VIDEO CASE ASSIGNMENT. . . Strategies in Action: Language Arts, Grades K-2 (Tab 2)



Go to your WileyPlus course and view the video. While watching the video, think about how Ms. Cheong utilizes social constructivist methods. Be prepared to discuss how she capitalized on multiple student perspectives, scaffolded student learning within the zone of proximal development, and used student collaboration.

Tutoring and Reciprocal Teaching

In the tutoring method, students who mastered a topic help others who have not yet mastered it. Peer tutoring can happen within the same class or between classes, such as when older students are asked to tutor younger students (Brown & Campione, 1994; Kermani & Moallem, 2001). Similar to the cognitive apprenticeship method reviewed in Chapter 3, tutoring is consistent with Vygotsky's idea that more capable others are key agents in promoting the cognitive development of students. Peer tutoring can lead to greater academic gains than more traditional whole-class instruction (Baker, Gersten, Dimino, & Griffiths, 2005), with both tutors and tutees showing benefits from this teaching method (Biemiller, Meichenbaum, Shany, & Inglis, 1998; Davenport, Arnold, & Lassmann, 2004; Fuchs, Fuchs, Mathes, & Simmons, 1997).

Tutoring is also helpful in promoting cooperation among students, enhancing social skills, and reducing behavioral problems in the classroom (DuPaul, Ervin, Hook, & McGoey, 1998; Greenwood, Carta, & Hall, 1988). However, experts recommend that teachers first provide a good structure so that students can tutor their peers effectively (Fantuzzo, King, & Heller, 1992). The Peer-Assisted Learning Strategies (PALS) project has the following structure:

1. Students are ranked by reading ability.
2. The rank listed is divided by 2.
3. The first student in the top half of the list is paired with the first student in the bottom half of the list.
4. The second student in the top half of the list is paired with the second student in the bottom half of the list.
5. The procedure continues until all students are paired (Fuchs et al., 1997).

In PALS, the stronger reader reads aloud for about five minutes and is followed by the weaker reader. In addition, the weaker reader is asked to summarize paragraphs and make predictions about what will happen next in the text with the scaffolding of the stronger reader.



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How would a sociocognitive view of learning explain the many benefits of tutoring?

To provide even more structure to this method, tutor students can be provided with scripted questions, such as "Can you describe what the paragraph you just read is about?" "What do you think will happen next?" (King, 1999). Not surprisingly, tutoring is much more effective when teachers model the tutoring method by showing how to create a good relationship with the tutee, how to break a task into smaller steps, how to give feedback, and so on. (Dufrene, Noell, Gilbertson, & Duhon, 2005). Peer tutoring has been especially effective with special-needs students (Kunsch, Jitendra, & Sood, 2007; Mastropieri, Scruggs, Spencer, & Fontana, 2003).

Reciprocal teaching is based on the cognitive apprenticeship and modeling methods and originally designed to help students improve reading comprehension (Palincsar & Brown, 1984). It is a constructivist method because it consists of discussions between teachers and students with the goal of constructing a joint understanding of text. Reciprocal teaching attempts to promote learning by means of the comprehension strategies of summarizing, generating questions, clarifying, and predicting (Palincsar & Klenk, 1991).

Reciprocal Teaching

A method aimed at promoting comprehension by means of summarizing, generating questions, clarifying, and predicting.

In reciprocal teaching, two to four students work with the guidance of the teacher. The teacher first models to the group each one of the comprehension strategies by summarizing the content of the text, asking questions about the main ideas of the text, clarifying portions of the text that are particularly difficult, and predicting what are possible pathways in the following paragraphs. Once the whole procedure is modeled, the teacher gradually shifts the responsibility of following the same four strategies to the students. Students practice the comprehension strategies with each other; the teacher's responsibility is to scaffold students with hints and reminders and to provide informational feedback during practice (Brill, Galloway, & Kim, 2001). The teacher continues to fade her involvement with the group and eventually intervenes only to monitor their performance from time to time. Research with students of varied ages and with special-needs students shows that reciprocal teaching is an effective method to promote learning (Palinscar & Klenk, 1992; Rosenshine & Meister, 1994).

Communities of Learners

Community of Learners

A method in which students not only co-construct knowledge but also work together in the design of their learning environment and curriculum.

Another social constructivist learning method is to create a **community of learners** (Brown, 1992; Brown & Campione, 1994). This approach goes beyond cooperative learning settings because students not only co-construct knowledge but also work together in the design of their learning environment and curriculum. In a science class, students may work in groups of mixed ability to design their own experiments, or, in a dance class, students of different backgrounds may work to create a performance for a cultural festival, with each student being responsible for accomplishing a specific task and sharing what he/she has learned with the other students.

Due to the emphasis on student autonomy and the number of social interactions required by this method, it is considered more appropriate for older students with well-developed self-regulatory skills. Specifically, a community of learners' model includes the following components (Brown & Campione, 1994):

- Building a community of discourse with a structure that enables constructive discussions and criticisms among group members
- Participating in multiple zones of proximal development and allowing students to become tutors for some and tutees of others
- Seeding or suggesting ideas to the community that may eventually migrate and become appropriated by the community
- Taking individual responsibility for part of the work involved in learning
- Sharing the gained expertise with the community members
- Participating in the rituals and procedures adopted by the community

As you see, the main characteristics of a community of learners are that teacher and students work together to help everyone learn and respect the diversity of interests, beliefs, and knowledge that exists among the community members.

Problem-Based Learning

In the **problem-based learning** approach, students work in collaborative groups to solve a complex ill-defined problem (Hmelo-Silver, 2004). The teacher typically presents students with an interesting problem and guides them during the problem-solving process. The steps included in problem-based learning are very similar to those presented in Chapter 7. Specifically, students need to identify the problem, create representations of the facts and issues of the problem, generate hypotheses about potential solutions to the problem, engage in a discussion about the gaps in their understanding, devise a plan to learn about the identified gaps, and apply their constructed knowledge to solve the problem. An important step in this method is to ask students to reflect on what they learned from the experience.

Problem-Based Learning

A method in which students work in collaborative groups to solve a complex, ill-defined problem.

Problem-based learning is an increasing trend in education. In medicine, problem-based learning involves presenting rich sets of patient data to medical students and having them analyze and produce diagnosis with the guidance of a facilitator (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006). In teacher education, it may involve presenting pre-service teachers with video cases of expert teachers as models to help think about how to adapt instruction to specific classroom cases (Derry et al., 2006). In the classroom, teachers can provide students with scientific problems and the research materials and tools that are necessary for students to reach a conclusion (Linn & Slotta, 2006).

Research suggests the following conditions for effective problem-based learning. First, the problem chosen must be complex, ill defined, interesting, and requiring the integration of knowledge from more than one domain (Barrows & Kelson, 1995; Kolodner, Hmelo, & Narayanan, 1996). Asking students to design a fund-raising program for their school is an example of a problem that is complex and ill defined; likely to be interesting due to the potential benefits to students' school; and requiring the use of skills from language arts, social science, and math.

Also, effective problem-based learning requires that the teacher effectively guide and scaffold students by combining modeling, questioning, prompts, and hints without giving students the final answer (Hmelo-Silver, 2002; Quintana et al., 2004). Scaffolding reduces the complexity of the learning task and supports students' learning of both how to do the task and why the task should be done that way (Hmelo-Silver, 2006). As in the cognitive apprenticeship model and the reciprocal teaching method, effective teachers fade their support gradually but keep monitoring students' progress throughout the problem-solving cycle.

Classroom Discussions

Traditional classroom discussions from elementary school to college are typically characterized by the following pattern: The teacher *initiates* a discussion by asking a question, one or more students *respond* to the question, and the teacher *evaluates* students' answers. This is called the **IRE pattern**, which stands for *initiate, respond, evaluate* (Alvermann, O'Brien, & Dillon, 1990; Cazden, 1988). Although the IRE pattern may be used to promote knowledge construction and higher-order thinking, it is generally used as the default classroom discussion pattern for recitation purposes, such as when a teacher quizzes students about a topic and later elaborates on students' responses or introduces new information related to the topic.

IRE Pattern

The classroom discussion method in which the teacher *initiates* a discussion by asking a question, one or more students *respond* to the *question*, and the teacher *evaluates* students' answers.

Classroom discussions, however, can be designed to help students build new knowledge rather than recite previously transmitted information. A challenge of classroom discussions is to provide enough structure to help students achieve academic goals yet allow all students to contribute safely to the co-construction of knowledge.

Effective constructivist discussions are those where teachers and students work together to establish the norms for participating in such discussions, develop the agenda

for the discussions and the methods to evaluate the outcomes of the discussion, and reflect on the outcomes of the discussions (O'Flahavan & Stein, 1992; Wiencek & O'Flahavan, 1994). As you will read in the chapters on motivation and classroom management, students who construct group participation norms and participate in the selection of topics and activities are more likely to be motivated to learn than their counterparts (Chinn, Anderson, & Waggoner, 2001).

What is the role of the teacher in constructivist discussions? O'Flahavan and Stein (1992) recommend that teachers facilitate the materials and context for the discussion, arrange the groups and seating, monitor the progress of the discussion, and help students evaluate how well the norms and discussion are working. Teachers monitor and support learning by using coaching and scaffolding methods. A teacher may coach students by helping them get organized and started on the discussion, allowing the students to work together for 15 minutes, and joining the group at the end, to coach them as they reflect on their outcomes.

The teacher may scaffold students by taking the role of the framer (directing attention to relevant information or issues) or the role of the elicitor (promoting further elaboration on information). Classroom discussions are motivating when discussions revolve around authentic topics, when teachers' participation is not too much or too little, and when students' ideas are valued by the teacher and incorporated into the classroom discussion (Brown, Collins, & Duguid, 1989; Calfee, Dunlap, & Wat, 1994; Nystrand & Gamoran, 1991). Importantly, teachers should assess students' prior knowledge, to ensure that they will have sufficient information to support their participation in the classroom discussion.

Informal Learning Experiences

Constructivist views of learning recognize that classroom learning constitutes only a small portion of students' experiences. Because students spend less than a third of their day at school and only about half the year attending class, the amount of learning happening in settings outside of the school, also known as *informal learning*, is very significant.

Informal learning is a lifelong process that can take a variety of forms, such as when we acquire attitudes, skills, and knowledge from work, play, and surfing the Internet. Most informal learning originates incidentally and therefore is not pedagogically planned according to a curriculum. Nevertheless, there are many different informal learning scenarios that teachers can use to complement the more structured classroom learning scenario, including field trips. Some examples include the following:

- Libraries
- Art, science, and natural history museums
- Zoos and botanical gardens
- Industrial and agricultural sites
- Places of ecological interest (e.g., nature sanctuaries)

What are some conditions that informal learning experiences need to meet to truly enrich the learning of important school topics?

Each one of these informal learning settings will offer different activities; yet they all include good opportunities to engage in social interaction, manipulate a variety of cultural and environmental tools and artifacts, and share the cultural values of the community. Before reading the next paragraph, answer the question in the caption of the photo on this page.



Arthur Tilley/Taxi/Getty Images, Inc.

Research on the effectiveness of out-of-school learning such as field trips suggests that students' learning depends on three factors:

1. The quality of the planning and organization of the experience
2. Students' perceived value for or interest in the experience
3. The relevance of the experience in relation to the school curriculum (Griffin, 2004)

Teachers need to carefully choose field trips that are likely to enrich the learning of important school topics. In addition, teachers should overtly communicate the educational value and rationale for the trip. Otherwise, students may view field trips as a welcome break from school or an opportunity to socialize with their peers

(Falk & Dierking, 2000). Teachers should plan relevant instructional activities and methods to manage students' behavior and assess students' prior knowledge first, to ensure that they can appropriately build knowledge with the novel experience (Smith & Carr, 2001).

The success of informal learning opportunities depends on a number of factors, some involving the teacher's planning and the support of other facilitating personnel and others involving the interest, motivation, and background of the participating students. Teachers should have a clear understanding of whether and how the out-of-school experience will positively affect students' learning or motivation before deciding to engage in such activities.

This section concludes our discussion of sociocognitive and constructivist learning theories. Before learning about diversity in social and constructivist learning, read Classroom Tips: How to Use Sociocognitive and Constructivist Principles, which summarizes some principles from this chapter with corresponding classroom examples.

CLASSROOM TIPS

How to Use Sociocognitive and Constructivist Principles

Principle	Classroom Examples
Clearly describe the behaviors that are desirable or undesirable and their consequences. Create a learning environment in which students are able to develop clear expectations.	From the beginning of the schoolyear, Mr. Booker spends significant time providing examples of positive and negative behaviors in his classroom and consistently applies corresponding consequences to all students.
Take into consideration learners' self-beliefs. Consider students' self-efficacy beliefs and expectations for success when examining the effectiveness of social learning.	Mrs. Napper is concerned that Jenny is falling behind in reading, despite her many attempts to use peer modeling. In a one-on-one meeting, Jenny tells Mrs. Napper, "Everyone struggles with reading in my family." Mrs. Napper decides to give Jenny a few reading tasks in which she can experience success.
Teach important knowledge, skills, and attitudes by modeling. Use effective models to teach students how to think and behave in the classroom.	After noticing how well Martin had planned his individual earth science project, Ms. Kinnel assigned Martin to the role of leading his group during the planning phase of their health science project.
Promote students' self-regulation. Help students set realistic goals, select appropriate strategies to meet their goals, and monitor and evaluate their own learning.	Throughout a two-week unit, Mr. Hixon helps his students develop self-regulation by asking them to (1) describe the steps needed to accomplish their projects, (2) write down a daily plan of action, and (3) reflect on what they think is going well and in what areas they need to improve.
Promote students' active construction of understandings. Allow students to form and test their hypotheses either by physically interacting with their environment or by interacting with others.	Ms. Flarret asks her class to create a working model for a renewable energy source. Tom lives on a ranch and knows a lot about windmills. He thinks that he can come up with a model for a wind collector that won't harm birds by building the windmill arms out of paper instead of metal. After experimenting, he discovers that the paper tears too easily, so he starts experimenting with other materials.
Give students opportunities to think collaboratively with teachers and peers. This is the crux of social constructivism and an effective pathway to enhance students' understanding, entertain alternative perspectives, and develop social skills.	Mrs. Trenton's fourth-grade class has just finished reading *The Giving Tree*. She discusses with the class the possibility of creating a project in which they give back to the school or community. As a class, students brainstorm different issues in the school, make a list of potential strategies to help with the issues, and prioritize the issues to decide which project they should undertake.
Engage students in authentic experiences within communities of learners. Communities of practice can provide meaningful learning experiences for older students while promoting the value of diversity in abilities and perspectives.	Mr. Rasson has students in his business class spend the last month working in small groups to create their own business. Group members bring different experiences and abilities to the project and collaborate in the design, marketing, and implementation of the business. All actual money made from the project is donated to a charity of the group's choice.
Embed sufficient structure, guidance, and monitoring when using constructivist methods. Constructivist learning methods can be very demanding, especially for students who lack significant prior knowledge or experience with constructivist methods.	Ms. Alonso likes to design webquests for a variety of academic activities to help her fifth-graders develop inquiry skills. She finds that asking her students to reflect on their thought processes aloud or in writing periodically during the project allows her to monitor their thinking for misconceptions without dictating their thinking.

DIVERSITY IN SOCIAL LEARNING AND CONSTRUCTIVIST LEARNING

Although sociocognitive and constructivist theories of learning provide us with useful instructional guidelines for all students, it is important to understand how these guidelines may need to be adapted to serve particular student needs. This section discusses some sources of diversity that may arise in social and constructivist learning.

Diversity in Social Learning

Sociocognitive theory recommends peer modeling and publicly recognizing good student work (both as a direct incentive to the student and as a vicarious incentive for their peers), and social constructivism recommends engaging students in social interactions to promote learning. However, it is important to be sensitive to personal and developmental diversity in social learning situations. Some students will be shy or introverted, some will feel uncomfortable working in groups, and others will display good peer-group and teacher interaction but be apprehensive when asked to perform in public (e.g., by showing their work, performing skits or demonstrations, or reading their poetry out loud). For many adolescents, posting their exemplar work on a bulletin board may be embarrassing, and this negative effect may not justify the potential vicarious effects on the student's peers.

Teachers should create a supportive, nonthreatening learning environment for all students. Although some students may need only a little encouragement to work with others or additional preparation time to perform in front of the class, others may prefer alternative forms of learning and demonstrating their learning. Sometimes direct instruction in social skills or a collaborative effort between teachers and parents will be needed, such as the case of students with emotional disturbances (Sheridan, Kratochwill, & Elliott, 1990). Table 8.3 summarizes some strategies for helping shy and withdrawn students learn in social settings (Dupper, 2003).

Diversity in Learning from Modeling

Young children will be less likely to pay attention to a model for long periods of time or know which aspects of the information being modeled are relevant (Broderick & Blewitt, 2006). Consequently, if you teach young children, consider presenting short, simple demonstrations of the behavior to be learned and guide their observation to what is important during modeling.

TABLE 8.3

Helping shy and withdrawn students learn in social settings.

- Learn about students' interests and use them as bases for conversations or social learning activities.
- Assign students a partner or promote their friendship with a peer who is popular and engages in frequent contact with peers.
- Help shy students set social development goals and assist them by teaching social skills.
- Provide students with a designated role that will cause them to interact with others productively.
- Teach students "door openers" for greeting other students (e.g., "Would you like to be my partner?" "Can I play, too?").
- Take the time to interact with students every day, listen carefully, and respond to what they share with you.
- Use reading materials that model how shy individuals can become more outgoing.

Source: Brophy (1996).

Models that are similar to themselves can be especially persuasive for minorities, students from lower-income families, and girls, because their exposure to professionally successful models is typically limited to middle- and upper-income European-American males (Howe, 1994; Lagerwey, Phillips, & Fuller, 2003).

Students at risk are also less likely than other students to have been exposed to successful academic models with which they can identify. Studies of disadvantaged youth suggest that one of the reasons that they have difficulty solving their personal problems is the lack of an effective adult role model (Ogbu, 1987). Although teachers can be powerful models, they will not share the same gender, ethnicity, or socioeconomic background with all students.

Therefore, it is important to try to expose students to a variety of successful real and symbolic models that are representative of students' ethnicity, gender, and socioeconomic background. You can search for good models in the community and invite them to do a presentation in your classroom, or you can even initiate a mentoring program. Mentors can be especially motivating and helpful for students who come from low-income backgrounds and who lack positive role models (Johnson, 2006). A fundamental difference between a model and a mentor is that a model might or might not be a mentor, depending on the quality of the relationship with the student. Mentors typically develop a personal relationship with the student over an extended period of time. As a pre-service teacher, you are likely to have been assigned a teacher mentor through an induction program.

In addition, teachers need to examine individual differences in self-beliefs when planning to use modeling. Research shows that children high in self-efficacy are more likely to learn from modeling than children low in self-efficacy (Linnenbrink & Pintrich, 2003). Because students with special needs have a history of academic and/or social failure, they typically have low self-efficacy and may have even developed a self-belief called **learned helplessness** (Seligman, 1992). Students with learned helplessness believe that their actions cannot make a change in their learning outcomes (Nurmi, Onatsu, & Haavisto, 1995). Consequently, they are less likely to exert effort at school, resulting in more instances of academic failure and the reinforcement of low self-efficacy.

Learned Helplessness

The psychological state associated with the belief that personal actions cannot make a change in one's learning outcomes.

You will learn more about how to enhance self-efficacy in Chapter 9, when you read about sociocognitive theories of motivation. This chapter will help you start thinking about the intimate relationship between students' self-beliefs and learning. To break the negative motivational cycle of students low in self-efficacy, teachers can help them develop a more optimistic view of themselves while teaching important knowledge and strategies.

Diversity in Self-Regulation

Young children will be more limited than older ones in their ability to engage in each one of the self-regulation phases: They will not be able to formulate well-defined long-term goals, select appropriate strategies for a certain task, or accurately assess their learning. Table 8.4 lists typical student characteristics by grade level and corresponding self-regulation strategies suggested by research (Blair, 2002; Bronson, 2000; Kochanska, Gross, Lin, & Nichols, 2002; Paris & Paris, 2001). Teachers can start encouraging self-regulation as early as in the preschool years.

However, not all students will demonstrate the typical level of self-regulation corresponding to their age. Due to the absence of models and fewer opportunities to engage in independent planning, time management, strategy use, and self-evaluation, adolescents at risk are not likely to have developed the necessary skills to help them accomplish their goals (Belfiore & Hornyak, 1998; Wilson & Corbett, 2001). On the positive side, although these students may need significantly more scaffolding than other students, when given explicit self-regulation instruction, they develop effective study strategies and self-regulatory skills (Cosden, Morrison, Albanese, & Macias, 2001; Eilam, 2001; Graham & Harris, 1996; Miller, Duffy, Rohr, Gasparello, & Mercier, 2005).

TABLE 8.4

Typical differences in self-regulation by grade level and suggested self-regulation strategies.

GRADE-LEVEL CHARACTERISTICS	SELF-REGULATION STRATEGIES
PRE-K AND K	
Typically low control of emotions and behavior.	Model self-instructions to control impulsiveness and emotional reactions.
Short attention span.	Use modeling for short periods of time and demonstrate behaviors slowly.
Innacurate self-evaluation of actions.	Remind children of the need to ignore distractions.
Limited ability to compare themselves to peers as a basis for evaluating actions.	Explain the consequences of actions and guide students' self-evaluation.
Incipient ability to set goals.	Show how specific actions can help students achieve their goals.
Use of inner speech to guide behavior.	
ELEMENTARY SCHOOL	
Increased ability to control emotions and behavior (e.g., focus attention, complete unsupervised homework).	Continue modeling self-instructions to control impulsiveness and emotional reactions.
Ability to attend to a model for longer periods of time.	Teach learning strategies and show students how their use is associated with learning and progress.
Incipient ability to self-evaluate performance.	Create opportunities for self-regulation by encouraging self-assessment and peer-group activities.
Fading of inner speech (only used to guide challenging tasks)	Scaffold children when they are confronted with challenging tasks.
MIDDLE SCHOOL	
Increased ability to do long-term planning.	Provide guidelines to help students set goals and assess progress.
Increased mastery of simple learning strategies.	Teach strategies to help students learn and study independently.
Increased awareness of the benefits of motivational control strategies.	Ask students to self-assess their work and compare their assessments with teacher assessments.
HIGH SCHOOL	
Ability to do long-term planning.	Help students set their long-term goals.
Increased mastery of complex learning strategies.	Model strategies for becoming independent learners that might be especially useful for college.
No uniform ability to apply self-regulation to achieve goals.	Teach self-regulation strategies before, during, and after tests.
	Assign complex independent learning tasks and model how to self-regulate for success.
	Use self-assessment methods.

As with students at risk, special-needs students can benefit significantly from self-regulation instruction (Sands & Wehmeyer, 1996). These students need guidance and support in all stages of the self-regulation cycle, from setting concrete, proximal, and realistic goals to acquiring self-monitoring, self-evaluation, and self-reinforcement skills. Teacher's guided instruction in these skills can produce significant differences in self-regulation and learning (Cunningham & Cunningham, 1998; Ellis & Friend, 1991; Mithaug & Mithaug, 2003; Yell, Robinson, & Drasgow, 2001).

Diversity in Learning with Constructivist Environments

It is important to take students' linguistic background into consideration when designing constructivist learning environments. Recall from our discussion of bilingualism that some English language learners (ELLs) will perform well in the use of conversational English but not yet be proficient in academic English. This may cause some ELLs to struggle with some of the technical terms used in constructivist environments for science (Buxton, 1998; Noguchi, 1998). On the other hand, when appropriate language and metacognitive strategies are provided, constructivist environments can promote science learning for ELLs. Table 8.5 lists some strategies that teachers can use to support students who are English language learners (Shaw, 2002).

Although constructivist methods are very effective for the average student, be aware that for some immigrant students, such as those from Asia, a more teacher-centered method of instruction may be more familiar to their home experience (Igoa, 1995). In contrast, because some collectivistic cultures (e.g., Native American, Hispanic American) emphasize cooperation, students from these cultural backgrounds may be more likely to achieve with cooperative and social learning activities (Garcia, 1995; Webb & Palincsar, 1996). Cooperative learning can be particularly helpful for girls, who tend to participate more actively when working in small groups as compared to whole-class discussions (Théberge Rafal, 1996). Keep in mind, however, that all students should be exposed to a variety of instructional methods, in order to maximize their opportunity to learn different knowledge and skills.

Table 8.5

Strategies to support ELLs' interactions in constructivist environments.

- Assess the complexity of the language ahead of time and simplify it when found to be too challenging.
- Use the KWL method (what I *know*, what I *want* to know, and what I *learned*) to activate students' schemas and assess their vocabulary knowledge.
- Encourage students to self-assess what they do and do not understand in a scientific explanation.
- Ask students to summarize what they have understood.
- Provide visual aids that can help them interpret complex verbal explanations.
- Explicitly teach vocabulary that is needed for understanding.
- Encourage students to use their own language as well as English to explain their thinking.
- Encourage students to present data with pictures and graphs.

REVISITING ISSUES IN EDUCATION

Should classrooms be teacher-centered or learner-centered to promote learning?

Points to consider: Teacher-centered instruction is characterized by a high degree of teacher direction and vividly contrasts with student-centered or constructivist approaches by establishing a leadership role for the teacher in the classroom. Direct instruction, teacher demonstrations, questioning, and immediate feedback are all key elements of this teaching approach. The case for teacher-centered instruction is based on two lines of research. First, a review of 25 years of research in which direct instruction interventions were compared to other teaching strategies showed that in 87% of the cases, students' post-treatment test scores were higher when learning with direct instruction (Adams & Engelmann, 1996). Second, research aimed at identifying teacher practices that are associated with improving student learning show that many of these practices are characteristic of teacher-centered instruction (Hirsch, 1996; Rosenshine & Stevens, 1986). Examples include summarizing previous learning, explaining new goals, presenting new materials in small steps, asking a large number of questions, guiding students during practice, providing individual seatwork, monitoring seatwork, and providing feedback and a summary.

On the other hand, constructivism has become a leading theoretical position in education, and many studies using learner-centered methods, such as the ones reviewed in this chapter, provide evidence for their potential to promote meaningful learning and motivation to learn (Bransford, Brown, & Cocking, 1999; Hmelo-Silver et al., 2007; Lambert & McCombs, 1998). Therefore, rather than taking an either/or approach to teaching, it is important to use the theory and methods that best serve your learning objectives (Kuhn, 2007). If your goal is to teach a set of well-defined steps in a procedure, it might be much more effective to plan your lesson as a well-organized lecture (Airasian & Walsh, 1997). In contrast, if your goal is to promote students' inquiry, meaning-making, and perspective-taking, it might be best to use methods that encourage the active participation of all students and to assume a less central (although challenging) role (Knight, 2005). Moreover, an integration of teacher-centered and learner-centered methods may be the best way to reach many learning objectives (Edelson, 2001; Krajcik, Czerniak, & Berger, 1999; Schwartz & Bransford, 1998). One successful reading program, called Success for All (Slavin & Madden, 2006), combines direct instruction, cooperative learning, reading tutors, and family support teams.

SUMMARY

- Four of the contributions that sociocognitive theory offers to education are the concepts of social learning, reciprocal causation, modeling, and self-regulation. Social learning, also called indirect learning or observational learning, takes place when students learn from observing the behavior of others. The observed consequences of a specific behavior can act as vicarious reinforcement or punishment, therefore increasing the expectations that the same behavior will be reinforced or punished in the future, respectively.
  Bandura's reciprocal causation model includes three main components: personal, behavioral, and environmental. The personal factors given the most emphasis by Bandura are self-efficacy (individuals' beliefs about their capabilities to produce designated levels of performance or achieve a certain goal) and outcome expectancy (individuals' beliefs about a positive relationship between performance and the outcome of such performance).
- Modeling consists of the cognitive, affective, and behavioral changes that resulted from social learning and can have inhibitory, disinhibitory, or response facilitation effects. The processes involved in effective modeling are attention, retention, production, and motivation. Modeling is most effective when the model displays power and prestige, competence, and coping as well as when he/she is similar to the student, such as the case of peer models. Cognitive modeling should be used when the task to be taught is highly complex.
- Sociocognitive views of learning encourage promoting students' self-regulation. A popular self-regulation model includes three phases: the forethought phase,

the performance phase, and the self-reflection phase. Teachers can promote self-regulatory skills by modeling how to plan and manage time effectively, how to pay attention to relevant information in class, how to focus and remain on-task, how to use study strategies and self-instruction, and how to self-assess learning.

- Constructivist learning theories are based on the idea that students actively construct their knowledge from their personal experiences with others and the environment. Piaget's theory has inspired individual or cognitive constructivism and Vygotsky's theory has inspired social constructivism.
  Methods that support individual constructivism are discovery- and inquiry-based learning. Methods that support social constructivism are cooperative learning, tutoring, reciprocal teaching, communities of learners, problem-based learning, and structured classroom discussions. Effective cooperative learning requires the following five elements: positive interdependence, individual accountability, face-to-face interaction, social skills, and group processing.
  Informal learning settings are constructivist because they offer opportunities to engage in social interaction, manipulate a variety of cultural and environmental tools and artifacts, and share the cultural values of the community. Constructivist methods involve significantly more planning than more traditional teaching methods. To be effective, they should promote the active participation of all students and include teacher guidance and monitoring.
- Teachers should keep in mind the personal and developmental diversity of their students in social learning situations. Some students will be shy or uncomfortable working in groups and performing in public. Modeling should consist of short and simple demonstrations for young students. At-risk students will especially benefit from similar models and methods that support the development of their self-efficacy. Young students, exceptional students, and at-risk students are less likely to engage in self-regulation than their counterparts, but teachers' guided instruction can produce significant differences in self-regulation and learning. Constructivist learning environments may pose a threat to English language learners who lack the technical language necessary to construct knowledge, and the student-centered nature of these environments may conflict with the cultural background of students who are used to a more teacher-centered approach.

KEY TERMS

cognitive constructivism 299
cognitive modeling 292
community of learners 312
constructivism 298
cooperative learning 303
discovery learning 299
enactive learning 286
guided discovery 300
inquiry-based learning 300
IRE pattern 313
learned helplessness 317
modeling 287
outcome expectancy 284
problem-based learning 313
reciprocal causation 283
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self-efficacy 284
self-evaluation 296
self-instruction 295
self-recording 295
self-regulated learning 293
social constructivism 302
social learning 282
sociocognitive theory 282
task analysis 294
vicarious learning 286

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is social learning?
2. What are the components of the reciprocal causation model?
3. How do sociocognitive views of learning differ from other learning views?

4. How do students learn from modeling and what are factors affecting modeling?
5. What are characteristics of effective models?
6. What are the phases of the self-regulation cycle?
7. How do individual and social constructivist theories compare to each other?
8. In what ways can you promote individual constructivism in the classroom?
9. In what ways can you promote social constructivism in the classroom?
10. What are some differences in learning with sociocognitive and constructivist methods?
11. How would you apply the sociocognitive and constructivist principles to your classroom?

Journal Activity THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with sociocognitive and constructivist theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. Pick a topic you are interested in and design an action research study to test the effects of symbolic modeling on learning in your classroom (Chapter 1).
2. Give a reciprocal causation example in which the same environmental component may have different personal or behavioral outcomes for students of different cultural or socioeconomic backgrounds (Chapter 2).
3. How would you relate Vygotsky's developmental theory to the cognitive modeling method (Chapter 3)?
4. How might vicarious consequences be related to peer pressure (Chapter 4)?
5. Compare and contrast classical conditioning and sociocognitive explanations for math anxiety (Chapter 5).
6. How would you explain the processes involved in modeling using the information-processing model (Chapter 6)?
7. In which ways might students' metacognitive skills help them become self-regulated (Chapters 6 and 7)?
8. What sociocognitive learning method(s) would you recommend for teaching critical thinking skills and why (Chapter 7)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Eleventh-Grade Classroom Use Sociocognitive and Constructivist Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"Diverse Perspectives in American History" is the title of an eleventh-grade course Ms. Alula teaches in Richmond, Virginia, where 91% of students are African-American, 5% are Hispanic, and 4% are of other ethnicities. Ms. Alula devotes attention to many conflicting aspects of history frequently ignored in textbooks and encourages her students to investigate multiple interpretations of events so that they can learn to recognize diverse voices in history.

The course is the result of a partnership between the University of Virginia and the Richmond school district to develop curricula that use literature and primary sources to present pluralist perspectives. Richmond teachers recognized that traditional instruction, which emphasizes timelines, names, and events, was not bringing history alive to their students. Furthermore, textbooks presented problematic depictions of minority groups. For example, slaves were portrayed as stereotypical victims rather than insightful human beings who adapted and survived the worst violation of human rights in U.S. history. Teachers wanted to change the pattern of studying African-Americans only in relation to slavery, Latinos only in relation to farming, or Japanese-Americans only in relation to World War II. They wanted to teach a curriculum that would reflect the actual diversity of American history and connect to their students' experiences. Ms. Alula has been teaching the course for two years now and notices positive changes in the way her students think about history.

"Created Equal?" Is the question Ms. Alula's class will be investigating in a series of activities over the next two weeks. The focus will be on Thomas Jefferson's efforts to deal with the complex issues of equality and slavery in the Declaration of Independence. Because Ms. Alula has multiple objectives and group activities, she has provided an outline of the upcoming lessons and a learning log for students' planning and reflection.

CREATED EQUAL?

1. Groups brainstorm and develop a working definition of what it means for everyone to be equal.
   Journal: *What does* equal *mean to you?*
2. Historical record and its limitations. Classroom guests: seniors in Advanced Placement history.
   Journal: *You are a historian in 2200. How would you decipher text messages sent in 2010?*
3. Jigsaw: Narratives written by Jefferson's slaves and David Walker's (1829) *Appeal* to abolish slavery.
   Resources: Slavery and the Making of America, *PBS video, online "Sale of Monticello" slaves.*
   Journal: *What conditions did slaves face on the Jefferson family's plantation?*
4. Groups interpret "All Men Are Created Equal" in the context of the Declaration of Independence.
   Resources: *Online text version of the Declaration of Independence.*
   Journal: *Compare your definition of equality to the definition used in the Declaration of Independence.*
5. Preparation for Debate:
   Defense: Find evidence that Jefferson compromised on the issue of slavery because of pressure from southern delegates.
   Prosecution: Find evidence that Jefferson should be convicted for crimes against humanity for owning and selling slaves.
   Resources: *Library of Congress Archives.*
   Journal: *Write an argument in defense or prosecution of Jefferson.*
6. Debate Day: All groups present evidence either for or against Jefferson.
7. Students rewrite portions of the Declaration of Independence to more accurately reflect contemporary American society.
   Resources: *United Nations Universal Declaration of Human Rights.*
   Journal: *Why is it important to recognize universal human rights?*

Today, Ms. Alula has invited two African-American high school seniors, now enrolled in the Advanced Placement history course, to talk to her class about analyzing primary sources. She wants to prepare her students for tomorrow's jigsaw activity, which will include narratives written by Jefferson's slaves. From experience, she knows that reading 19th-century sources will be a challenge for her students, so she wants them to get encouragement directly from their successful peers.

LESSONS	LEARNING LOG	STUDENT NAME: _____ GROUP MEMBERS: _____			
	ASSIGNMENTS TO ACCOMPLISH:	ASSIGNMENTS COMPLETED:	WHAT WENT WELL:	WHAT WE WANT TO IMPROVE:	SOMETHING NEW I LEARNED:
1					
2					
3					
4					
5					
6					
7					

To start, Ms. Alula and the seniors planned a quick activity to get students thinking about primary sources. Daryn begins, "I want you to write a list of all the activities you were involved in during the last 24 hours. Then, for each activity on your list, write down what evidence your activities may have left behind. Did you send an e-mail, throw a note in the trash, or leave a text message?" He gives students time to make a list in their journals.

Sharise asks, "Do music downloads count as evidence?"

"I think so," Daryn responds. "If a historian listened to my music, she could tell a lot about me."

Jerome thinks of another example; "When I swipe my lunch card every day, the school gets info on what I'm eating."

"Now, I want you to work with the members of your group and make a tally of all the evidence your activities have left over the span of a week."

"Our group came up with 155 records."

"We got 202!"

Ms. Alula connects their findings to history. "Next, I want you to think about evidence from your activities in comparison to the historical record. What is the size of the record? What evidence might be left out?" She gives students time to discuss.

Lloyd volunteers, "The historical record is huge. Just think about it—billions of people living on earth everyday, and leaving evidence of their lives. There's a ton of evidence to sort through."

Clarisse says, "Yeah that's the problem. How could you make sense of it all? Think about all the records that are lost, too. It's not like everyone kept a diary."

"Or knew how to write," Daryn interjects. "How would you know what people were really thinking in 1776?"

Ms. Alula recaps. "You're right. The historical record contains billions of records. But it gives us just a tiny glimpse of what life was really like in the past and what people were thinking. Much of what happened was never documented, or records have been lost or destroyed. That's why historians are like detectives. They need to fit all the pieces of the puzzle together."

Ms. Alula feels her students are starting to grasp the idea of the historical record and its complexity, so she shifts the focus to analyzing primary sources. "Now, in your group, I want you to think about how a historian or an archeologist would piece together records to learn about your life and friends." She gives them time to discuss.

"Well, for starters, a historian wouldn't understand my text messages."

"Explain what you mean, Ayana."

"My friends and I use text abbreviations; we'll write SC for 'stay cool.' A historian would have no clue what we're talking about."

"So how would a historian decipher your texts?"

"There might be a dictionary of abbreviations," Bronwin offers. "Or you could look at lots of text messages by lots of different people and pick out the patterns."

"Or you could interview people who use abbreviations."

Ms. Alula encourages them, "Now you're starting to think like historians."



Masterfile

On the overhead Ms. Alula projects five lines from David Walker's famous 1829 *Appeal* to abolish slavery. She has selected a small portion of text so that students can investigate the meaning and think about the author's beliefs and motives. On a flip chart she has written the group work tasks. First, rewrite David Walker's sentences in your own words. Second, discuss and write answers to these questions: What were Walker's beliefs? What was the purpose of writing the *Appeal*? Who was Walker's audience? How do you think readers reacted to the *Appeal*? "Remember to write these assignments in your learning log." During group work, Ms. Alula and the two seniors circulate and contribute to students' discussions.

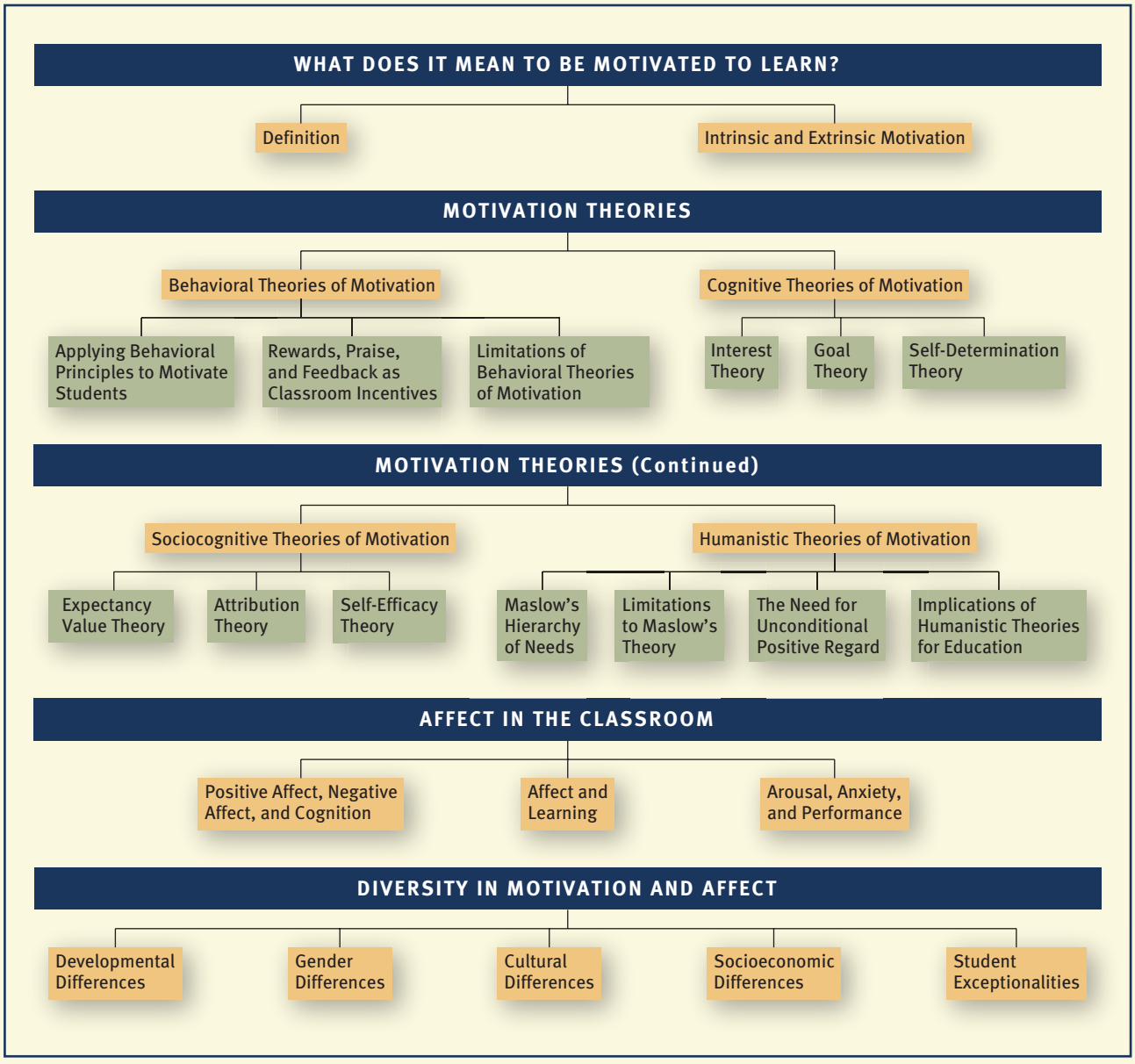
To close, Ms. Alula connects the lesson back to students' lives. She gives them the journal prompt: *You are a historian in the year 2200. How would you decipher text messages sent in 2010?* "After you write in your journals, please complete your reflections in your learning logs."

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. Was there evidence of modeling in this case? If so, what type of modeling?
2. Which sociocognitive and constructivist principles were applied and how?
3. Which components of the self-regulation cycle did the students display?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to sociocognitive and constructivist views of learning by including both strengths and weaknesses.

9 Theories of Motivation and Affect



Imagine You Are the Teacher

Ms. Hernandez is having a good first year as a music teacher in Roosevelt Middle School. After her first semester, she has become familiar with the school and started to build good relationships with many of her students. However, she is concerned about Isaiah, a friendly and likable student who, despite showing many signs of being very bright, seems not to care about doing well at school. After having failed to motivate Isaiah to learn with a variety of methods, Ms. Hernandez decides to talk to his parents to see if they can find a way to help Isaiah succeed at school. To her surprise, Ms. Hernandez finds out from the school administration that Isaiah is homeless. His mother is unable to find steady work, so Isaiah and his mom live in their car. Ms. Hernandez talked to the school counselor about how to help Isaiah. The counselor informs her that the school provides Isaiah with free breakfast and lunch and has referred his family to some local shelters. "Other than that, there is not much more that we can do to help," the counselor concludes.

- **What do you think might be the cause of Isaiah's lack of motivation?**
- **What could you do to motivate Isaiah to learn?**

Think about how you would respond to these questions as you read through the chapter.



Masterfile

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define motivation to learn.
2. Distinguish between intrinsic and extrinsic motivation to learn.
3. Compare behavioral, cognitive, sociocognitive, and humanistic motivation theories.
4. Use what you know about the relationship between affect and cognition to explain student learning and behavior.
5. Discuss issues of diversity related to the motivation to learn.
6. Apply motivation principles to the classroom.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. What are some reasons that students are motivated/unmotivated to learn?
2. Can teachers motivate students to engage in activities they find boring, useless, or irrelevant? Why or why not?
3. Do you feel that rewards and praise can motivate students to learn? Explain.
4. Can students' emotions affect their thinking and learning? Explain.

WHAT DOES IT MEAN TO BE MOTIVATED TO LEARN?

In your classroom, you will encounter as much diversity in motivation among your students as in any other factor (e.g., prior knowledge, ability, and cultural and linguistic background). Therefore, it is important to learn about the many motivation theories and strategies introduced in this chapter to start developing the skills that are necessary to motivate a diversity of learners. Take a few minutes to think about the following questions: What is motivation? How does motivation to learn look in the classroom?

Definition

Motivation is a crucial aspect of teaching and learning. In fact, some experts have argued that learning and motivation are so interdependent that it is impossible to understand learning without understanding motivation (Pintrich, Marx, & Boyle, 1993). Evidence for this relationship is the strong positive correlation between motivation and achievement: Students with higher motivation to learn are more likely to learn and achieve as compared to those with lower motivation to learn (McDermott, Mordell, & Stoltzfus, 2001; Wang, Haertel & Walberg, 1993; Weinstein, 1998).

People are more or less motivated to accomplish different goals. Motivation to learn is only one of the many goals that humans may have. Other motivations may include motivation to work, to eat, to raise a family, to compete in sports, to get well after an illness, and so on. In general, psychologists define motivation as the psychological processes "involved in the direction, vigor, and persistence of behavior" (Bergin, Ford, & Hess, 1993, p. 437). Therefore, **motivation** to learn can be defined as the psychologi-

Motivation

The psychological processes that direct and sustain students' behavior towards learning.

cal processes that direct and sustain students' behavior toward learning. For instance, you know that students are motivated to learn when they come to school early in order to ask questions about yesterday's lesson or when they are persistent in acquiring a skill that does not come easily to them.

As you see, motivation is the force underlying achievement. Even if you know that one of your students has great ability in a certain area, unless the student is motivated to use his/her ability to gain new knowledge or skills, learning will not occur. In this chapter, you will learn that motivation to learn varies from student to student and might even change for the same student, depending on his/her developmental age, the subject matter, or the context of learning. You will also learn that some students might be very motivated to go to school, although their primary goal may not be to learn but rather to make friends with other students, compete against other students, get away from home, and so on (Pintrich, 2000; Stipek, 2002).



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How can you tell whether or not a student is motivated to learn?

Intrinsic and Extrinsic Motivation

The array of factors that may motivate a student to learn have led to the traditional distinction between intrinsic and extrinsic motivation. **Intrinsic motivation** is defined as the motivation to be involved in a learning activity for its own sake (Pintrich & Schunk, 2002). For example, an intrinsically motivated student studies a topic diligently because he finds it interesting or persists at solving a challenging problem because he is curious about the answer to the problem. On the other hand, **extrinsic motivation** is defined as the motivation to be involved in a learning activity as a means to an end. For example, an extrinsically motivated student completes homework to receive a reward from her parents or studies for an exam to get a good grade.

Intrinsic Motivation

The motivation to be involved in a learning activity for its own sake.

Extrinsic Motivation

The motivation to be involved in a learning activity as a means to an end.

Intrinsic and extrinsic motivation were traditionally thought of as being exclusive of each other. In other words, students were viewed as being either intrinsically or extrinsically motivated to learn. However, more contemporary views of motivation argue that intrinsic and extrinsic motivation might act simultaneously (Cameron & Pierce, 1994; Covington, 2000; Pintrich & Schunk, 2002). A student who studies hard for an exam might do so because she is motivated to learn more about the topic but also because she would like to get a good grade so that she can later apply for a competitive fellowship. Students who are intrinsically motivated to learn outperform those who are only extrinsically motivated (Lin, McKeachie, & Kim, 2001). In general, students who are intrinsically motivated are eager to learn classroom material and sometimes become so focused on and absorbed in a learning activity that they might lose track of time and completely ignore anything else that is happening around them, a phenomenon that has been called **flow** (Csikszentmihalyi, 2003). Think about your past learning experiences. Have you ever felt a sense of flow while learning something new? If so, would you say that this feeling was related to your intrinsic motivation?

Flow

The motivational state characterized by becoming extremely focused and absorbed in an activity, losing track of time, and completely ignoring anything else that is happening in the environment outside of such activity.

Unfortunately, intrinsically motivated students will not be consistently motivated and intrinsic motivation to learn tends to decline over the schoolyears (Covington & Mueller, 2001). This decline has been explained as a combination of several factors, including the emphasis on the importance of good grades for promotion, graduation, and college admission; the lack of match between students' personal goals and the academic goals set by the school environment; and the perception that school is overly structured, repetitive, and boring (Battistich, Schaps, & Wilson, 2004; Larson, 2000). Extrinsically motivated students are characterized by needing to be enticed to complete classroom activities, as illustrated by Figure 9.1. Students with an extrinsic motivation to learn are more likely to process information superficially and to meet only minimum classroom requirements (Gottfried, Fleming, & Gottfried, 2001; Larson, 2000; Schiefele, 1991; Tobias, 1994).

FIGURE 9.1 What is likely to happen to the motivation of this student if her parents were to stop offering incentives to do well at school?

econ e e ter e ection

My Name : *Elizabeth Jones*

Grade : *7th Grade*

What went well last semester?
One thing that was good about last semester was my group. I liked working with those people. I know I need to study more to get a higher grade. I also need to turn in my homework every day.

What could you improve during the second semester?
Last quarter I missed a lot of points on homework. My mom was really mad when I got a D. She told me that if I got all As and Bs that I could get a new guitar. I already know what one I want.

How will you make these improvements?
I'm going to work way harder this quarter because that would be great. Last week I turned in all my homework so I'm doing better and I think I can do it for the whole quarter.

Signatures _____ Student

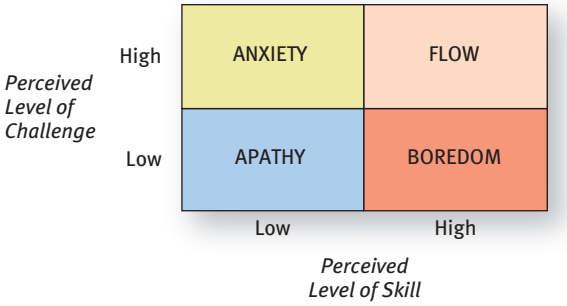
_____ Teacher

Monday	Tuesday	Wednesday	Thursday	Friday

The teacher will initial each day I am successful.

As teachers, we need to keep in mind that the type of motivation a student brings to the classroom is highly dependent on the context and conditions of learning that we create in our classrooms (Nisan, 1992). When a teacher always focuses on the importance of learning a concept because students will need it to perform well in high-stakes tests, she creates an environment that induces extrinsic motivation. On the other hand, teachers can create classroom conditions that help the extrinsically motivated student become more intrinsically motivated, such as when they present challenging activities, allow students to gain control over their own learning, or spark their curiosity with thought-provoking questions (Brophy, 2004; Perry, VandeKamp, Mercer, & Norby, 2002; Ryan & Deci, 2000). Challenge, control, and curiosity are likely to sustain the eagerness to learn that characterizes intrinsically motivated students. However, the specific effects of these methods will depend on the particular characteristics of each learner. For example, take a look at Figure 9.2.

FIGURE 9.2 Emotional outcomes of students' perceived levels of challenge and skill.



As you can see, the same learning activity might be motivating or unmotivating, depending on how a particular student perceives the degree of challenge and his/her skill level. When students are presented with an activity that they feel is not challenging enough, they are likely to become bored or apathetic, two emotional states associated with lack of motivation. However, when the activity is perceived as being challenging, only students who believe that they have the skills to attack the challenge will become motivated. The emotional outcome for those who do not believe that they have the skills to perform successfully is anxiety rather than flow (Brophy, 2004). As you learn more about different motivation theories, you will gain a better understanding of the relationship between task characteristics (e.g., challenge), learner characteristics (e.g., beliefs), and motivation to learn.

MOTIVATION THEORIES

Teachers need to have a repertoire of classroom strategies that will support students' motivation to learn. The first step is to understand the different psychological perspectives that explain motivation. In this section, we focus on the four main theories that explain motivation to learn: behavioral, cognitive, sociocognitive, and humanistic.



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Why are you reading this chapter? Would you say that you are intrinsically motivated, extrinsically motivated, or both?

Behavioral Theories of Motivation

According to behaviorism, student motivation is the result of seeking rewards and avoiding punishments. Students will be motivated to do things that are reinforced and unmotivated to do things for which they are likely to be punished. Remember that reinforcements can be positive (e.g., rewards) or negative (e.g., removing the obligation to do homework) consequences that increase the likelihood that a student will engage in a desirable activity. Conversely, punishments are consequences that decrease the likelihood that a student will engage in an undesirable activity.

Behaviorist theories of motivation, therefore, focus on the use of reinforcement to promote academic motivation and the use of punishment to decrease students' motivation to engage in academically nonproductive activities. However, as you might remember from Chapter 5, punishment should be avoided whenever possible. It is not only less effective than reinforcement for achieving behavioral change, but it also creates negative emotional consequences that become associated with the punisher (i.e., the teacher) and the learning experience itself.

Get Connected!

ANIMATION ASSIGNMENT. . . Motivation Theories

Go to your WileyPlus course and watch the animation that outlines how student motivation can be undermined. Be prepared to discuss the theory represented in the animation and the differences between extrinsic and intrinsic motivation.



Applying Behavioral Principles to Motivate Students. Table 9.1 lists some typical examples of academic incentives. Positive reinforcers may include giving money, tokens, or gifts for completing assignments; praising students either verbally or by giving them a certificate of achievement or placing them in the school's honor roll; and allowing students to do something they are interested in, such as giving them extra time at recess, allowing them to play computer games, or having a pizza party. The most common negative reinforcer used by teachers is removing a homework assignment.

Despite the teacher's intention, a student may not respond to an incentive because he/she may not find that the incentive is important or interesting. Likewise, a student may not respond to punishment if the type of punishment is appealing to the student. In other words, the right consequence for a student is one that is personally meaningful to him/her. Therefore, you should know your students' interests and values to ensure that the consequences that you establish will have the effect that you intend. Some students strive for praise whereas others are motivated by tangible rewards such as money, candy, or privileges or by social rewards such as peer recognition or popularity. Unfortunately, sometimes peer acceptance may motivate wrong or unproductive behaviors in the classroom. For example, Dan gets the reputation of being cool because he does outrageous things in the classroom, such as bullying smaller children, throwing spitballs, or writing graffiti on desks.

Behavioral approaches to motivation are closely linked to extrinsic motivation because they rely on external incentives to promote academic performance. The fact that extrinsically motivated students are less likely to achieve as compared to

TABLE 9.1

Positive reinforcers: Behaviorist methods to increase academic motivation and examples.

METHOD	EXAMPLES
Rewards	A student receives an A on an exam or is the first to finish a drill.
	A teacher gives tokens that can be exchanged for school supplies whenever students complete their homework.
	A parent promises to give her child extra allowance money if she gets an A on a math exam.
Praise	A teacher says, "Good job on the essay!"
	After receiving a grade report, a parent says, "I am so pleased with this report! Nice job!"
	A peer tells a student, "You are so good in math!"
Privileges	A teacher gives a student extra recess time.
	A parent allows his child to invite his best friend to a concert.
Social recognition	A teacher nominates a student into the school honor roll.
	Peers vote and elect a student to represent their classroom in a spelling contest.
Obligation removal	A teacher removes a homework assignment.
	A parent removes the duty to mow the lawn for the week.

intrinsically motivated students raises a question: Should teachers use incentives as academic motivators? To answer this question, we discuss the effectiveness of three of the most common incentives in the classroom: rewards, praise, and feedback.

Rewards, Praise, and Feedback as Classroom Incentives. Rewards are positive reinforcements aimed at increasing the likelihood that a student will perform a desirable academic task. You may recall from Chapter 5 that a long-debated issue in education is whether teachers should provide rewards to promote long-term learning (Eisenberger, Pierce, & Cameron, 1999; Kohn, 1993; Spencer, Noll, & Cassidy, 2005). Before we answer this question, we need to distinguish between two kinds of rewards: informational and controlling (Deci & Ryan, 1987). *Informational* rewards are highly recommended because they provide useful feedback to students and typically increase intrinsic motivation and learning. Examples are saying, "Excellent job! You have mastered reducing fractions to their common denominator" or "You have made very good progress on your science project: You planned your work well, completed all the requirements, and helped your peers who were falling behind. You deserve an award!"

In contrast, *controlling* rewards are aimed only at shaping students' behavior. Messages such as "If you do your homework, you will earn extra points" or "Those who work on their problems quietly will get a gold star" are examples of controlling rewards. Controlling rewards may increase extrinsic motivation, but they typically reduce task engagement and interest once the rewards are terminated. Consequently, experts in motivation recommend using extrinsic motivators only when students would not otherwise engage in the task, in the hope that students will eventually appreciate the learning experience and become intrinsically motivated to learn (Cameron, 2001; Covington, 2002; Deci, Koestner, & Ryan, 2001). In these cases, it is very important that all students be given equal opportunity to get the reward and that teachers model intrinsic reasons for engaging in the task, such as by demonstrating how exciting, enjoyable, or valuable the task can be. As students experience the joy and value of learning themselves, the incentives are no longer needed to promote their motivation.

For instance, knowing that most of her students are not intrinsically motivated to learn how to solve fraction problems, Ms. Shang starts an incentive system whereby students can get 1 point for each correctly solved problem and later exchange their accumulated points for privileges. As she observes her students become more engaged and competent, Ms. Shang modifies her system by reducing the rewards (e.g., 1 point for every 10 correct problems), giving frequent informational feedback (e.g., "Nice job! You showed me that you really understand when you need to reduce fractions to the common denominator. Keep it up!"), and modeling intrinsic motivation for math learning (e.g., "Doesn't it feel wonderful to be able to use fractions to solve everyday problems?"). Eventually, Ms. Shang phases out the extrinsic rewards altogether.



Christina Kennedy/PhotoEdit

What is the relationship between classroom incentives and extrinsic motivation?

Another classroom incentive, praise, is also considered a reward. Praise is the most common incentive in the classroom. Students from lower socioeconomic backgrounds and those high in anxiety are likely to react positively to praise (Brophy, 1981; Good & Brophy, 2000). Although your intuition may suggest that praise is an effective motivator, research has shown that this is not always the case. Young children are motivated by praise, even when overdone and given in front of a class. In contrast, older students react better if praise is given quietly and individually (Stipek, 2002). Praise can also undermine students' motivation when it is given for performing easy tasks. In this case, students interpret such praise as a *low-ability cue* (Emmer, 1988; Good, 1987). For example, Ms. Ortega, who teaches fifth grade, praised Jesse for adding single-digit numbers correctly. Jesse turned red and, embarrassed, looked down at his desk, knowing that the lesson was about how to add decimals, a skill that involves adding double-digit numbers with decimals, which he still struggles with.

As you will read later in the section on sociocognitive theories of motivation, when students believe that their teacher thinks they have low ability, their self-efficacy decreases, which, in turn, decreases motivation to learn (Bandura, 1986). Praise can be simple and general when students are confident of their performance (e.g., "Great job, Shiloh!") but should be more specific and provide additional useful feedback when their performance is good, but tentative (e.g., "Your penmanship is very easy to read") (Rosenshine, 1987). In general, praise should be genuine, not overused, and accessible to all students. The next chapter offers examples of how to effectively use praise to motivate your students.

The effects of criticism, the opposite of praise, are not straightforward. Although your intuition may prevent you from criticizing students' work or behavior, criticism can have a positive effect on students' motivation (Graham, 1994; Parsons, Kaczala, & Meece, 1982). Students who receive criticism for performing below their typical level will perceive their teacher's criticism as a *high-ability cue*, an indication that the teacher believes they are competent enough to do a better job. Knowing that Adriana is good at science, Ms. Mallot tells her that she could have put more effort into her homework to get a perfect grade in order to motivate her to improve further.

Feedback, another classroom incentive, can be motivating when it provides students with information about their increasing competence because it satisfies their need to know how they are progressing (Clifford, 1990). Similar to rewards, the reinforcing effect of feedback depends on the type of feedback given by the teacher. *Performance feedback* focuses on giving students information about how they performed in relation to other students in the class. *Informational feedback* focuses on giving students information about how their performance can be improved. For instance, Mr. Martella gives Dawn the following informational feedback on a writing assignment during a teacher—student conference: "Dawn, you wrote a very good paper. Your ideas were clear and original, you organized the paper well by creating good headings for each main topic, and you produced a very engaging conclusion. I would have liked to see better transitions between the topics that you covered. Sometimes you end one topic and jump to

the next without explaining how the two topics relate to each another. I brought with me some good transition examples that I would like to show you." Informational feedback leads to greater intrinsic motivation, task engagement, and persistence than performance feedback, with written informational feedback showing the highest effectiveness (Hattie & Timperley, 2007; Mory, 2004).

Limitations of Behavioral Theories of Motivation. Behaviorist theories of motivation suffer similar limitations to those discussed in Chapter 6. First, by emphasizing the use of incentives, behaviorism leaves little room for promoting intrinsic motivation to learn (Kohn, 1996; Ryan & Deci, 2006). Another limitation is philosophical: Critics argue that schools should cultivate intrinsic motivation and feel that focusing on rewards will encourage students to develop a materialistic attitude toward learning (Anderman & Maehr, 1994). A third limitation is that behavioral approaches to motivation can offer only an incomplete explanation for motivation because they don't take into account the role of students' expectations and beliefs. For example, Jonathan has a history of struggling with reading comprehension. Even though he loves computers, when his teacher announced that students who completed their book report would receive extra time at the computer, Jonathan was not motivated by this reward. If students believe they can't accomplish a task, they are unlikely to become motivated to engage in the task, regardless of how interesting the reward is. Since behaviorist theories do not take into consideration students' beliefs, the theory is unable to explain why Jonathan isn't motivated to complete the book report.

Cognitive Theories of Motivation

Cognitive theories of motivation focus on students' thoughts, beliefs, expectations, and attitudes—and how they create or reduce motivation to learn (Schunk, 2000). Consequently, cognitive theories emphasize the importance of promoting intrinsic rather than extrinsic motivation and explain why, even under identical environmental circumstances, some students strive to succeed while others are apathetic and unmotivated. In this section, we will review three important cognitive theories of motivation: interest, goal, and self-determination.

Interest Theory. According to interest theory, the key to motivating students is finding activities that are aligned with their personal interests. If students are personally interested in a certain activity or topic, they will direct their energy toward learning, which, in turn, should result in higher performance with less effort (Dewey, 1913; Hidi & Renninger, 2006). What is "interest" and how does it motivate students to learn? Experts in this area distinguish between dispositional interest and situational interest.

Dispositional Interest

Stable interest in a topic or subject.

Dispositional interest, also known as personal or individual interest, is a stable interest in a topic or subject (Schiefele, 1999). For example, a student may have a personal interest in dinosaurs, drumming, or sports cars. The basis of dispositional interest appears to be preexisting knowledge, experiences, and emotions (Alexander & Jetton, 1996). A review of 25 years of research on the relationship between students' dispositional interest and achievement in 18 countries revealed similar results for five different topics (i.e., math, literature, social science, natural science, and foreign language): Students' personal interest was moderately correlated to their achievement level in that subject. Research also shows that dispositional interest has a positive effect on attention, memory, persistence, effort, and learning (Hidi & Renninger, 2006).

Teachers should consider using their students' personal interests when planning instruction to promote motivation to learn. Interest surveys (Figure 9.3) can be a valuable tool to learn more about your students, especially if students trust you and understand the reason you are asking them for their personal information.

Situational Interest

Spontaneous and transitory interest that is activated by the environment rather than the learner.

In contrast, **situational interest** is spontaneous, transitory, and activated by the environment rather than the learner (Krapp, Hidi, & Renninger, 1992). For example, even when students do not have a personal interest in reptiles, their situational interest in learning about them is raised when the class visits the reptile house at the zoo.

What I Do for Fun

- My hobbies are _____
- The types of things I like to do with other people are _____
- The things I do for fun are _____
- The things I do to relax are _____
- When I need to get away from it all, I _____
- I feel good when _____
- The type of present I would most like to receive would be _____
- If I had an extra $10, I would _____
- If I had an extra $50, I would _____
- If I had an extra $100, I would _____
- I spend money every week on _____
- Of the things I do every day, I would hate to give up _____

Completely Me

- I am happiest when I _____
- The best thing about me is _____
- The worst thing about me is _____
- My favorite _____ is _____
- If I could have one wish, it would be _____
- I get angry when _____
- A thought I keep having is _____
- Something I've never told anyone about before is _____
- I feel important when _____
- I don't like to _____
- I seem to get my way when _____
- The thing I am most concerned with is _____
- I am _____
- If I were president, the first thing I would do is _____
- One question I have about life is _____

FIGURE 9.3 Student interest survey.

Source: Adapted from McCombs & Pope (1994).

Situational interest often precedes and facilitates the development of dispositional interest and may be an important way to catch attention (Hidi, 1995; McDaniel, Waddill, Finstad, & Bourg, 2000), whereas personal interest may be more important in holding attention (Hidi & Baird, 1986; Mitchell, 1993). Situational interest increases reading comprehension (Alexander & Jetton, 1996), computer engagement (diSessa, 2000), and learning (Mitchell, 1993; Schraw, Flowerday, & Lehman, 2001). Consequently, situational interest can be an important motivation force.

However, there is a caveat to this argument. Imagine a student who has no personal interest in reading about the scientific phenomenon of lightning formation. In an effort to increase situational interest, you present the student with a multimedia encyclopedia, which contains very attractive pictures of people who have been struck by lightning and whose shoes or hats were blown several feet away by the impact. Now you observe your student paying attention to the computer screen and moving ahead through the instructional materials. The question is: Do the added "bells and whistles" that increase students' situational interest also increase their learning? Unfortunately, a review of research on **seductive details** (i.e., interesting text, pictures, videos, etc. that are not necessary to a lesson) concluded that "adding seductive details . . . does not facilitate and often has a detrimental effect on learning of important information" (Wade, 1992, p. 272). The negative

Seductive Details

Interesting details that are not necessary to understand a lesson and which can distract students from the main goal of the lesson.

My Name : *Elizabeth Jones*

Grade : *7th Grade*

Describe the three subatomic particles inside an atom.
There are three particles inside an atom. One is electron, one is a proton and one is a neutron. In chapter 3 I learned that these particles are involved in atomic bombs. Its what makes them blow up. I know that the charge on these particles is very big because that's what makes an atomic bomb blow up.

Where is each subatomic particle located?
Atoms are everywhere so these particles are everywhere.

What is the charge on each subatomic particle?
They are not always dangerous, only when there is the right type of atoms that are unstable and then there's a lot of energy. You really need an explosion before the atomic bomb blows up because it takes a lot of energy to get the reaction started.

Signatures _____ Student

_____ Teacher

Monday	Tuesday	Wednesday	Thursday	Friday

The teacher will initial each day I am successful.

FIGURE 9.4 **Seductive details can hurt learning by focusing students' attention on irrelevant information.**

Mastery Goal

A goal that focuses on improvement and increased understanding.

Performance Goal

A goal that focuses on competence or ability and achieving a certain end result.

effect of seductive details is illustrated in Figure 9.4. Seductive details in the form of pictures (Harp & Mayer, 1998), video (Mayer, Heiser, & Lonn, 2001), and music (Moreno & Mayer, 2000) can produce similar negative effects.

Although situational interest can play a role in engaging students who do not have a personal interest in particular tasks or subject matter, teachers need to make sure that the novel or interesting materials do not distract them from the relevant information of a lesson (Ainley, Hidi, & Berndorff, 2002; Hidi & Harackiewicz, 2000).

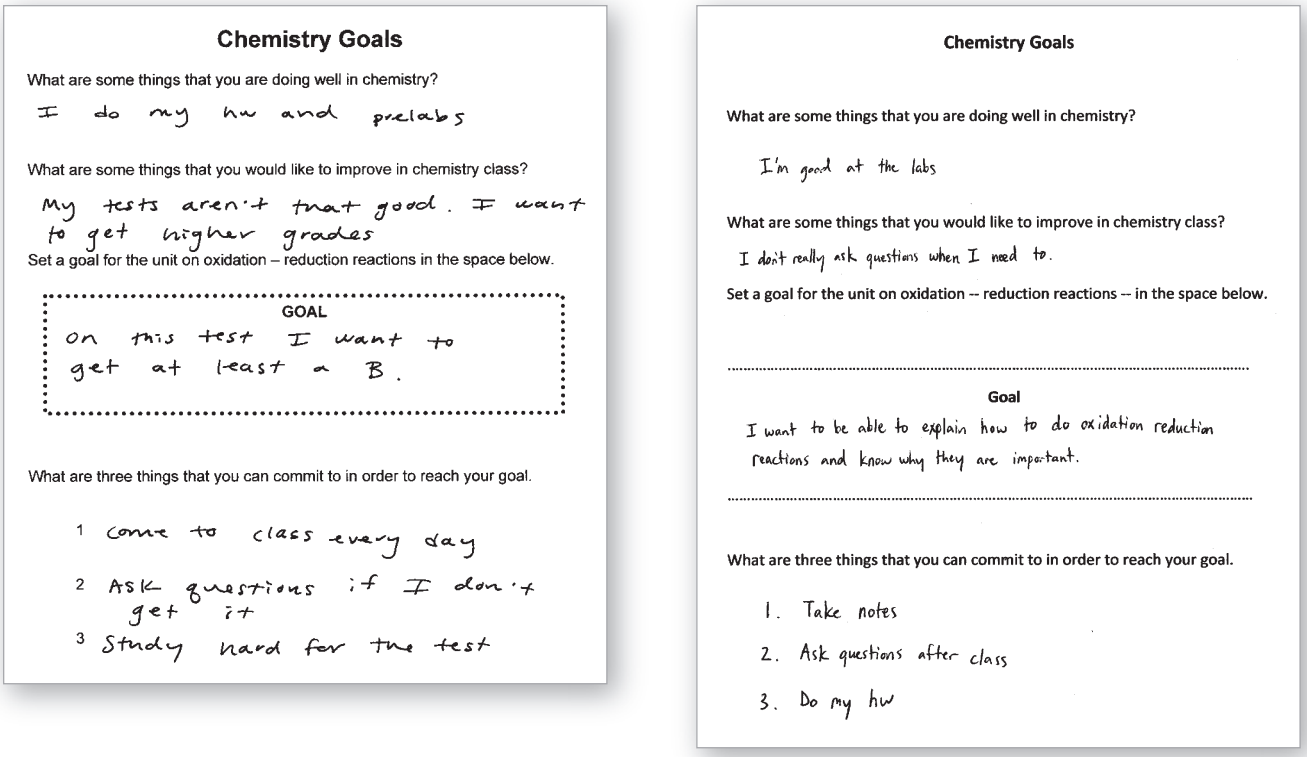
Compare and contrast the motivational effects of increasing situational interest and dispositional interest.

Goal Theory. Goal theorists believe that the process of goal setting and the type of goals chosen by a student can have a strong influence on his/her motivation to learn (Thrash & Elliott, 2001). The most traditional classification of learning goals consists of mastery and performance goals. A **mastery goal**, also called a learning goal, focuses on improvement and increased understanding (Midgley, 2001; Pintrich, 2000). A student who persists on trying to learn a difficult language because he would like to be able to read in that language is said to have a mastery goal. Conversely, a student who has a **performance goal** will not be interested in mastering the task or gaining a good understanding of a topic but will focus on competence or ability and achieving a certain end result, such as a high grade or social recognition. Figure 9.5 shows the different goal orientation of two students in the same classroom.



David J Sams/Stone/Getty Images, Inc.

Performance-oriented students usually compare their achievements to those of other students (Elliot & Thrash, 2001; Midgley, 2001). Although mastery and performance goals might seem antagonistic, they are not mutually exclusive (Covington & Mueller, 2001; Harackiewicz, Barron, Taurer, Carter, & Elliott, 2000). A student who is intrinsically motivated to learn about web design techniques (mas-



Chemistry Goals

What are some things that you are doing well in chemistry?

I do my hw and prelabs

What are some things that you would like to improve in chemistry class?

My tests aren't that good. I want to get higher grades

Set a goal for the unit on oxidation – reduction reactions in the space below.

GOAL

On this test I want to get at least a B.

What are three things that you can commit to in order to reach your goal.

1 come to class every day

2 ASK questions if I don't get it

3 Study hard for the test

Chemistry Goals

What are some things that you are doing well in chemistry?

I'm good at the labs

What are some things that you would like to improve in chemistry class?

I don't really ask questions when I need to.

Set a goal for the unit on oxidation -- reduction reactions -- in the space below.

Goal

I want to be able to explain how to do oxidation reduction reactions and know why they are important.

What are three things that you can commit to in order to reach your goal.

1. Take notes
2. Ask questions after class
3. Do my hw

FIGURE 9.5 **What type of goals (mastery versus performance) are these two students displaying?**

tery goal) may also be extrinsically motivated to design the best personal website in his class (performance goal). Table 9.2 lists some characteristics of students who have mastery and performance goals (Bruning, Schraw, Norby, & Ronning, 2004).

Students with mastery goals are those who benefit the most from classroom experiences because they are more likely to believe that they can make progress if they put forth effort; they are self-regulated; they have intrinsic motivation to learn; they persist when confronted with challenges; they attribute their success and failure to internal, controllable causes (e.g., effort); and they actively engage in learning strategies that promote meaningful learning (Gabriele & Montecinos, 2001; Kumar, Gheen, & Kaplan, 2002; Wentzel & Wigfield, 1998).

Is there any benefit in helping students set performance goals, especially in light of the rewards that today's society offers to those who are driven by achievement? Examples of how society offers rewards for achievement include colleges and universities that emphasize high grades and test scores when considering student applications. Moreover, setting performance goals may help students become better prepared to face the adult world, in which many professions and occupations are competitive in nature. Although providing students with a realistic view of the world is important, experts recommend that teachers emphasize mastery goals to promote long-term motivation to learn (Church, Elliot, & Gable, 2001; Newman, 1998; Wentzel, 1999). In general, students become motivated to learn when mastery goals are specific, moderately challenging, meaningful, and attainable within a relatively short period of time (Anderman & Maehr, 1994; Erez & Zidon, 1984; Locke & Latham, 2002). Some strategies that teachers can use to promote mastery goals are listed here:

- Focusing on understanding rather than memorizing
- Demonstrating how the knowledge and skills taught are valuable or relevant to students' goals

TABLE 9.2

Characteristics of students with mastery and performance goals.

MASTERY GOAL STUDENTS. . .	PERFORMANCE GOAL STUDENTS. . .
Seek out challenges.	Avoid challenges.
Become unmotivated with easy tasks.	Become motivated with easy tasks.
Are more intrinsically motivated.	Are more extrinsically motivated.
Are very likely to undergo conceptual change.	Are unlikely to undergo conceptual change.
Seek informational feedback.	Seek flattering feedback on performance.
Attribute their success and failure to effort.	Attribute their success and failure to ability.
Display self-regulation.	Are less likely to display self-regulation.
Have high self-efficacy.	Are less likely to have high self-efficacy.
Collaborate to enhance learning.	Collaborate to show competence or status.
Use errors to improve performance.	View errors as a sign of low ability.
View the teacher as a resource and guide.	View the teacher as a judge.
Use strategies that promote deep learning.	Use strategies that promote rote learning.
Are satisfied if they try hard and improve.	Are satisfied if they succeed.
Do not display anxiety on tests or assignments.	Are anxious about tests or assignments.
Evaluate performance based on progress.	Evaluate performance based on how they compare to others.

- Emphasizing the relationship between effort and success
- Identifying errors as opportunities to learn
- Using informational feedback to help students make progress
- Encouraging collaboration with peers to expand students' individual learning
- Focusing on progress rather than performance
- Helping students set specific, proximal, challenging goals

Performance-Avoidance Goal

The goal to avoid looking bad and receiving unfavorable judgments from others.

Learning and performance are not the only goals that students might bring to the classroom. Some students may have a **performance-avoidance goal**, which can be defined as the goal to avoid looking bad and receiving unfavorable judgments from others (Elliot & Thrash, 2001). In this case, students are motivated when schoolwork is easy and when they can complete assignments as quickly as possible (Pintrich & Schunk, 2002). Because the focus of performance-avoidance students is to avoid looking dumb, they will usually display strong concerns about how their accomplishments compare to those of their peers (Anderman, Urdan, & Roeser, 2005; Midgley et al., 1998). For example, a student with a performance-avoidance goal who finds writing stories to be easy and math to be hard may complete creative writing assignments but not turn in math homework.

Social Goal

A goal that focuses on achieving in one's social life.

In addition, students may bring a **social goal** to the classroom, such as making friends, gaining peer status or teacher approval, helping others, and meeting social obligations (Davis, 2003; Dowson & McInerney, 2001; Ford, 1996; Hicks, 1997). Social goals may help or hinder students' behavior and performance, depending on the ultimate reason under-

lying their motivation to socialize. Because some of these goals reflect students' need for **relatedness**, they are likely to enhance their psychological well-being and motivate them to learn rather than interfere with learning. For example, a student may put a lot of effort into learning to gain her teacher's approval or may improve her learning as a consequence of actively engaging in cooperative learning activities. In contrast, behavior and achievement will suffer if social goals are motivated solely by the need to impress teachers or peers or to gain their attention (Ryan, Hicks, & Midgley, 1997). For instance, the goal of maintaining friendships with peers may interfere with learning when cooperative learning group members fail to challenge their friends' wrong answers or lack of involvement because they are afraid to hurt their feelings (Anderson, Holland, & Palincsar, 1997). In addition, social goals may conflict with academic goals when a student feels peer pressure to not comply with the classroom's norms and standards (Ogbu, 1987; Wentzel, 1999). For instance, Ken will not do his homework when his friends are around because he knows that they will tease him about being "a responsible boy" and trying to please the teacher.



Laura Dwight Photography

How would you design small-group activities to avoid having social goals conflict with academic goals?

Self-Determination Theory. Self-determination can be defined as the process of deciding how to act in one's environments (Deci, 1992; Deci & Ryan, 2002). According to self-determination theory, teachers can help create two types of learning environments: autonomy supporting and controlling. In *autonomy-supporting classrooms*, students choose to engage in school activities because they are intrinsically interested whereas in *controlling classrooms*, students comply with school activities to meet external expectations. The difference between these two environments resides in students' perceived sense of autonomy. In autonomy-supporting environments, students are given choices and voices in the classroom; therefore, they choose to complete their assignments because they enjoy the topic, task, or learning the material. Because controlling environments do not take into consideration students' need for autonomy, they are less likely to be intrinsically motivating. For example, a student in a controlling classroom may complete an assignment only to avoid a failing grade or to please his teacher or parents, a case of extrinsic motivation.

Self-determination theory assumes that people have three innate psychological needs: the need for competence, the need for control, and the need for relatedness (Ryan & Deci, 2000). When these three needs are satisfied, students become intrinsically motivated to learn. The need for competence explains, for instance, why students are motivated when academic challenges provide them with information about their proficiency and skill (Stipek, 2002). Teachers can help students gain competence by presenting them with informational feedback and genuine praise and criticism. Once students take on a challenge and successfully master the task, their self-efficacy and intrinsic motivation increase, even when they make frequent errors (Covington, 1992; Deci, 1992). Teachers need to keep in mind, however, that challenges will be motivating under the following conditions: the criteria for succeeding are realistic; sufficient scaffolding is offered to achieve success; there are no penalties for errors; the incentives to succeed are greater for challenging tasks than for easier tasks; and students attribute their success to their own ability, strategies, or effort (Brophy & Alleman, 1992; Clifford, 1990; Dweck & Elliott, 1983).

Relatedness

The need to feel connected or associated with others.

The second source of intrinsic motivation according to self-determination theory is **autonomy**, which is similar to the idea of having an internal locus of control (Rotter, 1966), the belief that one can change the conditions of the environment. Teachers can help students feel autonomous by giving them choices or soliciting their input. For example, a teacher might ask students to pick a topic of their choice for a writing assignment, have students participate in the process of setting the classroom rules

Autonomy

The idea of having an internal locus of control, the belief that one can change the conditions of the environment.

CLASSROOM TIPS

How to Motivate Students Using Cognitive Theories

Theory	Classroom Implication	Classroom Tips
Interest	Motivation increases when students' personal interests are taken into consideration when planning instruction.	Have students choose a topic of interest for a writing assignment. Ask students to pick a book of their choice for a reading assignment.
Goal	Motivation increases when students are allowed to set goals that are realistic, reasonably difficult, proximal, and meaningful.	Have students develop a schedule to complete a research project. Teach students how to monitor their progress toward a goal.
Self-determination	Motivation increases when classrooms encourage student autonomy, competence, and relatedness.	Allow student participation in setting classroom rules and consequences. Present a challenging project coupled with informational feedback. Accept students' feelings and opinions even when they are at odds with your own.

and consequences, and allow students to demonstrate their learning in different formats (e.g., presentation, essay, portfolio). Students' intrinsic motivation increases when they are given opportunities to take personal responsibility for their learning (Grolnick, Gurland, Jacob, & Decourcey, 2002; Stipek, 2002), such as allowing students to set their own learning goals (deCharms, 1984) and to organize their own experiments in a high school science class (Rainey, 1965).

Finally, according to self-determination theory, students' motivation is promoted when classrooms support their need for relatedness, which is similar to Maslow's (1971) need for belonging. Relatedness affects motivation positively because students are more likely to become engaged in school activities when they believe that their teachers and peers care about them and understand their feelings and thoughts (Furrer & Skinner, 2003). Students who feel a sense of belonging in classrooms report more interest in class work and feel that school is more important than those who feel distanced from their teacher (Goodenow, 1993; Kohn, 2005). In addition, students who view their teachers as being supportive are more likely to develop social responsibility in the classroom (Wentzel, 2002). Teachers who spend time with their students before and after school, helping them with homework and talking to them about personal concerns, promote motivation to learn by nurturing students' need for relatedness. Classroom Tips: How to Motivate Students Using Cognitive Theories lists the three theories we just reviewed with corresponding classroom implications and tips.

ISSUES IN EDUCATION

Do assessments undermine students' self-determination?

Although assessment is an essential part of teaching, it has been argued that testing students may have a negative influence on intrinsic motivation and students' need for autonomy. What do you think about this argument? A response to this question can be found at the end of the chapter.

Sociocognitive Theories of Motivation

Some experts in motivation distinguish between cognitive and sociocognitive theories of motivation in the same fashion that we distinguished between cognitive and sociocognitive theories of learning in Chapter 8 (Graham & Weiner, 1996; Pintrich & Schunk, 2002). Recall that sociocognitive theories combine cognitive and behavioral theories. Therefore, motivation is viewed as resulting from both students' cognition (e.g., thoughts, beliefs, attitudes, expectations) and the environmental conditions (e.g., the expected consequences, the difficulty of a task). In this section we discuss three sociocognitive theories of motivation: expectancy X value, attribution, and self-efficacy.

Expectancy X Value Theory. According to expectancy X value theory, students become motivated to learn by the product of two main forces: their expectation of reaching the learning goal and the value of the learning goal. If either the expectation to reach a learning goal or the value of a learning goal is null, students will show no motivation to learn (Tollefson, 2000). When students believe that in order to achieve a goal (e.g., become a doctor) they need to spend a large amount of time on a very challenging task, then the expectation of reaching the goal may be very low. Consequently, motivation to achieve the goal will be low unless there is much value in succeeding (e.g., vocational, financial, social status). When students are presented with goals that are very likely to be achieved in a short period of time and with little effort (e.g., drill-and-practice homework) but fail to find any value in accomplishing the goal, motivation is low.

Students who have high success expectations choose more challenging tasks, persist more under difficulty, and perform better than those with low success expectations (Eccles, Wigfield, & Schiefele, 1998). Expectancy for success is affected by students' self-schemas and their perceptions of task difficulty. **Self-schemas** are stored in long-term memory and consist of all the information about ourselves that make us the person we are. For example, part of our self-schema is our beliefs about what we are good at or not so good at, such as how athletic, attractive, and good we are at different tasks or in different domains. The effect of task difficulty is similar. Recall from our prior discussion of goal theory that goals should be reasonably difficult to motivate students to learn. A student who believes that he is not good at drawing is likely to become unmotivated when asked to create a mural on the wall for the entire school.

Self-Schemas

All the information about ourselves that make us the person we are, stored in long-term memory.

Research has identified at least four factors that may affect task value. The first factor is *intrinsic interest*, which we discussed in our review of interest theory of motivation (Dewey, 1913; Hidi & Renninger, 2006). Students are more likely to find value in learning when they have a dispositional interest in a task. Although what makes something interesting for someone is a personal issue, there are some universal topics that attract all humans, such as death and health, love and sex, and money and power (Hidi, 2001). Young students are interested in animals, humor, and scary stories (Worthy, Moorman, & Turner, 1999).

The second factor affecting task value is *importance*, which has been defined as the extent to which a task confirms or disconfirms people's self-schemas (Wigfield & Eccles, 1992). If a student believes that he is very good in language arts, preparing for a spelling bee contest may be important because it confirms his self-schema. *Utility* also affects task value. Even when the task is not considered so important, if students believe that engaging in the task will be useful for accomplishing their goals, task value will be high.

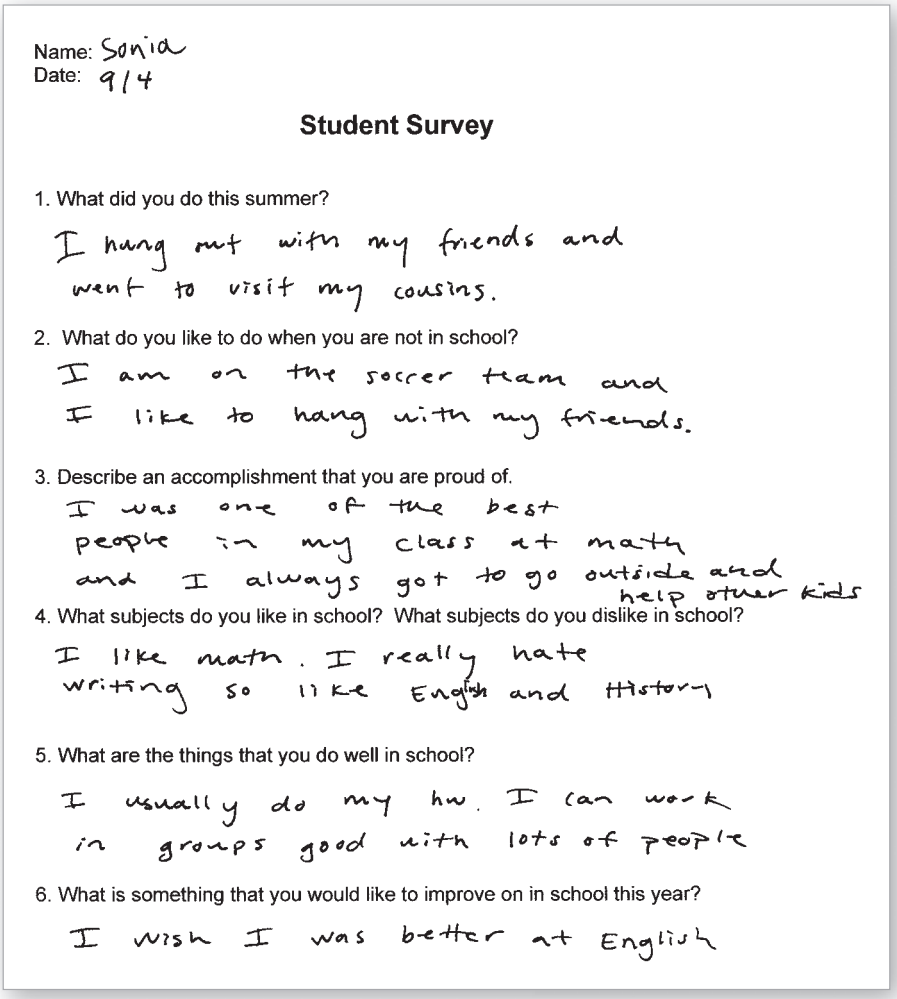
Finally, the relative *cost* of the task will also affect its value. If a certain task is considered interesting, important, and useful, but the cost to accomplish it (e.g., time, money, emotional and physical investment) is too high, motivation will be hurt. Marina is taking a course on computer programming; yet she drops the course when she discovers there are five projects that require working on weekends.

Learning about students' self-schemas is very relevant to understanding their academic motivation. You can gain insight into students' self-schemas by having them share their **possible selves** (Markus & Narius, 1986), which are the visions that students have of themselves in the future. Ask students to describe their *ideal* possible selves, their

Possible Self

The vision of one's self in the future.

FIGURE 9.6 By learning about students' self-schemas, teachers can help them develop strategies to achieve academic possible selves.



Name: Sonia
Date: 9/4

Student Survey

1. What did you do this summer?

I hang out with my friends and went to visit my cousins.

2. What do you like to do when you are not in school?

I am on the soccer team and I like to hang with my friends.

3. Describe an accomplishment that you are proud of.

I was one of the best people in my class at math and I always got to go outside and help other kids

4. What subjects do you like in school? What subjects do you dislike in school?

I like math. I really hate writing so I like English and History

5. What are the things that you do well in school?

I usually do my hw. I can work in groups good with lots of people

6. What is something that you would like to improve on in school this year?

I wish I was better at English

expected possible selves, and their *feared* possible selves. Students with academic or school-oriented possible selves are more likely to show improvement at school than those without these possible selves (Oyserman, Bybee, Terry, & Hart-Johnson, 2004). Helping students develop strategies to attain academic possible selves has a positive effect on achievement and even compensates for low parent–school involvement (Oyserman, 2008; Oyserman, Brickman, & Rhodes, 2007). Figure 9.6 shows an activity used by a teacher who is interested in learning about her students' academic self-schemas.

Attribution Theory. This sociocognitive theory describes the relationship between students' explanations or justifications for their academic success and failure and their motivation to learn. Originated by Bernard Weiner (1979, 1986, 1992, 2000), attribution theory suggests that students attribute academic success and failure to four main factors: ability, effort, luck, and task difficulty. These attributions can be classified along three dimensions: locus of control, stability, and controllability. First, attributions can have either an internal or external locus of control.

- A student who says "I am smart in science" is expressing an attribution for success that has an internal locus of control because ability is internal to the student.
- Conversely, a student who says "I failed the test because the questions were impossible to understand" is expressing an attribution for failure that has an external locus of control because the test questions are created by the teacher and the student therefore has no control over the cause of her failure.

The locus of control dimension is usually associated with different emotional responses. For instance, pride and confidence are usually present when students feel that their academic success is the product of internal causes such as ability and effort, whereas guilt and anxiety are usually present when students feel that the cause of their success resided in external factors such as cheating or getting unsolicited help. Internal and external attributions can be further classified in stable/unstable and controllable/ uncontrollable.

A stable attribution for success or failure is one that students believe will not be likely to change, such as the case of ability (i.e., internal/stable) or teacher characteristics (i.e., external/stable). Attributions for success/failure in such areas as health conditions (i.e., internal/unstable) or luck (i.e., external/unstable) are expected to vary. The stability dimension of attributions is associated with students' success expectancy. Only for stable causes will students expect that the same outcomes will repeat again.

Finally, attributions of success or failure can be controllable or uncontrollable, depending on whether students believe that they can or can't change the cause of their success or failure in the future. For example, Ivy can control the amount of invested effort in a school assignment, but she may feel she does not have control about the level of difficulty of the task. This third dimension of attributions has been associated with students' anxiety and persistence. When the cause of academic failure is believed to be uncontrollable, students are less likely to try harder and more likely to resort to avoidance strategies. In extreme cases, such as when failure attributions are based on stable, uncontrollable factors, students can develop learned helplessness, the belief that one is incapable of succeeding or changing the conditions that lead to failure. Learned helplessness can originate when a student believes that his/her failure is due to an internal, stable, uncontrollable trait such as low ability or intelligence. In this case, students are said to hold an *entity theory of intelligence* (Dweck, 2000), the belief that intelligence is fixed. In contrast, other students hold an *incremental theory of intelligence*, which is the belief that ability can be improved with effort. Many students who have learned helplessness believe that their ability is unchangeable, have low self-esteem, and may even become anxious and depressed at school (Graham & Weiner, 1996).

Knowing about students' attributions for academic success and failure can help teachers understand their motivation to learn. Students who have negative attributional styles (e.g., attributing failure to teachers or lack of ability) are less likely to have good grades, to seek help, or to use effective strategies, and they have lower success expectations than those who have more positive attributions (Karabenick & Knapp, 1991; Peterson, 1990). The good news is that teachers can use **attributional training** to help students gain awareness about their negative attributions and change them into more positive ones (Fosterling, 1985; Pintrich & Schunk, 2002; Robertson, 2000). For instance, Dweck (1975) presented both successful and unsuccessful experiences to students with learned helplessness. When students were unsuccessful, they were given feedback explaining that the failure was caused by lack of effort or the use of ineffective strategies. A control group of students was presented with the same experiences but no feedback. The findings showed that students who were counseled about their effort and strategies persisted more after failure and adapted strategies more effectively than their counterparts. Additional evidence on the effectiveness of attributional training was provided by deCharms (1972), who found that students improved achievement, reduced absences and tardiness, and increased their willingness to take moderate academic risks after being taught to shift their locus of control from external to internal. Table 9.3 lists different attribution causes with corresponding outcomes, dimensions, and examples of students' statements that might alert a teacher to the type of attributions they carry.

Attributional Training

A method aimed at helping one gain awareness of how one's actions affect outcomes.

What psychological state are students likely to develop when they believe that no matter what they do, they can't succeed at school?



agefotostock/SUPERSTOCK

TABLE 9.3

Attribution causes, outcomes, dimensions, and student examples.

CAUSE/ OUTCOME	DIMENSIONS	EXAMPLE
Typical effort/Success	Internal stable controllable	"I get good grades because I study hard."
Lack of ability/Failure	Internal stable uncontrollable	"I can't do math!"
Specific effort/Failure	Internal unstable controllable	"I just did not have the energy to study for this test."
Interest/Success	Internal unstable uncontrollable	"I wrote a good essay because I like the topic."
Teacher bias/Failure	External stable controllable	"I did not pass because I did not want to write about her favorite topic."
Task difficulty/Failure	External stable uncontrollable	"I don't stand a chance in this class. The textbook is way too difficult!"
Help/Success	External unstable controllable	"Thank God we could work in groups on this assignment!"
Luck/Success	External unstable uncontrollable	"I aced the test because it was my birthday."

Students' attributions may originate from a variety of sources, such as parents' messages, past learning experiences, and peer feedback. In addition, teacher expectations can have a strong impact on students' attributions. For example, when teachers assume that student failure is due to uncontrollable causes (e.g., lack of ability), they tend to respond with sympathy, pity, or praise for a "good try." Unfortunately, research shows that having low expectations and responding to students' failure in this fashion increases students' attributions of failure to lack of ability. Minority students are much more likely to be the targets of well-intentioned sympathetic messages (Graham, 1991, 1996; Graham & Barker, 1990).

Self-Efficacy Theory. As you probably remember from Chapter 8, where you learned about sociocognitive views of learning, the likelihood that a student will imitate a modeled behavior depends on the belief that he/she is capable of doing so. This belief is called *self-efficacy*, the judgment that students form about their ability to perform a task from a specific domain or with particular characteristics (Bandura, 1997). Self-efficacy is domain-specific: High self-efficacy in one domain does not engender high self-efficacy in another domain (Smith & Fouad, 1999). For example, a student may feel very efficacious in English but not in athletics. Self-efficacy, therefore, needs to be distinguished from *self-worth* (more commonly called *self-esteem*), which is a global judgment that we make about ourselves as individuals (Pintrich & Schunk, 2002).

There are several factors influencing students' self-efficacy. First is students' past performance (Ackerman, Kyllonen, & Roberts, 1999; Snow, Corno, & Jackson, 1996). Clearly, a history of success with a certain task or domain increases an individual's self-efficacy for future performance. A second factor is modeling (Bandura, 1986). Observing the performance of others increases our expectation of being successful in performing the same task (Kitsantas, Zimmerman, & Cleary, 2000). Although not as powerful, verbal persuasion can also be helpful in increasing students' self-efficacy. For example, when an influential person such as a teacher, parent, or peer expresses confidence in students' future performance, self-efficacy is likely to increase. Finally, self-efficacy beliefs can be affected by physiological and psychological factors (Bandura & Schunk, 1981). Students might notice that their hearts race or their palms sweat while performing a task, which may affect how efficacious they feel. Additionally, lack of sleep, anxiety, or fear may act to lower self-efficacy beliefs.

Self-efficacy has a strong influence on students' motivation to learn. For instance, self-efficacy is associated with initial task engagement, persistence, greater flexibility, resistance to negative feedback, and improved performance (Bandura, 1993; Goddard, Hoy, & Hoy,

2000; Pajares, 1996; Pajares & Schunk, 2001; Welch & West, 1995). Compared to students low in self-efficacy, students high in self-efficacy are more likely to accept challenges, control anxiety when goals are not met, discard unproductive strategies, and have an internal locus of control. Therefore, teachers can promote high self-efficacy by encouraging students to engage in specific challenging but attainable goals so that students can build a history of success that will empower them to engage in future tasks (Brophy, 2004). As you recall, this teaching implication is also derived from goal theory and self-determination theory, which stress the importance of fostering students' competence to increase motivation to learn.

Sociocognitive theory predicts that struggling learners (i.e., those who have suffered many academic difficulties and failures) will have low self-efficacy for academics (Henk & Melnick, 1995; Schunk & Zimmerman, 1997; Walker, 2003). This type of learner will need teachers' help the most. Classroom Tips: Promoting Self-Efficacy summarizes a set of strategies that teachers can use to increase struggling students' self-efficacy with corresponding examples (Margolis & McCabe, 2006). Remember that having low self-efficacy is not an unchangeable trait and that teachers have the power to increase the likelihood that struggling learners will become more motivated and successful.

CLASSROOM TIPS

Promoting Self-Efficacy

Strategy	Examples
Select tasks well within learners' abilities.	Ensure that students have the prerequisite knowledge and skills to master new topics and assignments.
	Sequence tasks from easy to difficult.
	Break complex skills into manageable components.
	Show learners how to correct their mistakes.
Frequently link new work to recent successes.	Give learners moderately challenging work they can succeed at if they make moderate effort.
	Administer brief criterion-based assessments to assess progress.
	Explicitly show learners how new work resembles past successes and remind them what they did to succeed in the past.
Teach needed learning strategies.	Model and explain strategies in a simple step-by-step fashion.
	Provide many guided-practice opportunities with specific feedback about what they are doing right and what needs improvement.
	Have them practice independently after reaching a mastery level.
Stress peer modeling.	Use peer coping models to show struggling learners that they can also acquire new skills.
	Have models explain their actions and correct their mistakes.
Teach students to make positive attributions.	Reinforce effort and persistence.
	Help students become aware of their control over learning.
	Have models verbally attribute failures to controllable factors (e.g., poor effort) and successes to controllable factors (e.g., using a good strategy).
Help students create personally important goals.	Find out struggling learners' goals with an interest inventory.
	Help students set short-term, specific, achievable, and meaningful goals.
	Relate short-term learning goals to longer-term personal goals.
Incorporate other motivational factors.	Model enthusiasm.
	Show unconditional positive regard.
	Compare students' achievements to their own past achievements rather than to other students' achievements.
	Encourage cooperative rather than competitive activities.
	Avoid providing unsolicited help in front of others to reduce the likelihood of sending a "low-ability cue."

CLASSROOM TIPS

How to Motivate Students Using Sociocognitive Theories

Theory	Classroom Implication	Classroom Tips
Expectancy X value	Motivation increases when the expectancy to succeed and value of the academic task increase.	Help students develop healthy self-schemas by examining their possible selves. Use interest inventories to learn about what students consider interesting, important, and useful.
Attribution	Motivation increases when students believe in controllable attributions for academic success and failure.	Unearth students' academic attributions. Retrain external academic attributions. Demonstrate the effect of effort on learning.
Self-efficacy	Motivation increases when students believe in their ability to perform a task from a specific domain.	Allow students to redo assignments until they reach a mastery goal. Give feedback that highlights students' improvement.

Classroom Tips: How to Motivate Students Using Sociocognitive Theories lists the three sociocognitive theories we just discussed with corresponding classroom implications and tips.

Humanistic Theories of Motivation

Humanistic psychology was developed in the 1950s. Unlike the previous three theories we discussed (behaviorist, cognitive, sociocognitive), humanistic theories are based on philosophy and focus on fundamental issues of life, such as identity, death, and freedom. Humanistic theories of motivation place motivation to learn within a hierarchy of human needs. For example, according to humanistic theories of motivation, a student is more likely to be motivated to learn if she has basic needs met (shelter, food).

Maslow's Hierarchy of Needs. Abraham Maslow (1954, 1971), one of the founders of humanistic psychology, proposed that all human beings have a hierarchy of needs, shown in Figure 9.7, ranging from the most basic to the highest-order needs.

Deficiency Needs

Basic physiological needs necessary for survival.

Growth Needs

Human needs that are not necessary for survival but are necessary for success.

Self-Actualization

The motivation to develop one's full potential as a human being.

According to Maslow, humans first need to satisfy their most basic needs before attempting to satisfy more sophisticated needs. The different needs can be divided in two main categories: **deficiency needs**, shown in purple/green in the figure, and **growth needs**, shown in yellow/orange in the figure. As humans satisfy their most basic physiological needs (e.g., food, water, sleep, shelter), they can move to satisfy other psychological needs (e.g., love and belongingness, self-esteem, knowing and understanding). Ultimately, humans might achieve the highest and most elusive of Maslow's needs: **self-actualization**, the development of one's full potential as a human being.

In Maslow's view, people who are unable to satisfy the most basic needs are at risk of suffering serious psychological consequences. Students who never completely address their needs for food or safety at home, for example, are impaired in their cognitive growth (Graham & Long, 1986), and those who are threatened with violence at school

may never feel safe again and have difficulty focusing on their studies (Kreitler et al., 1995). Research suggests that even when the financial situation of a student improves in the future, the negative effects of not having basic needs fulfilled at an early age may prevent him/her from moving up and addressing higher growth needs (Graham & Weiner, 1996). You may recall from "Imagine You Are the Teacher" that Ms. Hernandez could not figure out at first why Isaiah, who is homeless, was unmotivated to learn. However, a humanistic perspective on motivation helps us understand that Isaiah, despite being a bright and likable student, may not become motivated to succeed academically unless he is provided with a safe and stable living environment.

The need for knowing and understanding is one human growth need and can be well satisfied in the school environment. Recall from Chapter 3 that Piaget (1952) argued that children have a natural need for understanding and finding cognitive equilibrium. This natural curiosity to learn and understand, however, may be compromised by the lack of fulfillment of basic needs. On the other hand, when lower needs are satisfied and the search for understanding is fulfilled, individuals can start enriching their lives by appreciating the beauty in the world (i.e., aesthetic appreciation need) and eventually reach self-actualization. People who have fulfilled their growth needs can seek intellectual challenges (i.e., motivation to learn). They might find pleasure in artistic activities or devote part of their energy to serving the needs of others.

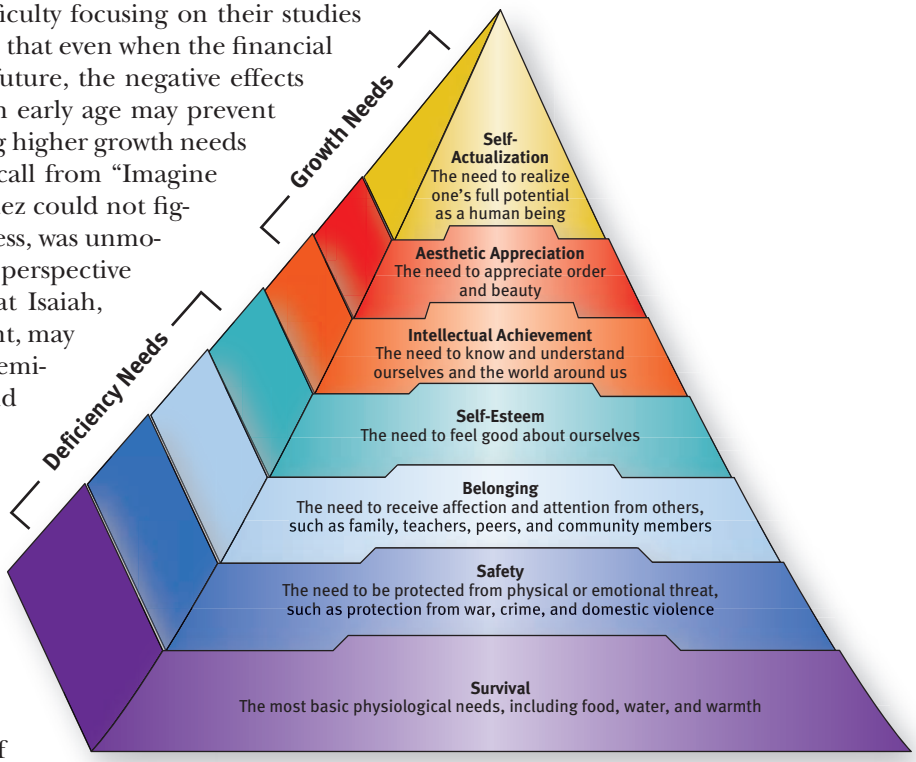


FIGURE 9.7 **Maslow's hierarchy of needs.**

Limitations to Maslow's Theory. The first limitation of Maslow's theory is his lack of a rigorous scientific methodology in deriving it. Maslow based his theory on the reports of a few people that he selected based on his belief that they were self-actualized individuals. In addition, his assumptions about the hierarchal nature of human needs—that is, the order of human needs—and their development have been criticized (Frame, 2005). For instance, unlike Piaget (1952), who argued that children are naturally curious and motivated by the need to understand the world around them, Maslow believed that students are most likely to become genuinely interested in gaining knowledge at a much later stage (e.g., college).

The most common criticism of Maslow's theory is the lack of research evidence to support it (Pintrich & Schunk, 2002). For example, some cultures appear to place social needs before any others. Also, the need hierarchy is unable to explain motivational cases such as the "starving artist," where a person neglects physical needs in pursuit of aesthetic or spiritual needs. Furthermore, there is little evidence to suggest that people are motivated to satisfy one need at a time before moving to the next need, except in situations where needs conflict with each other (Drenth, Thierry, Willems, & de Wolff, 1984). Finally, motivation researchers have found evidence for higher needs that are either not accounted for by Maslow's hierarchy or defined differently in it. The following are some examples:

- The need for power, which includes the need to control others and be publicly recognized (McClelland & Teague, 1975; Winter, 1973)
- The need for achievement, which is the drive to excel and succeed (McClelland, 1985)
- The need for affiliation, which includes not only the need to belong but also the need to avoid arguments (Exline, 1962) and competition (Terhune, 1968)



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Think about your past classroom experiences. Can you remember a teacher who made you feel unconditional positive regard? If so, did that motivate you to learn?

Achievement Motivation

The need to achieve in academics.

Unconditional Positive Regard

A teacher's attitude of total acceptance towards students.

The need to achieve in academics has been called **achievement motivation**. Different students might be more or less motivated by these needs, and expert teachers who understand the differences in motivation among their students appeal to needs that effectively motivate each student.

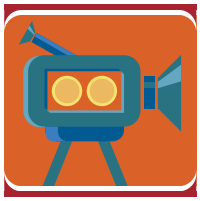
The Need for Unconditional Positive Regard. Carl Rogers (1959, 1963), another humanistic psychologist, believed that every human being has a tendency toward becoming self-actualized but that this tendency is highly dependent on experiences with others. In this regard, Rogers emphasized the need for **unconditional positive regard** to become self-actualized. In the classroom, the need for unconditional positive regard is supported when students believe that they are worthy and acceptable regardless of their behavior or performance. For instance, a teacher who encourages and accepts all students' comments and answers to questions and communicates clearly that making mistakes is an opportunity to learn is demonstrating unconditional positive regard.

Implications of Humanistic Theories for Education. Humanistic theories of motivation remind us that students are developing human beings who strive to fulfill many different needs across their life span and that academic motivation must be examined within a broad context that acknowledges nonacademic needs, drives, and goals (Schunk, 2000). Importantly, teachers should never assume that all students have had their deficiency needs satisfied appropriately. In fact, a large number of children are not adequately fed or loved in their homes (Noddings, 1992). An additional implication of humanistic theories is that teachers should try to separate students' performance and behaviors from their intrinsic worth and provide all students with unconditional positive regard (Rogers, 1959).

Because teacher preparation programs emphasize the educational mission of schools, it is easy to forget about students' basic needs and focus instead on the academic dimensions of the classroom. Too much of a focus on the need to learn may prevent teachers from realizing that the reason a student is withdrawn or apathetic in the classroom is due not to lack of motivation to learn but rather to unmet needs for food, safety, or physical comfort (Stipek, 2002).

Humanistic theory, therefore, suggests the need to develop strategies to help students fulfill their most basic needs so that they can reach their full academic potential. One way in which schools address this issue is by the free or reduced breakfast and lunch programs. In addition, teachers may help fulfill the need for belongingness and self-esteem by ensuring that students are accepted by their peers in collaborative learning activities (Miserandino, 1996; Nichols, 1996). Once these basic needs are met, teachers can focus on promoting students' motivation to learn. For instance, teachers should model their passion for knowing and understanding by teaching useful knowledge and strategies to help students appreciate the value of these intellectual tools; they should also model their appreciation for aesthetics by introducing students to different art forms (Alexander, 1997). In addition, when given the responsibility of teaching students from diverse backgrounds, teachers' attitudes and practices need to reflect an appreciation of the cultural, linguistic, and social characteristics of each of their students (Sparks, 1994).

Get Connected!



VIDEO CASE ASSIGNMENT. . . Teaching Example 2: Maintaining Student Focus (Tab 1)

Go to your WileyPlus course and view the video. While watching the video, think about how Mr. Ribiero utilizes the "How to Use Motivation Principles" discussed on the next page. After the video, summarize Mr. Ribiero's actions as they relate to each of the principles. Then evaluate how well he enacted each principle and make recommendations for change.

Recall from Chapter 2 that teachers who meet the needs of students from diverse backgrounds are those who go beyond the mere recognition of and respect for the fact that diverse students bring different experiences, values, and styles to the classroom (Gay, 2002). Effective multicultural teachers nurture their students' needs by creating challenging experiences that include students' diverse perspectives and values; fostering

students' sense that they are becoming competent in learning something that they value; and developing caring, communication, and a sense of community within their classrooms (Brown, 2007; Harriott & Martin, 2004).

Classroom Tips: How to Use Motivation Principles summarizes some principles from the chapter thus far with corresponding classroom examples. After reviewing the motivation principles, read the Case Study on the following page and apply what you have learned to help Ms. Tarabay motivate her students.

CLASSROOM TIPS

How to Use Motivation Principles

Principle	Classroom Examples
Identify and relate instruction to students' interests. Learners are more motivated by activities that appeal to their personal needs, goals, and interests.	Mr. Hindrix is in his first year as a fourth-grade teacher in a small coastal New England town. He gives his students an interest survey and finds out that most of his students are very interested in boats. He then designs math lessons that include many sailing examples.
Model intrinsic motivation. Teachers who explain the rationale for engaging in an activity and model their own enjoyment usually have students who are more intrinsically motivated.	Dana, a seventh-grade student, is really excited about her science project. Ms. Chad, her teacher, has been talking about the importance of recycling the earth's resources all the week, so Dana is going to build a compost pile at home and write a report to share with her classmates.
Minimize the use of rewards. Tangible rewards should be used sparingly, unexpectedly, and only when intrinsic motivation is absent.	Jana has been wandering around for the last 20 minutes instead of quietly working on her vocabulary words. Mrs. Charles has noticed that Jana has a tendency to become distracted when asked to do seatwork in language arts, despite her efforts to make the activities more interesting to Jana. Finally, Mrs. Charles tells Jana that she can spend time in the reading corner as soon as she finishes her work.
Use praise carefully. Praise should not be overused and needs to be genuine and accessible to all students to become a motivator for learning.	Mr. Anderson has been watching Juan all week during physical education class. He has noticed that Juan has been struggling with striking the tennis ball with a racket, but Juan persists upon failure. Mr. Anderson pulls Juan to the side and lets him know that he is gripping the racket much better and that his hard work is showing.
Give students autonomy. Promote intrinsic motivation by allowing students to participate in the selection of classroom rules and the tasks that they engage in.	Mr. Cooper likes to start each year by allowing his fifth-graders to participate in setting up classroom expectations. He has his students brainstorm actions that can help the class run smoothly and actions that can disturb the class. Mr. Cooper then guides the students in the process of transforming their ideas into a set of classroom rules.
Reinforce increasing competence. Help students develop self-determination and self-efficacy by setting proximal, moderately challenging, meaningful goals.	Sara, a ninth-grader, has trouble completing large projects. With Mr. Garcia's assistance, she sets goals for completion of her English semester project. In two weeks, she will have her topic selected, so that she can spend the next month gathering research; then she will make an appointment with the school librarian so that he can teach her how to do research in the library.
Show caring. Help students become self-actualized and satisfy their need for belonging by showing unconditional positive regard.	Mr. Watts has been teaching middle school language arts for 10 years. He has found that middle school students are really responsive when treated with respect. When a behavioral issue arises, he makes sure he listens to the student to learn about what may be causing the behavior before addressing the issue.
Choose from a variety of techniques to motivate students. Use a repertoire of motivational strategies and consider student age and other diversity factors when choosing motivators.	Mrs. Pearson keeps a notebook in the top drawer of her desk in which she has a list of motivational strategies and detailed notes about the conditions and students for which the strategies have worked. Mrs. Pearson has found her notebook to be a helpful reference when she encounters students who seem to be unmotivated to learn.

A Case Study: DIVERSITY IN THE CLASSROOM

Issues of Motivation in an Eighth-Grade Language Arts Classroom

"Way to go, Langdon! Awesome. You did your homework!" Ms. Tarabay says enthusiastically as students file into her eighth-grade language arts class. "Aaliya, thanks so much for completing the assignment on time," Ms. Tarabay commends.

As a first-year teacher at Morrison Middle School in North Philadelphia, Ms. Tarabay believes it is important to provide positive encouragement to her students. She's alarmed by the Philadelphia School District's dropout crisis: Approximately 8,000 middle and high school students drop out each year and nearly 5,000 additional students are "half-way to dropping out," attending school less than 50% of the time. From her teacher training, she knows that the majority of the students who become dropouts failed their English or mathematics courses or attended school less than 80% of the time when they were in the middle school. Ms. Tarabay feels she can do her part to counteract the dropout crisis by providing students with support and frequent words of encouragement.

Demographics:

An Overview of the Students

Morrison Middle School

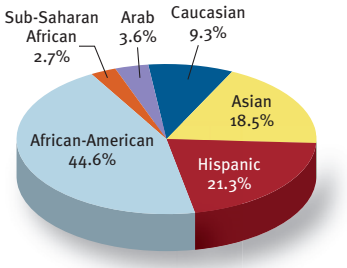
Logan, North Philadelphia

82.4% Students eligible for free and reduced lunch

17.3% Students Qualify ESL instruction

14.2% Students receive Special Education Services

Racial/Ethnic Groups



Lately, she's been concerned with students' lack of engagement. They're reluctant to participate in class discussions, don't seem motivated to make good grades, and many are missing homework assignments. Ms. Tarabay knows she needs to make changes in her lessons and has requested help from her mentor teacher. Today, she has set up a video recorder at the back of the room in order to reflect on the lesson later with her mentor teacher.

"We will continue to read *To Kill a Mockingbird*," Ms. Tarabay begins. "First, we'll review vocabulary and talk about the novel's setting, then you'll read Chapter 2 and discuss it with your reading partner. Let's start by reviewing the word *predilection*. Can anyone tell the class what *predilection* means and use it in a sentence?"

There are no volunteers. "You're so quiet this morning, you must be thinking hard," Ms. Tarabay surmises. "Well, thinking is a good start. Let me give you a hint—sometimes it's helpful to read the word in context. Page 13 reads, 'The Radleys, welcome anywhere in town, kept to themselves, a *predilection* unforgivable in Maycomb.'"

"Does that sentence give you clues about the word?" she asks. Once again, there is silence. "Does anyone remember learning this vocabulary last week?" Ms. Tarabay questions.

"Nah. I forget," Kaylee says.

"Yeah, we forget," Antonio chimes in.

"Don't worry, that's why we review," she responds. "Can someone tell me what this sentence means in their own words?"

"It's like everyone in the town wants to be friends with the Radleys and invite them over for dinner," Ella begins. "In the summer, our neighbors are always inviting us over for barbecue. Umm umm, those hot dogs are good," she digresses on a tangent.

"Nice job, that's a great start; thanks for sharing, Ella" Ms. Tarabay encourages. "What else does the sentence tell us?"

"Ugh, you like hot dogs?" Kaylee responds to Ella's comment. "Nothing, and I really mean absolutely nothing, can beat a hot Philly cheesesteak," he says and students laugh.

"Let's get back to the book, folks," Ms. Tarabay tries to steer the conversation back on course. "What is the sentence saying?"

"That the Radleys keep to themselves," Anthony offers.

"Good job!" says Ms. Tarabay. "So what does *predilection* mean?" She asks, but no one responds. "Anyone have an idea?" she asks.

"I don't know how to explain it," Miguel says tentatively. "Is it something that the Radleys do?"

"Yes, exactly, Miguel. Bravo!" Ms. Tarabay praises. "A *predilection* means a preference. In this case, the Radleys prefer to keep to themselves. You guys are doing a really great job today. Way to go! Can anyone use *predilection* in a sentence?"

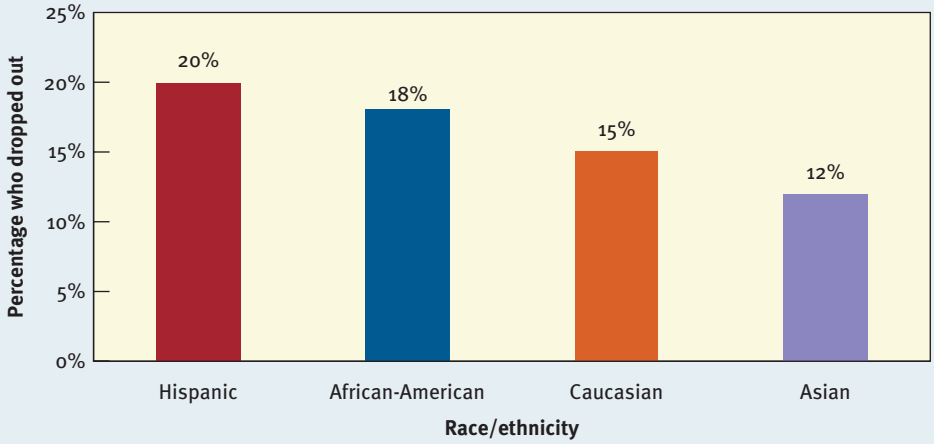
Once again, there are no volunteers.

After class, Ms. Tarabay meets with her mentor teacher, Mrs. Norris, to discuss the lesson and review the videotape.

"How's the book going so far?" Mrs. Norris asks.

"Well, I'm really excited to get to the themes of courage and racial injustice in the segregated South, but my students just aren't motivated," Ms. Tarabay explains.

"Why do you say that?" Mrs. Norris questions.



Source: Neild, R. C., & Bakfanz, R. (2006). *Unfulfilled promise: The dimensions and characteristics of Philadelphia's dropout crisis, 2000–2005*. Baltimore: Center for Social Organization of School. Johns Hopkins University.

"Well, reviewing vocabulary this morning was like pulling teeth. I don't know what the problem was exactly. They didn't seem to remember that we learned these words last week. Reading them in context didn't seem to help either—they just gave me blank stares. Of course, I try to be positive and encourage students who are participating. But, to be honest, I don't know how we're going to get through the book. They just don't seem to get it."

"That's surprising to me, because I've taught *To Kill a Mockingbird* to eighth-graders before, and they really connected with the story. They grasped the racial injustice and started to make connections between the book and inequalities they've witnessed growing up on the North Side of Philly."

"How did you motivate students to participate?" Ms. Tarabay asks. "I mean, at this point I congratulate them if they're willing to share anything, but they frequently go off on tangents, which distracts the whole class. I have a hard time keeping them focused and engaged."

"I found that giving students information-oriented feedback really helped. For instance, we created a simple discussion rubric, which we used as a reflection tool at the end of each class. Students would assess the focus of the conversation, the level of participation, how well they listened to each other, and identify something to improve for the next discussion. I also taught students how to set goals for their essay grades. Every Friday students would review their goals and make a plan for reaching their target."

"That sounds great, but I just don't know where to begin. Language arts seems to be the last thing on these kids' minds," Ms. Tarabay sighs. "At this point, I have some major questions: How can I motivate students to complete class requirements, such as turning in their homework on time and completing the essays? How can I encourage students to participate in meaningful discussions about the book? How can I help students set attainable learning goals that they can master?"

"I think those are all really good questions," Mrs. Norris responds. "As we watch the video of your lesson, we can discuss teaching strategies that can help promote students' motivation and engagement."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

AFFECT IN THE CLASSROOM

Affect

The mental state that results from our moods, feelings, and emotions.

So far, we have focused on the main theories of motivation and their implications for the classroom. Next, we discuss the role of affect in the classroom. **Affect** is the term used to refer to the mental state that results from our moods, feelings, and emotions. Helping students experience positive affect and reduce negative affect is important because when students feel good—by experiencing enjoyment, pride, competence, acceptance, and so on—they think more efficiently and become more motivated to learn, which in turn promotes more productive behaviors in the classroom. In this section we summarize what is known about the relationship between affect and cognition according to brain research and educational research with corresponding classroom implications.

Positive Affect, Negative Affect, and Cognition

Brain research shows that there are neural pathways connecting the brain's affective center (i.e., limbic system) with the frontal lobes, which play an essential role in learning (Leamnson, 2000). The limbic system interprets a person's emotional state (as positive or negative) and, depending on its interpretation, either opens (when affect is positive) or closes (when affect is negative) the use of cognitive processes such as attention, memory, and the ability to make novel connections (Vail, 2002). Take the following example. Before the last period of the schoolday, Brian told Jason that he was going to fight him after school. Jason knew that another student had ended up in the hospital last week after a fight with Brian. Jason spent all of history class worrying about Brian's threat. In this case, the student's brain is sending a fight-or-flight message, which typically prepares the body for vigorous emergency action while switching off any nonessential processes such as attending to classroom tasks and learning.

There is also evidence that material with high emotional content is better remembered than material with relatively little or no emotional content (LaBar & Phelps, 1998). According to neuroscientists, emotional materials trigger neurochemical activity affecting areas of the brain responsible for encoding and recalling memories (Hamann, 2001; Ritcher-Levin & Akirav, 2003). Some experts even suggest not only that emotions help us remember things that are emotionally loaded but also that emotions are so important that they have their own memory pathways (Jensen, 1998). For example, if students feel excited about a lesson on the U.S. Civil War, they will remember not only the content of the lesson but also their feeling of excitement during the learning experience. Yet a highly charged emotional event may have the opposite effect and be forgotten or repressed, such as the case of amnesia following a traumatic experience (Hurlemann et al., 2005). Fortunately, traumatic events are not typical in students' everyday classroom experiences.

Motivated Reasoning

The phenomenon that people become emotionally biased in their thinking when they have a strong emotional stake in an issue.

Brain research also shows a strong interaction between affect and cognition, called motivated reasoning. **Motivated reasoning** refers to the phenomenon that people become emotionally biased in their thinking when they have a strong emotional stake in an issue. For instance, motivated reasoners are willing to accept flawed information if it supports their beliefs and to maintain existing incongruent information if it boosts and protects their self-worth (von Hippel, Lakin, & Shakarchi, 2005). You may recall some examples of motivated reasoning in the classroom from Chapter 7, where we discussed thinking flaws such as confirmation bias, hindsight bias, overconfidence bias, and belief perseverance (Stanovich, 2004). Neuroimaging studies show that during motivated reasoning the brain engages both the neural circuits involved in cognitive processing and those involved in emotion regulation (Westen, Blagov, Harenski, Kilts, & Hamann, 2006). Taken together, the body of the most recent brain research on affect and cognition supports what is known as **hot cognition**, the idea that emotion is centrally implicated in cognitive reasoning processes (Damasio, 2000, 2003; Norman, 2004; Picard, 2000). Hot cognition contrasts with the more traditional view that cognition and emotion are separate processes that can be understood in isolation from one another.

Hot Cognition

The idea that emotion is centrally implicated in cognitive reasoning processes.

Affect and Learning

The exact relationship between affect and cognition is still the subject of intense research, but there is general agreement that positive and negative affect have measurable effects on students' learning, memory, problem solving, and creative thinking (Isen, 1999). For instance, positive affect helps students do the following:

- Activate mental schemas
- Make meaningful associations
- Consolidate long-term memories
- Become more creative and flexible during problem solving
- Take more risks
- Display more prosocial behaviors

Negative affect inhibits learning and memory and may even induce students to distance themselves from learning tasks and focus on avoidance behaviors instead (Isen, 1990; Jensen, 1998; Pekrun, Goetz, Titz, & Perry, 2002). In addition, studies show that when students are happy or in a good mood, they can detect discrepancies between new information and their existing conceptions; they are more likely to be open to learning new concepts (Bless, 2000; Linnenbrink & Pintrich, 2002). Simply stated, students' affective state can work as the on/off switch to motivation and learning (Vail, 2002).

What does this research on affect and cognition mean for the classroom teacher? First, it reminds us that learning is the result of the interaction between our information-processing and emotional systems. Therefore, teachers should cultivate positive emotional states and try to eliminate any source of negative feelings in their classrooms (Fredrickson, 2001). Because emotions are "contagious" (Hatfield, Cacioppo, & Rapson, 1993), teachers can monitor their own emotional state in the classroom—and project emotions that are motivating (e.g., enthusiasm, enjoyment, interest) and avoid displaying negative emotions (e.g., anxiety, frustration, boredom). In addition, students' cognitive performance will be affected by the particular emotional state that they bring to the task at hand. For example, Hannah loves reading time, but when her group starts to read a book that she believes is too easy for her, she quickly becomes bored and starts distracting one of her peers.

Teachers who understand the close relationship between cognition and affect also monitor students' affective state by interpreting their verbal and nonverbal language in the classroom. Leo is usually an engaged student who eagerly participates in class activities. One morning, Mr. Nion immediately notices that Leo is quietly sitting alone in the back of the room with his head resting on the desk. As the class gets started with their first group activity, Mr. Nion discreetly asks Leo if he is okay and finds out that his grandmother is in the hospital and is not expected to live. Mr. Nion asks Leo if he wants to talk to a counselor and offers to cover the day's material with him at another time.

The evidence for hot cognition also suggests that teachers should motivate students to be accurate thinkers by making them aware of their biases, helping them attend to relevant information more carefully, and helping them process information more deeply. Teachers need to consider how students' motivational beliefs (goals, values, self-efficacy, and control beliefs) may play a role in their conceptual change (Pintrich et al., 1993). Recall from Chapter 7 that students may resist changing their current beliefs when the new ideas are at odds with their values and goals, when the new ideas threaten their sense of self-worth, or when they are asked to take rather than construct new understandings. Finally, teachers can help students cement long-term memory by creating learning experiences that connect students' emotions to learning (Hardiman, 2001). Classroom Tips: Fostering Learning with Positive Affect summarizes principles about affect and learning and provides classroom examples of each principle.

CLASSROOM TIPS

Fostering Learning with Positive Affect

Principle	Classroom Tips
Cultivate positive affect in the classroom.	Model respect and caring in the classroom. Encourage students to pay attention to their peers' feelings. Display positive emotions such as enthusiasm during classroom activities. Praise students when they show prosocial behaviors in the classroom. Encourage students to write journal entries about their positive school experiences and share them with others.
Decrease negative affect in the classroom.	Avoid using sarcasm when interacting with students. Have a no-tolerance policy for student behavior that is hostile to or disrespectful of others. Teach students to talk about themselves and see themselves in a positive manner. Establish procedures that teach students to respect others' and their own ideas. Minimize stress in the classroom by creating a learning environment that has clear expectations and goals.
Be responsive to students' verbal and nonverbal emotional cues.	Be observant of atypical behaviors that may indicate emotional problems in the classroom. Establish good relationships with students so they are comfortable sharing thoughts and experiences that affect their learning. Provide an area for students to unwind if they are overwhelmed emotionally. Be flexible when planning and conducting a lesson so that you can adjust to the mood of the class.
Motivate students to be accurate thinkers.	Evaluate homework based on students' learning processes, not solely their final products. Ask students to explain how they arrived at an answer. Provide opportunities for students to form an opinion and explain why they think the way they do. Allow students to discuss their ideas in class in a respectful, nonthreatening manner.
Connect students' emotions to learning.	Use role-playing and debates to engage students' emotions. Incorporate art, cartoons, and other visuals to evoke emotions. Use current events that have high emotional content in your lessons. End classes with cliffhangers, open-ended questions, or intriguing issues to be resolved.

Arousal, Anxiety, and Performance

Anxiety

A negative affective state that involves a vague, highly unpleasant feeling of fear and apprehension.

Anxiety is a negative affective state that involves a vague, highly unpleasant feeling of fear and apprehension. For certain students, anxiety is so high that it inhibits their learning or performance, especially on tests (Everson, Smodlaka, & Tobias, 1994; Wigfield & Eccles, 1990). All students feel some level of anxiety at some time in school, and this emotional reaction, when moderate, does not necessarily carry negative learning effects. In fact, many high-achieving students express moderate levels of anxiety (Bandura, 1997), which has led to the distinction between *facilitative* anxiety and *debilitating* anxiety. Take a look at Figure 9.8, which plots the relationship between anxiety and performance levels.

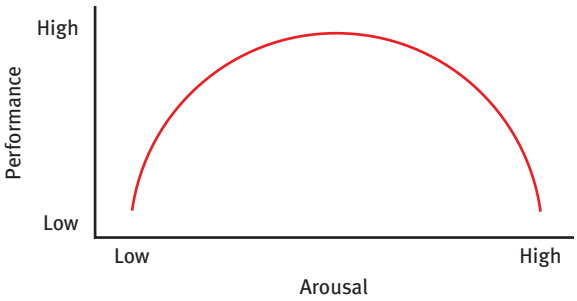


FIGURE 9.8 **The relationship between arousal and performance.**

As you can see, very low and very high anxiety levels are associated with the lowest performance levels whereas moderate levels of anxiety are associated with the highest performance levels. In other words, some anxiety is good, but too much is detrimental (Cassady & Johnson, 2002). The shape of this curve can be interpreted using what you have learned from cognitive views of learning in Chapter 6. Students need to experience a certain level of arousal to become alert or attentive while performing. **Arousal** can be defined as the psychological and physical conditions that are needed to be prepared to respond or act. Too little arousal will lead to passive learning. If the arousal level exceeds the happy medium, it can then turn into fear or debilitating anxiety and take away precious attentional resources for the task at hand.

Arousal

The psychological and physical conditions that are needed to be prepared to respond or act.

What are some of the sources of academic anxiety? One source of anxiety is *school transition*. K–2 children suffer anxiety upon beginning school and separation anxiety when parents leave the classroom (especially on the first days of starting kindergarten). Students also experience increased anxiety during the transition to middle and high school, respectively (Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991). Teachers should be aware of the potential transition anxiety at different school stages and use strategies to ameliorate its negative effects on learning. Warm, nurturing classrooms where children see themselves as members of a classroom family help young children reduce the anxiety associated with starting school. Providing students with a support group of three or four classmates as they enter middle or high school can help them feel part of a small, close group and reduce their transition anxiety. Students who make a smooth transition to high school are more likely to be academically successful and to graduate than those who don't (Roderick & Camburn, 1999).

Another common type of anxiety is *math anxiety*. Many students suffer from debilitating math anxiety when given problems to solve, especially word problems (Everson, Tobias, Hartman, & Gourgey, 1993). Experts believe that anxiety is domain-specific (a student who experiences math anxiety will not necessarily be anxious in other subjects) and originates in low self-efficacy and the fear of failure (Hill & Wigfield, 1984). Low achievers are very likely to feel anxious because they experience difficulty learning, using or transferring knowledge, and demonstrating knowledge (Bandalos, Yates, & Thorndike-Christ, 1995). Moreover, low achievers are likely to be self-conscious when asked to perform, a feeling that will distract them from focusing on the task at hand (Tobias, 1992). High-achieving students may be anxious about performing tasks that they are less than excellent at, or they may experience anxiety as a result of parents' expectations and pressure (Wigfield, Byrnes, & Eccles, 2006).

Is this student likely to be experiencing debilitating or facilitative anxiety?



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Finally, students are also likely to experience *test anxiety*. Students in grades 9–12 will typically exhibit anxiety when taking high-stake tests. Students' test anxiety originates in concern about the potential negative judgments that teachers and others (e.g., parents, peers) may make if they do not perform well (Harter, Whitesell, & Kowalski, 1992). In summary, debilitating anxiety will arise in any of the following situations:

- Physical safety is at risk.
- Expectations are uncertain or unclear.
- Self-efficacy is low.
- Self-worth is being threatened.

When children show substantial fears that persist over time, it might be necessary to engage in behavioral therapies, which are especially effective in reducing inappropriate anxiety and fear (Davidson & Neale, 2007). In the classroom, teachers can

use many strategies to reduce the negative effect of anxiety on learning and performance (Spielberger & Vagg, 1995; Wigfield & Eccles, 1989). Overall, anxiety-reducing strategies are aimed at creating a classroom climate that is accepting, comfortable, and noncompetitive. Classroom Tips: How to Reduce Anxiety in the Classroom lists typical student characteristics by grade level and corresponding anxiety-reducing strategies.

CLASSROOM TIPS

How to Reduce Anxiety in the Classroom

Grade-Level Characteristics	Anxiety-Reducing Strategies
Kindergarten	
High anxiety upon beginning school, especially when children have no preschool experience.	When possible, meet children in a quiet setting before school begins, to minimize the emotional shock of moving from home to the school environment.
Separation anxiety when parents leave the classroom.	Provide a warm and supportive environment.
	Provide clear, unambiguous instructions.
	Work with the parents to better understand the conditions that may help the child relax.
Elementary School	
Emergence of math anxiety, especially when little assistance is provided.	Monitor student behavior to identify signs of anxiety and talk to students privately to find the sources of anxiety.
Emergence of anxiety from concern about appearance.	Promote students' self-efficacy: Increase difficulty level gradually; give opportunities to correct errors or improve work before handing it in; avoid time pressure by giving plenty of time to complete and check schoolwork; give anxious students practice in the task that produces anxiety.
Increased anxiety at the end of elementary school and during the transition to middle school.	Work with the school counselor if necessary.
Middle School	
Increased anxiety in general.	Identify and discuss anxiety sources with students. If severe, work with the school counselor.
Stronger concern about others' opinions and judgments regarding appearance and performance.	Promote students' self-efficacy (see elementary school strategies above)
Increased anxiety at the end of middle school and during the transition to high school.	Make a personal connection with the student and express caring and confidence.
	Promote attributions based on internal causes.
	Provide opportunities to work closely with other students.
High School	
Considerable test anxiety, especially for high-stakes tests.	Support students, especially if they have just made the transition from middle school.
Emergence of anxiety from peers' behaviors and personal comments.	Show personal interest in students' welfare.
Increased anxiety at the end of high school and during the transition to college.	Help students set their career goals.
	Teach test-taking skills and use practice tests with clear study guides.
	Teach self-regulation strategies before, during, and after the test.

DIVERSITY IN MOTIVATION AND AFFECT

In this section, we examine what is known about diversity in motivation to help you become a more effective teacher. As you read, remind yourself of the limitations of between-groups research, which can only inform you about the average findings for students who belong to a certain group (e.g., culture, gender, age). Diversity *within* these groups, however, should not be dismissed. For example, even though the average Asian-American student is found to have strong achievement motivation, some Asian-American students will not have this characteristic.

Developmental Differences in Motivation and Affect

One of the most striking findings in motivation research is the developmental shift from a predominantly intrinsic to a more extrinsic motivation to learn (Harter, 1996). Typically, as students move from early elementary school to high school, intrinsic motivation to learn decreases and performance goals take primacy over learning goals (Carnegie Council on Adolescent Development, 1996). This phenomenon is largely the result of the changes in the school environment, which become misaligned with young adolescents' needs. Specifically, middle schools and high schools are more impersonal, formal, evaluative, and competitive than elementary schools; students have fewer opportunities to build a sense of community with their peers and teachers; and teachers are more likely to become controlling at a time when adolescents are seeking more autonomy (Bryk, Lee, & Smith, 1989; Eccles & Wigfield, 2002; Eccles et al., 1993). Developmental differences in affect are also evident. For example, adolescents experience more frequent negative emotions than preadolescents (including depression) and experience wider extremes of both positive and negative emotions than adults, a finding that is consistent across cultures and socioeconomic status (Larson, 2002).

Gender Differences in Motivation and Affect

You may recall from Chapter 4 that girls tend to perceive themselves as more competent than boys in reading and social activities whereas boys tend to perceive themselves as more competent than girls in math and athletics (Cole et al., 2001; Herbert & Stipek, 2005; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Wigfield, Byrnes, & Eccles, 2006; Wilgenbusch & Merrell, 1999). A cross-cultural study of more than 3,000 children in grades 2 to 6 showed a close correspondence between students' achievement and their competence-related beliefs (Stetsenko, Little, Gordeeva, Grasshof, & Oettingen, 2000). However, when girls outperformed boys, their beliefs in their competence were no greater than boys' beliefs, even though they did have stronger beliefs than boys in other aspects of their achievement potential (e.g., putting forth effort, getting teacher help). Other studies show that girls have lower expectations of success than boys and are more likely than boys to attribute failure to lack of ability, especially as they grow older; they also tend to attribute their success to unstable factors, such as luck, whereas boys are more likely to attribute success to ability and failure to bad luck (D'Amico, Baron, & Sissons, 1995; Dickhäuser & Stiensmeier-Pelster, 2002). The different academic beliefs of girls and boys are interpreted to be the result of gender-role stereotypes and caution teachers to avoid setting different expectations for girls and boys on different subjects and tasks (Halpern, 2006; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). There is also evidence of gender differences in affect. In general, girls are more likely than boys to worry about academic performance; to evaluate themselves negatively; and to experience internalizing symptoms, such as anxiety and depression (Pomerantz, Altermatt, & Saxon, 2002). On the other hand, girls talk more about their emotions, are better able to express their emotions and decode others' emotions, and put more value on the expressing of emotions than boys (Nelson, 1993).

Cultural Differences in Motivation and Affect

On average, African-American students are more focused on mastery goals than their European-American counterparts (Freeman, Gutman, & Midgley, 2002), and Asian-American students are more focused on performance goals than European-American students (Ng & Renshaw, 2002; Salili, Chiu, & Lais, 2001). However, some studies suggest that the assumption that students' mastery and performance goals are based on individual needs should be reconsidered. For example, Chinese students endorse performance goals in order to fulfill their social obligations and cultural demands for high achievement yet hold mastery goals as individual pursuits for knowledge, interest, and enjoyment (Tao & Hong, 2000); students who come from cultures that value group over individual achievement (e.g., Native American, Hispanic, Pacific Islander) typically focus their mastery goals on how much individuals *and their peers* improve rather than on individual progress alone (Kaplan & Maehr, 1999). Likewise, many Native American students are raised to do well at school so that they can use their knowledge and skills to serve their community rather than to serve individual needs (Suina & Smolkin, 1994; Timm & Borman, 1997).

Although all students are susceptible to the same emotions and feelings, research has documented cultural differences regarding students' anxiety sources. For instance, the average Asian-American student is likely to feel debilitating test anxiety due to the high family pressure to perform well in school (Pang, 1995). Being a recent immigrant to a new country can also be a source of high academic anxiety due to students' concern about how to behave, make friends, and make sense of the mainstream culture (Dien, 1998; Igoa, 1995).

Stereotype Threat

A phenomenon in which a member of a certain group performs more poorly and shows physiological anxiety reactions due to the fear of confirming a negative stereotype about his/her group.

Anxiety can also be the result of **stereotype threat**, a phenomenon in which a member of a certain group performs more poorly and shows physiological anxiety reactions (e.g., increased heart rate, sweaty hands) due to the fear of confirming a negative stereotype about his/her group (Aronson et al., 1999; McKown & Weinstein, 2003; Steele, 1997). Stereotype threat typically occurs when a fixed biological characteristic (e.g., race or gender) is emphasized before a given test. For instance, in a classic study, African-American students who were given the GRE test (a test that most colleges require for admission) and told that their ability was being examined underperformed their Anglo counterparts. However, when African-American students were not told that the tests were aimed at measuring their ability, their performance was not different from that of the Anglo students (Steele & Aronson, 1995). In a more recent study, a group of women were placed in either a stereotype-threat condition or a no-threat condition and then asked to complete a math test (Cadinu, Maass, Rosabianca, & Kiesner, 2005). Results showed that compared to the no-threat condition, women in the stereotype-threat condition underperformed and reported more negative thoughts about the test and about mathematics. Repeated exposure to stereotype threat, such as the one faced by some ethnic minorities in academic environments and by women in math, can diminish value for the domain in question (Aronson, Fried, & Good, 2002).

Socioeconomic Diversity in Motivation and Affect

An important implication of humanistic theories of motivation is that teachers should be concerned about all aspects of student development. Clearly, students who come to school hungry, chronically ill, depressed, or preoccupied by family issues cannot engage fully in the academic curriculum. Many students who live in poverty will also be burdened because they are required to work and take care of siblings or other relatives such as grandparents, roles that middle-class and upper-class students will typically not assume until they are older. Economic and other family stressors associated with poverty can affect students' motivation adversely by lowering their sense of competency and expectations for success, making them more pessimistic about the value of schooling and setting goals, causing them to miss school more often, and

engendering higher academic anxiety (Bronfenbrenner, McClelland, Wethington, & Moen, 1996). There is, however, substantial evidence that the educational context can have a profound effect on students' motivation to learn (National Research Council, 2004).

Depending on funding and the proclivities of the administration, schools will have special support programs that include counselors, mentors, social workers, and nurses. Even if these programs are not in place, teachers can significantly increase at-risk students' motivation by supporting their basic social, emotional, and practical needs in the classroom. The motivation role of the teacher will be especially important in urban schools, which tend to have few resources and large classrooms. Specifically, effective urban teachers are those who motivate their students with the following strategies: creating caring, personalized relationships; setting high expectations for all students; presenting authentic tasks; capitalizing on students' cultural knowledge; providing frequent informational feedback; allowing the use of multiple resources (e.g., using native languages, accommodating different learning styles, providing a diversity of assessment formats); and giving explicit attention to developing learning and problem-solving strategies (Applebee, Burroughs, & Stevens, 2000; Gutierrez, Baquedano-Lopez, & Tejada, 1999; Jimenez, 2000; Lee, 2001; Manouchehri, 2004; Snow, 2002). However, as with any other diversity factor, the effects of socioeconomic background vary from student to student and will depend on other important factors such as the resiliency of the student and the degree of parental support and involvement (Turkheimer, Haley, Waldron, D'Onofrio, & Gottesman, 2003; Wang, 1997).

Student Exceptionalities, Motivation, and Affect

Although there is diversity in motivation and affect among students with special needs, many of them will show greater negative emotions or signs of lack of motivation than their peers. For instance, recent studies show the following to exist in students with learning disabilities:

- A prevalence of depression (Maag & Reid, 2006; Sideridis, 2006)
- A tendency to develop helplessness (Valas, 2001)
- Low perceptions of self-efficacy and self-worth (Abela & Alessandro, 2002; Covington, 2000)

These negative feelings pose serious threats to their academic motivation and functioning (Chen & Li, 2000; Firmin, Hwang, Copella, & Clark, 2004; Yee, Pierce, Ptacek, & Modzelesky, 2003). Therefore, inclusive classroom teachers need to apply the motivation principles from this chapter to promote the confidence and success of students with special needs. Strategies to encourage positive feelings and motivation include the following (Carr & Borkowski, 1989; Duchardt, Deshler, & Shumaker, 1995; Heward, 2006; Turnbull, Turnbull, & Wehmeyer, 2007):

- Focusing on students' strengths
- Setting specific, short-term, achievable goals
- Holding high expectations
- Relating the curriculum to students' personal interests
- Modeling enthusiasm and interest in learning new knowledge and skills
- Helping students reflect on the relationship among effort, strategies, and learning
- Retraining students' attributions for failure from lack of ability to lack of effort
- Providing opportunities for peer mentoring, buddy-up, and cooperative learning
- Fostering social skill development
- Modeling respect and acceptance among peers

In addition, research on gifted students emphasizes the importance of promoting the motivation of these learners by providing opportunities to pursue their personal interests in challenging activities that are related to their long-term goals (Reis & McCoach, 2000). You can find many classroom strategies for motivating gifted and talented students in the section on giftedness and talent in Chapter 2.

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

What are some statements or questions teachers can make that will promote the development of intrinsic motivation in students and decrease the students' dependence on extrinsic motivation? Working with a partner or in groups of 3 to 4, make a list—you might want to connect the statements to specific groups of diverse students (developmental, cultural, gender, socioeconomic, and special needs groups). Consider the behaviorist perspective of informational rewards, praise and feedback. Consider the cognitive theories of interest, goals, and self-determination as well as self-efficacy. Consider also the expectancy x value and attribution theories discussed in this chapter. How do the lists for different needs students compare?

REVISITING ISSUES IN EDUCATION

Do assessments undermine students' self-determination?

Points to consider: As is usually the case in any educational debate, to assess or not to assess is not the question but rather how you design your assessments to promote motivation to learn. Recall our discussion of controlling versus informational rewards and feedback. When assessments are viewed as controlling or even punitive, they will decrease students' sense of autonomy and intrinsic motivation to learn. On the other hand, if you design assessments to provide students with helpful information about increasing competence, then assessments will have the opposite effect. Research suggests the following guidelines for creating motivating assessments: assess frequently and thoroughly; communicate your expectations clearly and align them with your instructional objectives; provide detailed feedback about students' performance, focusing on students' thinking processes rather than the answer itself; avoid comparing students' performance (Deci & Ryan, 1987; Dochy & McDowell, 1997; Pintrich & Schunk, 2002; Stipek, 2002).

SUMMARY

- Motivation is the willingness to spend a certain amount of effort to achieve a particular goal. Intrinsic motivation is the motivation to be involved in a learning activity for its own sake, whereas extrinsic motivation is the motivation to be involved in a learning activity as a means to an end. Both intrinsic and extrinsic motivation can operate at the same time in any given situation.
- There are four approaches to motivation in the classroom: behavioral, cognitive, sociocognitive, and humanistic. Behavioral theories of motivation emphasize reinforcement and punishment as keys in determining students' motivation. A limitation of this approach is its focus on extrinsic sources of motivation, which may produce only temporary changes in behavior or a materialistic attitude toward learning as well as eventually undermine any intrinsic motivation a student may have.
- Cognitive theories emphasize the role of students' thoughts and beliefs on academic motivation. Examples are interest, goal, and self-determination theories of motivation. Interest theory suggests tapping on students' dispositional and

situational interests to promote motivation to learn. Goal theory suggests helping students set meaningful goals and monitor their progress toward goals to promote motivation. Goals that are specific, moderately challenging, and proximal are most motivating. Students bring different goals to the classroom, such as mastery goals, aimed at improving knowledge and skills; performance goals, aimed at showing competence and achieving a certain end result; performance-avoidance goals, aimed at avoiding academic work; and social goals, aimed at connecting to peers. Self-determination theory suggests creating autonomous classrooms by supporting three innate psychological needs: the need for competence, the need for control, and the need for relatedness.

- Sociocognitive theories suggest that motivation to learn is the result of both students' beliefs and the instructional environment conditions. Examples are expectancy X value, attribution, and self-efficacy theories of motivation. According to expectancy X value theory, students' expectations for success and the value they place on what they want to achieve can affect their motivation to learn. Expectancy for success is affected by students' self-schemas and their perceptions of task difficulty; task value is affected by the interest, importance, utility, and cost of the task. Attribution theory describes how students' explanations for their academic success and failure affect motivation to learn. Weiner identified three attributional dimensions: locus of control, stability, and controllability. When failure attributions are based on stable, uncontrollable factors, students are likely to develop learned helplessness. Self-efficacy, the belief that one can successfully master a situation, is associated with initial task engagement, persistence, greater flexibility, resistance to negative feedback, and improved performance. Teachers can help students build higher self-efficacy by encouraging them to engage in specific, challenging, attainable goals.
- Humanistic theories of motivation place motivation to learn within a hierarchy of human needs, which Maslow classified into deficiency (survival, safety, belonging, and self-esteem) and growth needs (intellectual achievement, aesthetic appreciation, and self-actualization). Rogers emphasized students' need for unconditional positive regard, the belief that they are worthy and acceptable regardless of their behavior or performance.
- There is a strong relationship between affect and cognition: positive affect enhances thinking and performance, whereas negative affect impairs or inhibits thinking and performance. Hot cognition refers to the finding that reasoning can be biased by one's emotions, feelings, values, or goals. Academic anxiety can be facilitating or debilitating, depending on whether it helps or hinders performance, respectively. Debilitating anxiety is likely to occur when physical safety is at risk, expectations are unclear, self-efficacy is low, or self-worth is being threatened, with the most common anxiety sources stemming from school transitions, math performance, and testing.
- As students move from early elementary school to high school, intrinsic motivation to learn decreases and performance goals overtake learning goals, a phenomenon that is largely attributed to the impersonal and competitive characteristics of typical high schools. Motivation is also affected by students' gender, culture, socioeconomic background, and special needs. Girls tend to perceive themselves as more competent than boys in reading and social activities, whereas boys tend to perceive themselves as more competent than girls in math and athletics; girls are more likely to attribute failure to lack of ability and to attribute their success to unstable factors such as luck, whereas boys are more likely to attribute success to ability and failure to bad luck. On average, African-American students are more focused on mastery goals and Asian-American students are more focused on performance goals than European-American students, although differences exist within each cultural group. A special source of anxiety is stereotype threat, a phenomenon in which a member of a certain

group performs more poorly due to the fear of confirming a negative stereotype about his/her group. The effects of socioeconomic background vary from student to student and will depend on other factors such as the resiliency of the student and the degree of parental support. Nevertheless, economic and other family stressors associated with poverty can affect students' motivation adversely by lowering their sense of competency and expectations for success. Likewise, although there is diversity in motivation and affect among students with special needs, many of them will show greater negative emotions or more signs of lack of motivation than their peers.

KEY TERMS

achievement motivation 348
affect 352
anxiety 354
arousal 355
attributional training 343
autonomy 339
deficiency needs 346
dispositional interest 334
extrinsic motivation 329
flow 329
growth needs 346
hot cognition 352
intrinsic motivation 329
mastery goal 336
motivated reasoning 352
motivation 328
performance-avoidance goal 338
performance goal 336
possible self 341
relatedness 339
seductive details 335
self-actualization 346
self-schemas 341
situational interest 334
social goal 338
stereotype threat 358
unconditional positive regard 348

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is motivation?
2. What is the difference between intrinsic and extrinsic motivation?
3. What are students' psychological needs and how can teachers support them?
4. Should you use rewards in the classroom?
5. In what ways can teachers spark students' interest?
6. How do students' goals relate to their motivation and learning?
7. Why may it be important to examine students' attributions for academic success and failure?
8. In what ways can teachers help decrease students' anxiety?
9. What are the principles of motivation theories of learning and how would you apply those principles to your classroom?
10. What kind of student diversity are you likely to find regarding motivation to learn?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- What were the most useful concepts that you learned about?
- Are there any concepts that you feel are still unclear or questionable?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. Design an action research study in your classroom to test the effect of a token economy system in your classroom (Chapter 1).
2. How can you use what you have learned about motivation to design more effective IEPs (Chapter 2)?
3. What motivational effects may arise from failing to follow prereferral strategies, especially for linguistically diverse students (Chapter 2)?
4. How would you relate Vygotsky's developmental theory to the following motivational concepts: autonomy, relatedness, and self-efficacy (Chapter 3)?
5. Does Erikson's theory of psychosocial development take into consideration motivation? Why or why not? (Chapter 4).
6. Explain how students might develop test anxiety according to behaviorist learning theory (Chapter 5).
7. What are the implications of the research on hot cognition for cognitive theories of learning (Chapter 6)?
8. For each of the four motivation theories that you learned, list one motivational condition for successfully engaging students in a problem-solving activity (Chapter 7).
9. What motivation theories/principles support a constructivist approach to learning and how (Chapter 8)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Fifth-Grade Classroom Use Motivation Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions by applying the theories and research discussed in this chapter.

During Chula Vista Elementary School's November Open House, parents learn a lot about Mr. Larkin's fifth-grade students by reading their writing projects. "My History" posters include a photograph and a story about a special person in their lives, a family tree, a timeline of important events, a poem about their hobbies, and a letter to their teacher outlining their learning goals for the year. Mr. Larkin also displays a poster with pictures of his family, friends, and recent travels. The students' favorite part of his poster are headphones that let you sample a few of his favorite songs—by the Beatles and Aretha Franklin. During the project, students got to know each other better, while also finding out about their teacher's high expectations, learning classroom routines, and determining how to set learning goals. Mr. Larkin designed "My History" to motivate his students to write about personal experiences and to launch a new way of teaching writing in his classroom.

At the beginning of the schoolyear, Chula Vista teachers met with middle school colleagues to discuss writing. The middle school faculty reported that elementary school students used correct conventions and clear organization but struggled with sentence fluency, ideas, and voice.

Upon reflection, Mr. Larkin decided to change the way he would teach writing. Instead of teaching formulaic writing methods, he wanted to create a writing community. In the past, for instance, he taught students how to organize five-sentence paragraphs about teacher-selected topics. Then students would use checklists to systematically proofread their writing. This year, Mr. Larkin hopes to teach a writing workshop in which all students are engaged in the writing process and write independently on topics they choose themselves. He will continue to teach organization and conventions, but he will expand his instruction to include mini-lessons on a variety of writing topics, conferences with students to give them feedback, and community meetings where students can share their writing with the class.

To facilitate the workshop, Mr. Larkin created a well-organized classroom. Each student has a writing folder in which to keep current projects and forms to help them reflect on the learning process:

Folder Forms:

- *My Writing Projects:* Students write down all project titles, type of writing (memoir, letter, news article, report, poem, etc), and date it is completed.
- *What I Learned as a Writer:* Students reflect on what they have learned during the writing experience.

The Writing Center has a crate of hanging files in which students file finished projects, including successive drafts. The center includes materials such as lined paper, special publishing paper, envelopes, colored pencils, and a date-stamp. A table is set aside for writing conferences, where Mr. Larkin regularly meets with students to have conversations about their writing. He uses the time to listen to students talk about their writing, help them with specific strategies, and identify instructional needs. The structure of the workshop gives students autonomy to self-select projects, organize and reflect on their writing, and use materials to publish finished products.

The goal of today's mini-lesson on persuasive writing is to motivate students to use writing to effect change. Mr. Larkin wants to demonstrate that writing is a valuable tool and relevant to their lives. He plans to review persuasive writing and brainstorm a list of topics and ideas that can be used in a persuasive piece of writing on a topic of their choosing.

Mr. Larkin begins, "I know, from experience, that many of you are experts in the art of persuasion. Just last week, Gabriella tried to convince me that munching pretzels during writing workshop would improve her focus. She showed me samples of her work to demonstrate how pretzels improved her writing. Her evidence was very convincing." Gabriella grins. "How many of you have recently tried to persuade your parents?" Students' hands shoot up.

Daryl starts, "I tried to convince my mom that potato chips are just as healthy as celery, but it didn't work."

"Why didn't your persuasion work?" Mr. Larkin questions.

"I didn't make a convincing argument. I didn't have any evidence that potato chips are healthy."

"Just tell her they're both vegetables and they'll help you get your homework done." Vernon adds.

"You see," Mr. Larkin laughs, "Fifth graders are persuasion pros." He is pleased they are making personal connections to persuasive writing.

"Today, during our mini-lesson, we will get started with persuasive writing. I will be your scribe. What is the first thing we do when we prepare to write?"



Gary Rhijnsburger/Masterfile

Robyn reads the chart next to the board titled, "But, how should I start? First, brainstorm ideas and gather information."

"I will write down all your persuasive ideas." He hurries to note down all the topics. They range from convince your parents to take you to Disneyland to persuade your brother to take out the garbage.

Mr. Larkin wants them to also think about issues at school. "Are there things you would like to see changed at school?"

Responses include: "No homework on Fridays." "Longer recesses." "New basketball hoops and playground equipment." "Yeah, last week a first-grader got hurt on the slide because it's rusty." "We've had this same equipment since kindergarten." "The monkey bars are too far apart, so they're really hard to use."

Mr. Larkin prompts, "Is there anything you might be able to do about the playground equipment?

Students respond variously: "We could write about it, but what good would that do?" "We could give the letter to the principal." "But she already knows about our old equipment." "Who could we send the letter to?" "To the newspaper?" "To parents?" "Who makes decisions about playground equipment?"

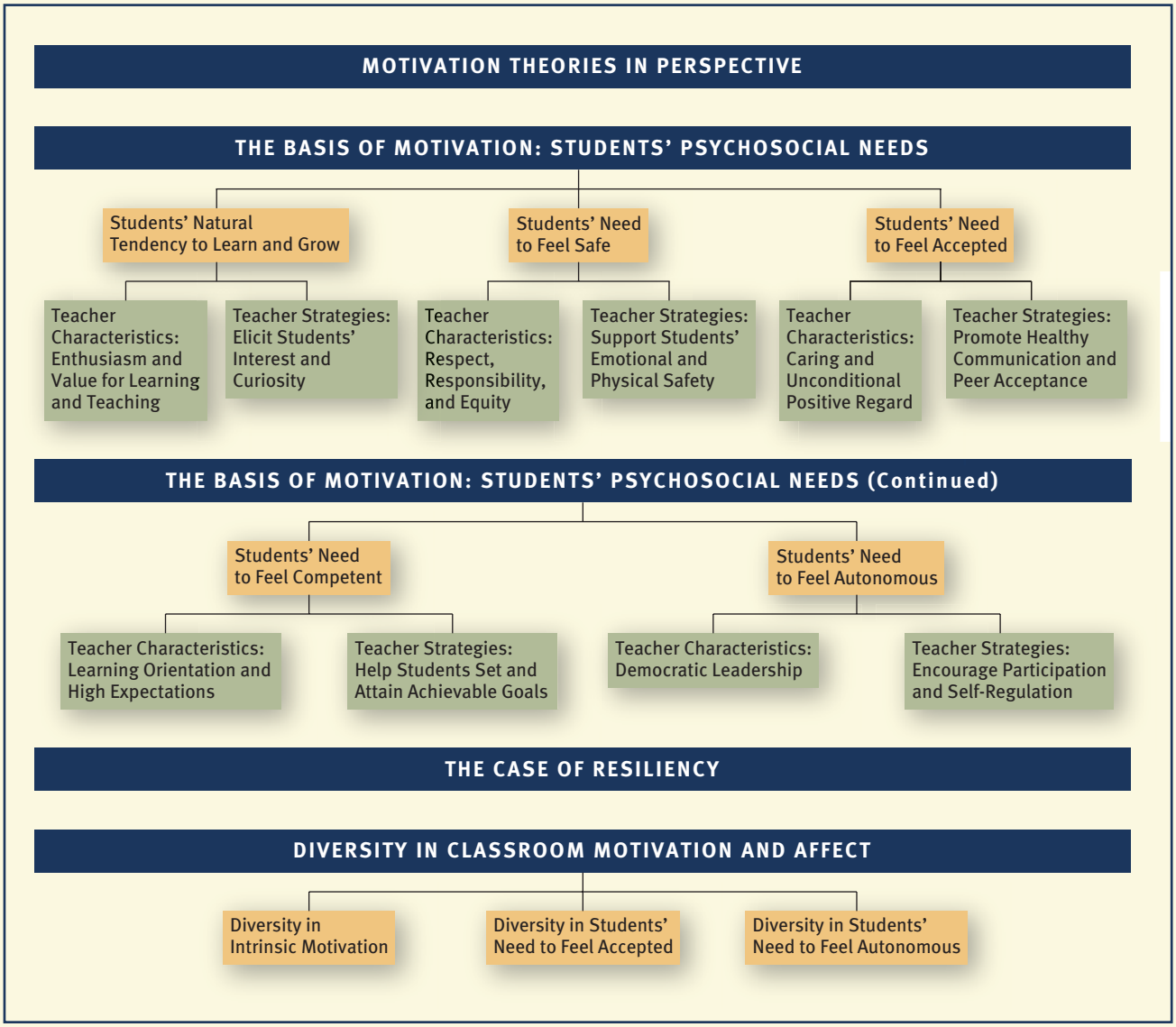
Mr. Larkin encourages them, "After the mini-lesson, you will have time to investigate who should receive the letter and how you can get their addresses and e-mails. For now, I want you to brainstorm all the reasons why you think the equipment should be fixed." As students generate ideas, Mr. Larkin can hear increasing excitement in their voices. He is pleased students have discovered a way to apply persuasive writing to an issue that affects them every day. Writing is not just another school assignment, but a powerful tool to create change in their lives.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What are some strategies that the teacher used to promote students' motivation?
2. Which of the motivation principles were applied during the lesson and how?
3. Which of the following types of motivation were promoted in the lesson and how: extrinsic, intrinsic, achievement, mastery?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to what you learned by including both strengths and weaknesses.

10 Motivation and Affect in the Classroom



Imagine You Are the Teacher

MS. GOMEZ IS READY TO START today's lesson with her seventh-grade honors algebra class. As the students loudly enter the classroom and find their seats, she notices that Alyssa, a gifted student who always outperforms the rest of the class, is unusually quiet. Although Alyssa actively participated in all class discussions and group projects during the first weeks of class, Ms. Gomez has observed that her enthusiasm has been slowly dropping.

"All right everyone, get your journals out and start answering the question on the board individually. In five minutes you will need to get in pairs to discuss your answers," Ms. Gomez says. In the meantime, Rebecca and Cat are whispering. "Yeah, she is so stupid. She is always acting like she knows everything," says Rebecca. "Like she is so . . . smart."

"We should do something to make her know how much we hate her," Cat reacts. "Maybe we should do something to her locker."

The five minutes are over, and Ms. Gomez starts walking around the paired students. She notices that Alyssa, Rebecca, and Cat have not written anything in their journals. When questioned why her paper is blank, Rebecca responds, "I just didn't get to it; I had something important to take care of first." Ms. Gomez then moves to Alyssa. "What's going on with you, Alyssa?"

"I just can't think of an answer to the question," answers Alyssa.

"What, the 'smarter than everyone else Alyssa' doesn't have an answer?" Cat asks ironically. "Did you take a stupid pill at lunch, smarty?"

"Cat, please turn to your partner and start working. We have a lot to do today," Ms. Gomez says.

- Why is Alyssa having trouble engaging in the task?
- What could you do to help Alyssa regain her motivation to learn?

Think about how you would respond to these questions as you read through the chapter.



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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Describe learner-based needs for motivation.
2. Explain the characteristics of teachers who motivate.
3. Understand specific strategies that support students' psychosocial needs.
4. Define resiliency and explain its relationship to motivation.
5. Discuss issues of diversity related to students' psychosocial needs.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Think about a time in your educational history when you felt very motivated to learn. What were the conditions that supported your motivation to learn?
2. Think about a teacher or instructor who genuinely inspired you to want to learn. What were the distinctive characteristics of that person?
3. Do you know of anyone who has succeeded academically, even in the face of adversity? If so, what factors do you think helped that individual stay motivated?

MOTIVATION THEORIES IN PERSPECTIVE

Now that you have a good understanding about the many different motivation theories and corresponding research (Chapter 9), you are ready to put what you learned into practice. Before we start examining the conditions for promoting motivation and positive affect in the classroom, let's examine the progression of the motivation theories you have learned to gain a better perspective about how each theory can serve your teaching goals.

First, you learned that behaviorist psychologists such as Thorndike (1913) and Skinner (1953) believed that motivation can be controlled by managing students' behavior through external rewards and incentives. As a teacher, you will need to decide about your position regarding an incentive system for your students. If you follow what the research says and believe that incentive systems are short-lived methods to promote extrinsic motivation, you may prefer to use a combination of cognitive, sociocognitive, and humanistic strategies, such as the ones suggested in this chapter, to promote motivation to learn.

Contemporary theories of motivation have moved from focusing on ways to extrinsically motivate students to finding ways to support students' basic psychosocial needs. Recall from Chapter 4 that the term *psychosocial* refers to the interaction between individuals' emotional needs and their social environment. When the classroom environment is supportive of students' psychosocial needs, such as the need to feel safe, accepted, competent, and autonomous, students are more likely to develop positive beliefs and emotions and become self-motivated to learn. The major contribution of cognitive and sociocognitive theories is to have shown the strong influence that students' beliefs and emotions can have on their motivation to learn and perform (Bandura, 1986; Dweck, 2000; Weiner, 2000; Wigfield & Eccles, 2002).

At the heart of contemporary views of motivation is also the humanistic idea that students have a natural tendency to be intrinsically motivated to learn and grow in

positive ways. Recall that humanistic psychologists such as Maslow (1971) and Rogers (1963) proposed that motivation is the unfolding of certain deficiency and growth needs that can be supported by an individual's environment to a lesser or greater degree. Motivation to learn, according to humanists, is the natural tendency to develop one's full potential as a human being and can be well satisfied in the school environment, provided that lower, more basic needs have been already fulfilled.

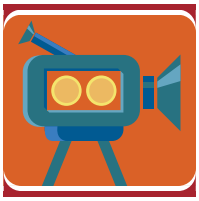
In sum, although intrinsic and extrinsic motivations are not exclusive of each other but rather might act simultaneously (Pintrich & Schunk, 2002), motivation theories have moved from focusing on external motivation factors to supporting students' basic psychosocial needs. This chapter is consistent with this contemporary view. Its objective is to discuss the characteristics of teachers who evoke students' natural tendency to learn and to offer concrete strategies to create a learning environment that promotes the development of self-motivated learners in the classroom. In particular, this chapter will help you understand the following:

1. The learner-based conditions needed to develop and sustain intrinsic motivation, such as students' needs for safety, acceptance, competence, and autonomy
2. The critical role that quality teacher–student relationships can play in supporting students' needs and developing a positive sense of self
3. The characteristics of instructional environments that elicit students' engagement and motivation

Although you should assume that all students are intrinsically motivated to learn under the right conditions, the emphasis of this chapter is on developing strategies to reach students who may have lost touch with their natural desire to learn. Students' lack of motivation is a growing concern in our country, from elementary school through higher education (National Research Council, 2003).

Get Connected!

VIDEO CASE ASSIGNMENT. . . Using the Strategies in Your Classroom: Hear from the Specialists



Go to your WileyPlus course and view the video. After watching the video, be prepared to discuss how the teacher's recognition of making progress toward a goal in addition to the recognition of accomplishing a goal can support both intrinsic and extrinsic motivation as well as fostering students' positive sense of self.

THE BASIS OF MOTIVATION: STUDENTS' PSYCHOSOCIAL NEEDS

In this section, we present five learner-based conditions to develop and sustain intrinsic motivation. Specifically, we discuss students' natural tendency to learn and grow as well as the needs for safety, acceptance, competence, and autonomy in the classroom. For each learner-based condition, we present supporting teacher characteristics and strategies. When you exhibit these characteristics (e.g., showing respect for students), and when you employ the strategies discussed here (e.g., having students participate in developing classroom rules), you will set the foundation that your students need to develop positive self-perceptions, become self-motivated, and take responsibility for their own learning.

Keep in mind as you read the remainder of the chapter that, although all students have the same psychosocial needs, some may show a stronger bias toward some needs than others. For example, Keisha is very confident about her knowledge and skills but constantly seeks her teacher's acceptance in the classroom. Because each student will bring his/her own "needs mix" to the classroom, any one strategy may not be appropriate for all students or may not be effective for even one student for an extended

period of time. As teachers, we need to plan and apply our strategies individually. Based on our knowledge about students, we should reflect on the effects of such strategies and make changes as appropriate. Effective teachers are aware that they only have a limited impact on the many factors that affect students' motivation to learn. Therefore, it is essential to create strong connections between home and school so that students have stronger supports for their learning and motivation. It is also vital for teachers to collaborate with other teachers and administrators to create a supportive environment throughout the school (Darling-Hammond & Baratz-Snowden, 2005).

Students' Natural Tendency to Learn and Grow

Jared is in Mr. Cornell's fifth-grade class and is in charge of the weather station this week. He has noticed that the temperature is getting warmer and is curious about why. He asks Mr. Cornell, who directs him to two websites to find the scientific explanation. Through the websites, Jared learns that the earth has a tilted axis, which causes specific areas to receive more direct light during the summer, making it warmer.

We start with the premise that all students have a natural tendency to learn and grow. Experts have explained this tendency in different ways. Recall from previous chapters that Piaget (1964) believed children have a natural need to understand and find cognitive equilibrium and that Maslow (1971) considered the need "to know and understand ourselves and the world around us" as the first growth need in his motivation model. Other researchers believe that our natural tendency to learn is due to curiosity, the cognitively based emotion that occurs when experiences or ideas are discrepant from one's own (Lowenstein, 1994). Yet others have argued that the tendency to learn results from people's need to maintain a certain level of arousal (Spielberger & Starr, 1994). According to this last view, every person has an optimal or preferred level of arousal (i.e., stimulation) and will try to maintain that level of arousal by engaging in exploratory behaviors. **Exploratory behaviors** happen when our arousal level is high, such as when students experience cognitive conflict (e.g., they believe that whales are fish but heard a peer say that they are mammals) or when they are in a situation that piques their personal interests (e.g., they have a fascination with bugs and read an article in the news about killer ants). In these cases, students will try to reduce their arousal level by engaging in exploratory behaviors aimed at resolving their cognitive conflict or by learning more about a personally interesting topic. In the classroom, students may show their natural tendency to learn and grow by asking questions, looking up information in books or other reference sources, experimenting, and thinking. Students' natural tendency to learn and grow can be nourished by attending to students' curiosity and interests.

Exploratory Behaviors

Behaviors aimed at resolving a cognitive conflict or learning more about a personally interesting topic.

Teacher Characteristics: Enthusiasm and Value for Learning and Teaching. Recall the powerful influence of modeling on students' behavior found by sociocognitive psychologists (Bandura, 1986). The first teacher characteristic that supports students' intrinsic motivation is enthusiasm and excitement about learning. Teachers' energy and enthusiasm are highly visible in the classroom and encourage similar feelings in their students (Feldman, 1997). In a set of classic studies, Perry and colleagues (Perry, 1985; Perry, Magnusson, Parsonson, & Dickens, 1986) found that enthusiastic teachers promoted students' sense of control, self-efficacy, and achievement more than did nonenthusiastic ones.

Typically, teachers who are enthusiastic can demonstrate the value of their subject area and even change the negative attitudes some students may harbor about that domain. Vanessa learned to hate math in her early teenage years. However, it only took one month of tutoring with Ms. Bravo, a very enthusiastic teacher, to change her beliefs about math and become motivated to learn. Ms. Bravo was also a successful engineer who was very passionate about the usefulness of math in solving real-world problems. She modeled her enthusiasm by demonstrating joy during problem solving and by sharing her personal success stories in math. In addition, she elicited the natural curiosity

TABLE 10.1

Characteristics of teachers who are dedicated to learning.

- Learn and grow as they expect their students to learn and grow
- View themselves as responsible for the success of their students
- Participate in professional development (PD) activities
- Discuss their participation in PD activities with their students in a positive way
- Share their ideas and assist other teachers with difficulties
- Volunteer to lead work teams and to be mentors to new teachers
- Take risks to improve education for all students
- Do not make excuses for student outcomes; hold their students responsible while also accepting responsibility themselves

of her students by creating thought-provoking problems that were based on teenage experiences. Not surprisingly, many of Ms. Bravo's students (including Vanessa) followed her steps by choosing math, science, or engineering careers.

Now, take a moment to look again at the second question raised in "Assess Your Prior Knowledge and Beliefs." Was enthusiasm one of the distinctive characteristics of the teacher that came to your mind while thinking about the question? Many people remember decades later the teachers who loved their subject. Enthusiasm is a positive affective state that, as you know from the discussion of affect and cognition in the previous chapter, is both contagious and likely to promote attention and learning. It is difficult to disregard an enthusiastic person. Although how we express and perceive enthusiasm will depend, among other factors, on our cultural background, experiences, and personality, the following are some indicators that have been used to measure teacher enthusiasm (Wlodkowski, 1999):

- Speaking with variation in tone, volume, pitch, and speed
- Making use of a variety of emotional facial expressions
- Gesturing with arms and hands
- Displaying high energy and vitality
- Moving around the classroom to illustrate points and interact with students

Other things being equal, students achieve more with teachers who present materials with appropriate gestures and expressiveness (Darling-Hammond, 2000). Another characteristic of teachers who support students' natural tendency to learn is the teacher's attitude toward learning and the teaching profession. Many studies show that teachers' dual commitment to student learning and to personal learning has a positive effect on students' motivation (Stronge, 2007). See Table 10.1 for a list of characteristics of teachers who are dedicated to learning.

Teacher Strategies: Elicit Students' Interest and Curiosity. According to interest theories of motivation (Dewey, 1913), the key to eliciting students' natural tendency to learn is to find topics or activities that are aligned with their personal interests. When students are personally interested in a certain activity or topic, they will direct their energy toward learning, which, in turn, will result in higher performance with less effort (Renninger, Hidi, & Krapp, 1992). Recall from Chapter 9 that research has identified

two types of interest: *dispositional* or personal interest, which is a stable interest in a topic or subject, and *situational* interest, which is spontaneous, transitory, and activated by the environment rather than the learner. Students' dispositional interest is positively related to achievement, attention and memory, persistence and effort, and learning; and students' situational interest has been shown to increase reading comprehension, computer engagement, and learning (Hidi & Renninger, 2006). Teachers can elicit students' interest and curiosity in the following ways.

(1) ***Tailor instruction to students' interests.*** Identify students' dispositional interests and goals by using surveys or personal interviews, gathering background information from school records and past teachers, and asking parents about their children's interests during parent–teacher conferences or conversations. Once you know your students, you will be in the best position to examine how the learning objectives for your grade and content area may be related to students' interests and goals.

(2) ***Create student-generated projects.*** An alternative to planning instruction based on students' interests is to involve students in finding ways to make content more relevant, such as asking students to indicate topics or activities that they are especially interested in before planning a lesson or having them design their own project assignment. However, keep in mind that, depending on the developmental age of your students, they may need explicit training about how to design student-generated projects.

(3) ***Use a variety of teaching methods.*** Variety can spark students' involvement in classroom activities and their motivation (Forsyth & McMillan, 1991). Reflect on your patterns and try to break out of your "comfort zone" by incorporating a variety of teaching activities and methods, such as role-playing, debates, brainstorming, discussion, demonstrations, audiovisual presentations, guest speakers, or small-group work. By using a variety of methods in your classroom, you will be able to recognize and value what your students do best and help them improve in areas or tasks that are least used and understood.

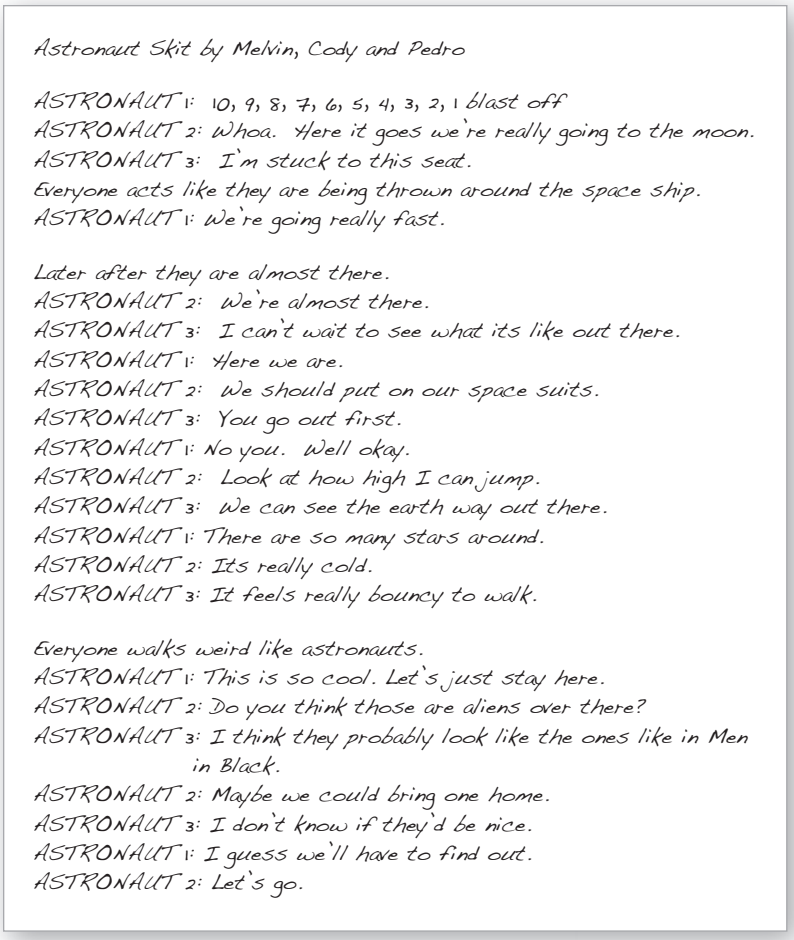
(4) ***Present real-life problems.*** Students can be intrinsically motivated to engage in learning activities when they can relate to them on a personal level, such as when presented with problems that they feel a need to solve. Authentic problem-based activities have been shown to successfully motivate engagement for most grade levels and school subjects (Cangelosi, 2003; Perry, Turner, & Meyer, 2006).

(5) ***Create cognitive conflict.*** Another way to elicit curiosity is to create cognitive conflict by posing paradoxical questions or by using demonstrations with seemingly contradictory results. Students' intrinsic motivation increases when teachers devise activities and examples that challenge mistaken beliefs (Chinn & Malhotra, 2002). Keep in mind, however, that students' motivation will last until the conflict is resolved or until they give up. If students cannot resolve the conflict you present (such as when they are asked to engage in discovery without sufficient guidance), they will become bored or frustrated and motivation will suffer.

(6) ***Involve students in fantasy and make-believe.*** There is evidence that fantasy can have a positive effect on students' intrinsic motivation (Lepper & Hodell, 1989). In one study, students who learned computer programming with a fantasy environment including pirates, detectives, or astronauts were more intrinsically motivated than those who learned in a more traditional context (Parker & Lepper, 1992). The motivating effects of fantasy seem to rely on students' increased attention and mental effort (Pintrich & Schunk, 2002). Figure 10.1 shows an example of student work that requires the use of fantasy.

(7) ***Provide opportunities to actively engage with the learning materials.*** Students report high motivation levels when they are able to manipulate, experiment, create new products, or interact with learning materials and other students (Andre & Windschitl, 2003; Certo, Cauley, & Chafin, 2003; Wentzel & Wigfield, 2007). Students learn by doing, creating, designing, solving, writing, and so on. Passivity hurts students' motivation and curiosity. Rather than telling your students something interesting, pose a question and ask them to find out or figure out the answer whenever possible.

(8) ***Integrate technology into the classroom.*** When properly used, technology can promote students' engagement and motivation to learn (Burbules & Callister, 2000; Cordova & Lepper, 1996; Goldman et al., 1996; Swan, Van't Hooft, Kratcoski, &



Astronaut Skit by Melvin, Cody and Pedro

ASTRONAUT 1: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 blast off
ASTRONAUT 2: Whoa. Here it goes we're really going to the moon.
ASTRONAUT 3: I'm stuck to this seat.
Everyone acts like they are being thrown around the space ship.
ASTRONAUT 1: We're going really fast.

Later after they are almost there.
ASTRONAUT 2: We're almost there.
ASTRONAUT 3: I can't wait to see what its like out there.
ASTRONAUT 1: Here we are.
ASTRONAUT 2: We should put on our space suits.
ASTRONAUT 3: You go out first.
ASTRONAUT 1: No you. Well okay.
ASTRONAUT 2: Look at how high I can jump.
ASTRONAUT 3: We can see the earth way out there.
ASTRONAUT 1: There are so many stars around.
ASTRONAUT 2: Its really cold.
ASTRONAUT 3: It feels really bouncy to walk.

Everyone walks weird like astronauts.
ASTRONAUT 1: This is so cool. Let's just stay here.
ASTRONAUT 2: Do you think those are aliens over there?
ASTRONAUT 3: I think they probably look like the ones like in Men in Black.
ASTRONAUT 2: Maybe we could bring one home.
ASTRONAUT 3: I don't know if they'd be nice.
ASTRONAUT 1: I guess we'll have to find out.
ASTRONAUT 2: Let's go.

FIGURE 10.1 **Students can work together to write a skit or presentation that fosters their imaginations and motivation to learn. What are some other ways for a teacher to follow up on students' interest and arousal about a subject?**

Unger, 2005; Zucker & McGhee, 2005). Most students are intrigued by computers and other new technologies. Applications such as word processors, graphic tools, and presentation software can be helpful tools to encourage students to take greater pride in the quality of their work. Two cautions should be noted. First, some experts warn educators about the potential **novelty effect** of technology, a term that is used to refer to any type of short-lived increase in student engagement and learning (Clark & Feldon, 2005). Second, students' interest in technology may be inhibited if they lack the necessary skills to take advantage of these tools. Therefore, before deciding on integrating technology into the classroom, it is very important to ensure that all students are technologically proficient. Developing computer skills frequently motivates students to want to produce high-quality work, especially when their work is on view for parents and peers (Office of Educational Research and Improvement, 1994).

Novelty Effect

Any type of short-lived increase in student engagement and learning that is due to the newness or originality of the learning experience.

Get Connected!

ANIMATION ASSIGNMENT. . . Motivation in the Classroom

Go to your WileyPlus course and watch the animation of high school students and the different levels of attentiveness when topics of interest, and those not of interest, are presented in a teacher's lesson. Be prepared to explain how appropriate motivation techniques can increase student interest and improve classroom instruction.



Classroom Tips: How to Support Students' Natural Tendency to Learn provides classroom examples of each of the strategies discussed in this section.

CLASSROOM TIPS

How to Support Students' Natural Tendency to Learn

Strategy	Examples
Model enthusiasm and value for learning and teaching.	Share with students what you learn outside of the classroom (e.g., books, journal articles, newspapers).
	Create opportunities for students to teach their peers or younger students.
Tailor instruction to students' interests.	Gather information about students' interests, and use the information when selecting topics for papers, projects, or reports.
	Create projects that will support the development of students' possible selves or serve community interests.
Create student-generated projects.	Allow students to participate in the development of rubrics that will be used to evaluate their projects.
	Have students brainstorm possible project topics and presentation formats.
Use a variety of teaching methods.	Rotate between using lecture, individual work, and group work when designing lesson plans.
	Use many different ways to demonstrate knowledge in your classroom.
Present students with real-life problems.	Use the local newspaper to generate real-life problems to be used in school projects.
	Ask students to apply recently acquired knowledge and skills to solve authentic problems.
Create cognitive conflict.	Expose students to alternative ideas, theories, and artwork.
	Ask students to debate issues that are likely to be controversial or to have multiple perspectives and solutions.
Use fantasy and make-believe.	Encourage students to create stories and interpret local legends.
	Incorporate role-playing and skits into units and projects.
Actively engage students with the learning materials.	Teach students how to use indexes and glossaries in textbooks so they can use books as resources.
	Create learning materials that can be manipulated by students as they learn.
Integrate technology into the classroom.	Provide a list of websites with accurate and high-quality information for topics covered in the classroom.
	Design projects in which students can learn how to use graphic software to represent their findings.

Students' Need to Feel Safe

According to humanistic theories of motivation, the first condition that needs to be in place to enable the development of self-motivated learners is safety. Humans need to first satisfy their most basic needs (e.g., safety) before attempting to satisfy more sophisticated needs (e.g., knowing and understanding). Therefore, students need to have a feeling of physical and emotional safety to flourish in the school environment. Without this feeling, they are likely to develop fear and/or anxiety, which, in turn, will prevent them from being willing to explore new challenges and grow academically. Take the following example. Sara goes to an urban school in a neighborhood threatened by gang violence. At least once a week, the school goes into lockdown due to drive-by shootings on the street. Unfortunately, a little girl was hit by a stray bullet at school last year. Sara spends much of her time wondering when the next lockdown will happen and whether it hurts when a bullet hits you.

A lack of *physical* safety, such as a school environment that suffers from vandalism and violence against teachers and students or one that suffers from constant disruptions, is a barrier to the growth of many children (Baker, 1994). Students' motivation

to learn can also be negatively affected by a lack of *emotional* safety, which includes feeling safe to express thoughts without fear of being ridiculed and feeling safe to make mistakes without fear of being punished. In Imagine You Are the Teacher, Alyssa, a high-achieving student, fails to engage in a classroom activity as a group of peers makes fun of the fact that she is smart and always seems to know the answers to the teacher's questions.

When classrooms are emotionally unsafe, students are likely to develop feelings of resentment, anger, and hostility. Eventually, students who fear continued physical and/or emotional assaults are likely to develop distrust and strong negative feelings about their teacher, class, and school. Some of these students will opt to withdraw, miss class, or take a passive stance about learning; others will think the solution to the problem is to quit school; yet others may resort to revenge or rebellion. In sum, how motivated students can become will be directly related to how emotionally and physically safe they perceive their learning environment to be. Nurturing teachers are aware of and attend to students' basic need to feel safe.

Teacher Characteristics: Respect, Responsibility, and Equity. Students' safety has two components: emotional and physical. The need to feel emotionally safe is fulfilled when students can trust that teachers and peers respect their viewpoints. The need to feel physically safe is satisfied when students do not fear becoming victims of violence, aggression, or classroom hazards. We offer some specific strategies to promote physical safety in the next section. In this section, we focus on teacher characteristics that support students' need to feel emotionally safe. Before doing so, think about someone who respects you. It is unlikely that person ever used threats to make you do something. And it is highly likely that person shows interest in your opinions.

Although you will not always agree with your students' thoughts and behaviors, it is essential to establish a climate in which students know that they are respected as individuals and that you will not hold their words or actions against them personally. In one study, the Oregon Department of Education asked students enrolled in alternative high schools what it was about their school that kept them in and what would make their previous high school a better place. Students all responded similarly, regardless of background or environment: "Respect me for who I am, require me to do my best, and give me the help I need to achieve it" (Brush & Jones, 2002, p. 3).

Teachers can support students' need to be emotionally safe by modeling respect, responsibility, and equity in the classroom (Black & Howard-Jones, 2000; Collinson, Killeavy, & Stephenson, 1999; Cotton, 2000; McBer, 2000; Peart & Campbell, 1999). Classrooms are complex social groups composed of 10–40 students with unique levels of knowledge, skills, beliefs, and backgrounds. Therefore, to create a climate of safety that is conducive to learning, teachers need to emphasize the importance of respecting others' individualities (Brown, 1994). A classroom where students are afraid to express their opinions due to fear of ridicule or embarrassment is likely to hinder students' motivation to learn. The following are some characteristics of motivating teachers according to student interviews and surveys (Pressley et al., 2003):

- Being consistent
- Treating students as people
- Practicing gender, racial, and ethnic equity
- Showing no favoritism for any particular student
- Avoiding the use of threats, name-calling, ridicule, and sarcasm
- Offering all students opportunities to participate and succeed
- Preventing situations in which students lose face in front of their peers
- Knowing and understanding the facts before taking disciplinary measures
- Addressing misbehaviors at an individual level rather than holding a whole class or a small group of students responsible for the actions of one student

Teacher Strategies: Support Students' Emotional and Physical Safety. In addition to modeling respect, responsibility, and fairness, teachers can use the following strategies to promote a classroom environment that supports students' need for safety.

(1) ***Engage students in developing classroom rules.*** Classroom rules provide students with guidelines for appropriate behavior and should be directed at creating an orderly and respectful classroom that ensures the continuity and quality of teaching. To help your students feel safe, classroom rules should not be focused on exerting control over your students but rather on protecting the teacher's right to teach, students' right to learn, students' emotional and physical safety, and property (Levin & Nolan, 2004). Involve your students in making the rules to the degree that their age and ability permit. Students are more likely to respect classroom rules when they participate in their development (Schaps & Salomon, 1990).

(2) ***Make your classroom physically safe.*** Effective teachers provide security and shelter by ensuring that each student has his/her personal space and that the classroom does not pose any risk of physical harm or discomfort to any student. Classrooms have many pieces of furniture and equipment—teacher and student desks, bookcases, tables, activity centers, projectors, computers, and boards. When arranging your classroom before school starts, make sure that high-traffic areas are free of congestion. High-traffic areas include the teacher's desk, the trash can and pencil sharpener, and group work areas. Make sure that students have easy access to frequently used teaching materials and supplies and that equipment that is not used every day (e.g., overhead projector, tape recorders) is stored when not in use. Finally, ensure that you can easily monitor all your students at all times.

(3) ***Establish classroom procedures.*** Procedures are routines for accomplishing recurring classroom tasks. Procedures can be as simple as routines for sharpening pencils and turning in homework or as complex and critical as safety procedures for working in a laboratory. You will learn more about how to plan classroom procedures in the next chapter. Clearly state your procedures from the very beginning of the schoolyear, discuss their rationale with students, and provide opportunities for practice and feedback. Examples of procedures that support students' need to feel physically safe include routines for storage of personal belongings, what to bring to class, movement of desks, transitions in and out of the classroom, out-of-room procedures (e.g., cafeteria, lockers, fire or disaster drills), and expected behavior during small-group work.

(4) ***Protect students from violence and aggression.*** Bullies and aggressive students can sometimes threaten their peers' sense of safety and well-being by physically or psychologically harassing other students. For this reason, teachers need to be aware of classroom dynamics and have a good set of intervention strategies at hand. Chapter 11 will prepare you to deal with challenges to students' physical safety by offering prevention and intervention methods for violence and aggression in the classroom. For example, many schools have adopted long-term strategies to develop curricula that emphasizes student responsibility for their actions, moral reasoning, and decision-making skills. In addition, teachers can also use peer tutoring, mentorships, conflict resolution, and anger management classes when students threaten the safety of the school environment.

Classroom Tips: How to Support Students' Need to Feel Safe summarizes the strategies discussed in this section with additional classroom examples.

Students need to feel emotionally safe to be motivated to stay in school and to learn.



Somos Images/Corbis Images

Students' Need to Feel Accepted

For students to become intrinsically motivated to learn, they need to feel accepted. This is also known as the need for relatedness or belonging. Belonging is not only one of Maslow's basic needs (hierarchically higher than survival and safety needs) but also one of the three innate psychological needs posited by self-determination theory (Ryan & Deci, 2000). The need to feel accepted goes beyond the need to feel emotionally safe in the class-

CLASSROOM TIPS

How to Support Students' Need to Feel Safe

Strategy	Examples
Model respect, responsibility, and equity.	Treat each student as an individual who has unique strengths and needs.
	Help students understand that equality and fairness do not look the same for each student.
Engage students in the development of classroom rules.	Use democratic principles to guide the development of classroom policies.
	Allow students to create leadership positions to support the functioning of the classroom, and help students establish a procedure for selecting those positions.
Make your classroom physically safe.	Incorporate a classroom safety check into your beginning- and end-of-the-day routines.
	Promptly report safety issues using the correct procedure in your school, and follow up on the report until the issue is corrected.
Establish classroom safety procedures.	Discuss and practice emergency response procedures (fire, lockdown, etc.)
	Post emergency response procedures in the classroom and make them available to substitute teachers.
Protect students from violence and aggression.	Create an atmosphere in which teasing and other actions that lead to aggression and violence are not tolerated.
	Be aware of and responsive to any bullying that happens in your classroom.

room because it depends on students' belief that their teachers and peers care deeply about them and understand their feelings and thoughts (Furrer & Skinner, 2003).

Many students will thrive when they feel accepted by those whom they consider to be important in their lives, and teachers rank just behind parents in this regard (Brookover & Erickson, 1969). Students' sense of belonging is positively associated with their effort, self-efficacy, academic achievement, and the pursuit of prosocial and social responsibility goals (Anderman & Anderman, 1999; Battistich, Solomon, Watson, & Schaps, 1997; Roeser, Midgley, & Urdan, 1996). **Prosocial goals** are those related to making and keeping friends, being helpful to teachers and other students, and getting others in the classroom to engage in helpful behaviors. For example, in Ms. Anderson's math class, Ralph always volunteers to help her with administrative tasks and to tutor others when they struggle.

Social responsibility goals are those whereby students express their adherence to social rules and expectations, such as striving to be responsible, dependable, and academically successful (Wentzel, 1991). For instance, Larissa shows social responsibility goals when she quietly raises her hand to ask a question as stated by the classroom rules and when she makes sure that she completes her homework every day. Other motivational outcomes that are related to students' sense of belonging are high intrinsic motivation, a willingness to respect classroom rules and procedures, positive attitudes toward school and teachers, high expectations of success, and low anxiety (Osterman, 2000).

In contrast, the feeling of alienation or rejection is associated with low intrinsic motivation, low achievement, and behavior problems; it is also one of the major causes of dropping out of school (Brown, Higgins, & Paulsen, 2003; Eckstrom, Goertz, Pollock, & Rock, 1986). **Alienation** is generally defined as "the state or experience of being isolated from a group or an activity to which one should belong or in which one should

Prosocial Goals

Goals related to making and keeping friends or being helpful to peers and teachers.

Social Responsibility Goals

Goals where students express their adherence to social rules and expectations, such as striving to be responsible, dependable, and academically successful.

Alienation

The state or experience of being isolated from a group or an activity to which one should belong or in which one should be involved.

be involved" (Mann, 2001, p. 8). When students feel alienated, they lack a sense of belonging and feel disconnected from peers, teachers, or school (Bronfenbrenner, 1986). Students' alienation can be the result of a classroom's focus on compliance rather than creativity; disempowering assessment practices; the experience of being an "outsider" in the academic world; self-estrangement, the difference between students' actual selves and ideal selves; and powerlessness, the feeling of losing control over one's own life (LaCourse, Villeneuve, & Claes, 2003; Mann, 2001). Adolescent alienation is a problem facing many U.S. schools (Case, 2008). Caring teachers support students' need for belonging by letting them know that they accept them for who they are and that they will work with them to become all that they are capable of becoming.

Teacher Characteristics: Caring and Unconditional Positive Regard. Take a moment to think about a teacher who was caring and helped you to feel worthwhile and accepted. What did that teacher do to communicate that caring and acceptance? How do you plan to show those characteristics when you are a teacher? Students' need to feel accepted is fulfilled when teachers and classmates support and express knowledge of and interest in the student (Connell & Wellborn, 1991). By accepting students for who they are, teachers help them cope with their problems and develop self-confidence and self-reliance. Two teacher characteristics support students' need to feel accepted in the classroom: caring and unconditional positive regard.

Caring is exhibited when teachers show empathy and commitment to the protection and development of their students (Noddings, 2001). Students who perceive their teachers as uncaring are less likely to develop intrinsic motivation (Ryan & Deci, 2000). Teachers can demonstrate caring in the following ways (Harter, Waters, Whitesell, & Kastelic, 1998; Moje, 1996; Oldfather, 1993; Oldfather & Thomas, 1998):

- Being organized and prepared for class
- Using quality practices in the classroom
- Encouraging students to express themselves in the classroom

In addition, teachers support students' need for acceptance when they display unconditional positive regard, an attitude that makes students feel worthy and acceptable, regardless of their behavior, performance, or background (Rogers, 1963).

Caring teachers understand students' personal goals, needs, and expectations and continuously consider students' perspectives when designing instruction (Wlodkowski, 1999). They have a clear vision of what they wish to accomplish in their classrooms but are open to students' input and even create learning goals together with students as a way of showing that their perspectives are valuable and relevant (Noddings, 2001). The following are some characteristics of caring teachers (Alder, 2002; Osterman, 2000; Wilder, 2000):

- Quickly learn and use students' names
- Use *we* and *our* when referring to class activities
- Encourage and accept all students' opinions
- Make eye contact, smile, and have relaxed body language
- Take time to get to know students' goals and expectations
- Listen, ask questions, and provide help in nonthreatening ways

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

What are some strategies you could use for learning all your students' names quickly? What are some strategies you can use as a teacher to get to know your students' goals and expectations? Think about what your teachers, camp counselors, or club leaders have used. Be ready to discuss the strategies in class.

ISSUES IN EDUCATION

Can culturally responsive education help close the achievement gap?

Many experts argue that culturally responsive education (CRE) can help close the achievement gap (Gay, 2000; Ladson-Billings, 1995; Sowers, 2004). Traditional school practices place culturally diverse students at a disadvantage because they are largely based on European-American culture. Because CRE programs are aimed at reducing this cultural mismatch, they are likely to promote the achievement of culturally diverse students. On the other hand, some skeptics question whether CRE can have a positive effect on closing the achievement gap and argue that schools and teachers should focus on standards, accountability, and the effects of poverty (Ludlow, 1992; Stotsky, 1999). What do you think about this argument? A response to this question can be found at the end of the chapter.

When students come from a background that is different from your own, caring and acceptance can be demonstrated by being culturally responsive (see Chapter 2). This is when caring will be as much an attitude as a skill: a constant challenge to our assumptions and active search for understanding what our students feel and need. In fact, experts use the term **cultural competence** to refer to the specific skill of culturally responsive practitioners. Cultural competence entails "mastering complex awarenesses and sensitivities, various bodies of knowledge, and a set of skills that taken together, underlie effective cross cultural teaching" (Diller & Moule, 2005, p. 5). As teachers, we should strive to be respectful of our students' culture, interests, and perspectives and invite and honor their ideas in our classroom. When students know that they have a voice in the classroom and that sharing ideas is a respected norm, they will be more likely to reveal their thinking and feel a sense of belongingness (Stinson, 2004).

Cultural Competence

Mastering complex awarenesses and sensitivities, various bodies of knowledge, and a set of skills that taken together, underlie effective cross cultural teaching.

Teacher Strategies: Promote Healthy Communication and Peer Acceptance. Did you ever have a teacher who actively listened to your opinions? What language did the teacher use when a student in your class misbehaved? What did this teacher do to encourage peer acceptance? Teachers support students' need to feel accepted through the following healthy communication and interaction practices.

(1) ***Actively listen when students share their problems and opinions.*** When a student owns a problem (i.e., the problem does not have implications for the learning environment), teachers do not have the responsibility to directly solve it. Yet ignoring students' concerns is likely to hinder establishing a long-term and loving teacher–student relationship. One method that can be used to support students' need for relatedness is **active listening** (Walker, 1997). Active listening, which occurs when teachers listen with interest and acceptance to what a student is saying, typically includes the following steps:

Active Listening

Listening with interest and acceptance.

- Acknowledging the problem
- Encouraging the student to talk out the problem
- Paraphrasing the student's words to help clarify his/her problem and emotions
- Demonstrating empathy toward the student (Wolfgang, 2005)

In the following dialogue, the teacher shows caring by demonstrating good active listening skills:

Teacher: Carrie, I noticed that you are a little absent-minded today [acknowledging the problem]. Would you like to tell me what is going on in your mind? [encouraging the student to talk out the problem].

Carrie: I hate to have to take care of my little brother Zack. My mom makes me do it every morning because she has to get to work real early and nobody can watch over him until the school bus picks him up. Today I couldn't find Zack's lunch box, and we were both late to school. I hate that! It was not my fault to be late.

Teacher: [*nodding*]

Carrie: I also have to watch Zach after school, because my mom isn't home until 5:00 and so I can never hang out with my friends. I wish my mom didn't make me do this.

Teacher: Okay, so let me see if I understand what you are saying. You need to watch Zack before and after school, which worries you because you might be late to school like today but also because you miss out on spending time with your friends. Is that correct? [paraphrasing]

Carrie: Yeah, it's not fair.

Teacher: I can sympathize, Carrie. I had to raise my little sister almost all by myself when I was growing up [empathy]. Have you thought about possible ways to solve your problem?

Should Carrie's teacher guide her problem-solving process? Should she call Carrie's mother? Or talk to the school counselor? Or report Carrie's problem to the principal's office? According to humanistic psychologists, children and adolescents have the capacity of being rational and solving their own problems. When given empathetic understanding, warmth, and openness, they will choose what is best and develop into a fully functioning person. If they are provided a supportive, nonjudgmental climate, students will feel accepted and then move to find their own solutions.

Active listening should not be reserved for student-owned problems but should also be used when students share their opinions during one-on-one, small-group, and classroom discussions. In these cases, it is very important to show acceptance of the student as he/she is without judgment or reservation, even though the student's viewpoint may be very different from your own. By modeling active listening in your classroom, you will help students develop acceptance for their peers and overcome their own listening limitations. Are you an active listener? Table 10.2 provides a checklist that you can use to gauge your active listening skills in the classroom.

TABLE 10.2

Checklist for gauging your active listening skills.

_____ Do you maintain eye contact with the student at least 90% of the time?
_____ Do you try to paraphrase what the student has said before you respond?
_____ Do you ask questions at the end of the student's statement in order to completely understand what has been said?
_____ Do you make an effort to understand the student's point of view?
_____ Do you give students the opportunity to finish what they are saying before you speak?
_____ Do you consciously watch the student's body language for additional clues as to how he/she feels about the topic under discussion?
_____ Does your facial expression, posture, and body language indicate your interest in what the student is saying?
_____ Do you resist the temptation to verbally or mentally finish what you think the student is going to say?
_____ Do you put aside preconceived opinions about the student's viewpoint and really listen with an open mind?
_____ Do you periodically assess your listening skills by reflecting on your listening strengths and weaknesses?

Source: Adapted from Kricos (2000).

(2) ***Address classroom issues positively.*** What communication style should teachers use to address classroom issues effectively while maintaining students' need to feel accepted? The careful use of language is especially important when addressing misbehavior because teachers are likely to become frustrated and upset. In particular, experts recommend avoiding warnings and threats, demeaning criticism, name-calling, and sarcastic comments (Nakamura, 2000). These types of messages are likely to evoke emotional fear, defensiveness, and anger in students. In contrast, teachers should formulate a request that is both respectful and constructive. This requires staying calm, avoiding the use of negative remarks, making efforts to create mutual understandings, and being assertive of what is needed to resolve the issue. The major barrier to supporting students' need to feel accepted is the tendency to judge, evaluate, and approve or disapprove of their statements and actions (Rogers & Roethlisberger, 1952). Students are more motivated when teachers use descriptive rather than judgmental language (Sobell & Sobell, 2003). For example, Mrs. Albrecht was using judgmental language when she saw Harry talking to Gabriella during silent reading time: "You are so disruptive! Can you ever be quiet?" A more effective, descriptive approach is for Mrs. Albrecht to say to Harry: "Your peers are having a very difficult time concentrating because you are making a lot of noise."

(3) ***Use warm-up activities.*** Teachers can help students accept other students by using warm-up activities. These nonthreatening informal activities allow students to verbally interact in an open and trusting atmosphere. Warm-up activities can be used at any grade level and help students to develop skills in the following areas:

- Listening, appreciating, and understanding the feelings of others
- Respectfully and openly communicating disagreement
- Showing empathy; becoming familiar with and trusting other students
- Appreciating diversity and uniqueness (Nakamura, 2000)

To help students become acquainted the first day of class, Mr. Flores distributes large index cards to all students and asks each one to write from top to bottom: their first name, the name of their favorite food, the name of their favorite animal, and the sport or activity that they like the best. Once students complete their cards, Mr. Flores instructs them to pin the cards to their shirts or blouses and to move around the room to become acquainted with each other. Later, Mr. Flores engages the class in a discussion about what they learned about other students in the class. Alternatively, Mr. Flores could collect the cards and pin the card of one student to the back of another student. Students could then try to guess what was written in the cards by asking a limited number of yes/no questions. Warm-up activities may also include 'show and tell' activities or creating and sharing artwork (e.g., collage, paintings, drawings) that are representative of students' identity (see Figure 10.2).

Affiliation

The tendency to cooperate, reciprocate, and maintain loyal relationships with peers.

(4) ***Involve students in collaborative activities.*** Collaborative activities have a positive effect on students' empathy, tolerance for differences, feelings of acceptance, friendships, and self-concept (Solomon, Watson, & Battistich, 2001). An important component of the need for acceptance is the need for **affiliation**, students' tendency to cooperate, reciprocate, and maintain loyal relationships with their peers. Teachers can support students' need to feel accepted by their peers by engaging them in



The emblem I drew to describe myself has three parts. For the part about what animal I felt like represented me I drew a cat. I drew it because I like cats and I am sometimes social and sometimes like to be left alone. Kind of like a cat. In the other square I drew something that I'm good at which is basketball. At the bottom I drew a goal which is to become a fashion designer. I'm a good artist and I know what looks good together and so it seems like it would be a fun career.

FIGURE 10.2 **Warm-up activities can also include visual representations of students' identities and students' artwork.**

activities that involve positive interdependence among group members to achieve a certain goal, such as reciprocal teaching, cooperative learning, group investigations, structured controversies, and problem-based learning. To ensure that group activities are supportive of students' need for acceptance, teachers should emphasize the value of sharing, cooperation, and respect. This is especially important in the inclusive classroom and for students whose interpersonal behaviors may threaten or alienate their peers.

(5) ***Promote a sense of community.*** Teachers can support healthy teacher–student and student–student relationships by promoting a sense of community in their classroom. How can they do this? First, by creating a supportive and caring environment with opportunities for students to participate actively in classroom decisions, planning, and goal setting (Osterman, 2000). Part of the observed difference in achievement between Japanese and U.S. students on standardized tests of mathematics and science after fourth grade can be attributed to the fact that Japanese schools encourage and model the value of friendliness, responsibility, and collaboration among students (Linn, Lewis, Tsuchida, & Songer, 2000). By the time Japanese children are in fourth grade, they have developed a positive emotional attachment to the school and classroom community. Studies have shown that programs aimed at enhancing a sense of community at school can help students establish a sense of acceptance and mutual respect; promote students' social skills, achievement, and positive feelings about school; and increase teachers' feeling of self-efficacy (Anderman, 2002; Northeast Foundation for Children, 2006; Rimm-Kaufman & Sawyer, 2004; Rimm-Kaufman & Chiu, 2007).

(6) ***Personalize the school experience.*** Students' need for acceptance is also supported by personalizing their school experience (Finn, Pannozzo, & Achilles, 2003). Personalizing school entails creating a link between students' background, interests, and goals and the content they are learning. An elementary teacher who uses her students' names and hobbies to contextualize math problems is using personalization as a strategy to engage students in a problem-solving activity. Likewise, a middle school teacher who asks her students to record the time that they spend in different activities out of school to later apply to estimating percentages uses personalization as an instructional method. Personalizing academic content has been shown to promote both learning and motivation to learn (Wortham, 2004). At the secondary level, personalization techniques can take many forms, such as developing personalized plans that tie learning to students' talents and aspirations; creating separate "academies" around career-oriented themes; having students interact with teacher teams for at least a portion of the school-day; and offering academic and social support through mentors, advocates, advisors, or tutors (DiMartino, Clarke, & Wolk, 2003). Personalizing the school experience makes a difference, both socially and academically, especially for at-risk students and students who are transitioning between schools (Lan & Lanthier, 2003). Although teachers and staff in smaller school environments have more opportunities to personalize schools than do teachers in large schools (Lee & Burkam, 2003), personalizing schools requires more than simply reducing the number of students in a class. One effort to personalize high schools was initiated in 2000 by the Bill and Melinda Gates Foundation. The initiative supports a conversion of existing large high schools into autonomous small schools and offers a challenging, inquiry-based curriculum that is motivating, rigorous, and preparatory to college. Preliminary findings indicate that students and teachers at the redesigned schools reported a very positive learning culture based on close interpersonal relationships, a common focus, and mutual respect and responsibility (AIR & SRI International, 2005).

Small high schools have no more than 500 students, so teachers, parents, and students get to know each other well. What are some strategies that secondary school teachers can use to personalize students' school experience?



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Classroom Tips: How to Support Students' Need to Feel Accepted summarizes the strategies discussed in this section with additional classroom examples.

CLASSROOM TIPS

How to Support Students' Need to Feel Accepted

Strategy	Examples
Model caring and unconditional positive regard.	Show students you value their unique qualities by encouraging them to add personal touches to assignments.
	Make sure that once a student is given an appropriate consequence for not conforming to classroom expectations that you do not permanently change your positive attitude toward that student.
Practice active listening.	Ask questions to gain greater understanding of students' problems.
	Show students that you care about their opinions by listening carefully and making eye contact while they are talking to you or their peers.
Address classroom issues positively.	Engage students in one-on-one discussions about classroom problems rather than addressing them in front of the entire class.
	Address classroom issues clearly, concisely, and factually.
Create warm-up activities.	Use the first month of school to incorporate warm-up activities into daily lessons to create an open and friendly classroom environment.
	Participate in warm-up activities with your students to allow yourself to get to know them as well as allowing them to get to know you.
Engage students in cooperative learning activities.	Use classroom issues (e.g., cleanliness, tardiness) as opportunities to practice cooperative skills by allowing student groups to generate solutions.
	Create buddy systems whereby new students are paired with buddies to show them around the school and help them to fit in with their peers.
Promote a sense of community in the classroom.	Allow student input when creating rules, policies, and systems for the functioning of the classroom.
	Create an atmosphere in which there is no tolerance for disrespect of people, materials, or ideas.
Personalize students' school experience.	Incorporate students' cultural backgrounds and interests whenever suitable in relation to the topics being taught.
	Create project-based learning opportunities in which students interact with community members with whom they share similar interests.

Students' Need to Feel Competent

Niki is reading in the hallway before history class. Tamra asks her, "Why are you reading?" Niki replies, "I am just reviewing the last section of the chapter one more time. I understood the chapter but wanted to quickly review what the book says about the balance of power established by the U.S. Constitution." Tamra responds, "I gave up on the book. I can't do well in history class."

Another foundation of students' motivation is their need to feel competent. This is one of the three innate psychological needs posited by self-determination theory (Ryan & Deci, 2000) and is supported by Bandura's (1986) self-efficacy theory. As you probably remember from Chapter 8, the likelihood that students will engage in an activity depends on their sense of self-efficacy, their personal belief about their competence to perform the task (Bandura, 1986). When students have high self-efficacy, they are more likely to accept challenges, control anxiety when goals are not met, discard unproductive strategies, and have an internal locus of control, which are all indicators of intrinsic motivation to learn.

Students' need to feel competent can be compromised by negative causal attributions for academic success and failure (Weiner, 2000). In particular, students who attribute failure to a stable cause such as ability ("I can't do math") or task difficulty

("This class is too hard") are less likely to develop a sense of competence and motivation to learn. In contrast, students who attribute failure to internal controllable causes such as lack of effort ("I did not study hard enough") are more likely to continue learning and develop a sense of competence. Typically, high achievers attribute their success to ability and effort and their failure to insufficient effort (Georgiou, 1999; Lloyd, Walsh, & Yailagh, 2005).

In contrast, students with a history of low achievement are likely to attribute failure to low ability, a belief that is at odds with the need to feel competent (Dweck, 2000). You may also recall from the prior chapter that this type of belief can make some students develop learned helplessness, a psychological state characterized by a sense of low self-esteem, anxiety, and depression (Graham & Weiner, 1996). Teachers support students' need for competence by creating activities of appropriate difficulty level so that they can accomplish them successfully and build up their sense of self-efficacy.

Teacher Characteristics: Learning Orientation and High Expectations. The goals that students bring to the classroom have a strong influence on their motivation and affect in the classroom (remember this from Chapter 9?) (Thrash & Elliott, 2001). Students who are focused on learning/mastery goals are likely to use errors to improve performance, to view the teacher as a resource and guide, to be satisfied when investing effort and improving, to seek out challenges, and to use strategies that promote deep learning (Kaplan, Middleton, Urdan, & Midgley, 2002; Pintrich, 2000). Because learning goals are also associated with positive attitudes and emotions, such as high self-concept and self-efficacy, teachers who have a learning orientation in the classroom are likely to sustain students' need for competence (Kaplan & Maehr, 2002). Teachers who have a learning orientation emphasize learning rather than grades, help students set achievable goals for themselves, avoid competition among students, and increase the difficulty of the material as students make progress. When teachers focus on performance rather than learning, such as when they emphasize grades and competition, struggling students come to believe that there is nothing they can do to achieve (Carr, Borkowski, & Maxwell, 1991; Covington, 1987). These students may simply stop putting effort in learning as a way to protect their self-worth. After all, it is better to think "I didn't try hard enough" than to conclude that if you failed after trying it was probably because of low ability (Covington, Omelich, & Schwarzer, 1986).

Having a learning orientation in the classroom can help ameliorate the negative effects that low standardized test scores may have on students' sense of competency. Poor standardized test performance is a regular part of the life of many students today. Unfortunately, these assessments can undermine lower achievers' motivation because the scores are typically estimated as the percentage of students who scored better than they did. The message then is loud and clear that these students did not do as well as others.

Teachers should have realistically high expectations of their students in order to promote their sense of competence (Pressley et al., 2003). In other words, teachers should be confident that, with effort, their students can improve their knowledge and skills (Au, 2001; Good & Brophy, 2003). All students need to feel competent, and those who perceive that teachers have lower expectations for them will eventually perceive themselves as inferior and act accordingly, creating a self-fulfilling prophecy.

Teachers may inadvertently harbor negative attributions for certain students and consequently have lower expectations for them. Teachers often hold lower expectations for disadvantaged children (Becker & Luthar, 2002; Hauser-Cram, Sirin, & Stipek, 2003), and it is well documented that Latino, African-American, and Native American students are disproportionately represented in special education and remedial classes and underrepresented in Advanced Placement classes (Cooper, 2002; Hill, Kawagley, & Barnhardt, 2006; Waxman & Tellez, 2002). When expectations are low, teachers are less likely to provide students with the emotional and instructional support that they need (Good & Brophy, 2003; Weinstein, 2002). Because expectations are unconscious (recall our discussion of low-ability cues from Chapter 9), reflective teachers need to

challenge their own assumptions about the causes for students' academic success or failure and strive to maintain high expectations for all students.



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Teachers need to be aware of any negative attributions they harbor and instead provide emotional and instructional support as well as hold high expectations for the success of all students.

Teacher Strategies: Help Students Set and Attain Achievable Goals. Think about teachers you had who made you feel competent. What kind of instructional activities did they use? What type of assessments and feedback did they use? The following are some strategies that teachers can use to help their students develop a sense of competence.

(1) ***Set achievable goals.*** For students to develop a true sense of competence, they must reach success through the use of their strengths. Therefore, the first strategy is to take into consideration students' strengths and set achievable goals for each student, to help them build a history of success that will empower them to engage in future tasks (Brophy, 2004). Effective goals are specific, moderately challenging (within students' zone of proximal development), meaningful, and proximal (Anderman & Maehr, 1994; Erez & Zidon, 1984). In addition, teachers should provide scaffolding as students learn a new task by modeling, thinking aloud, and giving hints or prompts (Hogan & Pressley, 1997). Once students take on a challenge and successfully master the task with the help of the teacher's scaffolding, their self-efficacy and intrinsic motivation increases, even when they make frequent errors (Covington, 1992). The task, however, needs to be perceived not only as challenging but also as meaningful and worth understanding to promote motivation to learn (Vavilis & Vavilis, 2004). Take the following scenario. Kamil is a junior in high school who currently reads at the fifth-grade level. He usually blows off reading class because he feels that it is hard and unrelated to his main passion: cars. One morning, after spending many hours in the shop with his cousin trying to fix a car, Kamil realized that he could not understand most of the car's manual. His cousin told him that unless he improved his reading skills, he would not get a job in the shop when he graduates. Now Kamil has a goal! Although he still feels that reading is hard, he attends class every day.

(2) ***Provide learning aids for complex tasks.*** Various learning aids, such as those available through new technologies (e.g., word processors, spreadsheets, digital libraries), can support learning by helping students think more effectively than they would if tackling a task without assistance (Edelson, Gordin, & Pea, 1999; Norris & Soloway, 2003; Singer, Marx, Krajcik, & Chambers, 2000). Providing students with learning aids can help them gain a sense of competency, especially when asked to engage in inquiry, problem-based learning, and any constructivist activity that requires high-order thinking. The Center for Learning Technologies in Urban Schools found that providing urban students with a web-based tool to search a preselected collection of sites in a digital library and save their work to a permanent workspace allowed them to successfully carry out online inquiry projects (Hug, Krajcik, & Marx, 2005).

(3) ***Give informational feedback.*** Academic challenges can be emotionally satisfying when they provide students with information about their proficiency and skill (Stipek, 2002). Teachers can help students gain a sense of competence by presenting them with informational feedback on their performance. Recall from Chapter 9 that informational feedback focuses on giving students information about how their performance can be improved, leading to greater intrinsic motivation, task engagement, and persistence than performance feedback (Pressley et al., 2003). For example, Mr. Dawson asks one student at a time to work on math problems while the remainder of the class is engaged in seatwork. Mr. Dawson watches one student as he solves the math problem. Then Mr. Dawson discusses with the student potential strategies to overcome the difficulties that the student encounters in arriving at a solution. *Note to self:* Whenever you identify a weakness, make it clear to the student that your comments relate to a particular task, not to the student as a person, and mitigate negative comments with a compliment about aspects of the task in which the student succeeded (Cashin, 1979).

(4) ***Provide frequent and varied feedback.*** Students develop a sense of competence when presented with frequent and varied assessments. Frequent informational feedback provides students with helpful information about the areas in which they need improvement and communicates their successes and strengths. More frequent and shorter assessments are preferred over less frequent and longer assessments because shorter evaluations are more manageable for the student, self-efficacy is less likely to suffer from any single poor performance, and multiple assessments give students more opportunities to correct poor performance. Teachers should also consider using different assessment types, such as tests, homework, projects, presentations, board work, seatwork, and drill and practice. Because each assessment is likely to measure different skills, students are given a broader base of information about their learning. For instance, Mrs. Cisco uses six ways to assess student performance: traditional testing, group projects, journal reflections, presentations, one-minute essays at the end of classes, and question-and-answer sessions during lecture. The forthcoming Chapter 12 on classroom assessment will discuss the strengths and limitations of each of these methods.

(5) ***Allow students to learn from their mistakes.*** When Mr. Dawson had his one-on-one time with Malia, he noticed that she had trouble solving problems involving fractions. He wanted to seize this opportunity to help Malia see the errors and to improve her skills by doing more work with fractions. He pointed out the types of errors she was making and then assigned her to handle the math portion of an upcoming small-group project. This would give Malia extra practice where she needed it. Teachers can help their students see their errors as opportunities to learn and teach them how to improve their thinking by examining the source of their errors (Ames, 1992; Blumenfeld, Puro, & Mergendoller, 1992; Stipek, 2002). Mr. Dawson also provided Malia with a "mastery opportunity" to redo the assignment on fractions because she failed to reach a certain criterion. Giving students an opportunity to redo assignments fosters deeper understanding and a sense of competency. Teachers can also ask students to reflect on what they have learned from an error. Owen is another student in Mr. Dawson's class. Owen has difficulty with spelling and misspelled the word *receive* as *recieve* on an essay, so Mr. Dawson asked him to write a brief reflection paper about something he had learned from his spelling error. In his paper, Owen wrote that he learned that the word *receive* follows the rule "*i* before *e* except after *c*." When mistakes are taken as a learning opportunity, students are likely to see them as a mechanism to improve their knowledge and skills.

(6) ***Emphasize the relationship between effort and learning.*** Students who have negative attributional beliefs ("I failed the math test because I'm just not very good at math") have lower success expectations than those who have more positive attributions (Weiner, 2000). Pablo is an English language learner who struggles with reading comprehension and believes that he will never be able to read English well. Even if Pablo's teacher models reading comprehension strategies, Pablo won't apply these strategies in the future if he does not believe that he can change his reading ability. However, research shows that when students like Pablo receive attribution training in addition to strategy training, they outperform those who receive strategy training alone (Borkowski, Weyhing, & Carr, 1988). Teachers can use attributional training by:

- Modeling that the effortful use of strategies results in increased success
- Modeling that lack of effort results in errors
- Providing students with opportunities to exert personal control over carefully selected tasks in which they can self-evaluate the effects of their effort on achievement

(7) ***Use praise effectively.*** Think about your own experience giving and receiving praise for different accomplishments. Can praise support one's sense of competence? If so, what are the characteristics of effective praise? Many educators and researchers are divided on the merits of praise. For some, praise is one of the most effective extrinsic motivators to learn. You probably recall from Chapter 5 that praise is a common classroom incentive, along with rewards and feedback. In contrast, others feel that stu-

dents' positive sense of self has to be developed from within, from a genuine sense of accomplishment and self-worth, and that praise can dishonor this objective (Dweck, 2007; Kohn, 2001). Praise can create praise junkies (expecting teacher and parent praise for everything that they do), steal the student's pleasure (we tell them what to be proud of), and eventually make a student lose interest in the work and reduce achievement. Students who are lavishly praised by their teachers are more tentative in their responses, are more likely to respond in a questioning tone of voice, and are more likely to back off from an idea as soon as an adult disagrees with them (Rowe, 1974).

In sum, praise can make students feel less rather than more competent. Praise for being smart or intelligent seems to be the worst type (Mueller & Dweck, 1998). In a study with more than 400 fifth-grade students from different parts of the country and from varied ethnic and socioeconomic backgrounds, students who were praised for being intelligent ("You must be smart at this") chose less challenging tasks than those who had received praise for their efforts ("You must have worked really hard at this"). When given the opportunity to tell an unknown student at another school about the task they had just completed, 40% of students who were praised for being intelligent exaggerated their scores whereas very few of the other students did. These results suggest that when we praise students for being smart, we are sending the message that they should avoid looking dumb. On the other hand, the negative effects of praise should not be taken to mean that all compliments are harmful. When praise is used carefully, it can encourage students to be proud of themselves and to be confident in their abilities and accomplishments (Good & Brophy, 2003). Table 10.3 lists characteristics of effective praise.



Laura Dwight Photography

Why is it not a good idea to praise students for merely participating in an activity or for accomplishing easy tasks?

(8) ***Use peer modeling.*** Teachers can also promote students' self-efficacy by using peer models in the classroom. Because peers are highly similar to one another in many aspects, their potential to affect students' competence beliefs is great (Bandura, 1986). In one study, three groups of elementary school children were asked to rate their competence in solving subtraction problems and given a pre-test (Schunk & Hanson, 1985). One group received instruction about how to solve the problems, a second group received the same lesson plus a peer-modeling treatment, and a third group was given no instruction (control group). The peer-modeling group watched two videos showing a teacher writing subtraction problems on the board while a peer made positive

TABLE 10.3

Characteristics of effective praise.

PRAISE SUPPORTS STUDENTS' NEED FOR COMPETENCY WHEN IT . . .
• Is genuine
• Is based on a criteria
• Attributes success to effort
• Provides performance information
• Does not focus on the teacher's approval or liking
• Is given contingently, in recognition of accomplishing challenging tasks
• Uses prior accomplishments as a context for the new accomplishments

self-efficacy statements such as "I can do that one!" or "I like doing these problems!" Once the treatment was over, all students were asked to rate their competence again and take a post-test. The findings showed that the group that learned with peer self-efficacy modeling had a large change in both self-efficacy ratings and achievement, whereas the changes for the other two groups were modest. Teachers can take advantage of the motivating power of peer modeling by emphasizing cooperative learning, working in pairs, student demonstrations, and helping each other (Morrow, 2002). There is also evidence that struggling students benefit more from peers who model coping (overcoming difficulty, fear, or anxiety), than from those who model mastery (performing flawlessly) (Schunk, Hanson, & Cox, 1987).

(9) ***Rely on criterion-referenced assessments.*** When you learn about classroom assessments in future chapters, you will be able to distinguish between criterion-referenced and norm-referenced assessments. Criterion-referenced assessments focus on the extent to which a student has achieved a predefined standard or criterion—for example, correctly answering 8 out of 10 quiz questions. Norm-referenced assessments compare each student's performance level to the average performance level in the class. Norm-referenced grading systems, such as grading on a curve, should be avoided because they limit the number of students who can be rewarded for mastering the content or skill. Not only do norm-referenced assessments lower students' self-efficacy but they are also more likely to lead students to avoid challenging tasks, give up in the face of difficulty, and believe that their successes are due to innate ability (Ames, 1992; Dweck, 2000). In contrast, criterion-referenced assessments are supportive of students' need to feel competent because they set an achievable standard that is certain and contingent only on students' effort and progress.

Classroom Tips: How to Support Students' Need to Feel Competent summarizes the strategies discussed in this section with additional classroom examples.

Students' Need to Feel Autonomous

Mr. Evans promotes a sense of autonomy in his writing class by having students engage in a self-selected project each semester. Then students write a personal reflection on the experience. The projects must have personal meaning for the students and be of service to their community. The need to feel autonomous is the foundation of intrinsic motivation according to self-determination theory (Deci & Ryan, 2002). The sense of autonomy is similar to having an internal locus of control, the belief that one can change the conditions of the environment (Rotter, 1966). Students' intrinsic motivation increases when they are given opportunities to take personal responsibility for their learning (Grolnick, Gurland, Jacob, & Decourcey, 2002; Stipek, 2002). A sense of autonomy increases the likelihood that students will actively engage in academic and extracurricular activities, transfer the skills learned at school to out-of-school settings, and stay in school until graduation (Hardre & Reeve, 2003; Reeve, Bolt, & Cai, 1999; Shernoff, Knauth, & Makris, 2000).

Students who are allowed to make choices in the classroom (e.g., picking topics for research or writing projects) are more likely to engage in their work, complete the project quickly and efficiently, and feel pride in their products (Deci & Ryan, 1992; Turner, 1995); they are also less likely to misbehave in class (Dunlap et al., 1994; Powell & Nelson, 1997; Vaughn & Horner, 1997). Take the following student statements: "When will teachers stop telling us what to do?" "I hate history! Who cares about memorizing all those names, dates, and facts?" "Why do we have to learn this stuff?" These comments are all too familiar to teachers. They are typical reactions from students who might feel that their need for autonomy has been ignored. Students with these feelings fail to engage in learning activities that they perceive to be of little or no value. According to expectancy X value and goal theories of motivation, students will become motivated to engage in an activity only to the extent that they expect to succeed at a task and perceive the task as valuable (Wigfield & Eccles, 2002; Zimmerman, 2000). Teachers can support students' sense of autonomy by involving them in the development of learning activities that are interesting, useful, and relevant to their personal goals.

CLASSROOM TIPS

How to Support Students' Need to Feel Competent

Strategy	Examples
Emphasize mastery and learning rather than grades and performance.	Ask questions that require students to explain how they arrive at answers and use their responses as part of your grading system. Create portfolios with which students can track their progress throughout a class to demonstrate the knowledge and skills they have mastered by the end of the year.
Hold high, realistic expectations for all students.	Provide opportunities for success early in the schoolyear so that students believe that your expectations are realistic. Be clear about your expectations and their rationale.
Help students set achievable goals for themselves.	Encourage students to write their goals down, and give them time to reflect on their progress toward their goals throughout the class. Counsel students to break down large future goals into smaller, proximal, attainable subgoals.
Provide learning aids for complex tasks.	Teach students how to use visual representations to help solve complex problems, such as flowcharts, graphics, and diagrams. Include time for students to develop proficiency in the use of learning aids, such as digital encyclopedias, dictionaries, and calculators.
Tell students what they need to do to succeed in frequent and varied ways.	Provide students with feedback throughout large projects, not just at the end. Use specific feedback in both oral and written forms.
Emphasize that mistakes are a normal part of learning.	Allow students to make mistakes without penalizing them through grades or harsh consequences. Create an open and warm environment that encourages students to take risks.
Help students see the relationship between effort and learning.	Provide students with the opportunity to reflect on their invested effort on assignments and to relate their efforts to learning. Present students with examples of people who persisted under difficult circumstances and achieved great things both in school and outside of school.
Use peer modeling.	Encourage students to ask at least one other peer their question before turning to you for the answer. Provide opportunities for students to teach each other through whole-class instruction or small-group instruction.
Use criterion- or standards-based assessments.	Provide students with the learning objectives and standards of a lesson so they understand what will be expected of them in future assessments. Evaluate students in terms of their ability to meet standards (e.g., mastery, proficient, nearing proficiency).

Teacher Characteristics: Democratic Leadership. You want your students to be independent and self-motivated. What is the best way to encourage autonomy? Should you listen more and let students decide what to do? Or should you maintain firm control, be the leader of discussions, and hand out stickers and rewards for achievement? Teachers vary along a controlling versus autonomy spectrum in their teaching styles (Deci, Schwartz, Sheinman, & Ryan, 1981). According to self-determination theory (Ryan & Deci, 2006), teachers can help create two types of learning environments: autonomy supporting and controlling.

Autonomy-supporting teachers give fewer commands, listen more, and ask more questions about what students want to do than controlling teachers (Reeve et al., 1999). Rather than planning what "to do to" students to motivate them to learn, autonomy-supporting teachers work *with* students to evoke their existing intrinsic motivation and knowledge. Because they see students as active participants in the classroom, autonomy-supporting teachers also emphasize communication and respect, realizing that greater appetite for learning can be created by combining their own resources with those of students. In contrast, controlling teachers emphasize external rewards ("carrot and stick") and

authority, an attitude that tends to make students more dependent on the teacher and less self-motivated to learn.

In a similar fashion, a classic study (Lewin, Lippitt, & White, 1939) showed how different forms of teacher leadership can affect students' learning and motivation. The researchers examined three types of leadership:

- *Authoritarian:* They assumed full responsibility and control and did not allow the students to make contributions.
- *Democratic:* They worked with students cooperatively, helped them develop strategies to accomplish projects, posed questions, and had them share ideas.
- *Permissive:* They did not take responsibility for the tasks, did not provide structure in the classroom, and let students work on tasks with minimal supervision.

Democratic Leadership

Working with students cooperatively, helping them develop strategies to accomplish projects, and promoting the sharing of ideas.

The democratic and authoritarian leadership styles here can be equated to what self-determination theory has called the autonomy-supporting and controlling classrooms, respectively. The results of this study showed that students preferred the **democratic leadership** style and that the students with a democratic teacher displayed a high degree of independence, initiative, and positive affect; they also continued to work productively when the teacher was absent. Permissive leadership created chaos and uncertainty, while authoritarian leadership led to high performance but also to negative affect in students, such as frustration, aggression, and a negative group atmosphere.

There are many external pressures that may push teachers toward being controlling and focused on getting students to comply with the school's objectives, such as meeting performance standards, accountability issues, and time constraints (Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982). Students' apathy and disengagement may also tempt the teacher into using directives and commands to get them to perform (Skinner & Belmont, 1993). Yet when teachers learn how to relinquish control, students' engagement increases significantly (Reeve, Jang, Carrell, Barch, & Jeon, 2004; Ryan & Deci, 2006). Teachers whose style is supportive of student autonomy have students who are more intrinsically motivated and self-regulated than students of more controlling teachers and report greater self-worth and sense of competence (Grolnick et al., 2002).

Teacher Strategies: Encourage Participation and Self-Regulation. Next, we discuss specific strategies that can be used to support students' need for autonomy.

(1) ***Teach students how to set academic goals.*** Supporting students' academic goal setting is an effective motivational strategy for at least two reasons. First, teaching students how to set goals and decide on a plan to achieve those goals will give them a strategy for making their dreams come true. They will be able to transfer the planning skills learned to solve other real-life problems (Perkins, 1999). Second, the process of goal setting is likely to set up positive self-beliefs and affect because it shows students that they are in control of their own lives by determining the direction in which they want to go and the ways to accomplish their goals (Ryan & Deci, 2000). By having opportunities to set academic goals and a corresponding plan of action, students learn to become self-directed and responsible for their own learning. Some experts recommend teaching students how to set goals as part of a class activity and later having them apply it to a personal goal in an area such as home, school, friends, or hobbies (McCombs & Pope, 1994). Remember, however, that according to expectancy X value theory, the extent to which goal setting may become an effective student motivator depends on the product of two main forces: students' expectation of reaching the goal and the value of the goal (Pintrich & Schunk, 2002). Figure 10.3 illustrates this idea. As teachers, we need to make sure that students set goals that are both attainable and valuable to effectively support their need for autonomy and motivation to learn.

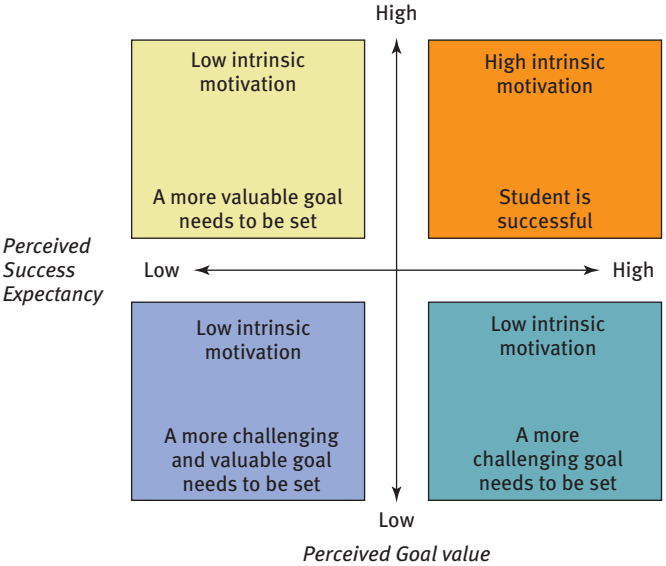


FIGURE 10.3 **Applying expectancy X value theory to support students' need for autonomy.**

(2) ***Support the development of students' possible selves.*** When you were in school, did you have a dream? Teachers can help students develop their possible selves, the visions that students have of themselves in the future (Oyserman, Brickman, & Rhodes, 2007). Possible selves can be strong motivators to engage students in acquiring relevant knowledge and skills, especially during adolescence (Oyserman & Markus, 1990). A student whose dream is to become an Olympic athlete may decide to get in shape and start training in the school gymnasium. By accomplishing short-term goals (e.g., getting in shape, training), students get closer to the longer-term goal of becoming their possible selves (Cross & Markus, 1994). Students' possible selves can include a combination of academic and nonacademic aspirations. On average, students who have academic possible selves have higher achievement levels than those who don't, and students who fail to attain desirable selves are more likely to engage in problem behaviors (Oyserman, Bybee, & Terry, 2006). These findings suggest that schools and teachers should help students translate their hopes and dreams for the future into a concrete set of actions, especially those goals that would lead them to become more connected to school and academic success. In a school-to-job program, students learn about attractive possible selves through research, problem-solving activities in groups, and interactions with guest speakers from their community. One study shows that a nine-week intervention using a school-to-job program helped students articulate academically oriented possible selves, identify the skills they needed to develop, and improve school engagement (Oyserman, Terry, & Bybee, 2002).

(3) ***Create agency for learning.*** To support students' autonomy, allow them to experience control—also referred to as **agency**—of their own learning. When students are given agency for their learning, such as picking a topic of their choice for a writing assignment, participating in the process of setting classroom rules, and demonstrating learning in different formats (e.g., presentation, essay, portfolios), they are likely to feel a sense of control and increase their motivation to learn. Compared to students who are assigned a reading topic, those who are given a choice of topic report more interest and satisfaction with the learning experience (Schraw, Flowerday, & Reisetter, 1998). However, there is a caveat to offering students choices. When choices are not meaningful, giving the opportunity to choose may have no effect or even a negative effect on learning and motivation. Imagine the following scenario. A woman of Italian background is visiting her family in the United States. To make her feel comfortable, her relatives ask her to make a choice among a set of potential nearby restaurants. "Would you like to go to the Chinese place around the corner, to our favorite Thai restaurant, or to a new Mexican restaurant that has very good reviews?" If the Italian woman does not like any of the restaurant choices or is not familiar with such choices, she is likely to become frustrated and even lose motivation to eat. It would have been more thoughtful for her relatives to first learn about her food interests. Asking students to choose among predetermined options is the most common type of choice teachers give, yet students typically do not experience autonomy and intrinsic motivation in these circumstances (Overskeid & Svartdal, 1996). In one study, students' interest and effort were not affected by the provision of choice, nor was choice a significant factor in learning outcomes, suggesting that the choices given to students were not interesting enough to engage them in the task (d'Ailly, 2004). Other challenges that teachers face when giving students choices are providing clear expectations about the standards to be achieved, offering creative guidance to make effective choices, and ensuring that all choices require comparable amounts of work (Vokoun & Bigelow, 2008). As you see, providing students with choices can be a complex undertaking. Table 10.4 shows some rules for giving students choices.

Agency

Students' control of their own learning.

How can teachers help students develop into their possible selves?



NG Image Collection

TABLE 10.4

Rules for giving students choices.

- Give choices when students are calm.
- Offer choices that you are comfortable with.
- Provide choices within classroom structures and routines.
- Consider whether choices will allow students to master required content.
- Offer choices whose consequences you have carefully thought through.
- Make sure that choices are not used as opportunities to do the bare minimum to pass an assignment.
- Do not give choices unless you are prepared to choose among them for students who don't make up their minds in a reasonable period of time.

(4) ***Use noncontrolling language.*** Autonomy-supporting teachers use language that is informational rather than controlling (Lowman, 1990). Openly invite students to discuss classroom issues while keeping control of the learning objectives. Some autonomy-supporting statements include: "Class, we only have 10 minutes left before going to recess. How about we spend that time completing our social science project?" "Now, you will be working on 20 new practice problems. You can choose to do the odd or the even ones." "Peter, would you please focus on your work so that others can finish their problems, or would you rather sit in the front of the class by yourself?" Refrain from making controlling statements that eliminate the student from the picture. Some controlling statements include: "In the next 10 minutes before recess, I want to see everyone working on their social science project." "You need to get through these problems." "Peter, you must finish the assignment."

(5) ***Teach self-regulation.*** Teachers can model the self-regulation process to their students by demonstrating how to engage in strategic planning, self-monitoring, and self-evaluation (Zimmerman & Risemberg, 1997). This can be done as a whole-class demonstration or in the form of cognitive apprenticeship. When students have a supportive model, they can imitate and internalize the self-regulation strategies modeled. Recall from Chapter 8 that self-regulation develops gradually. In the early grades, students will not be able to set clear goals or carry out effective strategies. Therefore, their learning will depend on the guidance of the teacher, who will set the goal, make the plan, and evaluate students' outcome. During the process of becoming a self-regulated learner, teachers fade their guidance gradually, providing students with more opportunities to control the task as they become more confident. This period of transition is called **co-regulation**. Eventually, teachers remove their external guidance when students become sophisticated self-regulators. Although self-regulatory skills are rarely taught in school (Zimmerman, Bonner, & Kovach, 1996; Zimmerman & Risemberg, 1997), teachers can use several strategies to encourage self-regulation in the classroom (Zimmerman, 2001) (see Table 10.5).

Co-Regulation

Fading teacher guidance gradually to provide students with more opportunities to control the task as they become more confident.

(6) ***Provide opportunities for metacognition.*** Students' sense of autonomy is also promoted when they are provided with opportunities to engage in metacognitive activities such as thinking about their thinking, learning, and behaviors (Fu, 2007; Hollingworth & McLoughlin, 2001). There are many ways to promote students' metacognition. Teachers can model their own metacognitive skills by thinking out loud when making decisions and problem solving in the classroom or use small groups to prompt students to think about their thinking and strategies. Another strategy is to involve students in self-assessments. Although self-evaluation is a difficult skill that requires time to develop, as seen in Figure 10.4 even young children can do so when appropriate guidance is given by their teacher (van Kraayenoord & Paris, 1997). For instance, teachers can encourage students to critique their own work, analyze their strengths, and work on their weaknesses (Forsyth & McMillan, 1991). They can also ask students to reflect

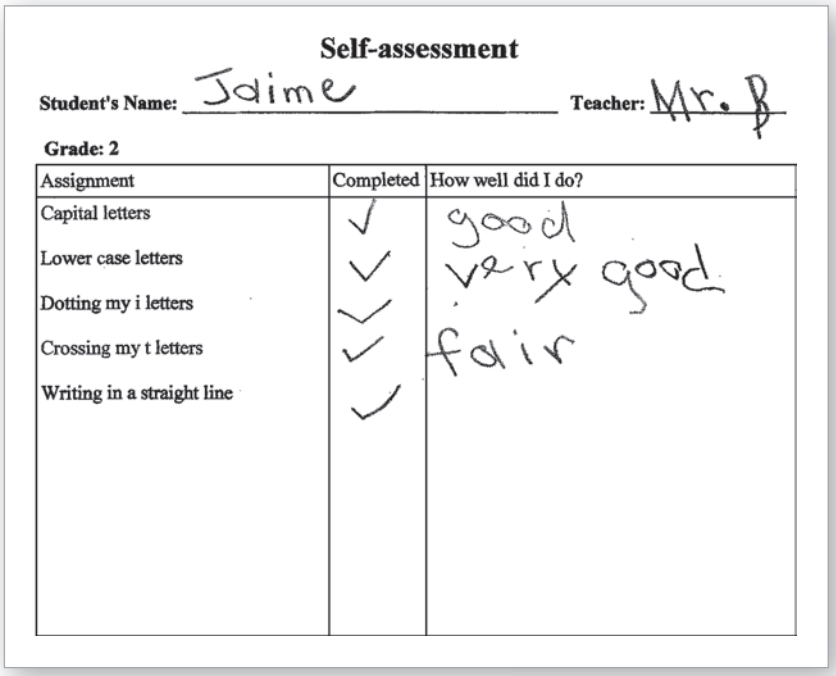
TABLE 10.5

Strategies for helping students with self-regulation.

- *Goal setting*: Ask students to make a list of objectives to accomplish while studying.
- *Strategy planning*: Teach mnemonics for remembering long lists of information.
- *Self-instruction*: Present a set of steps for problem solving and ask students to rehearse the procedure.
- *Time management*: Ask students to schedule the time to study and do homework.
- *Self-monitoring*: Teach students how to keep a log of their completed assignments.
- *Self-evaluation*: Ask students to check their work before turning it in.
- *Self-consequences*: Teach students to reward themselves when a goal is accomplished.
- *Environmental structuring*: Teach students to select a working environment that is conducive to success (e.g., quiet, comfortable).

on their effort and contributions when participating in group projects. In addition, many teachers use admit/exit slips to encourage students to reflect about their learning and understanding. Admit/exit slips require answering a short reflection question during the first (admit) or last (exit) 5–10 minutes of class. They can help students self-assess their understanding of new or old concepts and determine where they need additional clarification or assistance. A teacher might say, ask "Write down anything that you already know about . . ." or "One of the things that I would like to learn more about is . . ." Table 10.6 lists additional self-assessment strategies for the classroom.

(7) ***Emphasize the relationship among thoughts, feelings, and behavior.*** A powerful way to support the need for autonomy is to show students how their thinking relates to their motivation and how having control over their thoughts can affect their behavior and academic success. Recall from Chapter 9 that students need to believe that they are capable of accomplishing their goals and have positive outcome expectations



Self-assessment

Student's Name: Jaime **Teacher:** Mr. B

Grade: 2

Assignment	Completed	How well did I do?
Capital letters	✓	good
Lower case letters	✓	very good
Dotting my i letters	✓	
Crossing my t letters	✓	fair
Writing in a straight line	✓	

FIGURE 10.4 A self-assessment for early elementary students.

Table 10.6

Self-assessment strategies for the classroom.

- Ask students to provide ideas about evaluation criteria, such as grading rubrics.
- Have students rate their work based on a clear rubric and compare their ratings to those of the teacher.
- Help students keep records of their performance and progress.
- Present examples of "good" and "bad" academic work and have students grade the examples based on preestablished criteria.
- Ask students to generate test questions for upcoming exams.
- Engage students in compiling portfolios of their work.
- Have students reflect on their work and progress periodically in student–teacher conferences or by writing journal entries.

about their goals in order to become self-motivated. Unfortunately, many hard-to-reach students have developed insecure belief systems that, in combination with negative school and community experiences, may become a barrier to learning. One challenge for the classroom teacher is to help hard-to-motivate students get past their negative thoughts, feelings, and behaviors and regain their natural tendency to learn and grow in positive ways. McCombs and Pope (1994) suggest engaging students in an activity in which they generate examples of their thoughts (positive or negative), describe the feelings and behaviors produced by their thoughts, and list the expected outcomes. The goal of this activity is to help students understand that negative feelings and behaviors originate in their thoughts and that they can exert control over their academic success by choosing to think more positively about themselves and school.

Classroom Tips: How to Support Students' Need to Feel Autonomous summarizes the strategies discussed in this section with additional classroom examples. We are done discussing the basis of motivation: students' psychosocial needs. To see an example of how such needs may show in a classroom, read the following Case Study and try to solve Mr. Carroll's dilemma.

THE CASE OF RESILIENCY

Aggie and Angela Kehler are fourth-graders whose parents were killed two years ago. Two of the girls' teachers reflect on how the girls handled this tragedy in their lives. Mr. Azulay: "I had Aggie in my class two years ago, and now I have Angela in my class. I just can't get a handle on how different these two girls are."

Ms. Riddle responds, shaking her head: "I know what you mean; those two passed through my second-grade classroom, too. Aggie was in my class when her parents were killed. The sisters were first placed in foster care and, by the time I had Angela, they had been adopted by their grandmother, who could barely take care of herself. I remember that the poor girls always looked tired, dirty, and hungry."

Mr. Azulay: "I know that having lived through so much can take a toll on students' achievement, but how would you explain the fact that Aggie has done so well at school when Angela only seems to want to cause as much trouble as possible?"

Resiliency is the characteristic of children and adolescents who not only survive but manage to thrive in aversive environments (Dole, 2000; Gallagher, Alvarez-Salvat, Silsbee, & Kenny, 2002; Henry, 1999; Keogh, 2000; Masten 1994; Werner, 1993). In very impoverished neighborhoods, crime, the lack of positive role models, and inadequate social and health services can combine to create an environment that undermines

CLASSROOM TIPS

How to Support Students' Need to Feel Autonomous

Strategy	Examples
Create an autonomy-supporting classroom climate.	Ask for student input when planning certain classroom activities, such as field trips, group projects, and reading assignments.
	Provide ways for students to voice their opinions, and let them know how their opinions have guided your classroom practices.
Teach students how to set academic goals.	Encourage students to regularly reflect on their knowledge and skills and how they can help in achieving personal goals.
	Help students set academic goals and think about specific strategies that can lead to their achievement.
Support students' development of possible selves.	Create projects and opportunities for students to interact with successful adults outside of school who can serve as models and guides to developing students' possible selves.
	Help students find local programs that encourage the development of possible selves.
Promote student agency in learning.	Be open to student suggestions and incorporate them into your plans when aligned with your learning objectives.
	Know your students, so that the choices you provide are meaningful to them.
Use noncontrolling language.	Ask a colleague to observe your class so that you can become aware of any controlling language you may be using with your students.
	Be aware of situations that are likely to trigger you to use controlling language and reflect on alternative ways to communicate issues to your students.
Teach self-regulation.	Early in the year, survey students so that you can learn about what self-regulation skills they have already mastered.
	Provide opportunities for students to reflect on their self-regulation, and teach them strategies for improvement.
Provide opportunities for developing metacognitive skills.	Encourage students to write about the processes they use to think about different situations.
	Incorporate a self-reflection piece into daily lessons through admit/exit slips.
Emphasize the relationship among thoughts, feelings, and behavior.	Talk with students about the connections between their thoughts and behaviors, and teach them strategies to self-regulate their negative emotions and thoughts.
	When dealing with unwanted behavior, ask students to reflect on the feelings and thoughts that led to such behavior.

children's motivation, learning, and mental health (Lewit, Terman, & Behrman, 1997; Black & Krishnakumar, 1998; Vernez, 1998). These factors, however, do not automatically doom all children to academic failure. In fact, many at-risk children develop the ability to succeed despite many risk factors (Borman & Overman, 2004; Glantz, Johnson, & Huffman, 2002; Waxman, Gray, & Padron, 2002).

Resiliency is associated with a complex array of personal and external support factors (Garmezy, 1985; Masten & Garmezy, 1985). Resilient children tend to have easy temperaments, effective interpersonal and problem-solving skills, and a strong sense of autonomy and purpose (Benard, 1991). Resilient children also tend to have a sense of humor or the ability to laugh at their situations and find alternative ways of looking at them (Masten, 1994). Resilient children are good at thinking abstractly, reflectively, and flexibly (Rutter, 1984).

A Case Study: DIVERSITY IN THE CLASSROOM

Motivation Issues in an Eighth-Grade Language Arts Classroom

"How's life on the rez, Mr. Carroll?" asks Ms. Etsitty, the eighth-grade assistant teacher. "Oh, I love it out here, at 'the mouth of Canyon de Chelly in the heart of the Navajo Nation,' as they say. Ever since I came here on a college geology expedition, I've wanted to come back. There's such a rich cultural history, and teaching social studies at Chinle Middle School is a perfect opportunity to connect with the community."

"We sure do need good teachers. I'll be selling tamales and green chili stew at the flea market this weekend, so be sure to stop by."

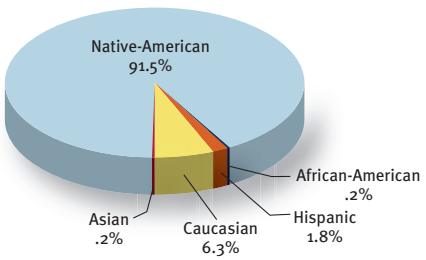
"Oh, believe you me! I wouldn't skip an Etsitty tamale!" Mr. Carroll promises.

Since moving to Chinle, he's felt welcomed by the school community. Between teaching and being an advisor to the fledgling environmental club and the young authors' committee, he keeps busy. He's particularly excited to be teaching Arizona history to the eighth-grade students and hopes to facilitate students' investigation into their local history.

Demographics:
An Overview of the Students
Chinle Middle School
Chinle, Arizona

75.3% Students eligible for free and reduced lunch
47.2% Students qualify for ESL instruction
12.2% Students receive Special Education Services

Racial/Ethnic Groups



As one of the longest continuously inhabited landscapes of North America, Canyon de Chelly is at the heart of southwestern history. Petroglyphs, hand-and-toe hold trails to Anasazi cliff dwellings, and bullet holes from Spanish Lieutenant Narbona's 1804 massacre can be seen on the sheer cliff walls. The canyon is also home to a contemporary community of Navajo people, for whom the landscape has great historical and spiritual significance. Mr. Carroll hopes his students will make personal connections to the history they're learning.

Earlier in the year, when teaching about the Anasazi Pueblo Era III (A.D. 1150–A.D. 1350), Mr. Carroll collaborated with the school's art teacher, Mrs. Tso, to demonstrate how to make Anasazi pottery. After taking the class on a field trip to cliff dwellings in Canyon de Chelly, they taught students how to make their own pots. First, students collected and prepared clay, then shaped it into coil pots and smoothed the edges with shells, and finally, with adult supervision, built a fire to cure the pots, which they later decorated with traditional black-and-white Anasazi designs. Both teachers felt the process gave students a deeper appreciation of Anasazi life and culture, motivating them to participate in class and complete their assignments.

In preparation for teaching Arizona history of the 1800s, Mr. Carroll begins, "I want you to close your eyes and imagine the town of Chinle in 1804. Navajo families live in hogans [traditional houses] in Canyon de Chelly, cultivating fields of corn, pumpkins, melons, beans, squash, and herding sheep and cattle. There are no cars, paved roads, or grocery stores. Imagine you're a scout for the chief and you saddle up your horse to ride the dusty trails in search of Spanish settlers."

"Oh, not this old stuff again," Richard interrupts.

"I want you to imagine how it looks, smells, and sounds," Mr. Carroll continues. "At dusk you come home, feed your horse, and join your family around the fire listening to grandma telling stories of Spider Woman and Coyote."

"Ahh, how sweet and traditional," Jeremy parodies.

Mr. Carroll is not sure how to respond. He says quietly, "I'll be happy to discuss this with you after class," and continues the lesson.

"Over the next month we'll learn about the Long Walk of the Navajo, when Kit Carson's army forced 9,000 Navajos to walk 300 miles to Fort Sumner, New Mexico. We'll also study the famous 1868 Treaty of Bosque Redondo, which established the Navajo reservation," Mr. Carroll explains.

"Finally! It's about time we learn Navajo history," Nizhoni says. "In fourth grade I remember learning about Christopher Columbus, the New England Pilgrims, and the cowboys of Tombstone, Arizona, and that was about it. We never talked about our history."

"I think it's important to investigate your own history," Mr. Carroll shares. "In this unit, one of the assignments will be to interview a family member about their personal history."

"I'll interview my grandpa, because he's always telling me, 'Take pride in your native traditions and your language. Learn from your elders.' That's why I want to go to Diné College here, near Chinle. I want to learn Navajo philosophy and government," Nizhoni says excitedly.

"That's right," Rachel agrees. "I want to be Miss Navajo Nation when I'm in college. So my uncle's teaching me how to butcher a sheep on his farm in Tsaile, and my aunty talks with me only in Navajo. Did you know you have to be fluent to apply for Miss Navajo Nation?"

"Yuck, butchering a sheep? Why don't you just go down to McDonald's and get a burger?" Cassandra says.

"Yeah, welcome to the real world. It'd be a lot easier," Jeremy adds and students laugh.

"I heard that out in Tsaile, there's no 'lectricity or running water. Now that's old school. I mean, what do you do without Direct TV? Sit around and weave rugs in the candlelight?" Cassandra asks and the class laughs.

Mr. Carroll is not sure if he should intervene. Before he decides, Nizhoni responds.

"Jeez. Sometimes it seems like you guys just don't understand. We want to learn about our traditional ways before they're lost," Nizhoni replies. "I want to be able to teach my kids Navajo."

"My mom doesn't even speak Navajo. What am I supposed to do? Anyways, it's not like I'll need it when I move to California. She wants me to go to high school over there, so I can get a good-paying job when I graduate," Jeremy counters.

Mr. Carroll redirects the conversation. "Let's get back to discussing the social studies assignments. You'll have the opportunity to interview a family member."

"I'm tired of those same old school assignments. Every year it seems like a teacher says, 'Ask your grandpa about what life was like when he was a boy.' You see, my grandpa Bill's more interested in watching NFL games than talking about his memories. He TiVos® every game. You know, he's better at using that new technology than me," Cassandra says proudly.

"Yeah, I've had that same interview assignment, and my aunty told me never to ask her again about the boarding school in Colorado," Ervin adds.

Mr. Carroll didn't realize some students' relatives might be reluctant to talk about their memories. "That's a very good point. You'll have to be sensitive to what your family members feel comfortable talking about. Perhaps we can think of alternative assignments for this unit," he suggests.

Mr. Carroll pauses, unsure of how to conclude the discussion. He hears different views among his students about what it means to be Navajo. Some students embrace their heritage traditions, while others want to assimilate into American culture. Nizhoni and Rachel are motivated to learn more about local history, whereas other students' families feel uncomfortable talking about the past. He realizes he'll have to reconsider how to teach the unit. How can he motivate students to learn about their history? What strategies will he use to teach sensitive topics, such as the Long Walk? How will he make lessons valuable and relevant to students' differing life goals? Can he help students set challenging goals?

Mr. Carroll concludes the lesson, "I think it's important to have this discussion as a class. It means you're thinking about what we're learning. As we continue to study history this year, I'll want to hear your ideas, concerns, and suggestions about the assignments and the topics we study."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?



Laura Dwight Photography

What are the implications for teachers of the research on student resiliency?

Research on resiliency reveals that the factor that clearly contributes to developing resiliency is the quality of the relationship established with at least one adult who expresses genuine care for the child and who is committed to and optimistic about the child's success (Reis, Colbert, & Hebert, 2005). These adults are typically parents, older siblings, or other people who decide to take a young person under their wing (Flores, Cicchetti, & Rogosch, 2005). A direct implication of this finding is that teachers can play a major role in developing student resiliency by using the strategies offered in this chapter.

Teachers who promote resiliency create learning environments that are emotionally and intellectually safe. These teachers are personally interested in their students and families, maintain high expectations, and emphasize success and mastery (Doll, Zucker, & Brehm, 2004). Likewise, schools that promote resiliency are orderly and well structured, emphasize the need to develop strong personal connections between teacher and students, and establish high academic standards for their students (Ilg & Massucci, 2003; Pressley, Raphael, Gallagher, & DiBella, 2004). The research on resiliency shows that a nurturing environment can provide disadvantaged students with a secure base to develop confidence, competence, feelings of autonomy, and safety (Benard, 2004; Strand & Peacock, 2002).

DIVERSITY IN CLASSROOM MOTIVATION AND AFFECT

Because the strategies discussed in this chapter are based on human psychosocial needs, they will help develop self-motivation in all of your students. Nevertheless, it is important to consider some potential areas of diversity in classroom motivation and affect.

Diversity in Intrinsic Motivation

As you know from Chapter 9, young children are more self-motivated than adolescents (Harter, 1999). Although the reasons for this motivational decline are many, an important one is that the culture of schooling changes significantly as children transition from elementary to middle school and from middle school to high school, with the elementary school environment being more conducive to the support of students' psychosocial needs. Elementary school classrooms are generally caring and nurturing and characterized by strong teacher–student and student–student connections, but middle and high schools present the following changes (Midgley, Middleton, Gheen, & Kumar 2002; Roderick & Camburn, 1999):

- Students have several teachers rather than one, and teachers have significantly more students to attend to, making teacher–student relationships more superficial and teachers less likely to know how well students are mastering academic content.
- Schools have significantly larger number of students, threatening the development of a true community of learners because classes are less socially cohesive.
- Teachers become more performance-oriented as the years go by and move from focusing on learning for its own sake to focusing on the products of learning (e.g., grades, standardized test scores). Activities are more competitive, and grades are often assigned on a norm-referenced basis.
- There is more whole-class instruction and less individualized instruction adapted to particular student needs.
- Students are given less guidance and fewer opportunities to set meaningful goals and make academic choices, yet they are expected to be more responsible for their own learning.

These trends help to explain why students develop less positive attitudes about school and show less intrinsic motivation to learn as they progress to secondary school.

Middle schools were originally developed to help in the transition from elementary to high school by attending to adolescents' personal, emotional, social, and academic development (Kohut, 1988; Lounsbury, 1984). Schools that follow this vision are sensitive to the increasing demands of high school and teach children the skills to become self-regulated and self-motivated. In many middle schools, teachers team up to work with subsets of students, coordinating their activities and exchanging information about the unique academic needs of each learner. Research shows that strategies of this type can ease students' transition to high school (Midgley et al., 2002).



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Adolescents show less intrinsic motivation than younger students. How can teachers help students improve their self-regulation and self-motivation skills?

Diversity in Students' Need to Feel Accepted

Research suggests that, despite its universal nature, the degree to which a child or adolescent needs to feel accepted varies (Kupersmidt, Buchele, Voegler, & Sedikides, 1996). Students with lower needs for affiliation may prefer to set their own independent study schedule, work alone, and choose academic partners they believe are likely to succeed in an academic task. In contrast, students with higher needs for affiliation may set a study schedule that enables them to be with their friends, to work with others, and to choose academic partners with whom they have a personal connection, regardless of their competence. Students who have lower self-concepts are also more likely to have a high need to feel accepted (Crowne & Marlowe, 1964). Developmental differences are also prevalent. Whereas elementary children typically seek teacher acceptance, secondary students are more likely to need to feel accepted by their peers (Harter, 1999; Urdan & Maehr, 1995). Adolescents with a high need for approval may give in easily to peer pressure and even self-handicap if they are concerned about gaining the approval of peers who do not value academic achievement (Steinberg, 1996; Wentzel & Wigfield, 1998).

Teacher caring may be especially important for exceptional students, students who live in poverty, or those from culturally diverse backgrounds. These students are typically more likely to succeed in school when they perceive that teachers are personally interested in their lives and concerned about their individual needs (Goodenow, 1993; Phelan, Davidson, & Cao, 1991; Smith & Wilhelm, 2002). Although most teachers care for all students in their classroom, we should be aware of how personal biases may affect how well we support our students' need to feel accepted. Recall our discussion about the relation between teacher expectations and student achievement. In your journey to becoming a reflective practitioner, make it a priority to examine your areas of potential bias to ensure that all your students have an opportunity to feel accepted and succeed.

Finally, because urban schools tend to be large, urban teachers should pay special attention to supporting students' need for acceptance (Rubison, 2004). Urban teachers tend to overemphasize control and discipline (Rimm-Kaufman & Sawyer, 2004) and to view their role as delivering content rather than supporting students' personal, social, emotional, and intellectual needs (Watson, Charner-Laird, Kirkpatrick, Szczesiul, & Gordon, 2006). Urban teachers tend to focus on low-order thinking and to have low expectations for their students' achievement (Ferguson, 2003; Landsman, 2004; Manouchehri, 2004). These school-based factors and the personal and social challenges that urban students typically encounter in their lives combine to disengage students from school. Many of the circumstances that prevail in urban contexts cannot be addressed by the school, yet teachers can help build resiliency in these students by nurturing the set of psychosocial needs reviewed in this chapter.

Diversity in Students' Need to Feel Autonomous

Students will vary in the extent to which they need to feel autonomous. Some cultural groups (e.g., Navajo) raise their children to be more autonomous and to have more control and initiative than adults in the mainstream culture (d'Ailly, 2003; Deyhle & LeCompte, 1999; Rogoff, 2003). Other cultural groups (e.g., African-American) may give

their children less autonomy as a strategy to ensure their safety in potentially hostile contexts (Hale-Benson, 1986; McLoyd, 1998). Although these differences seem to suggest that strategies to promote autonomy will have different effects among students of different cultural or ethnic groups, experts caution against making generalizations and favor focusing on individual differences such as personality, beliefs, and cognitive resources (Bauer & McAdams, 2000; Bembenutty, 2007; Grolnick et al., 2002; Miserandino, 1996; Roman, Moskowitz, Stein, & Eisenberg, 1995). Engaging in autonomous behaviors, such as self-regulation, requires a significant amount of cognitive resources and willpower (Metcalfe & Mischel, 1999), suggesting that individual differences in students' capacity to control cognition, emotions, and behavior are important predictors of the effectiveness of autonomy-inducing strategies (Jensen-Campbell & Graziano, 2005; Pintrich & Zusho, 2002). These individual differences may help explain why some students respond more positively to classroom choices than others. Specifically, low-achieving students were found to benefit less from being offered academic choices than their high-achieving counterparts (Sweet, Guthrie, & Ng, 1998), and some students do not want the responsibility that accompanies a choice because of an increase in performance anxiety (Clifford, 1991; Dyson, 1997).

Finally, there is also great diversity in students' academic possible selves (Oyserman & Markus, 1993). There is evidence that girls become concerned about their possible selves earlier than boys and are more likely to be torn between their desire to do well at school and to be a good family member (Curry, Trew, Turner, & Hunter, 1994). In addition, the number of academic possible selves seems to parallel the decline in intrinsic motivation across the transition to middle school and from middle to high school (Anderman, Anderman, & Griesinger, 1999). Other studies show

REVISITING ISSUES IN EDUCATION

Can culturally responsive education help close the achievement gap?

Points to consider: Recall from Chapter 1 that only experimental research can establish a causal relationship between two variables. Therefore, to answer this question, we should look at the findings of experimental studies that compared the achievement of culturally diverse students who were taught with culturally responsive education (CRE) to that of a group of culturally diverse students who were taught with traditional education methods (control group). Unfortunately, few experimental studies exist to help answer this question. A review of the research on CRE for Native American students found only a couple of experimental studies addressing this issue (Demmert & Towner, 2003). In one study, the Kamehameha Early Education Program (KEEP), a reading program for Hawaiian children (Tharp, 1982), was found to significantly increase students' achievement (Doherty, Hilberg, Pinal, & Tharp, 2003). A second unpublished study (Lipka & Adams, 2002) found that a CRE unit of instruction on geometry increased learning for a group of Yup'ik sixth-grade children.

Even if few studies have been undertaken to establish a causal relationship between achievement and the full implementation of a CRE program, a large number of nonexperimental studies find that culturally responsive practices are indeed related to student success. The following is a summary of culturally responsive practices found to promote students' learning outcomes and perceptions:

- A climate of caring, respect, and the valuing of students' cultures is established (Cooper, 2002; Gay, 2000; Ginsberg & Wlodkowski, 2000; Ladson-Billings, 1994; Sheets, 1995; Tharp, 1982; Waxman & Tellez, 2002).
- Teachers learn from and about their students' culture, language, and learning styles to make instruction more meaningful and relevant (Apthorp, D'Amato, & Richardson, 2003; Lee, 2003; Lipka, 2002).
- Bridges are built between students' prior knowledge, native language, and classroom learning (Conrad, Gong, Sipp, & Wright, 2004; Doherty et al., 2003; Ginsberg & Wlodkowski, 2000; Ladson-Billings, 1994; Powers, Potthoff, Bearinger, & Resnick, 2003; Waxman & Tellez, 2002).
- Traditional knowledge, language, and culture are fully integrated into rather than added to the curriculum (Demmert, 2001; Hollins, 1996).
- School staff build trust and partnerships with families, especially with those marginalized by schools in the past (Bryk & Schneider, 2002; Cooper, 2002; Demmert, 2001; Henderson & Mapp, 2002; Sosa, 1997; Trumbull, Rothstein-Fisch, Greenfield, & Quiroz, 2001).

that low-income, rural, and Hispanic adolescents are at risk of having few academic possible selves; and when the social context lacks images of academic possible selves, they are likely to be missing entirely or to be too general to motivate students to learn (Oyserman & Fryberg, 2006). Nevertheless, when students are actively engaged in a supportive academic environment, positive academic possible selves can be developed. In two studies with urban African-American middle school students, a school intervention increased students' academic possible selves and produced significant changes in school behavior (Oyserman et al., 2002, 2006).

SUMMARY

- Although contemporary views of motivation recognize that intrinsic and extrinsic motivations might act simultaneously, they have moved from focusing on extrinsic motivators to focusing on methods that promote students' natural tendency to learn and grow. The tendency to learn and grow can be nourished by modeling enthusiasm and value for learning and eliciting students' curiosity and interests. Research-based strategies shown to support students' natural tendency to learn include identifying students' personal interests and goals and using the information to tailor instruction, using a variety of teaching methods, creating student-generated projects, presenting real-life problems, creating cognitive conflict, using fantasy and make-believe, providing opportunities to actively engage with learning materials, and integrating technology tools that can help students learn relevant knowledge and skills.
- Students need to feel safe in the classroom in order to become self-motivated learners. Students' need to feel physically and emotionally safe in the classroom can be nourished by teachers who model equity, respect, and responsibility. Strategies that support students' need to be physically safe include arranging classrooms so that students have personal space and the classroom does not pose any risk of physical harm or discomfort, establishing classroom routines for recurring tasks, protecting students from violence and aggression, and having a good set of intervention strategies at hand. In addition, teachers can engage students in developing classroom rules that emphasize respect and responsibility.
- Students' need to feel accepted is fulfilled when teachers are caring and show unconditional positive regard in the classroom. This involves being culturally competent when working with students of diverse cultural backgrounds and displaying healthy communication patterns, such as practicing active listening and addressing behavioral issues in positive, respectful, and nonjudgmental ways. In addition, teachers can use warm-up and collaborative activities to help students bond with each other; promote a sense of community in their classrooms by modeling the value of friendliness, responsibility, and respect; and personalize the school experience.
- Students' need to feel competent is supported when teachers create a learning-oriented classroom and have high but realistic expectations for all students. Strategies to help students develop a sense of competency focus on helping students set and attain achievable goals, providing learning tools for scaffolding complex tasks, providing frequent and varied informational feedback, showing how mistakes are a normal part of learning, using peer modeling and criterion-referenced assessments, and emphasizing the relationship between effort and learning. To effectively support students' sense of competency, praise should be genuine, based on a criterion, given in recognition of accomplishing challenging tasks, provide performance information, not focus on the teacher's approval or liking, and attribute success to effort.
- Students' need for autonomy is supported when teachers show democratic leadership in the classroom. Strategies to support students' need to feel autonomous include teaching students how to set academic goals; supporting the development of students' possible selves; encouraging student agency; using noncontrolling

language and self-assessments; promoting self-regulation and metacognition; and emphasizing the relationship among students' thoughts, feelings, and behavior, and academic outcomes.

- Resiliency is the characteristic of students who manage to thrive in aversive environments and is associated with a complex array of personal and external support factors. One factor that clearly contributes to developing resiliency is the quality of the relationship with an adult who genuinely cares for the student and is committed and optimistic about the student's success. Teachers who promote resiliency are personally interested in their students and families, maintain high expectations, emphasize success and mastery, and create learning environments that are emotionally and intellectually safe.
- Although psychosocial needs are universal, teachers should keep in mind several diversity factors when considering strategies to promote motivation and positive affect in the classroom. First, students develop less positive attitudes about school, show less intrinsic motivation to learn, and decrease their academic possible selves as they move from elementary to secondary school. Of special concern are low-income, rural, and Hispanic adolescents, who are shown to be at risk of having few academic possible selves. Second, the degree to which a student needs to feel accepted varies. Elementary children typically seek teacher acceptance, and secondary students typically need to feel accepted by their peers. Within each developmental level, some students will have lower needs for affiliation and prefer to work independently, whereas others will display higher needs for affiliation. Nurturing the need for belongingness will be especially important to promote the academic success of students with lower self-concepts or exceptionalities. Finally, students' need to feel autonomous will largely depend on their culture (the extent to which they are raised to have more control and initiative) and individual diversity factors (e.g., personality, ability to take initiative).

KEY TERMS

active listening 379
affiliation 381
agency 391
alienation 377
co-regulation 392
cultural competence 379
democratic leadership 390
exploratory behaviors 370
novelty effect 373
prosocial goals 377
social responsibility goals 377

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. In what ways can teachers support students' natural tendency to learn?
2. How would you design your learning environment to support students' need to feel physically safe?
3. What does emotional safety mean and how can teachers support this student need?
4. What strategies can teachers use to support students' need to feel accepted?
5. What are the characteristics of learning-oriented classrooms?
6. What strategies can teachers use to support students' need to feel competent?
7. Should you use praise to build students' sense of competence? Explain.
8. What strategies can teachers use to support students' need to feel autonomous?
9. What does research say about resiliency and what are some classroom implications?
10. What kind of student diversity are you likely to find regarding motivation and affect in the classroom?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- What were the most useful concepts that you learned about?
- Are there any concepts that you feel are still unclear or questionable?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. Which type of knowledge will a teacher need to design effective motivation strategies and why (Chapter 1)?
2. What learner-based needs might bilingual education support for linguistically diverse children (Chapter 2)?
3. For which of the reviewed motivational strategies would it be essential to consider students' zone of proximal development (Chapter 3)?
4. How would you relate the stages in Erikson's theory of psychosocial development to the learner needs reviewed in this chapter (Chapter 4)?
5. What are the limitations of reward systems according to current motivational theory and research trends (Chapter 5)?
6. How would you explain the negative learning effects of seductive details in instruction according to cognitive learning theories (Chapter 6)?
7. What are examples of motivation strategies that require students' problem-solving and critical thinking skills (Chapter 7)?
8. Which individual constructivist learning methods are likely to promote self-motivated learners and why (Chapter 8)?
9. Which of the concepts that you learned in Chapter 9 can be used to explain alienation in the classroom (Chapter 9)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Middle School Classroom Use Motivation Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

Ms. Singh is beginning her second year teaching science in an urban middle school in Detroit. During her first teaching year, she observed that students were very motivated to learn, as indicated by their high attendance rate. On the other hand, many of her students had a tendency to focus only on their final grades and to lack a personal commitment to learning. In addition, participation in whole-classroom and small-group activities was very low. After reflecting on these observations, Ms. Singh thought it would be helpful to sharpen her motivation skills in the classroom, so she decided to attend a summer workshop on motivation and learning. Now she is ready to use the new strategies to increase students' participation and intrinsic motivation.

On the first day of class, Ms. Singh facilitates a few warm-up activities that gradually increase the interactions between students so that, by the end of the day, they are starting to feel comfortable with each other. On the second day, Ms. Singh asks her students to write two goals for the science class in their journal, with three strategies to accomplish each goal, and to share their responses with a partner. On the third day, Ms. Singh creates small cooperative groups by combining two of the pairs who had worked together the day before. After assigning each group member a specific role (encourager, scribe, time manager, presenter), she asks each group to brainstorm class rules that will help them achieve the personal goals that they had set. Ms. Singh then guides her students during a whole-class discussion as they come up with a set of classroom rules and consequences.

At the end of the first week, Ms. Singh reflects on the effects of her methods in her journal. Overall, she feels a sense of accomplishment. Most students seem to be very comfortable with each other, and participation is already very high during the few group and classroom activities that she created. However, Ms. Singh noticed that two of her students might need more help to succeed. One was Zaara, a quiet English language learner (ELL) who did not speak to anyone the first day of class. Knowing that Laura is also an ELL who shares Zaara's native language, Ms. Singh paired Laura and Zaara on the second day of class and encouraged them to practice their English together. By the end of the second day of class, Ms. Singh had noticed that Zaara was beginning to speak in front of others, but only after watching Laura. Ms. Singh is happy to see that Zaara seems to be using Laura as a model and will continue to work at helping Zaara gain self-confidence so that she feels more comfortable participating in the classroom.

Ms. Singh's mind then turns to Daniel, and she has to smile. Daniel's goals for the class included having the highest grade on all tests and getting perfect scores on all homework assignments. When Ms. Singh asked Daniel to describe the three strategies he would use to achieve his goals, he replied "Well, I will have to study really hard, check my work over and over, and spend a lot of time on my homework."

Ms. Singh then replied, "I am glad to see that you understand that learning will take a lot of effort on your part, but what happens if you get the second-highest grade? Would that mean you failed?"

Daniel quickly responded, "Yes, I want to have the highest grade because my dad gives me more money when I have the highest grade."

Ms. Singh realizes that she will need to come up with strategies to help Daniel appreciate the importance and joy of learning. Although this may not change Daniel's motivation completely, she hopes that by the end of the year he will value mastery as much as he values his father's incentive. To begin, Ms. Singh gives students the following homework assignment on Friday: "Please write down the two reflection items that I listed on the board in your journals and bring a response by Monday. You will have the opportunity to talk about your answers with a partner or share them with the class."

Journal Reflection:

1. Think of something that you are really good at and describe:
   - How did you learn it so well?
   - What do you like about being really good at it?
2. Think of a time when, because of practice, you got much better at something difficult and describe:
   - How did you practice?
   - What do you like about having improved at something difficult?



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APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. In what ways did the teacher support students' natural tendency to learn?
2. Which of the following student needs were supported by the teacher and how: safety, acceptance, competence, autonomy?
3. Did the teacher demonstrate an awareness of students' diversity?
4. Evaluate the overall effectiveness of the lesson according to what you learned by including both strengths and areas for improvement.

11 Classroom Management: Creating a Successful Learning Environment



Imagine You Are the Teacher

MRS. COOPER IS A FOURTH-GRADE teacher who is committed to improving her students' metacognitive skills. On the first day of class, she pairs students up and asks them to share with each other the strategies they have used to help them learn in the past. Within a few minutes, Jason and Johnson are flicking papers onto the floor. When Mrs. Cooper asks them to stop, they briefly pause—only to start flicking papers at each other. Soon, the assigned time for the activity is over. As Mrs. Cooper asks her students to share their strategies with the class, she realizes that most students have no answer.

The following day, Mrs. Cooper gives her students their first classroom assignment. She distributes a worksheet to help them plan their work in pairs. The worksheet includes a space for students to make a checklist of the steps required to accomplish the task and a space to estimate the time and materials needed. Jason and Johnson are giggling in the back. As she approaches their desks, Mrs. Cooper sees that they used the worksheet to make inappropriate drawings. Mrs. Cooper gives them a new blank worksheet and asks them to take the activity more seriously. Justin and Jessica are also giggling. When Mrs. Cooper approaches them, she sees that their answers are just as silly. By the end of the first week of class, Mrs. Cooper starts to worry. More and more students are ignoring her request to plan their work before beginning a task. Yesterday, two students asked her why she didn't deal with the "bad kids" by kicking them out or calling their parents.

- What might be the cause of the increasing misbehavior in this classroom?
- What could you do to create a more productive learning environment?

Think about how you would respond to these questions as you read through the chapter.



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CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define classroom management and explain its relation to motivation and learning.
2. Describe the skills that teachers need to create successful learning environments.
3. Create a classroom environment that is conducive to learning.
4. Explain how to communicate and collaborate to meet management goals.
5. Describe effective interventions for routine misbehaviors.
6. Describe strategies to deal with student violence and aggression.
7. Discuss issues of diversity in classroom management.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. What is your definition of classroom management and discipline?
2. Should teachers post classroom rules? Why or why not?
3. What are some ways to promote positive behavior in the classroom?
4. Is any type of punishment appropriate in the classroom?
5. Should teachers intervene if students become violent? If so, how?

WHAT IS CLASSROOM MANAGEMENT?

As mentioned in Chapter 1, classroom management is one of the essential skills of effective teachers. Poor skills in classroom management have caused many teachers to quit the profession and move on to a different career (LePage, Darling-Hammond, & Akar, 2005). The goal of this chapter is to help you become an effective classroom manager by discussing the skills and strategies that are necessary to create a productive learning environment. Although classroom management tips can be learned from more experienced teachers (Covino & Iwanicki, 1996), there is significant research in this area to set the beginner teacher on the right track.

Definition

Classroom Management

The skills and strategies that teachers use to organize instruction and maximize the productive use of their instructional time.

Classroom management refers to the skills and strategies that teachers use to organize instruction and maximize the productive use of their instructional time. In a well-managed classroom, students' behaviors rarely interfere with the achievement of instructional objectives (Bohn, Roehrig, & Pressley, 2004; Doyle, 1990; Pressley et al., 2003). Poor classroom management occurs when students are disruptive or off-task and learning does not occur. For instance, Imagine You Are the Teacher illustrates the importance of planning how to manage student misbehavior from the very beginning. By the end of the first week of class, Mrs. Cooper appears to have lost control of her classroom. Because she did not communicate a clear set of classroom rules and consequences, a minor misbehavior from just a couple of students has escalated to a point that prevents Mrs. Cooper from accomplishing her learning objectives.

What a Successful Learning Environment Looks Like

A successful learning environment is not one in which students have been managed into being quiet and orderly but one in which their voices and behaviors serve the purpose of learning. Therefore, we should not conclude that a quiet classroom is a sign of management success. Instead, we should reflect on whether the management methods that we use in our classrooms are conducive to the learning and motivation of all students. Effective classroom management maximizes student's learning opportunities (Evertson, Emmer, & Worsham, 2006; Evertson & Weinstein, 2006; Weinstein & Mignano, 2007). Management that promotes student passivity and compliance with external rules, on the other hand, hinders student engagement and high-order thinking (Charles & Senter, 2005; Jones & Jones, 2004). Although safety and order are a necessary component of productive learning environments, classroom management should not be used as a synonym of teacher control (Barth, 2002).

Emphasizing classroom management in teacher education is vital because the changes in our society and schools present increasingly more challenging and serious management issues. For instance, students in the 1950s were easier to manage than students today—gum chewing and littering were among the top-10 teacher concerns. Now, violence and drug use are among the top-ten teacher concerns (Astor, Pitner, Benbenishty, & Meyer, 2002; Elam & Rose, 1995). In addition, managerial difficulties are the main source of teacher stress, exhaustion, and burnout (Emmer & Stough, 2001) and the main reason teachers leave the profession during their first three years of practice (Weiner, 2002). Preparation in classroom management will help you increase your competence and teaching self-efficacy.

The Impact of Good Classroom Management on Learning

In prior chapters, we discussed the importance of designing instruction that is informed by learning and motivation theory and research. By critically applying this body of professional knowledge to address the needs of all learners, teachers can enhance the academic achievement of all students (Darling-Hammond & Bransford, 2005). So why is it so important for teachers to have strong classroom management skills? Isn't it more important to provide quality instruction to accomplish classroom objectives? Research has consistently shown that classroom management is the teacher variable that has the greatest effect on student achievement (Marzano & Marzano, 2003; Wang, Haertel, & Walber, 1993). Students learn more and are more motivated to learn in well-managed classrooms (Barth, 2002; Good & Brophy, 2003; Purkey & Smith, 1983).

WHAT SKILLS DO TEACHERS NEED TO CREATE SUCCESSFUL LEARNING ENVIRONMENTS?

One of the first researchers to study classroom management was Jacob Kounin (1977), who conducted a set of pioneering studies examining the effects of different teacher management methods on students' behavior. According to Kounin (1977), the key to classroom management resides in the teacher's ability to prevent problems from occurring rather than on his/her intervention after occurrence. This idea has been supported by research (Emmer & Stough, 2001; Good & Brophy, 2003). Approximately 80% of an effective management plan entails anticipating classroom disruptions and establishing the conditions to prevent them (Freiberg, 1999). **Prevention** consists of arranging the classroom environment conditions before the occurrence of a disruption. Perhaps one of Kounin's greatest contributions was to differentiate between classroom management, which encompasses the prevention, intervention, and remediation of student misbehavior, and the narrower term **discipline**, which consists of any teacher action designed to address student misbehavior. By focusing on prevention, teachers

Prevention

Arranging the classroom environment conditions before the occurrence of a disruption.

Discipline

An action designed to address misbehavior.



Image Source/Getty Images, Inc.

What is the difference between classroom management and discipline?

can reduce their need to discipline students in the classroom. In the next sections, we review specific skills and classroom conditions that can help teachers prevent disciplinary problems and create a successful learning environment.

Planning

Ms. Brown starts her science lesson by arranging her fifth-graders in groups of three. Students are to discuss the answer to a question from yesterday's lesson on the concept of "matter." During the discussion, Ms. Brown sets up the equipment that each group will need for a subsequent lab activity. After doing a demonstration of the concept "density," she hands out a worksheet that she designed to guide students through the lab work. Very quickly, students start asking questions about the worksheet. Unfortunately, she realizes that the worksheet is missing important information, so her students are confused about how to proceed and where to write their answers. As she bounces from group to group to clarify their questions, the groups that are waiting for her attention begin shooting water at each other and laughing loudly. Pretty soon, the classroom is in chaos.

This vignette illustrates how difficult it is to maintain an orderly classroom when planning is poor. Unless classroom activities are well structured and carefully planned, students are likely to exhibit undesirable classroom behaviors and frustration as a result of not knowing where to direct their mental and physical energy (Good & Brophy, 2003; Rimm-Kaufman, La Paro, Downer, & Pianta, 2005). On the other hand, when teachers have well-developed plans, students are likely to become engaged in productive activities for most of the schoolday (Anderson & Krathwohl, 2001; Doyle, 1990). A well-developed plan has the following characteristics:

- It is aligned with your learning objectives.
- It is connected to related learning experiences.
- It takes into consideration the diversity of students' needs, interests, and goals.
- It is based on best practices as suggested by educational theory and research.
- It is flexible, allowing for changes that result from unexpected student responses.
- The objectives and value of the lesson are shared with students beforehand.

Good planning minimizes management problems because students understand the objective, rationale, and value of the academic goals, which is likely to increase their motivation to learn (Pintrich & Schunk, 2002). In addition, a well-developed plan can help teachers save valuable instructional time by having materials ready and a set of strategies at hand to adapt the content and pace of instruction as needed. Although classrooms are complex and unpredictable in many ways, by engaging in the process of planning, teachers are also more likely to reflect on potential student problems and think about ways to prevent them before they occur.

Organization

Teachers with good organizational skills, such as making good use of the instructional time, having instructional materials prepared for their lessons, and developing routines and procedures for handling typical classroom business, are also likely to prevent classroom management issues. Differences in lengths of schooldays and number of schooldays per year among different districts have only a minor effect on student achievement (Karweit, 1981; Walberg, 1988). On the other hand, **time-on-task** or engaged time—the number of minutes spent on learning activities—is a strong predictor of learning (Marks, 2000; Rowan, Correnti, & Miller, 2002). A research study in elementary school math showed that only 60% of the **allocated time** for math—the available instructional time during which students have an opportunity to learn—was actually spent on learning mathematics (Karweit & Slavin, 1981). The remaining 40% was spent on noninstructional activities (e.g., late starts,

Time-on-Task

The number of minutes spent on learning activities.

Allocated Time

The available instructional time during which students have an opportunity to learn.

TABLE 11.1

How to increase time on task.

1. Communicate to students that learning is worth their time and effort and that school time is for learning (Salganik, 1980).
2. Start on time and avoid early finishes by planning more instruction than you think you will need (Evertson, 1982).
3. Have materials organized and any necessary equipment set up ahead of time.
4. Give clear directions about learning tasks and informational feedback about students' responses (Weinert & Helmke, 1995).
5. Teach engaging lessons by emphasizing active learning rather than passive, individual seatwork (Bransford, Brown, & Cocking, 2000).
6. Choose tasks that are appropriate for students' ability level in order to maximize engagement and minimize off-task behavior (Moore & Edwards, 2003).
7. Minimize interruptions by maintaining *momentum* during a lesson (Brophy & Evertson, 1976).
8. Maintain focus during instruction (Kounin, 1977).
9. Maximize students' time-on-task by creating a system whereby those who finish a task earlier have something else to do (Emmer, Evertson, & Worsham, 2006).
10. Manage transitions effectively because they are the points at which classroom order is most likely to fall apart (Burns, 1984).

announcements, passing out materials), instructional activities in which students were not engaged in learning, and missed instruction (e.g., teacher absence, school fairs). More recent studies are even less optimistic, showing that elementary school students spend as little as one-third of their allocated time engaged in learning activities (Hong, 2001; Meek, 2003; Weinstein & Mignano, 2007). Although some losses of instructional time are inevitable (e.g., standardized testing days or snow days), most of students' time on-task is under the direct control of the teacher. Teachers with effective classroom management skills increase time on-task using the methods in Table 11.1.

See Classroom Tips: How to Manage Transitions Effectively for some transition management strategies and examples.

CLASSROOM TIPS

How to Manage Transitions Effectively

Strategy	Example
Teach students how to respond to a signal.	Instruct students that whenever they hear the sound of a rainstick (a piece of wood containing small seeds), they should be quiet and make eye contact with the teacher.
Present a clear signal when a transition is needed.	Invert the rainstick to produce the signaling sound that will catch students' attention.
Have a clearly predefined instruction to guide what students will do next.	Say "Now, I want you all to put your books away and get ready for math. Get your pencils and the math problem sheet that we were working on yesterday and put them on your desk as quickly and quietly as you can."
Make transitions as a group.	Say "Class, please put away all the supplies that you have been using" rather than asking particular students at different times to put their supplies away.
Establish regular procedures for routine activities.	Have students place their homework in a specified homework basket as they enter the classroom. Write on the board the "next activity" for those who finish an assigned activity early.

Withitness

Withitness

Being attentive to everything that is happening within a specific area.

Teachers who display **withitness** are those who are attentive to everything that happens in their classroom (Kounin, 1977). Teachers who have developed this skill prevent management problems by immediately picking up on students' cues and responding to them before they become a discipline problem (Davis & Thomas, 1989; Hogan, Rabinowitz, & Craven, 2003). Students are more likely to stay on-task and display desirable behaviors when teachers demonstrate withitness, especially from the beginning of the schoolyear (Woolfolk & Brooks, 1985). Withitness includes three components (Doyle, 2006):

- Watching for behavior, with particular attention to discrepancies from the intended program of action
- Monitoring the pace, rhythm, and duration of classroom events, making sure that activities run smoothly
- Attending to what is happening in the entire classroom without disregarding individual behaviors and activities within small groups.

Beginning teachers can develop this skill by actively monitoring students' behavior and demonstrating awareness of what each student is doing, such as making frequent eye contact, using body language, and calling students by name. For instance, upon noticing that two students are whispering to each other while others are engaged in an assigned reading, you can demonstrate withitness by moving toward the whispering students and staying close to their desks for a while. A with-it teacher has eyes in the back of her head.

Overlapping

Overlapping

Addressing behavioral issues without interrupting instruction.

A teachers' ability to address behavioral issues without interrupting instruction is referred to as **overlapping**. For example, you might notice that one of your students is using his cell phone under his desk to send a text message to a friend. You can demonstrate overlapping by walking around the class and standing next to the student's desk without interrupting your explanation to the rest of the class. If needed, you can then address this issue personally with the student after class. Overlapping helps teachers maximize time-on-task and is strongly associated with classroom order and achievement (Charles, 2002).

Adapting

How might adapting instruction help prevent classroom misbehaviors?

Studies of teacher strategies show that the most effective classroom managers adapt instruction to particular student needs, and ineffective classroom managers appear insensitive to the diverse needs of their students (Brophy, 1996; Brophy & McCaslin, 1992). For instance, Mr. Allis starts his fraction lesson by reviewing his sixth-graders' prior knowledge. He soon realizes that very few of his students have really mastered the concept and thinks to himself, "Oh well, I guess they did not pay attention to their fifth-grade math teacher." Nevertheless, to stay on schedule, Mr. Allis decides to push ahead with his planned lesson and starts adding fractions. Most of his students are unable to follow the procedure. As a result, many of them start asking each other questions, texting on their cell phones, and drawing.



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Effective classroom managers are aware of the different needs of their students and draw from a repertoire of methods to meet these needs (Marzano, 2003a). When students misbehave, beginning teachers may be too eager to think about what *students* are doing wrong. More experienced teachers typically think about what *they* can do to keep students on-task and adapt instruction accordingly (Emmer & Stough, 2001; Sabers, Cushing, & Berliner, 1991). Students are less likely to become frustrated and engage in off-task activities when classroom activities are adapted to their knowledge and skill levels (Robinson & Griesemer, 2006).

Leadership

A meta-analysis of more than 100 studies showed that the quality of teacher–student relationships is the keystone for all other aspects of classroom management (Marzano, 2003a). Did you know that, on average, teachers who have high-quality relationships with their students have 31% fewer discipline issues over the schoolyear than those who do not? According to management experts, high-quality relationships have nothing to do with the teacher's personality or with whether students view the teacher as their friend. Instead, they depend on setting an appropriate level of control in the classroom. In a study that involved interviewing over 700 students in grades 4 to 7, students reported a clear preference for strong teacher guidance and control over a more permissive style (Chiu & Tulley, 1997). This finding parallels the results of the classic study by Lewin and colleagues that we discussed in Chapter 10 (Lewin, Lippitt, & White, 1939). Recall that in this study, students preferred teachers' democratic leadership over permissive and authoritarian leadership styles, which are characterized by too little or too much control, respectively. Classroom Tips: How to Set an Appropriate Control Level lists some recommendations for setting the appropriate level of control to effectively manage your classroom. As you see, the optimal control level for classroom management occurs when teachers show caring and flexibility yet provide strong structure for student behavior.

CLASSROOM TIPS

How to Set an Appropriate Control Level

Strategy	Examples
Establish clear behavior expectations.	Create classroom rules with student participation. Clearly communicate classroom rules and procedures. Acknowledge students' behavior. Consistently apply positive and negative consequences to desirable and undesirable behaviors, respectively.
Establish clear learning goals.	Establish clear learning goals before starting instruction. Clearly communicate learning goals to students (e.g., concrete end products, a mastery criterion, or grading rubric). Provide feedback on the attainment of learning goals.
Provide flexible learning goals.	Adapt instruction to high- and special-need students. Consider individual differences in ability and prior knowledge and scaffold each student through his/her zone of proximal development (see Chapter 3 for specific strategies).
Communicate personal interest in your students.	Talk to students about their interests. Comment on events that are important to your students, such as their participation in extracurricular activities. Compliment students on their achievements in and out of school. Greet and address each student by name both inside and outside of school.
Display equity.	Make eye contact with all students as you lecture. Move around the classroom and try to stand close to different students during the class period. Encourage all students' participation and call on those who may be shy.
Show assertiveness.	Use assertive body language (i.e., face an offending student while keeping enough distance to avoid appearing threatening). Use assertive verbal language (i.e., speak clearly and deliberately, keeping your normal pitch, and avoid displaying negative emotions in your voice). Listen to students' arguments but persist until they respond with appropriate behavior.

WHAT PRACTICAL ARRANGEMENTS AND PROCEDURES CREATE A POSITIVE LEARNING ENVIRONMENT?

In addition to the teacher's classroom management skills, the way in which the physical and social classroom environment is designed has a strong influence on students' behavior and learning (Tanner, 2000; Weinstein, 1979). Specifically, the following three environmental conditions can support a productive classroom (Emmer et al., 2006; Evertson et al., 2006):

- Arranging the room in a way conducive to effective management
- Beginning the schoolyear with a clear set of classroom procedures
- Setting the rules of conduct that will guide classroom interactions

Physical Arrangement

The way a teacher arranges students' desks, instructional materials, and equipment will likely affect students' behavior and learning. Imagine the following scenario. Mrs. Hernandez is using the overhead projector to show maps of Lewis and Clark's expedition to the West Coast. She is frustrated because she constantly has to interrupt to redirect students' focus to the screen. During lunch, she shares her frustration with her co-teacher, Mr. Solomon. After finding out that students' desks were arranged in ten clusters of four, Mr. Solomon pointed out that, although the arrangement was ideal for group work and encouraging interaction, it was ineffective for focusing students' attention to the front of the class. Due to the large number of clusters, students sitting in the back were probably too far away to see the overhead clearly.

Classrooms need to be arranged so that they minimize potential student distraction and facilitate the interactions that are needed to learn. For direct instruction or lecture, seating should facilitate teacher–student interaction. Because students who are closer to their teacher are more likely to pay attention and engage in classroom activities, it is a good idea to place misbehaving or uninvolved students closer to the teacher (Doyle, 1986; Woolfolk & Brooks, 1985). For small-group activities, seating should facilitate student–student interaction among group members, and for whole-class debates or discussions in which the teacher is the facilitator, seating should facilitate both student–student and teacher–student interactions. Regardless of the type of activity, however, teachers should be able to see all students at all times, to facilitate withitness (Emmer et al., 2006). Imagine that your students are tightly seated next to each other while working individually on solving math problems, as shown in Figure 11.1. Before reading the next paragraph, think about some possible consequences of this seating arrangement on one of the students in the class, Cynthia.

First, if Cynthia needs to sharpen her pencil, she will disrupt the students sitting behind her when she stands up to use the pencil sharpener in front of the class. Second, Cynthia is seated next to her friend John, so she is likely to engage with him in off-task conversations because of the proximity of their desks. Third, Cynthia can probably see John's work, which may be a problem if you are trying to individually assess their learning. Fourth, Cynthia may become distracted because she is also sitting too close to the classroom's science project, an intriguing collection of insects.

On the other hand, sitting students close together may facilitate the accomplishment of learning objectives. If your goal is to have small groups of students collaborate on a project, the best seating arrangement is to have the group members face each other so that students can talk to each other and easily share their work with each other. As you see, the seating arrangement needs to be carefully planned to facilitate your classroom activities and assessments. Otherwise, you could spend most of your time managing disruptive behaviors, and students' learning will suffer (Sabers et al., 1991).

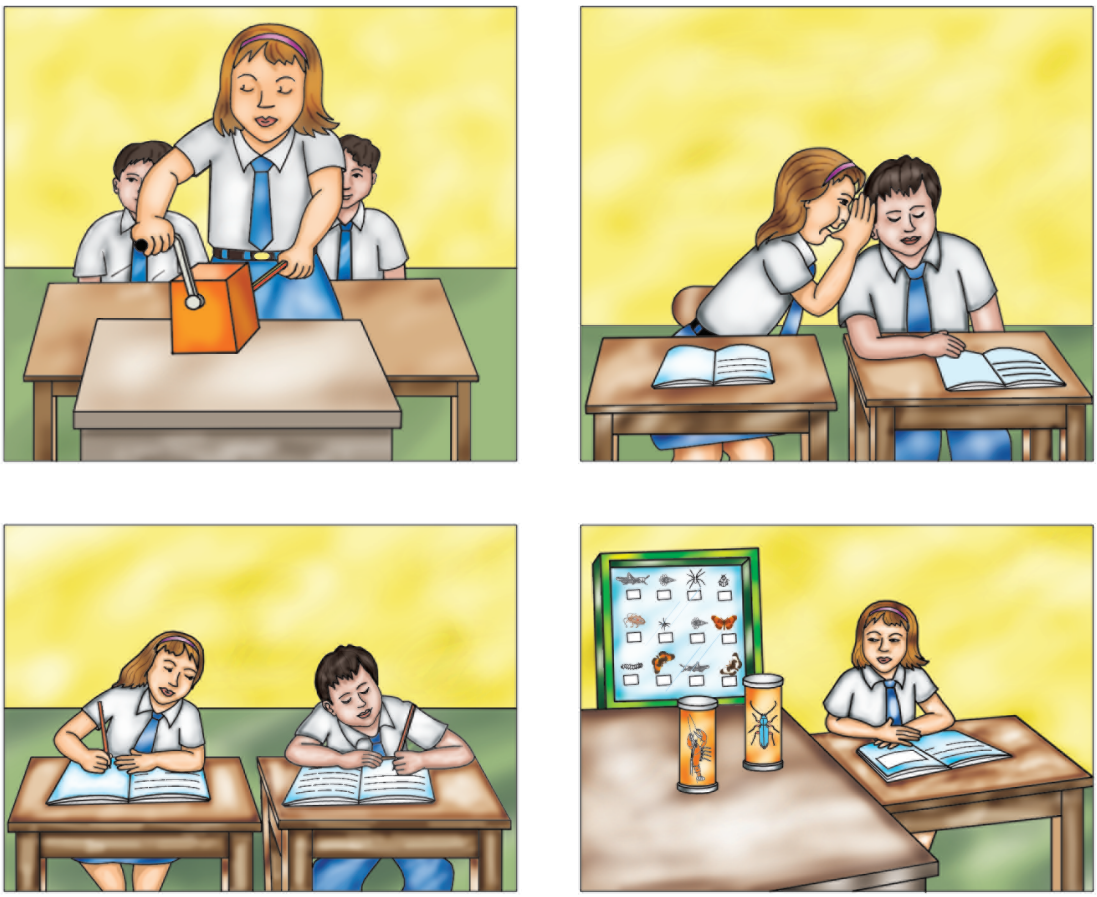


FIGURE 11.1 **What are some advantages and disadvantages of having this seating arrangement for Cynthia?**

Figure 11.2 shows a set of seating arrangements that are aimed at supporting different goals. Before reading the next paragraph, try to figure out what classroom arrangements you should use to attain the following objectives:

1. Minimizing distraction during silent reading
2. Working in cooperative learning activities
3. Engaging in whole-class discussion
4. Conducting individual student presentations
5. Administering standardized tests

You probably found the off-set arrangement to be the one in which students are less likely to distracted by other students during reading time (1). This setting may also be preferred when administering standardized tests in the classroom (5), although leaving sufficient space between individual desks or having students sit in alternating desks in the auditorium style (i.e., having an empty desk between every two students) can also serve this purpose. Despite the fact that, in general, face-to-face settings promote higher distraction than other settings, this is an excellent format to facilitate smooth whole-class discussions (3) or group activities (2). Finally, the seminar arrangement (4) is the best option to conduct student or teacher presentations, especially if the audience is expected to actively participate in a discussion.

In addition to decisions regarding seating arrangements, teachers need to carefully design other spaces for learning in their classrooms, such as learning centers or interest areas. For instance, creating a science center and a library corner promotes more involvement in science and literature activities (Morrow & Weinstein, 1982; Newman &

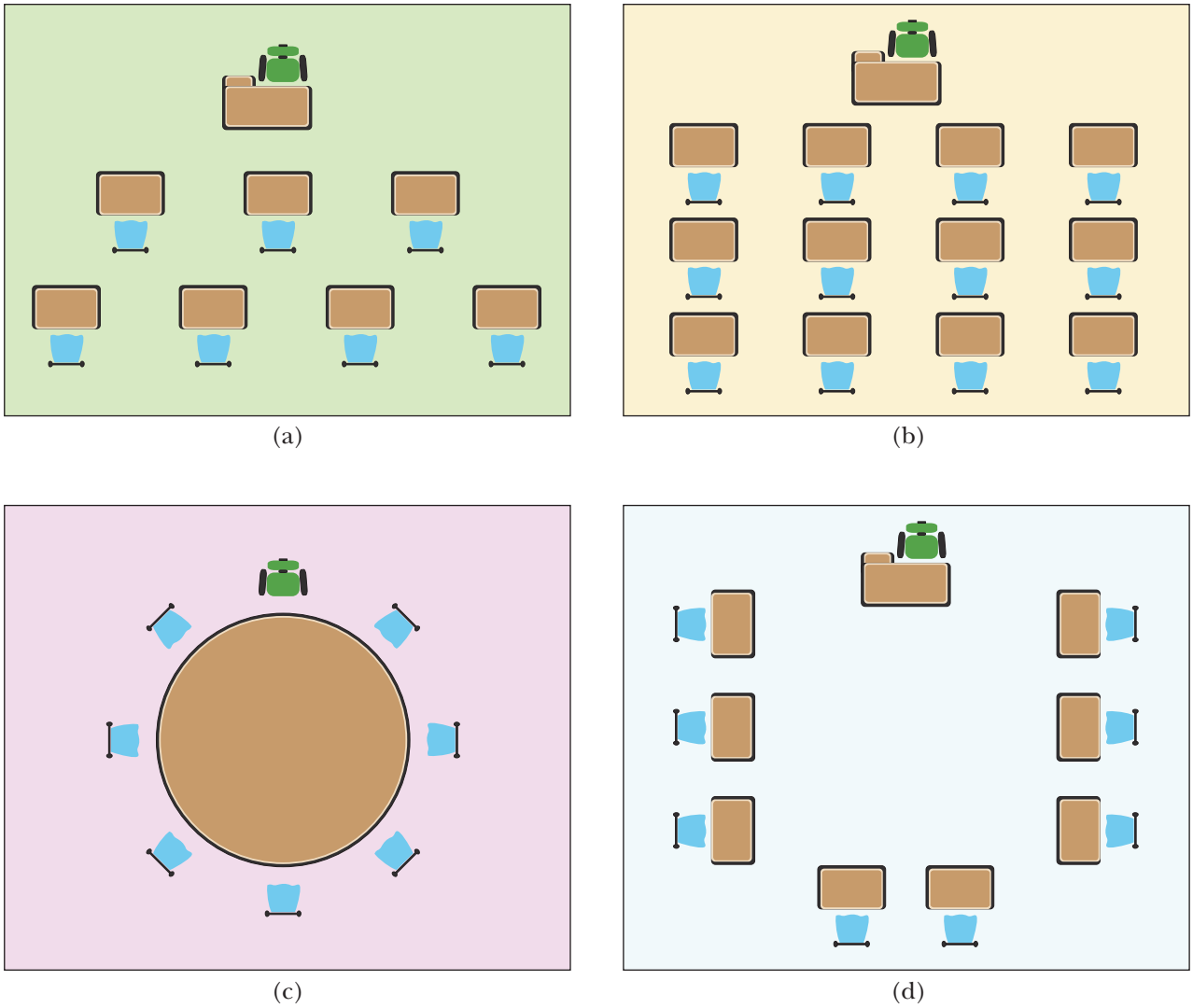


FIGURE 11.2 **A sample of seating arrangements: (a) an off-set arrangement, (b) an auditorium arrangement, (c) a seminar arrangement, and (d) a face-to-face arrangement.**

Celano, 2001; Reutzel & Fawson, 2002). When classrooms are small and seating alternatives limited, it is also a good idea to establish certain traffic patterns and place potentially distracting materials out of students' reach. Other considerations in designing a classroom to prevent management issues are to ensure that you can move easily and quickly around the classroom and that all students can see and hear what you intend.

Teachers need to take into consideration students' need for security and shelter when planning the physical arrangement of their classrooms. For instance, Weinstein and Mignano (2007) recommend arranging the classroom so that each student has his/her personal space (i.e., a delimited area that is under only the particular student's control) and that the classroom does not pose any risk of physical harm (e.g., removing wires and sharp objects from transit areas) or discomfort (i.e., having appropriate lighting and heat levels for every student).

Classroom Procedures

As the bell rings to start class, Mr. Jong observes that most students have their journals on their desks and have started answering the question he posted on the board. Sue, who was absent yesterday, has pulled out the yellow folder from the book shelf and is

collecting the handouts and assignments that she missed. As Mr. Jong enters attendance into the computer, he notices that the Hand-in Basket is almost full, which means that many students did their homework. Two minutes into class, attendance has been taken, homework has been turned in, and students have answered their review question. Mr. Jong is ready to start with a discussion of the question.

Classroom procedures are the routines for accomplishing recurring classroom tasks, such as how students will turn in homework, go to the restroom, or transition from one activity to another. Effective classroom managers use procedures to eliminate disruptions and maximize instructional time. Procedures promote order and help reduce the number of tasks that teachers need to monitor in the classroom. Teachers should develop procedures for the following activities (Weinstein, 2006; Weinstein & Mignano, 2007):

Classroom Procedures

The routines for accomplishing recurring classroom tasks, such as how students will turn in homework, go to the restroom, or transition from one activity to another.

1. Student movement (e.g., entering class, going to recess or the restroom, sharpening pencils)
2. Administrative tasks (e.g., taking roll, responding to lateness)
3. Lesson routines (e.g., collecting and returning homework and other assignments)
4. Housekeeping (e.g., putting supplies away, storing personal items, cleaning up desks)
5. Student–teacher interactions (e.g., help seeking)
6. Student–student interactions (e.g., group work routines, socializing)

Good managers try to identify frequent classroom activities and develop corresponding routines to reduce opportunities for disruption in the classroom (Kounin, 1977). Procedures are especially useful with time-consuming, noninstructional activities (Jones & Jones, 2004). Once established, routines need to be taught and practiced. How long it will take until a specific routine becomes automatic depends on the developmental age of the student. A secondary school teacher may model a new procedure and need to revisit it only occasionally, but elementary school teachers may need to use more active methods and provide many practice opportunities. Effective methods to help younger students learn new procedures include the following:

- Role-playing ("The First Hour," 2002)
- Having a signal to inform students it is time for a procedure (Greenberg, 2000; Miller, 2001)
- Using the say–show–check method (Wolfgang & Wolfgang, 1995)

This last method consists of the following: During the *say* step, the teacher describes the procedure; during the *show* step, the teacher demonstrates the procedure or has a student model it; and during the *check* step, the teacher shows either a correct or incorrect use of the procedure and has students explain why it is correct or incorrect.

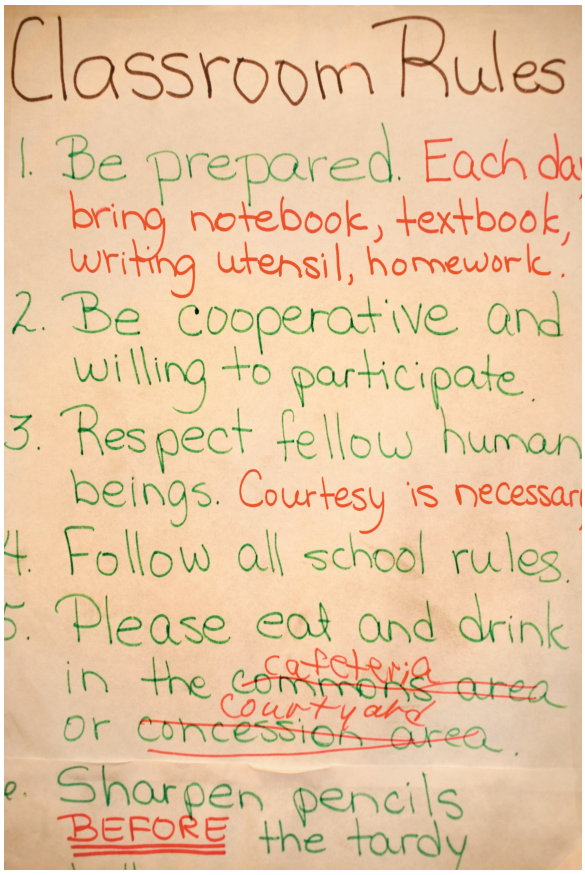
Classroom Rules

In addition to establishing efficient classroom procedures, a teacher can prevent potential classroom management problems by setting clear classroom rules at the beginning of the schoolyear. **Classroom rules** list the "dos and don'ts" of classroom behaviors and corresponding consequences and can be thought of as classroom expectations (Campbell, 1999). Studies show that effective classroom managers take time on the first day of school to help students understand these expectations and their purpose (Doyle, 1986; Emmer, Evertson, & Anderson, 1980; Rathvon, 1999).

Classroom Rules

The "dos and don'ts" of classroom behaviors and corresponding consequences.

What are some guidelines to help you set classroom rules? According to experts in classroom management, students should participate in the rule development process to increase their commitment to the management system (Eggleton, 2001; Glasser, 1998;



SUPERSTOCK

What are the advantages of asking students to participate in the rule development process?

Lewis, 2001; Liconia, 1991). Making students part of this process facilitates their understanding and ownership of the rules and promotes their sense of self-determination and self-esteem (Blumenfield, Kempler, & Krajcik, 2006).

Although student participation may take many forms, a good model consists of starting with a discussion of why rules are important in general and then moving to the specific rules needed for the classroom. For instance, the teacher can ask students to suggest potential classroom rules as she writes them on the board; then she can arrange them into broad categories. During this activity, two additional guidelines can help ensure that the rules are easier to remember and follow (Davis & Thomas, 1989):

1. It is better to have few general rules covering many specific behaviors than having a long list of dos and don'ts.
2. It is better to avoid the use of negative rules.

Let's imagine that students offer the following negative rules for the classroom: "Do not talk in class." "Do not yell in class." "Do not interrupt others." The teacher can summarize students' suggestions under one positive rule: "Raise your hand to be called on." Emmer and colleagues (2006) suggest the following six general rules for secondary school students:

1. Bring all needed materials to class.
2. Be in your seat and ready to work when the bell rings.
3. Respect and be polite to everyone.
4. Respect other people's property.
5. Listen and stay seated while someone else is speaking.
6. Obey all school rules.

For younger students, however, it might be more appropriate to provide a set of rules instead of asking children to generate the rules from scratch. Students can then participate by giving examples of the rules and explaining the rationale for each one. This method can give children a sense of involvement and is a good way to communicate that transgressing the classroom rules is an offense to the whole class rather than to the teacher's arbitrary mandates (Kauffman & Burbach, 1997; Nelsen, Lott, & Glenn, 2000).

The following five general rules work well for elementary children (Evertson et al., 2006):

1. Be polite and helpful.
2. Respect other people's property.
3. Listen quietly while others are speaking.
4. Do not hit, shove, or hurt others.
5. Obey all school rules.

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

Classroom rules are often written in general terms. Many students need concrete examples of what the rules really mean. Form a team of 3 or more classmates with one member using the list of rules given above for elementary grade levels, and other team members creating similar lists for middle and high school levels. Describe what students' behavior would look like and sound like for each rule. Compare your list to that of your classmates.

Another guideline for setting effective classroom rules is to make sure that the rules help create a productive learning environment while imposing the least amount of restrictions. For instance, demanding that students be quiet at all times is an unreasonably restrictive rule and one that is counterproductive to learning. Clear, reasonable rules that are fairly and consistently enforced reduce behavior problems, promote students' feeling of pride and responsibility (Good & Brophy, 2003; Marzano & Marzano, 2003a), and increase their commitment to the rules (Blumenfeld et al., 2006; Eggleton, 2001; Lewis, 2001). Being consistent about the consequences of breaking the rules is especially important, as it will ensure that the rule system is respected by your students. Being very strict one day and lenient the next, or very strict with one student and lenient with another, is likely to undermine students' need for a safe environment and result in a lack of respect for the classroom rules.

On the other hand, consistency and fairness should not be equated with "one size fits all" rules, because your students may transgress a rule or procedure due to extenuating circumstances. For example, Ryan did not turn in his homework today. Ms. Jessop is concerned because Ryan is typically excited about the class; yet today he seems very apathetic. Before deciding on applying a consequence, Ms. Jessop tells Ryan that she would like to talk to him after class. During their meeting, Ryan confides that he is tired because his parents had been fighting all evening so he could not focus on the assignment. Ms. Jessop offers to stay after class with Ryan and help him complete the assignment.

Once a set of rules has been established, effective managers monitor and revisit the rules periodically with students as the schoolyear progresses. For example, you may find that some initial rules are overly restrictive or that some consequences are overly harsh. In the case of Ms. Jessop, she may want to consider having a homework rule whereby students are allowed to skip one homework assignment a week or every two weeks without penalty. Teachers can use whole-class discussions to examine whether existing rules and procedures are serving their purpose and make agreed-upon revisions (Campbell, 1996). This mechanism is not only effective in promoting student ownership but also provides teachers with an opportunity to develop moral reasoning and critical thinking among their students (Power & Power, 1992).

COLLABORATING WITH PARENTS AND OTHER TEACHERS

Students' education is greatly enhanced when their parents become involved in the classroom (Weinstein & Mignano, 2007). Encouraging parent participation in your management plan will help you become a more effective teacher. Beginning teachers will also find that other teachers, especially those who have several years of teaching experience, are a particularly valuable resource when making decisions about classroom management. In this section, we discuss the benefits of collaborating with parents and other teachers to create a successful learning environment. Developing these collaborative relationships will help you prevent management problems and find possible solutions when classroom management situations arise.

Parent Collaboration

Parents can help you become a more effective classroom manager by reinforcing your classroom management plan with their children and adolescents. Teachers who are successful at collaborating with parents report more favorable feelings about teaching and their school and have more positive expectations about parental involvement (Epstein, 2001). Although schools typically include regular communication opportunities such as start-of-the-year open houses, progress reports, and parent–teacher conferences, teachers can proactively seek more specific involvement opportunities. According to research, parental involvement is associated with higher long-term achievement and



Masterfile

What steps would you take to ensure a successful partnership with your students' parents?

motivation as well as more positive attitudes and behaviors in the classroom (Garcia, 2004; Hong & Ho, 2005). In this section, we discuss how to cooperate with parents to reinforce classroom management plans.

The first principle for involving parents in classroom management is to plan their cooperation from the start. As with classroom rules and procedures, it is highly recommended that teachers get parents' cooperation from the beginning of the schoolyear. For example, send an informative letter, including a list of your expectations for the year and the role that parents can take to help their child meet those expectations. The effectiveness of this letter will depend on how specific the guidelines for cooperation are and whether parents are asked to commit to the support of their child's education (Smally & Reyes-Blanes, 2001). Although not necessary, some teachers ask parents to commit to the support of their child by requesting their signature at the bottom of the letter. An example of an introductory letter is shown in Figure 11.3. It is also a good idea to send home a letter informing parents about your management plan. But be sure you have discussed the rules and consequences with your students first. By informing parents about your classroom management plan, you create a common ground to discuss any behavioral issues in the future.

Maintain regular communication with parents by sending home reports and samples of students' work and by calling parents after school hours if needed. Phone calls are particularly useful when a behavior issue requires immediate attention. In many instances, a phone call is all that is needed to resolve minor classroom misbehaviors (Emmer et al., 2006). On the other hand, face-to-face meetings are most productive when students' misbehavior is serious or reflects a pattern over time. Another advantage of face-to-face meetings is that they help you understand students' home conditions (e.g., family expectations, marital problems, parents' language barrier). Experts suggest scheduling conferences around parents' work schedules (Lindeman, 2001), and some teachers even

Welcome to 6th Grade Math!

Dear Families,

Hello! My name is Ana Young and I will be your 6th grader's math teacher. This will be my third year teaching at Kennedy Middle School and I am looking forward to getting to know you and your 6th grader throughout the 2008-2009 school year.

I am committed to helping each student learn the material by approaching each lesson in several ways. In order to create a safe space in the classroom where every student can learn, I hold all students to the following behavior expectations.

1. Follow directions
2. Keep hands, feet and objects to yourself
3. Use respectful language and actions

If a student chooses not follow to follow these class expectations, the following consequences will occur in order.

1. Verbal Warning
2. Reflection Log
3. Detention — 30 minutes after school
4. Parent Conference — student will be removed from the classroom until I meet with a parent or guardian in person.

Any serious offenses will result in an immediate office referral.

I expect students to come to class prepared and try their best each day. You can support your 6th graders by encouraging *them* to:

- Attend class every day.
- Get their planner signed each night.
- Ask me questions if they need help
- Find a quiet place to do homework each night
- Come to class prepared with the correct materials

I look forward to working together during the school year. Please complete the attached form indicating that you have read this letter and letting me know the best way for me to communicate with you so that we can work together to help your son or daughter succeed in math class. Feel free to contact me with any questions or concerns at (510) 352-4951.

I look forward to a great year!
Sincerely,

Ana Young

Please return the following form.

Student's Name: _____

Parent/Parents Name: _____

Address: _____

Home phone number: _____

Cell phone number: _____

Work phone number: _____

Email: _____

What is the best way to reach you during the day?

What is the best way to reach you in the evening?

Are you interested in volunteering for any of the following opportunities?

_____ Chaperone field trips

_____ Set up/clean up family math night

_____ Class fundraisers

Please read and sign the following.

We have read the 6th grade math introduction letter and agree to follow the class rules and expectations.

Student signature: _____

Parent signature: _____

FIGURE 11.3 A sample introductory letter to parents.

conduct home visits to communicate their strong commitment to students' success (Bullough, 2001). Make sure that your communication has a positive tone. In other words, do not focus on students' weaknesses or problems. Parents' feedback and cooperation are essential when you need to design an intervention plan, and sharing students' strengths and accomplishments will improve your teacher–parent partnership.

Collaborating with Other Teachers

Classroom teachers have higher self-efficacy about their teaching and are much more effective when they collaborate regularly with other teachers to identify obstacles to students' learning and find ways to overcome such obstacles (Battistich, Solomon, Watson, & Schaps, 1997; Gottfredson, 2001; Langer, 2000). According to research, teachers who collaborate with each other have a higher **collective self-efficacy**, the belief that working as a team can have an impact on students' achievement (Bandura, 2000; Goddard, Hoy, & Woolfolk, 2000). Working collaboratively rather than in isolation can also provide students with a sense of school community, which, in turn, promotes more positive attitudes toward school and more prosocial behaviors in the classroom. Therefore, to minimize the well-documented stress level experienced by beginning classroom managers (Emmer & Stough, 2001; Weiner, 2002), it is highly recommended that new teachers collaborate regularly with their colleagues. New teachers report greater confidence in their ability to help their students when they regularly collaborate with their colleagues, especially when working with students who are at risk for school failure (Chester & Beaudin, 1996). Some schools have schoolwide management programs, with teachers, administrators, and other school staff creating a consistent management system that can be implemented throughout the school. For instance, the *Unified Discipline* program (White, Algozzine, Audette, Marr, & Ellis, 2001) is aimed at creating consensus around expectations, rules, consequences, and responsibilities in classroom management. An elementary school study showed an increase in students' time-on-task, a decrease in rule violation, and a 20% decrease in referrals to the main office in the first implementation year and decreases of 50% or more in subsequent years (Algozzine & White, 2002).

Collective Self-Efficacy

A teacher's belief that working as a team can have a positive impact on students' achievement.

INTERVENING WITH PROBLEM BEHAVIORS: COMMUNICATION AND STRATEGIES

So far, we have focused on the teacher skills and classroom conditions that can help prevent classroom management problems. In many cases, presenting engaging and organized lessons and carefully designing the physical environment and social norms will be sufficient to prevent behavior problems (Barr & Parrett, 2001). However, one of the main reasons that classroom management has historically been the main source of teacher stress is the challenge of having to deal with students' misbehaviors. **Misbehaviors** are any student actions that have the potential to disrupt classroom learning and activities (Doyle, 1990); they can range from minor rule and routine violations (e.g., talking out of turn, turning in homework late) to serious offenses (e.g., violence and aggression).

Misbehaviors

Any student action that has the potential to disrupt classroom learning and activities.

Should teachers intervene when students misbehave? If so, what strategies should they use? Although most educators and management experts agree that interventions are necessary to foster a productive learning environment, humanistic theories hold that students who engage in disruptive behavior need to be listened to by an empathetic teacher who does not intervene. According to this view, warm, positive, and empathetic teachers promote a higher self-awareness of students' behavior, which, in turn, facilitates their behavior management (Rogers & Stevens, 1967). The role of the teacher in the humanistic view, therefore, is to try to understand students' behaviors by being open to how things seem from the students' point of view. Rather than enforcing consequences for students' misbehavior, a humanistic approach suggests that teachers should facilitate or encourage their students' self-management (Combs, 1965).

The humanistic approach to management was developed as a reaction against behaviorism, which focused on applying a rigid set of interventions to control students' behavior. Experts in classroom management, however, note that there has been a change in current thought about the best way to manage the classroom. This change has moved away from both the noninterventionist approach, which can lead to chaos when students do not have the ability to self-manage their behavior, and the controlling approach, which undermines students' need for acceptance and self-determination (Bear, 2005; Pianta, 2006; Watson & Battistich, 2006). According to more recent management approaches, the role of the teacher is to demonstrate caring and acceptance within an environment that has a clear set of expectations and consequences for interfering with the classroom's goals.

How to Communicate Problem Behaviors

Classroom teachers need good communication skills when behavior problems arise. This section discusses key aspects of communication when responding to student misbehavior. Effective communication extends beyond just talking to the student. How you talk and how you listen to your students can have a strong effect on their behavior.

Establish Problem Ownership. The first step in deciding whether and how to communicate about a classroom issue is to determine ownership of the problem. Teachers who reflect on why they are troubled by a particular misbehavior and who owns the problem before reacting to the misbehavior are more likely to have a good relationship with their students (Gordon, 1981). Recall from the previous chapter that students own the problem when their behavior does not directly interfere with teachers' learning objectives. For example, this would be the case for a student who regularly gets in trouble at home for borrowing his mother's car without permission.

When students own the problem, your role is to support their need for acceptance by actively listening to them and encouraging them to work through the problem. Keep in mind that, depending on the severity of the student-owned problem, you may need to offer additional professional assistance. Therefore, consider learning about the support services that are available in the school, school district, and community and how students can access these services. Depending on the nature of the problem (e.g., child abuse, unwanted pregnancy, suicide attempts), many states require that teachers report it to the police or other authorities. For instance, the California Penal Code requires teachers and any other adults who work with minors to report any suspicion of child abuse. Failure to report may lead to a jail sentence, loss of teaching credentials, or even a charge of obstruction of justice. Other states have similar laws. Talk to your principal if you feel that one of your students is in distress from a serious mental or physical problem and find out exactly what your responsibilities are.

Use Descriptive Language. Teachers own a classroom problem when students' behaviors have a direct effect on their learning objectives, such as when a student shoots spitballs in the middle of a whole-class discussion. How should teachers communicate with the student in this case? Students feel less threatened and defensive and are more willing to engage in learning when working with teachers who consistently use descriptive rather than judgmental language (Van Horn, 1982). Descriptive language is aimed at portraying students' behavior, achievements, or feelings, but judgmental language evaluates students' behavior, achievements, or feelings. Focusing on judging students' personalities is detrimental to a climate of cooperation (Ginott, 1972). For example, a teacher uses descriptive language when she says, "Cindy, it is very difficult for me to listen to what John is saying while you are talking to your partner" or "Robert, it is hard for us to concentrate on the lesson when you get up and sharpen your pencil in the middle of a demonstration." A teacher who instead says "Stop being so rude, Cindy!" or "Quit being a distraction, Robert!" is using judgmental language. Experts recommend being careful with the language you choose to communicate students' misbehavior in order to avoid attacks on students' personalities. For instance, a student who misbehaves should not be addressed as a "problem student" because students are

unable to do away with a problem without doing away with themselves (Cangelosi, 2004). Communicating that the misbehavior rather than the student is the source of the problem is more likely to result in a student's willingness to change his/her behavior.

Show Assertiveness. Assertive teachers are more likely to build positive relationships with their students than are passive or hostile teachers (Canter & Canter, 1992). Effective classroom managers display an **assertive style**—they express their feelings, stand up for the legitimate rights of themselves and others, insist that behavior be corrected, and resist being coerced or manipulated (Alberti & Emmons, 2001; Dobkin & Pace, 2006; Lumsden & Lumsden, 2006). *Passive* teachers are those who ignore misbehavior or fail to enforce stated consequences, while *hostile* teachers are those who undermine students' sense of self-worth and apply extreme and ineffective punishments.

Assertive Style

Expressing feelings, standing up for the legitimate rights of one's self and others, insisting that behavior be corrected, and resisting being coerced or manipulated.

Here are some suggested strategies to become a more assertive teacher (Bourne, 1995):

1. Evaluate your rights in the situation at hand.
2. State the problem to the student involved in terms of consequences to you and his/her peers.
3. Express your feelings about the situation.
4. Ask for what you want in a straightforward manner.

Strategies to Address Problem Behaviors

In this section we discuss behavioral, cognitive, and sociocognitive strategies to address classroom misbehavior. Teachers typically use a combination of these strategies to manage their classrooms. Among other factors, the right strategy will depend on the context in which the transgression occurred and the underlying reasons that motivated the student to misbehave. For instance, some students may misbehave because the lesson is not challenging enough or too difficult to understand; others may misbehave because they think that it is *cool* to do so; still others may misbehave because they are under the influence of drugs or a certain medication. Understanding the conditions that may be triggering students' misbehavior will be very important to finding an effective strategy. This is another area where teachers' reflective and critical skills can be put into practice.

Behaviorist Strategies. Because behaviorist strategies were explained in Chapter 5, here we revisit them only briefly. As you read the strategies suggested by this approach, keep the **principle of least intervention** in mind: Effective managers address misbehaviors by using the simplest intervention that works (Kyle & Rogien, 2004; Nelsen et al., 2000). Only when the least intrusive intervention does not work should you move to a more intrusive approach. Your goal in effectively managing your classroom is to address the misbehavior without unnecessarily disrupting the lesson.

Principle of Least Intervention

Using the simplest intervention that works to manage the classroom.

The first behaviorist strategy that teachers should consider is *differential reinforcement*, which consists of reinforcing behaviors that are more appropriate or even incompatible with the undesirable behavior. An example is to praise students who speak softly rather than loudly, such as saying, "Alison, I like how you are using your indoor voice."

The second behaviorist strategy consists of *ignoring* students' behavior. When the target misbehavior is not likely to interfere significantly with learning and not likely to be imitated by other students (because they have not noticed it), the best course of action is no action (Davis & Thomas, 1989; Silberman & Wheelan, 1980). For example, if Timmy is folding his handouts like an accordion during class, his teacher might ignore the behavior because he is not disrupting anyone else. This strategy is effective because the instructional momentum is not disrupted and the lack of attention to the behavior is likely to extinguish it. In general, ignoring behavior is the best management strategy when the behavior is any one of the following:

- Rare (e.g., loud burping)
- Not serious enough to disrupt the class (e.g., drawing)

- Typical for a particular age (e.g., a kindergartner who repeatedly shifts positions while sitting in the circle)
- Not likely to become "contagious" (bouncing a leg or fidgeting with hands)
- Unpleasant or embarrassing enough to deter the student from repeating it in the future (e.g., passing gas).

The third behaviorist strategy, *cueing*, consists of providing students with verbal or nonverbal signals demonstrating your awareness of the misbehavior. Students are more likely to behave appropriately when given cues that certain behaviors are expected from them (Taylor & Levin, 1998). Verbal cues should focus students' attention on positive rather than undesirable behaviors (Emmer et al., 2006; Good & Brophy, 2003) and should be more explicit for younger than older students. Saying "I am waiting for the Lobo team to be on-task so that we can all move along together with this project" is an example of a verbal cue. Nonverbal cues can take many forms, such as flicking the classroom lights to remind students that they need to speak quietly or approaching a desk when a student is off-task.

The fourth behaviorist strategy, *contingency contracting*, consists of negotiating and agreeing to a contract that establishes the goals that the student must accomplish in order to earn a certain reward. This strategy can be effectively used for a number of purposes either in isolation or in combination with other behavioral interventions (Miller & Kelley, 1994; Newstrom, McLaughlin, & Sweeney, 1999). Contingency contracts should include the following components (Alberto & Troutman, 1999; Jones & Jones, 2004; Schloss & Smith, 1994):

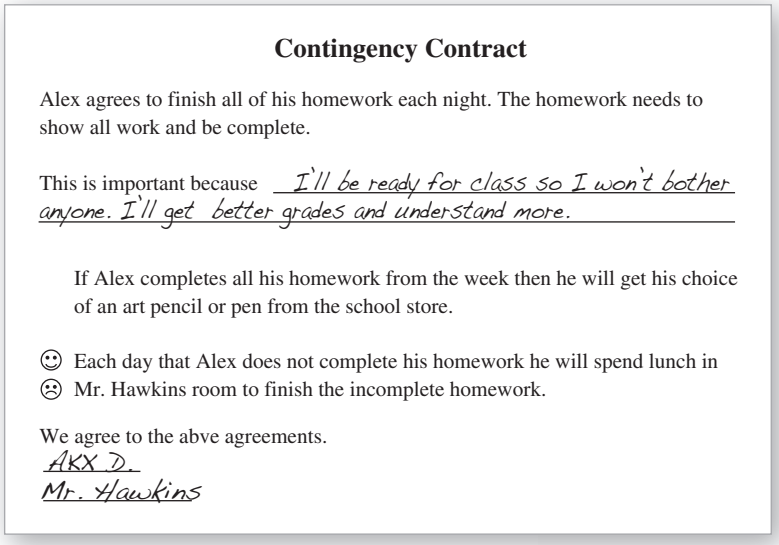
- A specific definition of the target behaviors
- A description of the reinforcement that can be earned
- Penalties for failure to achieve the specified goals and added incentives for exceeding the goals
- Time limits for completion
- Signatures of the involved parties
- Environmental support provided to the student, such as peer, parent, or teacher help

Figure 11.4 shows an example of a contingency contract.

Group-Oriented Contingency Contracting

Establishing management contingencies to more than one student in a group.

A promising variation of contingency contracting is **group-oriented contingency contracting**, which consists of establishing management contingencies to more than one



Contingency Contract

Alex agrees to finish all of his homework each night. The homework needs to show all work and be complete.

This is important because I'll be ready for class so I won't bother anyone. I'll get better grades and understand more.

If Alex completes all his homework from the week then he will get his choice of an art pencil or pen from the school store.

☺ Each day that Alex does not complete his homework he will spend lunch in
☹ Mr. Hawkins room to finish the incomplete homework.

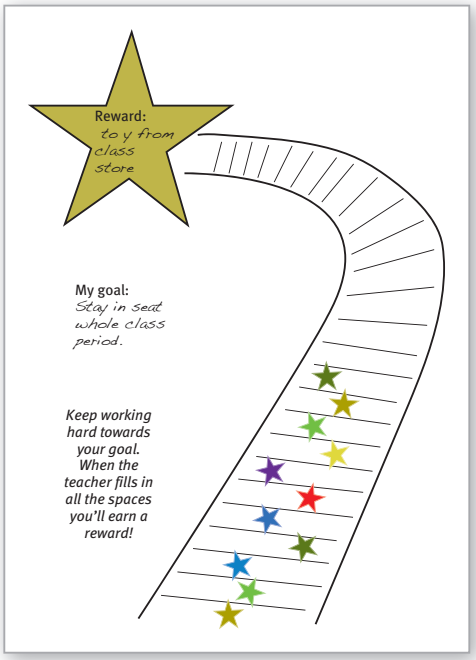
We agree to the abve agreements.
AKX D.
Mr. Hawkins

FIGURE 11.4 An example of a contingency contract.

student in a group (Skinner, Williams, & Neddenriep, 2004). *Dependent* group-oriented contingency systems are those in which individual student accomplishments have consequences for all members of the group, such as when a cooperative learning group gets additional free time if two student members get perfect scores on a test. *Independent* group-oriented contingency systems are those in which the goals are set for all members of the group but consequences are applied on an individual basis, such as when any student who passes the test gets a note sent home informing parents of his/her good performance. *Interdependent* group-oriented contingency systems are those in which each individual's behavior can affect the consequences for the whole group, such as when all students in a group need to create two pages of a project website for every member of the group to receive an incentive.

Group-oriented contingencies showed the largest effects among many interventions designed to reduce inappropriate behaviors in public schools (Stage & Quiroz, 1997). There are, however, some limitations that need to be considered when deciding on the use of group-oriented contingency systems. All students should be able to perform the target behavior when applying a dependent or interdependent contingency contract; otherwise, the contract can unfairly punish the other members of the group. One way to overcome this limitation is to create a contract that is based on performance improvements instead of specific outcomes. A physical education teacher might provide group incentives when members improve the number of free throws in basketball, rather than when they make nine out of ten free throws. Some students may sabotage the group efforts (Barrish, Saunders, & Wolf, 1969) or turn against other group members they feel are preventing the group from succeeding (Romeo, 1998). In these cases, it is best to establish individual contracting with the students, establish independent group contracting, or include a penalty for those who display undesirable behaviors against their group or group members (Davies & Witte, 2000).

Creating a *token economy system* is a behaviorist intervention in which students can earn or lose tokens when they display desirable or undesirable behaviors, respectively. Tokens accumulated can be exchanged for specific incentives, such as time for preferred activities. Token systems should clearly provide a visual representation of how much a student has accomplished and how much more he/she needs to accomplish before getting an incentive (see Figure 11.5). Try to involve students in the design of the token system rules and to model and practice how the system works before its implementation.



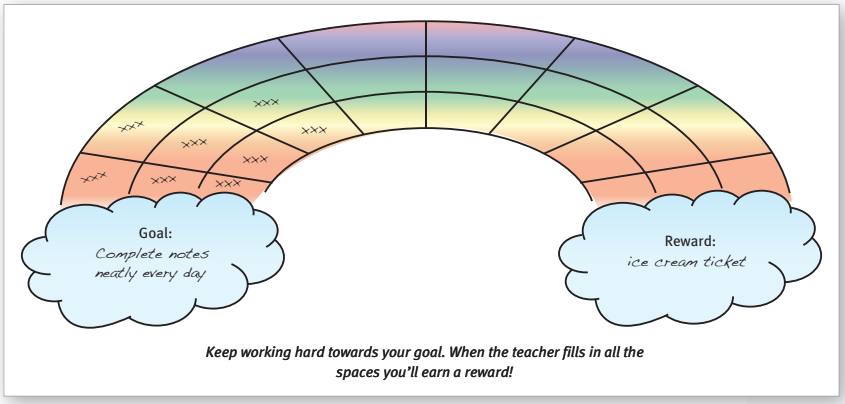


FIGURE 11.5 Samples of handouts used to visually keep track of a token economy system.

TABLE 11.2

Seven negative consequences and corresponding examples.

CONSEQUENCE	EXAMPLES
Expression of disappointment	Frown and make eye contact upon watching a student talking to another student while the teacher is lecturing.
Loss of privileges	For students who did not complete homework on time, remove their right to go to recess by having them complete homework instead.
Exclusion from the group	Remove students from a study group if they fail to cooperate or engage in the learning activity.
Written reflections on the problem	Ask students to write in their journal a reflection paper about the consequences of their undesirable behavior on their learning or their peers' learning.
Detention	Request that students remain after school or during a free period to talk about the misbehavior.
Visit to the principal's office	Require that students leave the class to discuss their misbehavior with the principal.
Contact with parents	Call students' parents to seek support with an intervention aimed at addressing a recurring misbehavior.

Imposing a *negative consequence* when misbehavior occurs is another effective behaviorist intervention. Table 11.2 offers seven categories of negative consequences (Weinstein & Mignano, 2007).

When deciding on the type of negative consequence to impose, keep in mind the principle of least intervention and the context in which the misbehavior occurred. For example, a minor first-time infraction may need only the teacher's nonverbal disapproval to become extinct. However, if this infraction recurs, the teacher may consider removing the student's privilege of free time. Regardless of the type of negative consequence imposed, experts recommend that teachers administer consequences *consistently*, after every occurrence of the target misbehavior; *fairly*, to any student who exhibits the target misbehavior; and *calmly*, in an unemotional fashion (Burden, 2006). In addition, avoid the following consequences: harsh and humiliating reprimands, threats, nagging, forced apologies, sarcastic remarks, assigning extra academic work, assigning writing assignments that are not logically linked to the student's action (e.g., writing "I will never do _____ again" 100 times), reducing grades, requesting physical labor or exercise, or using corporal punishment. These consequences are likely to be ineffective and result in negative emotional reactions (Hyman, 1997; Weber & Roff, 1983).

Get Connected!



ANIMATION ASSIGNMENT. . . Managing Your Classroom and Creating a Successful Learning Environment

Go to your WileyPlus course and watch the animation that illustrates the difference between positive and negative reinforcement in the classroom. Be prepared to explain how behavior reinforcement can create a successful learning environment.

Finally, if you wish to create a more systematic intervention plan to reduce a certain undesirable behavior, use the *applied behavior analysis* (ABA) method described in Chapter 5 (Bergan & Caldwell, 1995). ABA can lead to significant improvements in classroom behaviors for a variety of student populations (Elliott & Busse, 1991; McNamara, 1987). Classroom Tips: Using Behaviorist Interventions lists the behaviorist strategies just reviewed, with corresponding examples. Although behaviorist strate-

CLASSROOM TIPS

Using Behaviorist Interventions

Intervention	Example
Using differential reinforcement	Praise a student for walking slowly in the school hallways rather than running.
	Allow a student free time for completing an assignment instead of turning it in half done.
Ignoring misbehavior	Ignore a student who is whispering in class.
	Ignore a student who is moving around a lot in her seat.
Cueing	Approach a student's desk when found to be off-task.
	Place your hand on a student's desk or book to draw attention back to their task.
Individual contingency contracting	Agree to a certain number of credit points for attendance, homework, and in-class completed work.
	Agree to a certain amount of drawing time for a set amount of on-task time.
Group contingency contracting	Agree to give additional computer time to the group of students who complete a PowerPoint presentation two days before it is due.
	Allow students to choose the day's activity if they have completed all the tasks assigned earlier in the week.
Token economy system	Establish a system in which students can earn or lose "school money" to buy supplies when they display desirable or undesirable behaviors, respectively.
Imposing a negative consequence	After breaking a peer's toy, request that the student come to class half an hour early to repair it.
	Have the student visit the principal's office to describe his misbehavior and offer an explanation.

gies are very effective interventions for classroom management, keep in mind that experts recommend their use as short-term interventions and suggest developing understanding and responsibility through cognitive strategies to promote long-term changes in students' behavior and self-regulation (Freiberg, 1999; Gottfredson, 2001).

Cognitive Strategies. Cognitive strategies for classroom management focus on promoting desirable behaviors and decreasing undesirable behaviors by having students reflect on the consequences of their actions. Therefore, cognitive strategies emphasize developing students' higher-order skills such as comprehension, problem solving, and critical thinking. The simplest cognitive strategy is to use **I-messages**: clear, direct

I-Messages

Clear, direct statements identifying what the student transgression was, how the misbehavior affects the teacher's ability to accomplish her learning goals, and how the misbehavior makes the teacher feel.

ISSUES IN EDUCATION

Can a zero-tolerance policy help reduce student violence and aggression?

Educators and schools across the nation are trying various measures to improve school safety. Some argue that a zero-tolerance policy for violence, aggression, and other disruptive behaviors is necessary to allow equal access to educational opportunities to nonoffending students. A **zero-tolerance policy** consists of specifying a set of unacceptable behaviors with a corresponding set of negative consequences for students who engage in those behaviors. Others argue that zero-tolerance policies are ineffective and create fear rather than trust and respect in students. What do you think about this argument? A response to this question can be found at the end of the chapter.

Zero-Tolerance Policy

A policy where consequences are automatically and immediately applied, without consideration of the circumstances surrounding students' behavior.

Table 11.3

The four steps in I-messages.

1. Describe your feelings (e.g., I feel disappointed, I get discouraged, I feel frustrated).
2. Describe the event (e.g., when people use that type of language, when people lie to me, when people take things from others).
3. Describe the reason the event affects you (e.g., because I think that people should respect each other, because I am afraid that someone will get hurt, because we need an orderly class to learn).
4. Describe what you want (e.g., I want you to tell me the real reason you did not complete your homework; I want you to return what you took from Brandon's bag).

statements identifying what the student transgression was, how the misbehavior affects the teacher's ability to accomplish her learning goals for the class, and how the misbehavior makes the teacher feel (Ginott, 1972; Gordon, 1974). I-messages consist of the four steps shown in Table 11.3. Their goal is to promote understanding of the causal relationship between students' behavior and the teacher's learning objectives and feelings.

Here is an example of an I-message: "Laura, I am very disappointed that you decided to set our classroom pet free without my permission because we need an orderly class to learn. I am also disappointed because it looks like you don't believe that school work is important. Please return our pet to the hutch and apologize to your peers for interrupting class." The goal of I-messages is to try to change students' behavior by appealing to their understanding and willingness to cooperate with you in achieving learning goals. I-messages allow students to accept responsibility for their feelings and help create a warm, friendly teacher–student relationship (Harris, 2000).

Another cognitive strategy, *logical consequences*, entails negative consequences that are directly and logically related to the action of the student (Dreikurs, Grunwald, & Pepper, 1982; Nucci, 2007). For example, have students stay in the classroom during recess to clean up their desks after failing to do so during class time or have a student take a peer's coat to the cleaners after he/she wrote an embarrassing message on the coat. Students are more likely to respond favorably to logical consequences than to arbitrary consequences (Burden, 2006). To help students understand the connection between their actions and the imposed consequence, logical consequences should be communicated immediately after behavior occurs.

A variation of the logical consequences method is to give students the choice of controlling their actions by issuing a warning—if misbehavior does not cease, a logical consequence will follow. "Glynda, if you don't stop distracting the students around you, you will need to sit by yourself in the front of the class." Or have the student write a reflection paper on the target problem in order to see his/her actions more objectively. This assignment can be completed in class or during a time-out and should be guided by questions such as: "What did I do to create a problem? How did my actions affect my teacher and peers? How did my actions affect my learning? What can I do to avoid the problem in the future?"

Problem-Solving Conference

A strategy rooted in the idea that students acquire meaningful understandings through their efforts at solving authentic problems.

A **problem-solving conference** (Glasser, 1998) is a strategy rooted in the idea that students acquire meaningful understandings through their efforts at solving authentic problems. It's important not to focus on fault-finding and punishment for past behaviors but rather to help students develop the ability to evaluate their own behaviors and generate alternative behavioral choices. For example, Karl is a class clown who continuously wanders around Ms. Lorenzo's classroom to get his peers' attention. Ms. Lorenzo can use a problem-solving conference to help Karl learn how to stay in his personal classroom area. Table 11.4 lists Glasser's (1990) steps to successful problem-solving conferences with students.

TABLE 11.4

Glasser's steps to successful problem-solving conferences with students.

STEP	EXPLANATION
Be personal.	Show caring before and during the problem-solving steps. "Karl, how are you doing today? Let's talk for a few minutes."
Identify the problem.	Ask students to describe their behavior. "Karl, I see you are not in your seat. Could you tell me what you are doing?"
Ask for students' judgment.	Ask students to evaluate the outcomes of their behavior. "What do you think might be one of the drawbacks of wandering around the classroom? How will it affect you? How do you think your classmates feel about it?"
Make a plan.	If students agree that their behavior is undesirable, collaborate on a short-term plan to improve. "Let's talk about a plan to help you stay in your seat."
Get students' commitment.	Ask students to formally commit to the plan, such as having them sign a contract or shake your hand in agreement. "Do you agree that you'll get a silver star for every 10 minutes you stay in your seat today?"
Don't accept excuses.	If the plan does not succeed, work with students on a better plan and do not focus on the reasons for the plan's failure. "Karl, I noticed you did well yesterday, but today it's difficult for you to stay seated. Let's talk after class to see if there is something else we can do to help you."
Don't punish.	Refrain from punishing students for failing to execute the plan. "Karl, I thought we had a good plan to help you stay seated during class. What is getting in your way? Let's make an agreement to concentrate on staying seated today."
Persist.	Evaluate why the plan failed and restart the problem-solving process. "Okay, today let's try pairing you up with your friend Tom during math instruction. The two of you can work together and that might make it easier to stay seated during class."

Source: Glasser (1990).

Conflict resolution, a step-by-step cognitive process, guides individuals who are part of a conflict toward a mutually agreeable solution to their problem (Girard & Koch, 1996). In a typical conflict resolution scenario, teacher and students hold a class discussion about how a problem can be solved. To maximize its effectiveness, experts recommend teaching students communication skills, activating students' understandings of conflict resolutions by discussing examples (for instance, how countries solve their problems), and assigning a classroom area and time for the conflict resolution activity (Jones & Jones, 2004).

Conflict Resolution

A step-by-step cognitive process, guiding individuals who are part of a conflict towards a mutually agreeable solution to their problem.

Finally, teachers can consider a special approach to conflict resolution called **peer mediation** (Chittooran, 2000; Peterson & Skiba, 2001). This method consists of using a cadre of trained peer mediators to act as third parties in a negotiation between other peers. The goals of this intervention are to solve the disagreement and teach students the social skills of mediation and how to handle conflicts in their lives. Peer mediation is especially effective for conflicts that arise out of misunderstandings, jealousy, or the end of a friendship (Schrumpf, Crawford, & Bodine, 1997). Establishing a peer mediation system can be time-consuming and is typically a schoolwide effort. To create a peer mediation system, teachers and administrators can work together on the six phases listed in Table 11.5 (Wolfgang, 2005).

Peer Mediation

A method that consists of using a cadre of trained peer mediators to act as third parties in a negotiation between other peers who have a conflict.

Once the system is in place, peer mediators who do not know the disputants personally are assigned to help solve particular conflicts. Ideally, peer mediators should be impartial, empathetic, good listeners, respectful, and trustworthy. Peer mediators can effectively resolve a variety of conflicts, including insults, perceptions of unfairness, stealing, and physical aggression (Johnson & Johnson, 2001; Johnson, Johnson, & Dudley, 1992; Troop & Asher, 1999). However, peer mediators need to be well trained and monitored to ensure that the mediation is effective and kept confidential (Latham, 1997).

TABLE 11.5

Six phases in setting and administering a peer mediation system.

PHASE NUMBER	PHASE DESCRIPTION
Phase 1	A staff and student conflict resolution team is created and trained. A program coordinator is designated and faculty consensus is gathered.
Phase 2	A timeline for implementation is established. An advisory committee is formed, policies are developed, and funding sources to support the program are identified.
Phase 3	Student peer mediators are recruited through nominations, selected, and trained.
Phase 4	Informative workshops about the mediation process are offered to staff, students, parents, and community members.
Phase 5	The conflict resolution program is announced in local media.
Phase 6	The guidelines for the program's operation is designed, including the process of soliciting requests for mediation, scheduling mediations and mediators, supervising mediators, recording data, providing training and support, and evaluating the program's effectiveness.

Source: Wolfgang (2005).



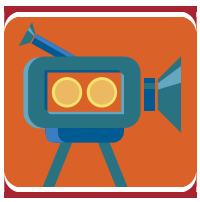
David S. Holloway/Getty Images, Inc.

What conditions should be met to ensure that peer mediation effectively resolves classroom conflicts?

To summarize, the ultimate goal of cognitive strategies is to help students understand the reasons for keeping an orderly environment, comply with classroom rules because they make sense to them rather because they will receive a reward or avoid punishment, and develop the social and critical skills necessary to solve classroom issues (Good & Brophy, 2003). This approach to classroom management provides long-term benefits to both students and teachers (Emmer & Stough, 2001; Jones, 2007). Students are more likely to obey rules in the long run and to develop moral, problem-solving, and critical thinking skills; teachers typically spend less time monitoring and enforcing the rules. Classroom Tips: Using Cognitive Interventions lists the cognitive strategies just reviewed with corresponding classroom suggestions.

Sociocognitive Strategies. Sociocognitive theory provides strategies that help students self-regulate their behavior. Teaching students how to manage their own behavior is important because external management systems such as those created by teachers or parents may preclude students from developing an internal behavior regulation system (Savage, 1999). Importantly, classroom management procedures are more likely to be respected when students are involved in their design and application (Jones & Jones, 2004). Students' self-management involves the goal setting, self-monitoring, self-instruction, self-reinforcement, and self-evaluation components of the self-regulation cycle described in Chapter 8.

Get Connected!



VIDEO CASE ASSIGNMENT. . . Applying Consequences for Behavior: View a Teaching Example (Tabs 1 and 2)

Go to your WileyPlus course and view the video of Mrs. Petrone's class. Then identify the behavioral, cognitive, and sociocognitive strategies that she used. Be prepared to discuss the effectiveness of each strategy and provide an alternative strategy to try.

CLASSROOM TIPS

Using Cognitive Interventions

Intervention	Classroom Suggestions
I-messages	Clearly identify students' transgressions and their effect on your classroom and feelings.
	Establish respectful relationships with students to ensure that they will be responsive to the I-message.
Logical consequences	Allow students to figure out the logical consequences of their actions.
	Make sure the logical consequence chosen is emotionally and physically safe.
Problem-solving conferences	Allow students to brainstorm possible resolutions to problems individually as well as in groups.
	Guide student brainstorming to find resolutions that will meet the needs of all sides involved.
Conflict resolution	Actively listen to all sides of the conflict so fair resolutions can be found.
	Remain calm and open during resolutions and try not to be defensive.
Peer mediation	Ensure that the peer mediators and the students needing mediation have neutral relationships.
	Provide continual training and support for peer mediators.

Goal setting is the establishment of criteria for successful management of students' behavior (Belfiore & Hornyak, 1998). Recall from prior chapters that effective goals are specific, of moderate difficulty, proximal, and valuable (Oppenheimer, 2001). Students who are involved in setting personally relevant goals are more likely to persist in the face of difficulty and to self-monitor their performance (Meichenbaum & Biemiller, 1998). Teachers can make goal setting a regular part of their classroom management system by asking students to commit to their behavior goals for the week, record their goals on a chart, evaluate their progress toward the goals, and establish new goals or improved plans of action. This can be facilitated by a goal-setting form such as the one shown in Figure 11.6.

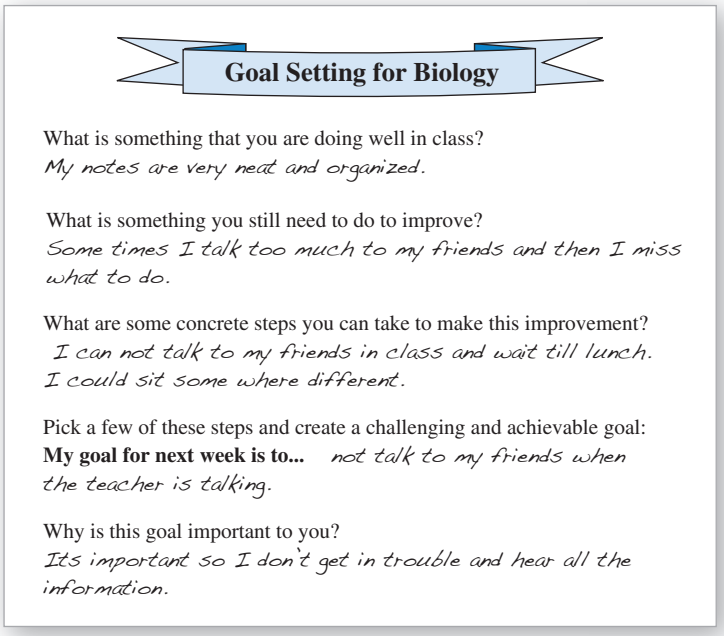


FIGURE 11.6 An example of a goal-setting form.

Self-monitoring is a useful method to help students who do not have an accurate perception of their disruptive behavior. For example, students may not realize that they typically interrupt their classmates or may believe that they are making progress when, in reality, they are off-task for the majority of the instructional time. Studies show that these behavior problems can be effectively prevented with self-monitoring techniques, such as asking students to tally the number of times they interrupt their classmates or having them keep records of how much time they spend on task-relevant and task-irrelevant behaviors (Broden, Hall, & Mitts, 1971; Harris, 1986; Mace, Belfiore, & Shea, 1989). Figure 11.7 shows a sample form to help students self-monitor their behavior.

Self-Monitoring

A method used to help students become aware of the occurrence and consequences of their disruptive behavior.

How am I doing?

Every 10 minutes during class check whether or not you are working on your Ancient Greece research project.

Time	Working on project?	Not working on project?
10:00	✓	
10:10	✓	
10:20		✓
10:30	✓	
10:40		✓
10:50	✓	

FIGURE 11.7 **An example of a self-monitoring form.**

In some cases, self-monitoring techniques may not suffice and students will need more specific directives to control their behavior. *Self-instruction* provides those directives by reminding students about appropriate actions or strategies that can help prevent undesirable behaviors. For example, a teacher can provide the following self-instruction script to help a student avoid interrupting others: (1) Count to 3, (2) think about what you want to say, (3) raise your hand and wait to be called by the teacher. During *self-evaluation*, students judge the quality of their behavior. For instance, teachers can ask students to complete daily rating scales where they need to rate how well they met their goals or to write short reflection papers identifying the positive things they did, the problems they had, and what strategies they will use to improve in the future (Clees, 1995; Scheinman, 2000; Stone & May, 2002). A way to help students accurately evaluate themselves is to reward them when self-ratings match the ratings of the teacher for the same behaviors (Shapiro, DuPaul, & Bradley-Klug, 1998). Finally, to promote self-regulation further, students can use *self-reinforcement*, which is a self-imposed reward for having accomplished a goal or subgoal. For example, the student might count the number of periods during which she was on-task for most of the time using a self-observation form, and then select a learning activity from a list of choices as a reward for reaching a certain criterion (Alberto & Troutman, 1999). Classroom Tips: Using Sociocognitive Interventions lists the self-regulation strategies discussed in this section with classroom suggestions.

CLASSROOM TIPS

Using Sociocognitive Interventions

Strategy	Example
Goal setting	Conduct a lesson on the benefits of goal setting and how to set meaningful goals before engaging students in goal setting.
	Acknowledge students' progress and effort toward reaching their goals, even when they have not reached their goals yet.
Self-monitoring	Create ways for a student to self-monitor that are not intrusive to the class so that others do not necessarily become aware of the process.
	Allow students to help design forms or ways to monitor themselves and be flexible if the chosen methods do not work.
Self-instruction	Keep self-instruction steps short and simple so students can remember them easily.
	Let students participate in creating self-instruction methods so that they have buy-in to using them.
Self-evaluation	Use different forms and ways for students to evaluate their progress so one method does not get stale.
	Provide informational feedback about students' self-evaluations so that students can better develop the skill.
Self-reinforcement	Use goal-setting forms that include a section on how students will reward themselves when reaching their goal.
	Provide students with the necessary time or resources to self-reinforce themselves when goals are achieved.

ADDRESSING SERIOUS ISSUES OF CLASSROOM MANAGEMENT: AGGRESSION AND VIOLENCE

Experts in classroom management distinguish between minor and moderate interventions for problem behaviors (Evertson et al., 2006). **Minor interventions** are appropriate for behaviors that are infrequent and/or do not disrupt class activities; they include strategies such as verbal and nonverbal cues, ignoring students' misbehavior, and warning about a potential logical consequence if the behavior does not cease. **Moderate interventions** are appropriate for behaviors that are recurrent and/or disruptive of the classroom momentum. Negative consequences (e.g., loss of privileges, time-out, detention) are appropriate strategies to address moderate interventions, but cognitive and sociocognitive strategies can be also very useful, especially to obtain long-term results (Evertson et al., 2006). In sum, you can use the repertoire of strategies reviewed in this chapter to effectively address any minor or moderate behavioral problem in your classroom. Most classroom management problems can be prevented, many will be minor misbehaviors that can be dealt with quickly, and some will be moderate misbehaviors that will require a more systematic intervention (Curwin & Mendler, 1999).

Minor Interventions

Appropriate for behaviors that are infrequent and/or do not disrupt class activities and include strategies such as verbal and nonverbal cues, ignoring students' misbehavior, and warning about a potential logical consequence if behavior does not cease.

Moderate Interventions

Appropriate for behaviors that are recurrent and/or disruptive of the classroom momentum.

On the other hand, it is becoming more common to find schools where students fight, bully other students, or threaten each other and their teachers either verbally or with a weapon. Aggression, truancy, and delinquency increase as students enter adolescence (Tierno, 1991). Even though there is evidence that youth violence has declined in the past decade, according to national data for the 2005–2006 schoolyear, 86% of public schools reported at least one violent crime, 8% of students in grades 9–12 reported being threatened or injured with a weapon in the past 12 months; and 28% of students ages 12–18 reported having been bullied at school during the past 6 months (National Center for Education Statistics, 2007). The goal of this section is to help you learn how to address typical cases of student aggression. In particular, we discuss defiance, violence, and bullying.

How to Manage Student Defiance in the Classroom

Morris is disrupting his friend, who sits at the desk next to him, by poking his leg with a pencil. Mr. Albrecht notices the problem immediately and asks Morris to stop his unacceptable behavior. Once class is over, Mr. Albrecht asks Morris to stay to discuss the episode in private. Morris replies, "No way! I am not staying after class with you. Who are you to keep me in school, anyway?"

What should you do if you encounter a defiant student like Morris? Students who are **defiant** or noncompliant can be very challenging to teach; they frequently interrupt instruction, are likely to do poorly academically, and may even show little motivation to learn. Experts in classroom management offer the following suggestions to deal with defiant students (Henricsson & Rydell, 2004).

Defiant

A student characterized by being noncompliant and hostile to teachers and/or peers.

- First, stay calm. Try to control your natural tendency to get angry. This attitude will send the message that you are not threatened and may even elicit students' remorse or fear (Good & Brophy, 2003).
- Second, instruct the class to continue with their assignment and firmly request that the offender steps outside of the classroom to talk with you. If the student agrees, let the student express him/herself fully before reacting.
- Then offer a solution that is acceptable to both the student and yourself. If the student does not agree to meet with you and continues threatening you or your students, immediately send a noninvolved student to the front office for help.

If the defiant student does not show signs of cooperation, it may be time to solicit the help of a mental health professional. Studies suggest that defiance is more likely to happen with aggressive, impulsive, and hyperactive students and with those who do not have a positive relationship with their teacher (Henricsson & Rydell, 2004).

A Case Study: DIVERSITY IN THE CLASSROOM

Managing Portable Technology in a Tenth-Grade Classroom

"Today, we'll prepare for our lab on cellular respiration," Mr. Morales tells his tenth-grade biology students. "First, let's review a few concepts from last week. Can anyone draw a diagram of diffusion across a semipermeable cell membrane?"

"Oh, I remember that," Anita volunteers. Using different-colored markers, she sketches molecules moving across a membrane.

"Can you explain your diagram?" prompts Mr. Morales.

"Well, concentrations of molecules on the inside and outside of the cell should be the same. You see here," Anita points to her sketch, "the molecules travel across the membrane until both sides are equal."

"That's right. Does this process require energy?" Mr. Morales asks.

"I'm not sure; I wouldn't think so" Anita replies. Mr. Morales scans the room for a volunteer to expand on the answer. He notices Javier is not taking notes and seems to be occupied with something inside his desk. Last week, he was dismayed to discover Javier text-messaging during a lesson and had discussed it with him after class.

"Javier, I'm going to ask you to describe active transport next, so please pay attention to the lesson," Mr. Morales informs him.

"I *am* paying attention," Javier replies defensively.

Mr. Morales doesn't want to interrupt the flow of the lesson, so he continues. "Okay, let's get back to our review. Can anyone explain the relationship between energy and diffusion?"

"Diffusion doesn't use energy, it just happens because of the motion of the molecules," Raul explains.

"That's right, diffusion takes place spontaneously. Javier, now I would like you to explain active transport and how it is different from diffusion," Mr. Morales request.

"No problem," Javier says, getting up to draw a diagram.

As students work in groups to prepare for the lab, Mr. Morales circulates through the room, listening to their conversations. Most groups are answering the lab questions, but Malaya and Corazana are giggling.

"Did you give Damien my digits?" Malaya asks.

"Yeah, let me see. I think he texted me—I'm gonna check real quick." Corazana hides her cell phone beneath her desk.

"I'll have to confiscate that phone," Mr. Morales interrupts. They look up in surprise.

"No, I won't do it again, I promise," Corazana pleads.

"Well, get back to work," directs Mr. Morales.

"Oh, we're working," Malaya replies. "See, we've already answered the first question."

Demographics:

An Overview of the Students

Miami Palmetto High School

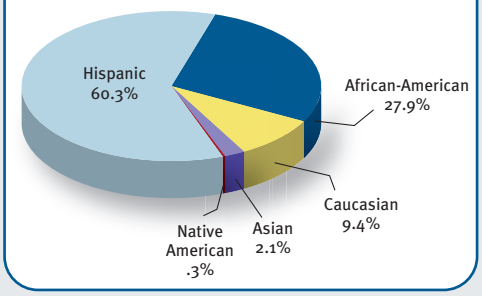
Miami, Florida

51.2% Students eligible for free and reduced lunch

38.2% Students qualify ESL instruction

11.9% Students receive Special Education Services

Racial/Ethnic Groups



Before class is dismissed, Mr. Morales gives students a reminder. "As I've said before, *all* electronics must be turned off during class. I will confiscate cell phones and iPods if I see you using them."

"Oh, come on, Mr. Morales, you can't do that. Anyways, I concentrate better when I'm listening to my iPod. I'll show you next class," Nelson responds.

"Yeah, and we need our cell phones for emergencies, because you never know what could happen these days," Eleesha adds.

"That's right, I take the public bus home every day and my dad says I need to have a phone," Javier interjects.

"Well, all I'm asking is that you turn them off during class," Mr. Morales reiterates as the bell rings.

Over lunch, Mr. Morales talks with his colleague, Mrs. Elwell. "I didn't realize cell phones would be such a headache. I mean, what more can I do? I've repeatedly told them to turn all electronics off, but today a student was texting while I was teaching, and last week, a girl was listening to her iPod while she was taking the chapter test."

"How did you respond?" Mrs. Elwell asks.

"I knew that confiscating her iPod would create a big scene and I didn't want to distract the other students, so I let her listen and talked about it with her afterwards. It didn't help, though, because today she was checking her text messages."

"I know what you mean. I have an "electronics off" rule in my classroom, too, but they're a big distraction," Mrs. Elwell acknowledges. "It's frustrating, because it's difficult to monitor how and when students are using them. Even if they're not texting during class, they're talking about who to call and what to say."

"Tell me about it," Mr. Morales concurs. "I hear students gossiping about text-messages when they should be studying biology."

"You know, when we were growing up we survived without cell phones, so I don't understand why this generation can't do the same. Phones make it a lot easier for students to cheat, too. Honestly, I think the school district should ban them completely, like they did in New York City and Detroit," Mrs. Elwell concludes.

"I'm just not sure that's a viable solution because students can always sneak them into school, especially if we don't have permanent metal detectors. I would hope students could learn how to use technology responsibly," Mr. Morales counters.

"I wholeheartedly agree, and I think the majority of students do use them responsibly," Mrs. Elwell replies. "But then there are some who use phones to organize gang rendezvous, take inappropriate photos in the bathrooms, and harass each other."

"But those problems existed before kids had cell phones. I think the district needs a policy that considers the needs of teachers, parents, and students," states Mr. Morales.

The next morning, Mr. Morales sees Mrs. Elwell in the hall. "Based on our conversation yesterday," she says, "I've decided to post a sign in my classroom that reads:

> All electronics must be turned off during class.
>
> If electronics devices are used they will be confiscated.
>
> Two-time violators will ***not*** get electronics back until a meeting takes place between the student, teacher, and parents about the issue.

"I'm also sending a copy home to their parents because I want everyone to be on the same page," Mrs. Elwell explains. "I know students may be upset at first, but they can't afford to miss out on valuable learning time. They'll thank me when they make good grades and get into college."

"Let me know how it goes," Mr. Morales replies. "I'm still thinking about how to respond."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

How to Manage Student Violence in the Classroom

Students who are prone to being violent often show a number of warning behaviors prior to any violent act. The U.S. Department of Education and the Department of Justice have a guide for schools containing a list of early warnings and imminent signs of potential violent acts (Dwyer, Osher, & Warger, 1998). These are summarized in Table 11.6.

An effective intervention in response to any violent behavior entails the following three steps.

- First, *stop the incident*, by shouting or making a loud noise to draw students' full attention to you. According to the law, teachers are required to intervene when witnessing any violent episode among students but are not required to physically intervene in the event (e.g., break up a fight).
- Second, *protect the victim*, by separating or isolating the victim from the offender. Failure to intervene may result in your personal liability for negligence—that is, failing to protect your students from injury.

TABLE 11.6

Early warnings and imminent signs of students' violence.

EARLY WARNINGS
Social withdrawal
Excessive feelings of isolation or rejection
Being a victim of violence
Uncontrolled anger
Impulsive and chronic threatening, hitting, fighting, and bullying
Drug and alcohol use
Display of prejudice and lack of tolerance
Gang affiliation
Poor academic performance and motivation
Expression of violence in writings and pictures
Access to firearms or other weapons
IMMINENT SIGNS
Physical fighting with peers or family members
Severe property destruction
Rage for seemingly minor issues
Threats of lethal violence
Possession of firearms or other weapons
Self-injuries and suicide threats

- Third, *get help*, such as taking the students to the main office or calling security. As a general rule, experts recommend first attending to the safety of the victims and yourself, then attending to the safety of the offender, and last attending to property damage (Good & Brophy, 2003).

This intervention process will only take care of your basic responsibility as defined by the law. Long-term solutions to violence will require helping the offender understand that violence is an unacceptable way to solve personal problems and teaching strategies to reduce aggressiveness and improve social adjustment. For instance, students can be taught how to express their anger verbally rather than physically or how to solve conflicts with negotiation rather than fights (Lee, Pulvino, & Perrone, 1998). Students who are taught how to effectively communicate and how to distinguish between arguments and verbal aggression become less likely to confront those with whom they disagree (Burstyn & Stevens, 2001).

To increase the effectiveness of any long-tem intervention, it is also essential to involve the parents or caregivers in the intervention. When you start teaching, you may find that your school already has a good violence prevention and intervention program in place that you can learn about. If this is not the case, there are many successful programs that your school may consider adopting to increase students' social competence and conflict resolution skills (Coie & Dodge, 1998; Dodge, Coie, & Lynam, 2006). Table 11.7 provides you with examples of such programs and corresponding research.



Laurence Mouton/Getty Images, Inc.

What is the teacher's responsibility when students engage in a violent act?

TABLE 11.7

Violence prevention and intervention programs and corresponding research.

PROGRAM NAME	DESCRIPTION	RESEARCH FINDINGS
Improving Social Awareness/Social Problem Solving	An elementary school program that teaches cognitive, emotional, and behavioral skills in applied contexts. Students engage in role-playing, discussion, and problem-solving activities that are integrated in their daily lessons.	Students improve their ability to cope with everyday problems and reduce their violent behaviors (Elias, Gara, Schuyter, Branden-Miller, & Sayette, 1991; Elias & Schwab, 2006).
Social Competence for Young Adolescents	A middle school program aimed at developing students' self-control, anger management, and responsible decision making to prevent antisocial behaviors.	Students reduce their violent behaviors and show improved stress management and prosocial behaviors (Weissberg, Barton, & Shriver, 1997; Weissberg & Kumpfer, 2003).
Classroom Organization and Management Program (COMP)	An elementary and secondary school prevention program that combines training workshops, classroom application, and collaborative reflection among teachers.	Students decrease misbehavior and increase engagement and achievement and teachers increase their personal satisfaction in teaching (Evertson & Harris, 1999; Evertson & Smithey, 2000).
Skills for Life	A K–5 program to improve students' self-control, responsibility, and social problem solving skills through activities, discussions, workbooks, and parent workshops.	Teachers report improvement in aggression, teasing, fighting, and bullying (Manning, Mohole, & the Goodman Research Group, 2002).
The Good Behavior Game	A team-based approach to help students understand and develop rules and strategies to manage their own behavior and that of their team members.	Students decrease disruptive behavior and increase positive behavior, even two years after the intervention (Ialongo, Poduska, Werthamer, & Kellam, 2001; Van Lier, Muthen, van der Sar, & Crijen, 2004).

How to Manage Bullies in the Classroom

Bully

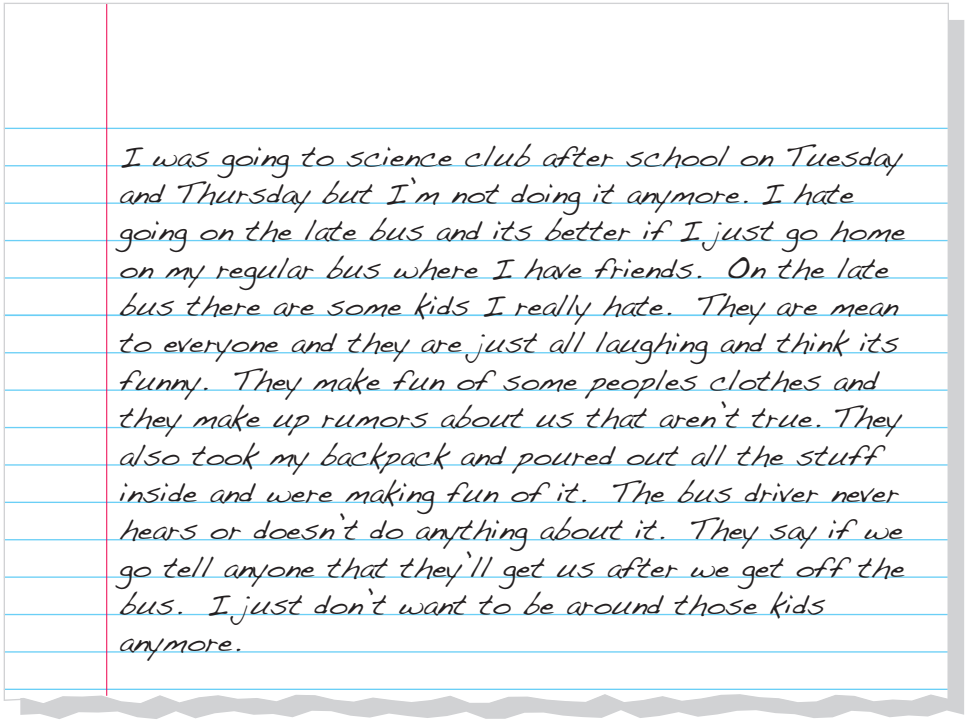
A student who oppresses or harasses other students in a physical or psychological way.

A **bully** is a student who oppresses or harasses other students in a physical or psychological way, such as fighting, teasing, verbally threatening, and destroying or confiscating the victims' property (Germinario, Cervalli, & Ogden, 1992). Although female bullies exist, bullies are typically males, presumably because males are biologically more aggressive than females (Bloomquist & Schnell, 2002; Connor, 2002). Environmental influences, however, cannot be dismissed and include factors such as peer pressures and rewards and family influences (Smith, Schneider, Smith, & Ananiadou, 2004). Elementary and middle school teachers have identified approximately 12% of all boys as bullies (Hoover & Hazlet, 1991), and a national survey found that 33% of students in grades 6–8 had been involved in moderate or frequent bullying (Nansel et al., 2001).

The effects of bullying can be devastating for the victim, as illustrated in Figure 11.8. When teachers witness an aggressive bullying episode, they should respond using the same guidelines offered for dealing with any violent behavior (Bonds & Stoker, 2000; Pellegrini, 2002). However, in most cases, bullying does not happen in the classroom. This is why it is advisable to have open discussions about the need for respecting others' feelings, rights, and property; to develop corresponding rules of conduct from the start of the schoolyear; and to communicate that any violation to the conduct code will not be tolerated (Espelage & Swearer, 2004).

There have been many recent efforts to reduce bullying by implementing prevention/intervention schoolwide programs (Fekkes, Pijpers, & Verloove-Vanhorick, 2005). Recent studies have shown support for the Bully Proofing Your School program (Epstein, Plog, & Porter, 2002), which focuses on how to recognize and respond to bullying behavior and how to teach conflict resolution skills to students. Steps to Respect is a schoolwide program that educates students in grades 3–6 about bullying and that involves students, teachers, parents, and school staff in creating antibullying policies and consequences (Hirschstein, Van Schoiack Edstrom, Frey, Snell, & MacKenzie, 2007). In one study, the researchers observed significant declines in bullying and argumentative behavior and increases in agreeable interactions among a group of children who participated in Steps to Respect as compared to a control group of children (Frey et al., 2005).

Classroom Tips: How to Use Management Principles summarizes some principles from this chapter with corresponding classroom examples.



I was going to science club after school on Tuesday and Thursday but I'm not doing it anymore. I hate going on the late bus and its better if I just go home on my regular bus where I have friends. On the late bus there are some kids I really hate. They are mean to everyone and they are just all laughing and think its funny. They make fun of some peoples clothes and they make up rumors about us that aren't true. They also took my backpack and poured out all the stuff inside and were making fun of it. The bus driver never hears or doesn't do anything about it. They say if we go tell anyone that they'll get us after we get off the bus. I just don't want to be around those kids anymore.

FIGURE 11.8 A student's reflection on how his emotional and physical safety are being affected by a bully.

CLASSROOM TIPS

How to Use Management Principles

Classroom Management Principle	Classroom Examples
Be prepared the first day of class. The best classroom management prevention strategy is to carefully plan your physical environment and classroom routines and explain the basic procedures to your students from the start.	Several years of teaching experience have taught Mrs. Rose that the school administration will arrange for many meetings before the students start class, leaving her little time to prepare for lessons. Therefore, a week ahead of time, she creates lesson plans for her first week of classes and arranges the desks to facilitate the planned activities.
Involve students in the development of classroom rules. Effective managers involve their students in developing classroom rules, explain their rationale, and model and practice the rules until they are learned.	Mr. Jones asks his students to share what they liked about their favorite class and records students' ideas on the board. Using these ideas, he then asks the class to come up with five rules to ensure that their ideas will work in his class. During the next period, Mr. Jones asks the class to give examples that demonstrate the rules and examples that do not.
Model good classroom management skills. Present well-planned activities, clear transitions, and a variety of teaching approaches to keep a diversity of students engaged at all times.	Mr. Jacobs gets to school an hour before the students so that he can plan the day without interruption. He lays out a chart that includes the activity, the purpose, the materials needed, the amount of time needed, and how to transition to the following task.
Be with it. Show your students that you are alert for any sign of disruptive behavior and handle the incidents quickly and confidently.	It is the second week of classes when Mrs. Garcia sees Brian poke Tony. When she addresses this issue with Brian, he does not see what the big deal is, and Tony agrees. Mrs. Garcia is not deterred. She explains that today it might seem funny but the next time someone may get mad and the poking will turn into hitting.
Be supportive of student-owned problems. Actively listen to students' problems and show empathy when they are experiencing a problem that they own.	Ms. Storey is concerned because Andrew falls asleep in class a lot. She has tried using cues, asking him to stay awake, moving him to the front of the class, and talking to his parents. One day she calls Andrew to her desk and asks him why he is so tired. He explains that he had a fight with his dad and moved out to live in his car. Ms. Storey calls the counselor to arrange for a talk with Andrew and sends Andrew to her office.
Be assertive about teacher-owned problems. Resist passive or hostile reactions to students' misbehavior; instead, use I-messages and descriptive language to communicate classroom issues.	Sara has a favorite tune that she sometimes sings in Mrs. Long's Spanish class. Mrs. Long has tried to ignore her behavior and given Sara several verbal and nonverbal cues, but Sara's singing continues. Mrs. Long meets with Sara to describe the disturbing effects of her singing and the rights that her peers have to learn in an orderly classroom. She assertively requests that Sara control her singing and reminds her that she will need to impose the consequence for not respecting others in the classroom next time.
Apply the least intervention available. Address misbehaviors by using the simplest intervention that works.	Jim enjoys pushing and shoving when his class walks down the hall. To correct his behavior, Mr. Hampton starts by recognizing Jim when he is not rough housing, but Jim continues to play. He then tries to ignore Jim's behavior, but that seems to promote more shoving. He then communicates the issue with an I-message, but Jim continues to push in the hallway. Finally, he and Jim make a contract. Every five times Jim walks down the hall without pushing, Mr. Hampton will let him choose a book to take home to read.
Teach students how to be responsible for their actions. Encourage students to judge their own behavior, guide them toward accepting responsibility, and do not accept any excuses.	Mr. Archuleta has a procedure to handle student misbehavior. He first asks students to meet with him after class. During the meeting, he asks students to explain why they think they were asked to stay after class and why they are misbehaving. Then Mr. Archuleta asks students how they plan to change their behavior and gives them time to think about it until they come up with a reasonable and honest answer.
Encourage parents' collaboration from the start. Establish a partnership with caregivers from the beginning. Communicate your expectations and regularly inform them about how students are meeting those goals.	Mrs. Zamora starts off the year by mailing letters to her students' parents. In the letter she introduces herself, describes her expectations, and outlines how she plans to communicate with the parents throughout the year. The letter also includes her work phone number and e-mail address, with a commitment to return any phone message or e-mail within 24 hours. By the third week of class, she has also called all parents to reinforce her message and to personally invite them to contact her at any time.

Respond immediately to violent and aggressive episodes. Do not assume that you are overreacting when students' or your safety is at stake. Avoid taking any risks with threats of violence and involve other teachers, administrators, or authorities in solving the problem.	Mr. Sena and Ms. Shrieve are watching the playground. Loud voices draw their attention to the basketball court, where Dustin and Jovi appear to be threatening to hit each other. As Mr. Sena approaches, he has a hard time telling whether they are joking or are seriously upset. Jovi walks away when she sees the teacher, and Ms. Shrieve follows her to ask if everything is okay. Jovi assures Ms. Shrieve that she is fine, but within minutes she and Dustin are at it again. Mr. Sena then asks both students to come inside to talk to the counselor before the situation really escalates.
Get help. Collaborate with other teachers in your school and learn who among the school staff might help you solve specific discipline problems.	As Ms. Flask writes notes for the next-day substitute, she reflects on each of the students in her class to anticipate management issues. She lets the substitute know that if Josh is really withdrawn and only drawing, it is best to direct him to his special education teacher. She also lets the substitute know that Candace is going through some serious problems at home. If Candace shows signs of being angry or upset, Ms. Flask suggests offering Candace the opportunity to talk to the school counselor.

DIVERSITY IN CLASSROOM MANAGEMENT

This section summarizes what is known about diversity in creating successful learning environments. Keep in mind that the findings of studies that examine differences *between* groups need to be carefully interpreted. This research can be useful in informing us about average tendencies or trends for a certain group of students but should not be used to assume that students who belong to such groups will necessarily follow those patterns. Diversity *within* groups should not be dismissed.

Developmental Differences in Classroom Management

Perhaps the most important diversity factor to consider when developing a management plan is students' developmental age and maturity. For instance, examine the following progression. During kindergarten and the first years of elementary school, direct teaching and reinforcement of classroom rules and procedures is important. Management programs focusing on establishing consistent behavior expectations and on building positive relationships with cooperative learning methods have been shown to be effective in improving the behavior of elementary children (Freiberg, Connell, & Lorentz, 2001; O'Donnell, Hawkins, Catalano, Abbott, & Day, 1995).

For middle elementary school students, many rules and procedures will have become automatic, but new ones will need to be explained, monitored, and reinforced. However, children will start testing and defying classroom rules and procedures, so the teacher will need to focus on effective strategies to minimize disruptions and undesirable behaviors. During high school, the greatest challenge is to design instruction so that it is engaging and relevant to students' interests and to help students develop self-management skills (Brophy & Evertson, 1978). Because cheating is widespread among middle and high school students (Anderman & Midgley, 2004; Ditman, 2000; Murdock & Anderman, 2006), secondary teachers will also need to establish assessment conditions that help prevent cheating. Teachers might employ these strategies: Assign different seats for exams; create multiple exam forms; give high-order tests requiring elaboration rather than memorization; ban pagers, cell phones, and PDAs during exams; and use software to scan the Internet for plagiarized student work (Cizek, 2003). Overall, management programs that emphasize rule clarity and understanding, consistent enforcement, and frequent communication with parents have been shown to be effective in improving adolescents' behavior (Gottfredson, Gottfredson, & Hybl, 1993).

Diversity in Parents' Involvement and Expectations

Most parents are willing to become involved in their children's education if you let them know what you are trying to accomplish and what their role will be in helping you accomplish your goals. However, teachers need to be aware of the different cultural perspectives parents may have on their involvement in classroom management issues. In some cultures it is not appropriate for parents to intervene or even ask for information regarding their children's behavior or progress at school (Olneck, 1995; Perez, 1998). Asian and Latino parents are likely to believe that these issues are better handled by the school (Harry, 1992). Parents from Asian cultures are also likely to believe that Western schools have a bias toward giving excessive praise and not disciplining students sufficiently (Dien, 1998). Asian and Native American parents are likely to use ostracism as punishment when their child's misbehavior is shameful to their family or community (Salend & Taylor, 1993). Parents from some cultural minorities may become involved in school activities only if they have a specific invitation and believe that the school is genuinely interested in their involvement (Hoover-Dempsey & Sandler, 1997). Therefore, teachers should inquire about the parents' attitudes and beliefs regarding management collaboration and try to find strategies that are respectful of those beliefs (Good & Nichols, 2001).

Some cultural groups may have a different perspective regarding what are appropriate or inappropriate behaviors in the classroom and/or which family member is responsible for raising the children. For instance, in some cultural minorities, students' primary caregiver is the grandmother, aunt, or uncle (Stack & Burton, 1993; Wilson, 1989). To gain a multicultural perspective of the community in which you will be teaching, it is a good idea to actively participate in community activities and use community members as resources to better understand diverse perpspectives on parental involvement and discipline (McCarty & Watahomigie, 1998; Minami & Ovando, 1995).

Teachers should also be aware that some parents may not be able to become involved in school issues for several external reasons. For instance, in many low-income families, parents' job schedules and high mobility rate may preclude them from establishing long-term relationships with a particular teacher or school (Nakagawa, Stafford, Fisher, & Matthews, 2002). In addition, some parents may lack the resources needed to sustain regular communications with their children's teacher, such as independent transportation, home computers and Internet access, or phones. Another barrier to parent–teacher collaboration arises when parents are not able to communicate in English either orally or in writing. This will limit their ability to understand your expectations, help their children with school assignments, or collaborate in classroom activities. In these cases, teachers should learn from their students or other school resources (e.g., past teachers) about the best way to communicate with these parents. For instance, bilingual teachers can translate letters into parents' first language or a telephone network of bilingual parents can be used to disseminate a message to other parents (Peña, 2000).

Diversity in Students' Management Needs

As a result of his prolific research, Robert Marzano (2003b) identified five categories of high-need students and corresponding strategies for adapting instruction to minimize management issues. These are shown in Table 11.8.

You may have noticed that these high-need student types resemble some of the exceptionalities discussed in Chapter 2, specifically, students with emotional or behavioral disorders (passive, socially inept, aggressive), giftedness (perfectionist), and ADHD or ADD (attention problems). This suggests that, although all students will benefit from good management practices, teachers in the inclusive classroom will need to keep the special needs of exceptional students in mind when planning management strategies and classroom rules and routines. For example, students with specific cognitive difficulties such as mental retardation, autism spectrum disorder, brain damage, or learning disabilities will be less likely to stay on-task and self-regulate than their nondisabled peers. In these cases, it will be most important to provide a caring, predictable

TABLE 11.8

Five high-need student types and corresponding management suggestions.

STUDENT TYPE	STUDENT CHARACTERISTICS	MANAGEMENT SUGGESTIONS
Passive	Fear of relationships and fear of failure: Attempts to protect the self from criticism, ridicule, or rejection by avoiding challenging tasks and relationships with others.	Promote positive self-worth and self-efficacy. Withhold criticism and quickly praise success. Provide safe adult and peer interactions.
Socially Inept	Is unable to make friends, displays poor social skills, and is often teased for unusual behavior.	Teach the student how to interpret verbal and nonverbal emotional behavior. Make suggestions regarding dress, mannerisms, and posture. Teach the student to keep appropriate physical distance from others.
Aggressive	Hostile, oppositional, and covert: Threatens others verbally or physically; contradicts others and often acts innocent while setting up problems.	Contract with the student to reward desirable behavior and set up consequences for undesirable behavior. Give student responsibilities to help others.
Perfectionist	Self-critical, focuses on details and personal results rather than on relationships. Avoids projects if unsure of their outcome.	Ask the student to tutor other students. Demonstrate acceptance of student's mistakes.
Attention problems	Hyperactive and inattentive: Has difficulty controlling physical and verbal behavior, staying on task, and listening and remembering.	Contract with the student to self-manage behavior using cognitive behavior modification. Assign student a quiet work area and list each step of a task. Assign student a tutor.

Source: Marzano (2003b).

environment with clear expectations, monitoring, and guidance. Recall that one of the skills of effective managers is to be sensitive to the diverse needs of their students (Brophy, 1996). You can adapt your practices for exceptional students using the accommodations and strategies described in Chapter 2. Understanding the special needs of exceptional students and taking them into consideration when making management decisions can help you build a strong relationship and successful learning environment for every student (Dunn & Baker, 2002).

SUMMARY

- Classroom management refers to the strategies that teachers implement to create a successful learning environment. Students in a successful learning environment spend more time engaged in learning and less time off-task. Students in well-managed classrooms learn more and are more motivated to learn than those in poorly managed classrooms.
- Effective classroom management focuses on prevention rather than intervention. Teachers can prevent management problems when they carefully plan instruction and demonstrate strong organization skills so that instructional time is maximized. Other teacher skills that help prevent management issues are

REVISITING ISSUES IN EDUCATION

Can a zero-tolerance policy help reduce student violence and aggression?

Points to consider: You have read about many intervention strategies and programs that schools and teachers use to deal with student violence and aggression. A zero-tolerance policy is a very controversial strategy. The keystone of this policy is that consequences are automatically and immediately applied, without consideration of the circumstances surrounding students' behavior. Those who support zero-tolerance policies argue that they are necessary because protecting the safety of students and teachers should be the first responsibility of schools and the offenders should learn that certain ways of behaving in society are unacceptable (Shanker, 1995). According to this view, it is necessary to have an expedited system for quick removal of offending students so that the educational opportunities of the majority of students (e.g., the nonoffenders) are not neglected. Alternative programs that focus on attempting to change the offenders' behaviors from within (e.g., programs aimed at increasing self-esteem and prosocial behaviors) divert resources from the education of deserving students.

In contrast, those who are against a zero-tolerance policy argue that this policy is based on the assumption that harsh, indiscriminate punishment can effectively eliminate violence and aggression—yet there is no evidence to support this assumption (Kohn, 2004). For example, one study found that students in a zero-tolerance school reported feeling less safe than those in schools with more moderate discipline policies (Harris Bowman, 2002), and a couple of reviews of the effects of zero-tolerance policies have concluded that even after implementing the policy for years, schools do not show evidence of being safer than schools without such policies (Holloway, 2001; Skiba & Peterson, 1999). Furthermore, a recent national study suggests that zero tolerance policies are not cost effective and may produce long-term negative consequences for adolescents' development when not used appropriately (American Psychological Association Zero Tolerance Task Force, 2008). According to this view, prevention practices hold a great deal more promise than zero tolerance for creating productive learning environments.

withitness, overlapping, adapting, and having a democratic leadership style. Classroom conditions that help prevent management problems are a well-planned physical arrangement of the classroom and a system of classroom rules and procedures.

- It is critical for teachers to involve parents in their classroom management plan from the beginning of the schoolyear, maintain regular written and oral communications, and collaborate with other teachers to identify obstacles to students' learning and find ways to overcome such obstacles. Effective managers have an assertive style and use I-messages and descriptive language to communicate teacher-owned problems.
- Misbehaviors range from minor and moderate rule and routine violations to serious offenses such as violence and aggression. Most minor and moderate misbehaviors can be addressed using behavioral, cognitive, or sociocognitive strategies. Behaviorist interventions should be based on the principle of least intervention, which requires using the simplest intervention that works before moving up to a more intrusive approach. Specifically, teachers should consider the following intervention progression: differential reinforcement, extinction, cueing, contingency contracting, token economies, and applied behavior analysis. If necessary, punishment should be administered consistently, fairly, and calmly. Cognitive interventions focus on having students reflect on the consequences of their actions and include I-messages, logical consequences, problem-solving conferences, conflict resolution, and peer mediation. Sociocognitive interventions focus on providing techniques that help students self-regulate their behavior, such as supporting students' goal setting, self-monitoring, self-instruction, self-evaluation, and self-reinforcement.

- Typical examples of student aggression are defiance, violence, and bullying. Teachers are required by law to intervene in cases of violence by stopping the incident, protecting the victim, and seeking help. Long-term interventions to address student aggression, however, require helping aggressive students understand the consequences of their behavior on others and teaching social and conflict resolution skills either in the classroom or as a schoolwide intervention program.
- When considering how to effectively manage a classroom of diverse learners, teachers should keep in mind the developmental age of their students, the cultural perspectives that parents may have on their involvement in classroom management issues, and the special needs of exceptional students and high-need students.

KEY TERMS

allocated time 410
assertive style 423
bully 438
classroom management 408
classroom procedures 417
classroom rules 417
collective self-efficacy 421
conflict resolution 429
defiant student 433
discipline 409
group-oriented contingency contracting 424
I-messages 427
minor interventions 433
misbehaviors 421
moderate interventions 433
overlapping 412
peer mediation 429
prevention 409
principle of least intervention 423
problem-solving conference 428
self-monitoring 431
time-on-task 410
withitness 412
zero-tolerance policy 427

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is a successful learning environment?
2. What is classroom management and how is it different from discipline?
3. How did Kounin contribute to the classroom management field?
4. What are some teacher skills that help prevent classroom misbehavior?
5. How can teachers increase students' time-on-task?
6. In what ways is the physical classroom arrangement related to prevention?
7. Why do teachers need classroom procedures?
8. Describe some effective guidelines for classroom rule development.
9. How should teachers communicate behavioral problems to their students?
10. Compare and contrast behaviorist, cognitive, and sociocognitive interventions.
11. According to the rule of least intervention, what should be the order of behavioral interventions?
12. What steps can teachers take to partner with parents and other teachers in the classroom management process?
13. What is your basic responsibility in responding to students' violence?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- What were the most useful concepts that you learned about?
- Are there any concepts that you feel are still unclear or questionable?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. List the main characteristics of today's classroom and the potential management challenges that may arise from each (Chapter 1).
2. What are some management strategies that you can incorporate into IEPs (Chapter 2)?
3. How would you relate Vygotsky's zone of proximal development to the idea of minimizing off-task behavior during classroom assignments (Chapter 3)?
4. Using the parenting styles that you learned in Chapter 4, how would you classify the most effective classroom manager style and why?
5. Provide a concrete example of how you would use applied behavior analysis to manage classroom misbehavior (Chapter 5).
6. How might classroom procedures reduce the demands on student and teacher working memory resources (Chapter 6)?
7. Provide an example of how you would apply the guidelines for teaching new concepts (Chapter 7) to teach elementary children a new classroom rule.
8. Using what you learned about constructivist learning methods, explain the pros and cons of asking students to actively construct their own classroom rules (Chapter 8).
9. How would you describe the relationship between student motivation and classroom management (Chapter 9)?
10. How might you support each of the student needs discussed in the previous chapter by using good management principles (Chapter 10)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Ninth-Grade Classroom Use Classroom Management Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

Mr. Harmon and Mrs. Begay co-teach an algebra class for ninth-graders called Apply It! This unique class provides support for students who have failed their first semester of algebra. The structure of the course engages students in monitoring their progress and setting goals for their algebra assessments. During weekly conferences, teachers meet with students to review their assessments and create a plan for meeting their goals. Apply It! lessons are based on the principles of cooperative learning. After learning a new concept, students work in collaborative pairs to solve real-world problems. Computer lessons are an additional component, allowing students to solve algebra problems at their own pace. The software program determines areas of difficulty for students and creates tutorials to meet their specific needs. At the end of each lesson, students complete mini-assessments on new and old material to identify progress and areas on which to focus additional instruction and practice.

On the first day of Apply It! Mr. Harmon and Mrs. Begay arrange students' desks in a U-shape to facilitate class discussion and minimize potential distractions. The posted objectives of the lesson are that students will write a mission statement and create classroom agreements, which will set norms for classroom behavior and culture. Mr. Harmon and Mrs. Begay know how important it is for students to feel ownership of classroom norms and to understand their purpose. During the first week of class, they plan time to discuss procedures and clarify classroom agreements. From past experience, they know it is helpful to discuss specific behaviors, rather than creating vague norms that can potentially result in misinterpretations and misbehavior. The teachers also plan to reexamine the mission and agreements throughout the semester, to remind students of the purpose of what they wrote themselves in order to meet their own goals.

"Good morning, everyone. Welcome to Apply It! Does seeing $7x - 5 = 10 + 4x$ give you nervous butterflies in your stomach? We have designed this class to help you make sense of algebra, which can sometimes look like a confusing hodge-podge of numbers and letters. But before we get into algebra, we are going to write a mission statement for this class. When I say 'mission,' what does that mean to you? I want you to take a minute to write down everything that comes to your mind."

Afterwards, students share what they have written. "I think of a mission to the moon or a mission to graduate from college," Quintana starts.

"I think of a big ol' dream" Lorenzo continues. "Like, I'm on a mission to make it to the NBA."

"Your examples capture how mission statements guide people to achieve big goals, like NASA's mission to Mars," Mr. Harmon summarizes. "Today, we are going to write a mission statement that will guide your learning this semester."

Three questions are written on the board. Mrs. Begay instructs, "For the next five minutes, I want you to answer these three questions on sticky notes and post them on the board." Afterwards, Mrs. Begay asks student volunteers to read the responses aloud to the class.

WHY ARE YOU IN APPLY IT!?	HOW CAN WE BEST WORK TOGETHER?	WHAT CAN WE DO TO MAKE IT HAPPEN?
To pass algebra	Listen to each other	Complete homework
To learn math	Help each other learn new concepts and study for tests	Bring your books to class
To graduate from high school	Be patient	Stay focused
To get extra help	Teach each other	Keep trying

"From these answers, we can write a mission statement. Here's a suggestion for how it might start: 'Our mission in Apply It! is to _____.' How would you summarize why students are taking this class?"

"Well, it looks like we all want to pass algebra." Adrianna begins.

"Do you agree with Adrianna?" Mr. Harmon asks.

All students nod, except for Ben. "No, I think algebra is stupid."

Mr. Harmon ignores Ben and writes Adrianna's statement down. "What will we need to do together if our goal is for all students to pass algebra?"

"Well, helping each other to learn seems to sum it up," Christopher responds.

Looking at Christopher, Ben adds, "Yeah, help each other by making the smartest person in here do my work or I'll beat 'em!"

Mr. Harmon addresses Ben: "Ben, I feel like you do not want to be here when you make comments like that. It is very disruptive for the rest of the class. So, if you are not going to add something positive, will you please keep it to yourself next time? All right, does anyone else have something to add to what we need to do to help all students pass algebra?"

"How about listening to each other?" Karina adds.

Mr. Harmon writes down their suggestions. "Finally, what can we do to meet these goals?"

"Coming to class ready to learn is important—if you're ready, then you'll have your homework complete and bring your books, too," Isaiah adds.

Mr. Harmon finishes writing the following statement on the poster:

> *The mission of Apply It! is for all students to pass algebra. We will accomplish our goal by helping and listening to each other and coming to class ready to learn.*

"You might be thinking, hmmm, are we really going to be able to accomplish our mission? *All* students passing algebra? Yeah, right. Well, it is going to take commitment and dedication to create a focused classroom. That's why we *all* need to agree on classroom behavior. Do you think you can *all* pass algebra if some students sit in the back exchanging the latest music downloads?" The students laugh. "Apply it! will require team effort all the way."

Mr. Harmon continues: "Next, I want you to brainstorm classroom agreements that will help us accomplish our mission. Can someone give me an example of how we should treat each other?"

"Listen to each other, so you can hear people's ideas," Celeste offers.

"Thanks, Celeste, that's a very clear example of how we can treat each other in the classroom. I'll write it on the board. What about an example for how we treat property?"

"No littering," Lorenzo replies. "Is there a way you can rephrase that positively?" Mr. Harmon asks.

"How about, 'Pick up after yourself?'" Lorenzo offers.

"That's clear," Mr. Harmon responds. "Now we're going to collaboratively write our agreements and talk about how your ideas translate into norms for our classroom. What do you think is important about how we treat each other?"

"Well, my mom always says to respect people," Tamika offers.

"Okay, Tamika, respect is important. It's also a big idea, which can mean different things to different people. What does respect mean to you?" Mrs. Begay responds.

"It means I want people to really listen to me when I talk and to be patient if I don't understand something right away."

"Good, those are very clear examples. What does 'participate in class' mean to you?" Mrs. Begay asks the class.

"It means you're not asleep in the corner," Brianna responds.

"It means you share your ideas."

"It means you really listen when a classmate is trying to explain something."

"Good, I'm glad you're thinking of lots of different examples," Mrs. Begay encourages them.

The class continues to discuss behaviors as volunteers write the agreements on a large poster. Next to each agreement, in parentheses, is an example of specific behaviors so that everyone knows exactly what the agreements mean.

Classroom Agreements

1. Listen to each other. (*Classmates and teachers take turns when talking.*)
2. Participate in class. (*Contribute during discussion and when working with classmates.*)
3. Care for all property. (*Food, drinks, gum out of classroom. Pick up after yourself.*)
4. Come to class prepared. (*Complete homework, bring all materials to class.*)

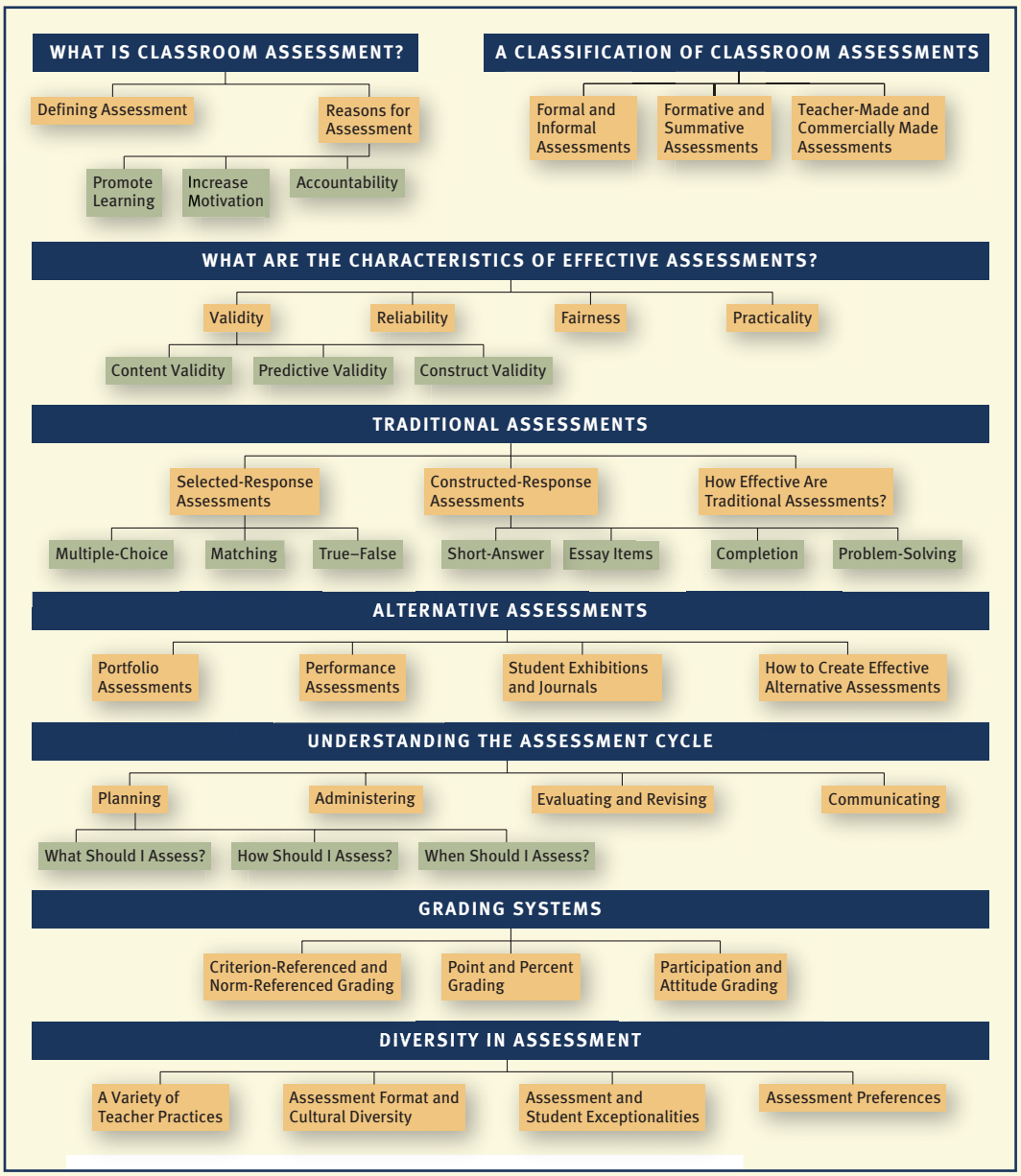
Before leaving class, students copy the mission statement and agreements into their binders. Mr. Harmon and Mrs. Begay have written a letter to students' families introducing themselves and the structure of Apply It! In the letter they left space for students to add the class mission and agreements to share with their families. Finally, students sign the Apply It! mission and agreements poster, in support of the classroom norms they have created.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What strategies did the teachers use to promote students' self-control?
2. Which theory (behaviorist, cognitive, sociocognitive) was most prominent in the lesson?
3. Which of the management principles were applied during the lesson and how?
4. How effectively did the teachers collaborate with students' parents?
5. Evaluate the overall effectiveness of the lesson according to what you learned by including both strengths and weaknesses.

12 Assessment in the Classroom



Imagine You Are the Teacher

MRS. JIMENEZ JUST FINISHED TEACHING her students how to rearrange algebraic equations to solve for *x*. To assess their understanding, she assigns a set of practice problems and walks around the classroom asking students to explain their thinking. After listening to Mario's explanation for solving one of the most difficult problems, she thinks "Wow! They are really getting this stuff. Tomorrow I'll give them a quiz and then start with the next unit's lesson." The following morning, after the students had completed the quiz, Mrs. Jimenez is surprised to see that many of them left several problems blank. This prompts her to ask the class, "So, how did the quiz go?"

"I don't think I did very well. I knew I was supposed to do the opposite of something, but I couldn't remember the opposite of what," Kara said.

"Those problems didn't look anything like yesterday's work," responded Glen. "Yesterday *x* was only on one side of the equal sign, but the quiz had *x*'s on both sides. That's not fair."

"I think I got the right answers, but I couldn't explain what I was doing, so I left the explanation parts blank," said Alfredo.

After Mrs. Jimenez listened to her students' feelings, she decided to suspend the new unit's lesson and spend more time on solving equations. She also made a note to revise some of the quiz problems before saving them to her test bank.

- **Why was Mrs. Jimenez's original practice assessment at odds with the quiz performance?**
- **What are Glen's feelings revealing?**
- **What could you do to prevent these assessment issues?**

Think about how you would respond to these questions as you read through the chapter.



SUPERSTOCK

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define classroom assessment and its functions.
2. List the classifications of assessment.
3. Define validity, reliability, fairness, and practicality.
4. Describe the characteristics of effective traditional and alternative assessments.
5. Explain the components of the assessment cycle.
6. Develop an effective grading system.
7. Apply assessment principles to diverse classroom scenarios.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to the following questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Do you think that it is necessary to assess students' learning? Why or why not?
2. What are characteristics of good classroom assessments?
3. What steps would you take to assess your students' learning?
4. What factors should be considered when determining students' grades?
5. What are the pros and cons of current grading practices?

WHAT IS CLASSROOM ASSESSMENT?

You may recall from Chapter 1 that one of the realities of classroom teaching is the need to respond to the accountability movement by answering the following questions: How well are my students learning? How effectively am I teaching? Effective classroom assessments can provide teachers with a good answer to both questions. Classroom assessment has always been a part of the education system—there are references to administering oral quizzes in the schools of ancient Greece and Rome (Hogan, 2007). This chapter will help you understand why classroom assessment is important, and it will give you the tools to effectively plan and conduct your own assessments. Let's start by distinguishing assessment from other similar terms.

Defining Assessment

Assessment

All processes involved in making decisions about students' learning progress.

Assessment includes all processes involved in making decisions about students' learning progress; as such, it is an integral part of teaching and learning (Nitko, 2004). Assessment occurs when teachers observe students as they solve problems in class, when they listen to students' answers to questions, and when they analyze the results of students' standardized tests. In all these cases, teachers make use of verbal and nonverbal student information to draw a conclusion or make a judgment about students' strengths and weaknesses and about the effectiveness of their instructional methods. In Imagine You Are the Teacher, Mrs. Jimenez assesses learning by analyzing students' performance on practice problems, by asking students to explain their thinking, and by analyzing the results of the quiz.

Some terms related to assessment are *evaluation, measurement, grading*, and *testing*.

Evaluation refers more specifically to the judgment process involved in assessing students' learning. Teachers are evaluating when they ask themselves "How are my students doing?" or "How are my teaching methods helping students learn?"

Measurement is the quantification of students' knowledge and skills using some type of scale (i.e., score). Teachers are measuring learning when they ask themselves "How much did my students learn?" or "How much progress did my students make?" For instance, teachers are measuring learning when they score students' exams.

Testing consists of using a standardized process or device to obtain quantified information about a behavior or cognitive process (e.g., a quiz). Therefore, testing is one of the many assessment methods available to teachers. It is not uncommon to use the terms *assessment*, *evaluation*, *measurement*, and *testing* interchangeably. A teacher may ask another teacher "How did you assess your students' learning?" or "How did you evaluate your students' learning" or "How did you measure your students' learning?" or "What kind of test did you use?"

Evaluation

The judgment process involved in assessing students' learning.

Measurement

The quantification of students' knowledge and skills using some type of scale.

Testing

Using a standardized process or device to obtain quantified information about a behavior or cognitive process.

Reasons for Assessment

Effective assessment takes significant teacher time and effort. Teachers spend up to a third of their time assessing students' learning (Stiggins, 2004, 2005). Why do teachers spend so much time with classroom assessment? In the following sections, we'll examine some answers to that question.

Promote Learning. Before reading the next paragraph, take a couple of minutes to think about your past assessment experiences as a student. Did you learn from any classroom assessment? If so, what were the characteristics of those assessments?

Perhaps the most important function of assessment is to increase learning. Students learn significantly more in classrooms that integrate assessment and instruction effectively (McGlinchey & Hixson, 2004; Stiggins, 2005). The first way in which classroom assessments promote learning is by providing teachers with a mechanism for reflecting on the effectiveness of their instructional methods. Classroom assessments can help teachers identify students' strengths and areas for improvement and suggest the need for special instructional methods such as tutoring, enrichment programs, and so on (Carmichael & Caldwell, 1988; Kindsvatter, Wilen, & Ishler, 1996). By using a variety of assessments, teachers can better understand whether they reached their instructional objectives and which students benefited from their instructional methods.

Another way in which assessments promote learning is by providing students with a mechanism for reviewing content or practicing skills (Dempster, 1991; Kiewra, 1989) and by priming them to engage in the elaboration of what they learned (Fall, Webb, & Chudowsky, 2000; Foos & Fisher, 1988; Frederiksen, 1984). A meta-analysis of classroom assessment studies showed that students who are tested frequently score higher on final tests than those who are not tested before final exams (Bangert-Drowns, Kulik, & Kulik, 1991). Nevertheless, not all tests or assessments will automatically promote learning. For learning to occur—as you will see in this chapter—classroom assessments need to be reliable, to be valid, and to provide students with informative feedback about their performance.

Increase Motivation. Think about whether any classroom assessments motivated you to learn more. If so, what were the characteristics of those assessments?

The second reason for assessments is to motivate students to learn. Students are more motivated to learn when they are made aware that their learning will be assessed than when they are simply told to learn the material (Frederiksen, 1984; Halpin & Halpin, 1982). However, only well-designed classroom assessments will promote students' motivation to learn (Black, Harrison, Lee, Marshall, & Wiliam, 2004). Assessments that provide learners with information about their proficiency and skill are more motivating than assessments that only provide overall performance information (e.g., grades, points) (Stipek, 2002). Recall from Chapter 10 that an important



Laura Dwight Photography

What are the functions of classroom assessment?

strategy for supporting students' need for competence is to provide informational feedback, which communicates where students have succeeded, where they had difficulties, and how performance can be improved in the future (Pintrich & Schunk, 2002). When assessments are informational, students are likely to perceive them as a mechanism for helping them improve rather than as an evaluation of their performance (Spaulding, 1992).

In addition, assessments are effective motivators when they are aligned with instructional objectives (Pintrich & Schunk, 2002) and when they are criterion- rather than norm-referenced (Stipek, 2002). Criterion-referenced assessments support students' need to feel competent because they set achievable standards that are likely to elicit students' motivation to learn and grow. In contrast, norm-referenced assessments turn students off to learning because only a few can get high grades and success depends on what others do. We discuss criterion- and norm-referenced assessments in more detail later in this chapter.

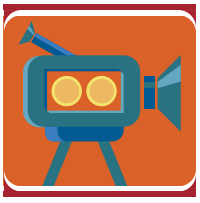
Accountability

The idea that schools and teachers must demonstrate their effectiveness in terms of student learning.

Accountability. Finally, classroom assessments respond to today's focus on **accountability**, the idea that schools and teachers must demonstrate their effectiveness in terms of student learning. You may recall from Chapter 1 that in response to federal concerns for educational achievement and the funding that is tied to that achievement, states typically have testing programs that allow them to rank every school in terms of student performance (Gandal & Vranek, 2001). We discuss standardized tests and learning in detail in the following chapter. Accountability, however, transcends the realm of standardized testing. Other assessments such as the ones discussed in this chapter are also crucial for giving parents information about how their children are performing in the classroom and for providing administrators with information about how individual students, classrooms, or schools are doing.

In sum, assessments provide teachers with useful information about their teaching practices and help them reflect on how to improve instruction (Otero, 2006). When classroom assessments are carefully designed, they become important learning and motivational tools for students and provide parents and school administrators with evidence about students' progress. In the upcoming sections, you will learn that classroom assessments should be integrated with instruction (see the section on understanding the assessment cycle). The relationship between assessment and instruction is so close that sometimes it is difficult to distinguish between them. For instance, Mr. Holland asks Felicia to solve the equation $3x - 5 = 2$ on the board. Felicia adds 5 to each side of the equation and rewrites the equation as $3x = 7$. After she pauses for a while, Mr. Holland gives her a hint: "What operation can we use to eliminate the 3 from the left side of the equation?" A few seconds later, Felicia tentatively asks "Division?" Mr. Holland then elaborates "Yes, very good, Felicia! To eliminate a number that is multiplying x, we need to divide by the same number on both sides of the equation." As you can see from this example, Mr. Holland was assessing and teaching Felicia simultaneously. Nevertheless, Mr. Holland's assessment had some limitations. Because he focused only on one student and one problem, his interaction with Felicia is not a good assessment of his classroom's learning. What can teachers do to create good classroom assessments? The next section looks at the characteristics of effective classroom assessments.

Get Connected!



VIDEO CASE ASSIGNMENT. . . Using the Strategies in Your Classroom: Hear from the Specialists (Tab 1)

Go to your WileyPlus course and view the video. While watching the video, think about what Ms. Dean is discussing and generate personal examples of assessments that support her description of assessments as well as examples of assessments that contradict her report. Discuss the issues of content and construct validity, alignment of objectives with assignments and assessments, and reliability in your personal examples.

A CLASSIFICATION OF CLASSROOM ASSESSMENTS

Classroom assessments include a wide range of options, from recording anecdotal notes while observing a student solve a problem in front of the classroom to administering state-mandated standardized tests. Let's examine some classifications of classroom assessments and the characteristics and functions of each.

Formal and Informal Assessments

Formal assessments are typically created in advance to establish what students have learned, and their implementation involves a disruption in teaching (a midterm exam, for example). Formal assessments include classroom tests and quizzes, where a particular class time is set aside for taking the test. **Informal assessments** are spontaneous methods of gathering information about students' knowledge and skills. Informal assessment typically happens during the course of instruction. When a teacher engages her classroom in a question-and-answer review about a topic, she is informally assessing students' knowledge on the topic. In Imagine You Are the Teacher, Mrs. Jimenez conducts an informal assessment of her students' understanding of how to solve algebraic expressions by walking around the classroom and asking students to explain their thinking.

Teachers can use one-on-one personal communications to evaluate learning and uncover misconceptions, attitudes, and beliefs about learning that may need intervention. Because students can express their knowledge without worrying about the mechanics of writing, personal communications are especially helpful in assessing English language learners.

Informal assessments are crucial in guiding instruction (Black et al., 2004). However, because informal assessments are not systematic, they can provide an incomplete or inaccurate picture of students' learning. Some students will be more likely to participate in classroom discussions than others, and evidence of their understanding should not be taken as evidence that the whole class has understood a topic. Therefore, it's important for teachers to use a combination of formal and informal assessments.

Formal Assessments

Assessments that are typically created in advance to establish what students have learned.

Informal Assessments

Spontaneous methods of gathering information about students' knowledge and skills.

Formative and Summative Assessments

Formative assessments provide information to teachers and students while teaching and learning are still occurring. Formative assessments give teachers and students feedback about how instruction is working so that changes can be made before the end of instruction to ensure ongoing improvement. The goal of formative assessments is to help set learning objectives at a level that challenges all students.

Examples of formative assessments include the following:

- Asking students to answer a few questions before leaving class (exit slips)
- Answering a quick question about the previous unit before class starts (bell work)
- Taking a minute to answer a question during a classroom activity (one-minute essay)

Because formative assessments are generally used as part of the teaching–learning sequence, they are mostly informal assessments. Yet typical formal assessments such as quizzes and seatwork can also be formative assessments. A teacher may decide to begin each class with a quiz to keep students regularly informed about their performance and to obtain feedback about her teaching effectiveness. Formative assessments are useful if they are informative, aligned with the curriculum being taught, timely, and frequent (McMillan, 2007).

Formative Assessments

Assessments that provide information to teachers and students while teaching and learning are still occurring.

What are the limitations of informal classroom assessments?



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A special type of formative assessments are *pre-tests* or pre-instruction assessments, which help teachers determine what students already know about a topic before instruction is designed. Many pre-tests are informal and include observations of students' verbal and nonverbal behaviors in the classroom, such as listening to students' responses to questions and observing facial expressions that are indicative of confusion or boredom (Doyle, 2006). However, as you now know, informal assessments need to be complemented with formal assessments to yield an accurate learning measure for all students. This is why Mrs. Jimenez's informal assessment during problem-solving practice was at odds with her students' performance on the quiz the following morning (see Imagine You Are the Teacher). Her conclusion—"Wow! They are really getting this stuff"—was based mostly on the work of just one student.

Imagine the following scenario. Ms. Porter teaches seventh-grade mathematics. Before planning a lesson on calculating the volume of three-dimensional figures, she gives her students a pre-test containing several problems in which students need to calculate the area of two-dimensional figures. This formal assessment will show her whether students have mastered relevant prerequisite knowledge. Based on the outcomes of the pre-test, Ms. Porter might decide to conduct a review session for students who are still struggling with area problems before starting with the new lesson.

Summative Assessments

Assessments that provide information about student performance at the end of instruction and which are typically used for grade assignment and promotion decisions.

You are probably very familiar with midterm and final exams. These are types of **summative assessments**. They provide information about student performance at the end of instruction (the end of a unit, term, or year) and are typically used for grade assignment and promotion decisions. The following are some examples:

- Semester final tests
- Science fair projects
- Standardized tests
- End-of-year performances in dance or piano recitals

Assessments that are designed to show students' accumulation of knowledge or skills are summative. The goal of summative assessments is to provide teachers, students, parents, and administrators with information about how well students have mastered the content, the grades that they should be given, and whether they are ready for the next unit (McMillan, 2007).

Teacher-Made and Commercially-Made Assessments

Teacher-made assessments are those in which the teacher decides who and what will be assessed and when the assessment will take place, how the assessment will be carried out, and what the scoring procedures will be. Typical examples are daily written and oral quizzes, weekly tests, and performance evaluations. Sometimes, however, schools will require the use of standardized assessments, which are commercially made assessments that include uniform administration procedures (we discuss standardized assessments in detail in the next chapter).

In addition, teachers can use tests included in textbooks and teacher's guides as well as other commercially prepared assessments. These materials have the advantage of saving teachers development time. However, caution should be exercised when using commercially prepared assessments because they may lack the characteristics of effective assessments discussed in the next section (Nitko, 2004). In particular, commercial tests may not be valid assessments when they fail to reflect your learning objectives or when they fail to test important concepts or skills (i.e., they focus only on factual information). Another concern with commercial tests is that they may not be a reliable measure of students' learning if they include too few items and/or items that are poorly written. Therefore, using commercially made assessments requires the following steps:

1. Identify your learning objectives.
2. Select items that are aligned with your learning objectives.
3. Create additional items for relevant topics/skills not covered by the assessment.
4. Analyze students' responses to identify items that may need revision.

WHAT ARE THE CHARACTERISTICS OF EFFECTIVE ASSESSMENTS?

This section provides you with some principles to guide your assessment decisions. We discuss the four characteristics of effective classroom assessments: validity, reliability, fairness, and practicality.

Validity

Assessments are valid when they measure what they are intended to measure and conclusions about their scores are accurate (McMillan, 2007). An example is a math story problem that requires knowing the number of planets in the solar system to successfully solve the problem. This assessment is not valid if students were never taught about the solar system because how well they do depends on their knowledge of astronomy, which is not the content intended to be measured. Validity can be assured by carefully examining an assessment for evidence of content validity, predictive validity, and construct validity. In the following sections, these terms are defined and explained.

Content Validity. An assessment has *content validity* when its specific questions or tasks provide a legitimate indication of the actual knowledge or skill that the assessment is intended to measure. For example, to assess students' understanding of an ecosystem, a test should not be designed to test their reading ability or problem-solving skills. Instead, the assessment would have content validity when each item in the test requires students to demonstrate their understanding of an ecosystem—nothing more, nothing less.

Predictive Validity. As you know, many colleges require applicants to take the Scholastic Assessment Test (SAT) or the test constructed by the American College Testing Program (ACT). These tests are administered because they are typically found to predict students' grade point average (GPA) by the end of their first college year. In other words, all other things being equal, students with higher SAT and ACT scores are likely to have higher GPAs than those with lower SAT and ACT scores. An assessment has *predictive validity* when students' performance on it allows us to accurately predict later performance on another relevant assessment.

Construct Validity. Assessments are not only designed to measure learning or academic achievement. Some assessments are aimed at measuring a particular skill (e.g., verbal ability, English language proficiency) or attribute (e.g., personality, anxiety). An assessment is said to have *construct validity* when performance on the assessment provides a legitimate indication of the skill or attribute that the assessment is purported to measure. For example, a spatial ability test has construct validity if it legitimately measures individuals' ability to visualize, rotate, or transform images using only their imagination (see Figure 12.1).

Classroom teachers are mostly concerned with the content validity of their assessments. To ensure the validity of classroom assessments, teachers should decide which concepts and skills they will be measuring and how extensively to measure each. Experts recommend creating a **table of specifications (TOS)**, which lists the learning objectives and different

Table of Specifications (TOS)

A table that includes a list of the learning objectives and different levels of understanding that need to be assessed.

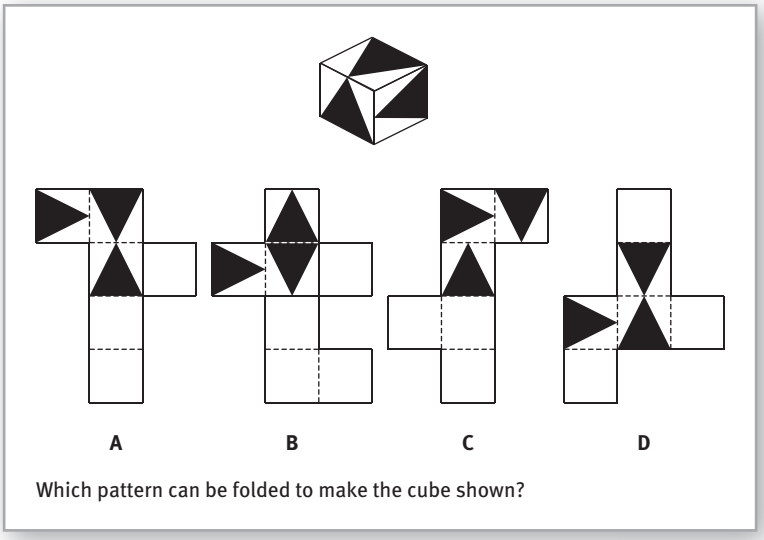


FIGURE 12.1 Sample item from a spatial ability test.
Source: Psychometric Success (2009).

BIOLOGY CONTENT	LEVELS OF UNDERSTANDING			TOTAL ITEMS
	KNOWLEDGE	COMPREHENSION	APPLICATION	
Identify parts of the circulation system.	12	2	1	15
Explain the function of parts in relation to the whole system.	2	7	6	15
Distinguish between circulation and other bodily systems.	1	5	9	15
Total Items	15	14	16	45

FIGURE 12.2 **A table of specifications for an eighth-grade unit on the circulatory system.**

levels of understanding to be assessed (Bloom, Hastings, & Madaus, 1971; Gronlund, 2000). For the cognitive domain, the levels of understanding to include in a table of specifications correspond to Bloom's taxonomy of learning objectives discussed in Chapter 7: remembering, understanding, applying, analyzing, evaluating, and creating. Figure 12.2 shows an example of a TOS for an eighth-grade unit on the circulatory system.

A table of specifications helps teachers see all the potential assessment areas. To be valid, however, the assessment should not include content areas or skills that have not been taught. Imagine the following scenario. Melissa is discouraged. She studied very hard for Ms. Jackson's final math test but still received a low score. As Ms. Jackson goes over the test, Melissa becomes more frustrated. Even though she got the right answers, Ms. Jackson took off many points because she failed to explain how she got those answers. Melissa raises her hand: "Ms. Jackson, this isn't fair. On our homework assignments, you always told us to make sure we apply the right formula and write down the correct answer. You never asked us to explain how we got our answer before. How are we supposed to know that this is what you are looking for on the quiz?"

Alignment

The correspondence among the teacher's instructional objectives, the classroom activities used to achieve those objectives, and the type of assessments used to measure learning.

As shown in Figure 12.3, assessments are valid when there is **alignment** with the learning objectives and instructional activities used in the classroom to promote students' mastery of such objectives.

Ms. Jackson failed to align the classroom activities (homework) with her summative assessment (test). Similarly, Glen, one of the students in Imagine You Are the Teacher, felt that Mrs. Jimenez's test was unfair because it was not aligned with the practice activities the class had engaged in.

The following are two additional examples of how the validity of assessments can be challenged when they are not aligned with instructional objectives and/or activities.

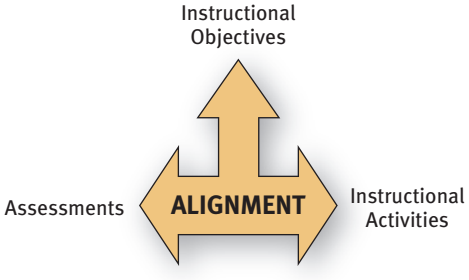


FIGURE 12.3 **Classroom assessments should be aligned with instructional objectives and activities to be valid.**

- Mr. Higgins just finished a unit on the American Civil War and wants to assess his students' learning. Because he did not carefully plan the lesson with the standards and benchmarks in mind, he has trouble recalling exactly what material he covered in lectures and class activities. So he creates an assessment using questions from the sample tests in the teacher's guide. Several of Mr. Higgins's students do poorly on the test and complain that the test included questions they did not understand.
- In an effort to align her assessment with the math standards and benchmarks in her school, Ms. Meyer gives her high school students a test in which they are asked to apply algebra to solve a variety of real-world problems. However, her students had only engaged in drill-and-practice problems in the classroom, so most of them do poorly on the test and complain that the test was too difficult.

Reliability

Ms. Francis is a first-year teacher in rural Montana. Her class just completed a unit on the Great Depression. Ms. Francis used a variety of assessments, including a test from the teacher's guide of her textbook. After Ms. Francis graded the tests and handed them back to her students, she decided to talk with the other sixth-grade teacher: "Have you ever used the tests from the teacher's guide when you taught sixth-grade science? I am just shocked because the test scores are not consistent with students' performance on the quizzes, homework, and project assignments. Not only that, but when I asked students to answer the same questions during the test review, a significant number of them changed their original answers. Something isn't right."

Assessments are reliable when they give consistent, stable results for each student. That is, if the same assessment is administered more than once, it should give approximately the same outcome each time. To better understand the idea of reliability, think about measurement and assessment in areas other than education. For example, in construction, a tape measure is a highly reliable measure of an object's length. If you have a piece of wood that is 3.5 feet long, a tape measure will show a distance of 3.5 feet from the start to the end of the wood. Measure it again and you will get the same result. Measure it repeatedly and you will consistently get a measurement of 3.5 feet.

As you will read in the next chapter, reliability is one of the most important characteristics of standardized tests. Reliability is a necessary condition for validity: Although a reliable assessment does not make it a valid assessment, assessments cannot be valid unless they yield consistent results. Think about the measuring tape example again. A measuring tape can reliably measure head diameter (it will provide consistent, stable results every time it is used), but this does not make it a valid way to assess intelligence. A measuring tape, however, can yield a valid assessment of head diameter. Now imagine that you want to measure a person's weight. If the scale that you use is defective, it will provide unreliable results every time it is used; therefore, it cannot be a valid measure of a person's weight. In short, reliable assessments can be valid or invalid, but unreliable assessments are always invalid. Use Figure 12.4 as a visual aid to remember the relationship between reliability and validity that we just discussed.

RELIABLE AND VALID WEIGHT ASSESSMENT



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TIME	WEIGHT READING
10:00 A.M.	110 POUNDS
10:15 A.M.	110 POUNDS
10:30 A.M.	110 POUNDS

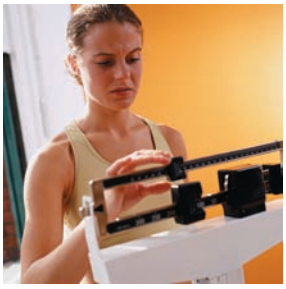
RELIABLE BUT INVALID INTELLIGENCE ASSESSMENT



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TIME	TAPE READING
10:00 A.M.	23.5 INCHES
10:15 A.M.	23.5 INCHES
10:30 A.M.	23.5 INCHES

UNRELIABLE, THEREFORE, INVALID WEIGHT ASSESSMENT



Photodisc/Getty Images, Inc.

TIME	WEIGHT READING
10:00 A.M.	90 POUNDS
10:15 A.M.	110 POUNDS
10:30 A.M.	150 POUNDS

FIGURE 12.4 **An illustration of the relationship between reliability and validity.**

Four common methods used to determine whether an assessment is reliable or not are test–retest reliability, split-half reliability, alternate-form reliability, and interobserver reliability. The first three methods are typically used with traditional assessments such as multiple-choice quizzes and tests. *Test–retest reliability* consists of using the same test with the same students on two occasions and measuring the degree to which the scores are correlated with each other. If students take the same math test on two occasions and score consistently, the test is said to be reliable. *Split-half reliability* consists of administering a test to a group of students, creating two scores for each student by dividing the test in half (e.g., odd and even items), and measuring the degree to which the scores for each half are correlated with each other. To provide good results, however, this method requires that the two halves of the test be equivalent. For instance, students might get higher grades on one of the halves if the items included are significantly easier than those

in the other half; yet this does not necessarily mean that the test is unreliable. The third method, *alternate-form reliability*, consists of administering two equivalent forms of a test (e.g., form A and form B) to the same group of students at the same time and measuring the degree to which the scores for each form are correlated with each other. Finally, *interobserver reliability* will be most important for classroom assessments that require human judgment, such as student essays, performance assessments, or portfolios. It consists of asking two independent scorers to assess learning using the same rubric or rating scale and measuring the degree to which the two scores are correlated with each other. If the scorers come up with significantly different scores, the assessment is said to lack interobserver, or interrater, reliability.

Although teachers may not be able to mathematically estimate the reliability of every classroom assessment, Classroom Tips: How to Increase the Reliability of Classroom Assessments offers some helpful practices to increase the reliability of any assessment. You will also learn specific strategies to increase the reliability of traditional and alternative classroom assessments in the upcoming sections.

CLASSROOM TIPS

How to Increase the Reliability of Classroom Assessments

Give clear instructions so that students know exactly what is expected in the assessment.	Mrs. Vinocur distributes a handout one week before every quiz listing all the topics that students will be tested on and the type and number of questions that will be included in the quiz.
Describe clearly the criteria that you will use to evaluate students' performance.	In anticipation of a research report assignment, Mr. Pane gives his students the grading rubric that he will be using to evaluate the quality of their work and a couple of research report models showing how the criteria are applied to make grading decisions.
Include multiple assessments of the same knowledge or skill and check for consistency.	Mrs. Ramsey uses mini-quizzes immediately after a lesson, short homework assignments, and end-of-unit summative tests and compares students' performance across the three assessments.
Align your assessments with your learning objectives and instructional practices.	Mr. Tenembaum keeps a log with his learning objectives and the type of instructional activities he used to meet such objectives. He uses the log to make decisions about what and how to assess.
Develop a variety of assessment methods.	Knowing that competence is multidimensional and individual assessment approaches have limitations, Ms. Vevea uses a combination of quizzes, group projects, individual presentations, and portfolios to assess whether students have met her learning objectives.
Avoid assessing learning when students are not in good health.	Mr. Dunn becomes aware that Zoe has not been feeling well for the past week due to a severe allergy reaction. He tells Zoe that she can have another week to prepare for the math test.
Assess all students in similar, standardized conditions.	During individual assessments of learning, Ms. Kiko arranges the desks so that all students face the board and have one empty desk on each side. She instructs them to have only one pencil and eraser on their desks and explains that she will not answer any question unless it is a question that is relevant for all students.
Create clear criteria to guide your evaluation before scoring any assessment.	As part of his assessment planning, Mr. Duvall creates grading rubrics that clearly specify the target learning objectives, the relative weight of each in the total grading system, and the criteria he will use to determine if students' work is excellent, very good, good, fair, or poor.
Design assessments in ways that eliminate potential bias from teacher expectations.	When Mrs. Wigfield uses writing assignments to assess learning, she asks students to write down their school ID number instead of their names to ensure that grading is not affected by her biases or expectations.

How reliable an assessment is will depend on how standardized the assessment conditions are, how objective the scoring procedure is, and students' own internal factors (McMillan, 2007). A student may not perform consistently across several tests because instructions were inadequate, because the teacher was fatigued during scoring, or because the student was not feeling well on a particular day. Although these external and internal factors will reduce the reliability of the assessments, good assessment planning (discussed later in this chapter) can help minimize their negative effects.

Fairness

Good classroom assessments are not only valid and reliable but also fair (McMillan, 2007; Popham, 2006; Reynolds, Livingston, & Willson, 2006). Assessments are fair when they provide all students with an equal opportunity to demonstrate their knowledge and skills (Yung, 2001). Before reading the next paragraph, think about the following questions: Does fairness mean treating all students in the same way? When might the fairness of an assessment be jeopardized?

When trying to define assessment fairness, experts recognize that giving equal opportunities to all students does not mean equality but rather equity. A student with a certain disability or impairment (e.g., blindness) may not be able to fully demonstrate his or her knowledge unless certain accommodations are in place (e.g., reading a test to the student). These modifications, however, should be part of the student's individualized education program (IEP), as you probably recall from Chapter 2. Let's take a look at other, more subtle challenges to the fairness of classroom assessments that teachers need to be aware of.

One challenge to fairness occurs when the assessment is offensive to a group of students, such as when a test portrays only females in stereotypical jobs such as nurses, secretaries, and clerks. Because females are likely to become offended by this bias, which in turn is likely to create anxiety or distraction, they do not have the opportunity to perform as well as males.

Another challenge to fairness occurs when assessments penalize a certain group of students, such as when a test contextualizes problems with knowledge that students from low-income families are not likely to have (Popham, 2005). Imagine a math problem that requires estimating the amount of food it is necessary to order in a plane that is to travel from the United States to Europe. Because students from low-income families are not likely to have been on a plane or to have heard from their parents about flights to Europe, they will not have the same opportunity to understand the content of the problem as other students.

Fairness is relevant not only when creating assessments but also when administering and scoring assessments. Unless there is a special accommodation that is justified by an IEP, giving extra time or help to a particular student will likely be perceived as unfair by the other students. Similarly, it is unfair to reward students who do more than the work required and penalize with partial credit those who followed the instructions carefully and decided to not do more than what was required.

Halo Effect

A tendency to attribute additional positive characteristics to someone who has one salient quality, such as physical attractiveness.

What are some threats to the fairness of classroom assessments?

Some teachers unconsciously give better grades to students they like. This **halo effect** occurs when a teacher knows which student wrote which response and alters the grading depending on her opinion of the student. Because research shows that teacher expectations may inadvertently create unfair practices (Graham, 1996; Graham & Barker, 1990), later in this chapter we present some methods that will help you prevent bias in scoring classroom assessments.



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Practicality

Classroom assessments are practical when they are relatively easy to implement. Consider giving assessments (such as a brief quiz) that do not require extensive time to develop and administer, that are cost-effective, and that easily yield a performance score. For

instance, it would not be very practical for a science teacher to assess students daily with a long set of open-ended questions. Practical issues are important but should not take precedence over more substantial issues. Keep in mind that effective assessments should be valid, reliable, and fair. In the next sections, we examine the characteristics and effectiveness of the most common traditional and alternative assessments used in the classroom.

TRADITIONAL ASSESSMENTS

Traditional Assessments

Assessments that measure students' knowledge and skills in paper-and-pencil format such as exams and quizzes.

Traditional assessments are used in most classrooms to measure students' knowledge and skills, typically in paper-and-pencil format. Math tests, spelling quizzes, and multiple-choice and essay exams are examples of traditional classroom assessments. Traditional assessments can be formative or summative, teacher-made or commercially made; they are considered to be formal assessments because they provide teachers with systematic data that can be used to evaluate students' learning. When well-designed, traditional assessments can be valid and reliable measures of students' learning (Linn & Miller, 2005). Traditional assessments can be classified into selected-response and constructed-response assessments.

Selected-Response Assessments

This type of traditional assessment requires students to select or recognize a correct answer from a set of alternatives. Selected-response assessments include multiple-choice, matching, and true–false items.

Multiple-Choice Items. Multiple choice is the most common form of selected-response assessment and is the traditional format of standardized tests. Multiple-choice items consist of a question, or *stem*, followed by a list of answer choices called foils or **distracters**, among which there is only one right answer. The most common multiple-choice items include three, four, or five alternative answers. The stem of a multiple-choice item can be a question, an incomplete statement, or an incomplete statement containing some background information. Here is an example of each type of stem:

Distracters

A list of answer choices in a multiple choice question that are used to divert the student from the correct answer.

QUESTION

How are latitude and longitude lines drawn on a globe of the earth?

INCOMPLETE STATEMENT THAT NEEDS TO BE COMPLETED WITH ONE OF THE DISTRACTERS

The system of lines used to locate a certain place on earth is called . . .

BACKGROUND INFORMATION ON WHICH A QUESTION OR INCOMPLETE STATEMENT IS BASED

The absolute age of a rock is the approximate number of years ago that the rock formed. The absolute age of an igneous rock can best be determined by . . .

To develop multiple-choice items, start by generating the questions based on previously determined learning objectives. Then generate the right answer and a set of three or four possible distracters that are clearly distinguished from the right answer.

CLASSROOM TIPS

How to Create Effective Multiple-Choice Items

Present a clear and single problem in the stem of the item.

Present only essential information in the stem.

State the problem in positive terms.

Avoid or capitalize negative words such as *NOT*, *NO*, or *EXCEPT* in the stem.

Make all distracters plausible to the uninformed.

Do not repeat what you said in the stem in the distracters.

Make sure that each distracter fits grammatically with the stem.

Avoid the words *always*, *never*, *all*, or *only* in the distracters.

Avoid overusing the distracters *all of the above* and *none of the above*.

Vary the position of the right choice randomly.

Avoid phrasing the correct answer in more technical terms than the wrong answers.

Avoid phrasing the correct answer in more/less words than the wrong answers.

Avoid using two distracters with the same meaning.

Avoid using the exact wording of textbooks.

When teachers have knowledge of students' typical misconceptions, it is a good idea to include some of these misconceptions as distracters so that they can be identified and later discussed. Some teachers use short open-ended questions first, to identify potential errors or misconceptions, and, at a later stage, use the misconceptions to construct multiple-choice item distracters (Stiggins, 2005). Classroom Tips: How to Create Effective Multiple-Choice Items lists some guidelines for constructing multiple-choice items as suggested by experts (Gronlund, 2003; Popham, 2005; Smith, Smith, & De Lisi, 2001).

Matching Items. This type of assessment consists of presenting students with two columns of words, phrases, or data. The problem or question can be answered by matching each item in the first column with one item in the second column. Similar to multiple-choice questions, it is recommended to keep the phrases in the right and left columns of approximately the same length. To prevent matching all the items

ISSUES IN EDUCATION

Can multiple-choice tests assess students' high-order thinking?

It has been argued that multiple-choice items can only tap into the lower level of Bloom's taxonomy (i.e., recall of factual information) and that only other assessment formats such as essays will engage students' higher-order thinking skills. What do you think about this argument? A response to this question can be found at the end of the chapter.

correctly by elimination, include more items in the right column than in the left. This format is especially suitable for assessing knowledge of factual information, such as in the following example:

On the line to the left of each compound in Column I, write the letter of the compound's formula presented in Column II. Use each formula only once.

COLUMN I	COLUMN II
1. _____ Water	A. H_2SO_4
2. _____ Salt	B. HCl
3. _____ Ammonia	C. NaCl
4. _____ Sulfuric Acid	D. H_2O
	E. H_2HCl

True–False Items. True–false items are statements or assertions that students need to evaluate as correct or incorrect. This format should be used sparingly because students have a high chance (50%) of guessing the right answer (Linn & Miller, 2005). In some content areas such as history or social science, it might be difficult to find statements that will be categorically true or false, such as in the following example: "The American victory at the Battle of Saratoga in 1777 was decisive in the war of American independence."

Similar to the guidelines for creating multiple-choice items, true–false items should present a clear and single statement with only essential information. True–false items should be stated in positive terms and should not include words that may cue the learner to guess the right answer (e.g., *always, never, all,* or *only* in false items). Figure 12.5 contains examples of well-written true–false items.

Constructed-Response Assessments

In contrast to selected-response assessments, constructed-response assessments require students to generate an answer rather than select an answer from a set of alternatives. There are several types of constructed-response items that teachers can use for classroom assessment. In this section we review the characteristics of short-answer, essay, completion, and problem-solving items.

Math:

T F 7 + 3 + 4 = 3 + 5 + 7

T F Swim practice starts at 6:00 P.M. It's 3:30 P.M. right now. You have 2 hours until swim practice starts.

Vocabulary: Have these words been used correctly?

T F Due to a life-threatening illness, the chairman planned to **ABDICATE** his position immediately.

T F Alexandra was positive that she was right and will **ABJURE** her friends to agree with her.

FIGURE 12.5 A sample of well-written true–false test items.

Short-Answer Items. This type of assessment consists of questions that can be answered with a short answer, ranging from a sentence or two to a paragraph. The following are some examples:

1. Predict what will happen to the character after the end of this story. Use details from the story to give reasons for your prediction.
2. What do you think the author's purpose was in writing this passage? Use examples to support your reasoning.
3. Explain why an 8-inch by 10-inch "enlargement" of a $3\frac{1}{2}$-inch by 5-inch photograph is not a true enlargement. Draw two enlargements that would be accurate, label the dimensions, and write about how you decided that the two diagrams would be true enlargements.

Essay Items. Essay questions require a longer answer than short-answer items, ranging from one to several pages. Essays allow students to demonstrate their understanding of the material, higher-order thinking, ability to organize information, and writing skills. Because essay questions take significant time to complete, only a few questions can be presented at a time. Thus, a limitation of essay items is that although they can assess depth of knowledge, it comes at the cost of breadth. An additional consideration when designing essay items is that they require several skills (e.g., recall, organization, argumentation, grammar, and spelling) that the teacher may want to assess separately.

The open-ended nature of essay items may make some students anxious, so it is important for teachers to provide sufficient guidance to students. Prepare students by telling them how much time they should spend answering each question and how the essay will be graded. Here are guidelines for preparing essay items:

- Provide very specific response verbs such as *compare*, *contrast*, *define*, and *explain* in the general instructions of the assessment.
- Write a response to the essay before giving the assessment to your students so that the approximate time that is needed to respond can be estimated (students may take up to four times the teacher's time to respond).
- Include the number of points that students can achieve when responding to the question.

The following are some examples of well-constructed essay items:

1. Identify the three major economic conditions that led to the stock market crash of 1929. Briefly describe each condition in correct chronological sequence, and in one paragraph indicate how the three factors were interrelated. (30 points, 30 minutes)
2. Discuss some of the ways in which groups of people living in North America and Europe responded to political and socioeconomic conditions in the period following the Revolutionary War, 1781–1810. Document your response with specific examples from at least two of these three areas: politics and government, economics, social conditions and concerns. (100 points, take-home exam)
3. Protein synthesis is vital for cell growth and metabolism. Describe transcription and translation, being sure to include ways in which they are similar and different. Also include the structural changes that can occur to a protein after translation to make it function properly. (20 points, 20 minutes)

Completion Items. Completion items require students to complete a statement with appropriate words, numbers, or symbols. When designing completion items, it is recommended to use only one blank. Several blank items may penalize the student unnecessarily because wrong information completed in one blank may affect the correctness of information in successive blanks. It is also recommended to use $a(n)$

rather than *a* or *an* to prevent giving clues about the right answer. When a numerical response is needed, the completion item should clearly indicate the type of numerical unit (e.g., W or kW, cm or m). The following are some effective completion item examples:

- Every atom has a central core of positive charge called a(n)_____. Answer: nucleus
- Trees that keep their leaves year round are called_____. Answer: evergreen
- Red, blue, and _____ are considered primary colors. Answer: yellow
- _____ are symbols used at the end of written statements that ask questions. Answer: question marks

Problems-Solving Items. Students are assessed with problem-solving items when they need to select relevant information from a question, organize the information, and apply a set of strategies or procedures to produce an answer. As with essays, the evaluation of problem-solving items requires assessing different skills, such as understanding the problem, representing the problem, applying an effective procedure to solve the problem, and presenting a reasonable answer to the problem. The following are examples of problem-solving items:

1. Isaiah's piano teacher asked him to practice for 5 minutes the first night, 10 minutes the second night, 15 minutes the third night, and 30 minutes the following nights. How many nights will it take Isaiah to complete 3 hours of piano practice?
2. Keisha and three friends have just bought a pizza to share. The pizza cost them $12.00. Keisha had three slices, Jan and Liz each had two, and Sara ate one. If they want to divide the cost of the pizza based on how many slices everyone ate, how much should each girl pay?
3. Using information from the U.S. Environmental Protection Agency website (www.epa.gov), explain which pollutants are causing the most harm to the area's wildlife and what plan should be implemented to clean up the river?

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

Following the guidelines given in this chapter, develop a traditional assessment question for the content of this chapter. Be sure the question has content validity and is fair and practical. What kind of selected or constructed response will you choose to use and why? At what level of Bloom's taxonomy is your question? Bring your question to class for a classmate to answer. Be sure you know the right answer!

How Effective Are Traditional Assessments?

When carefully developed, selected-response assessments can be quickly scored and provide a good measure of students' knowledge or understanding of discrete pieces of information. In most cases, scoring of selected-response assessments consists of just counting the number of correct answers produced. Although some teachers penalize guessing by deducting points for wrong answers, assessment experts recommend not using this practice (Sax, 1997).

In addition, selected-response assessments are very efficient because teachers can assess learning of many topics in a short period of time. The main limitations of selected-response assessments are that students can sometimes guess the right response (the larger the number of distracters, however, the lower the chance that a student will select the right answer by guessing) and that students are not able to demonstrate their elab-

orative or creative skills because they are limited to checking predetermined options. An additional problem is that when students are presented with erroneous information, such as the distracters in multiple-choice tests, they may eventually remember this information as being correct rather than wrong (Brown, Schilling, & Hockensmith, 1999; Voss, 1974).

What do you think are the main advantages and disadvantages of constructed-response assessments? Take a few minutes to think about this question before reading the next paragraph.

The main advantage of constructed-response assessments is that they are relatively easy to develop. A test can be constructed fairly quickly with just a few good questions. In addition, they allow teachers to assess not only how much information students know but also how well they organize and how clearly they communicate their knowledge. Consequently, when carefully written, constructed-response assessments can tap into Bloom's higher level of cognitive objectives, such as application, analysis, synthesis, evaluation, and creativity.

The main disadvantage of constructed-response assessments is that they are time-consuming to grade. Another disadvantage is that, compared to selected-response assessments, they cover less material. This is why experts recommend combining a few essay questions to assess more complex learning outcomes with several selected-response items that sample a larger range of course material (Gronlund, 2003). In addition, constructed-response items are more likely to be unreliable due to the subjective nature of their scoring. Unintentionally, teachers may be affected by their personal values, standards, and expectations when they score open-ended items, which, in turn, will make the assessment unreliable and unfair.

To improve the reliability of grading open-ended items, such as essays and problems, create a grading rubric ahead of time. **Rubrics** are scoring scales that describe the criteria for grading (Stiggins, 2005). Figures 12.6 and 12.7 show a sample grading rubric for a problem-solving item and for an essay assignment, respectively.

Rubrics

Scoring scales that describe the criteria for grading subjective assessments.

A typical grading rubric will include a list of criteria on the left side of the matrix and a list of clearly defined performance levels on the right side of the matrix (Huba & Freed, 2000). Studies find that when rubrics are given ahead of time, they can guide students' attention and increase performance (Arter & McTighe, 2001; Saddler & Andrade, 2004). When students see what elements of their work contribute to a good outcome, they are able to focus their attention and study time on those elements. In addition to creating scoring rubrics, experts recommend using the strategies listed in

POINTS	UNDERSTANDING THE PROBLEM	POINTS	PLANNING A SOLUTION	POINTS	FINDING AN ANSWER
2	Complete understanding of the problem	2	Plan can lead to correct solution	2	Correct answer and correct labels for answer
1	Partial understanding of the problem	1	Partially correct plan based on partial understanding of problem	1	Partial answer for problem; may have computational or copying errors
0	No understanding of the problem	0	No attempt to plan solution or inappropriate plan	0	No answer or wrong answer based on an inappropriate solution plan

FIGURE 12.6 **Sample grading rubric for a problem-solving item.**

	6 EXEMPLARY	5 STRONG	4 PROFICIENT	3 DEVELOPING	2 EMERGING	1 BEGINNING
Ideas & Content *Main theme and supporting details*	Exceptionally clear, focused, and engaging Relevant supporting details	Clear, focused, interesting ideas Appropriate supporting details	Main idea is evident Supporting details may be general or limited	Main idea may be unclear Supporting details are too general or even off-topic	Purpose and main idea may be unclear Supporting details may be irrelevant	Lacks central idea Development is minimal or nonexistent
Organization *Structure introduction and conclusion*	Effectively organized in logical and creative manner Engaging intro and conclusion	Strong order and structure Inviting intro and satisfying closure	Organization is appropriate, but conventional Attempt at introduction and conclusion	Attempts at organization; may be a list of events Intro and conclusion not developed	Lack of structure; disorganized and hard to follow Missing or weak intro and conclusion	Lack of coherence; confusing No identifiable introduction or conclusion
Voice *Personality and sense of audience*	Expressive, engaging, sincere, shows emotion Strong sense of audience Language helps the reader "see" what is happening	Appropriate for audience and purpose Writer's voice comes through	Evident commitment to topic Inconsistent or dull voice	Voice may be inappropriate or nonexistent Writing may seem mechanical	Writing is flat Little or no hint of writer behind words	Writing is lifeless No hint of the writer
Word Choice *Precision, effectiveness, and imagery*	Precise, carefully chosen words Vivid images	Descriptive, broad range of words Word choice energizes writing	Language is functional and appropriate Descriptions may be overdone at times	Words may be correct but mundane No attempt at deliberate word choice	Monotonous, often repetitious Sometimes inappropriate word choice	Limited range of words Some vocabulary misused
Sentence Fluency *Rhythm, flow, and variety*	Varied sentence structure and length adds interest to text Dialogue, if used, sounds like people talking	Easy flow and rhythm Good variety in length and structure	Generally in control of sentences Lacks variety in length and structure	Some awkward sentence constructions Many similar patterns and beginnings	Often choppy, monotonous sentence patterns Frequent run-on sentences	Difficult to follow or read aloud Disjointed, confusing, rambling
Conventions *Spelling, caps, punctuation, grammar*	Exceptionally strong control of standard writing conventions	Strong control of conventions; errors are few and minor	Control of most writing conventions; occasional errors	Limited control of conventions; frequent errors do not interfere with meaning	Frequent, significant errors may impede readability	Numerous errors distract reader and make the text difficult to comprehend

FIGURE 12.7 **Sample rubric for an essay assignment using the six-traits writing model.**

Source: Spandel (2005).

CLASSROOM TIPS

How to Increase the Reliability of Constructed-Response Assessments

- *Develop a model answer to constructed-response items and assign points to each learning objective that is met in the answer.* You may also choose to include points for staying within maximum length requirements and for the organization, clarity, or appropriate use of grammar and spelling. However, to ensure validity, it is recommended to assess writing skills separately from the content of students' responses, especially when assessing English language learners (Hamp-Lyons, 1992; Scarcella, 1990). Model answers are also useful to provide students with feedback on their performance.
- *Score all responses to a single item in one sitting*. When assessments include multiple constructed-response items, score all students' responses to one question first before moving to the next. This increases the likelihood that your grading will be consistent, which increases the reliability of the assessment.
- *Randomize grading order*. To avoid potential grading inconsistencies based on order of grading (i.e., being graded among the first or last students), shuffle students' assessments before scoring the next selected-response item. This allows for random order of grading and prevents unfairness as a result of expectation changes over time or increasing fatigue.
- *Use grading practices that minimize the likelihood of bias*. Ask students to turn in their assessments anonymously, such as writing an identification number that you are unable to associate with the student or writing their names on the back of the assessment. Alternatively, you can cover up students' names with removable sticky notes while you are grading. These methods will reduce the likelihood that expectations will unfairly bias your judgment of students' performance.
- *Ensure that grading is reliable*. Ask another teacher to review your grading criteria and even grade a few students' responses to check whether your grading is consistent with your colleague's grading.

Classroom Tips: How to Increase the Reliability of Constructed-Response Assessments (Stiggins, 2005).

Overall, traditional assessments have been criticized for focusing on low-level knowledge and skills and measuring only learning products rather than the learning process itself (Bandalos, 2004; Popham, 2005). Yet research does not support the claim that alternative assessments measure high-level thinking better than traditional assessments (Terwilliger, 1997); instead, it shows that they have significant reliability and practical challenges. Let's examine the characteristics of alternative assessments in more detail.

ALTERNATIVE ASSESSMENTS

Alternative assessments have been proposed by critics of traditional assessments and are gaining increasing attention among teachers (Lester, Lambdin, & Preston, 1997; Paris & Paris, 2001). Supporters of alternative assessments argue that traditional assessments are limited by focusing on low-order knowledge and skills and by providing information solely about the learning product rather than about students' thinking (Bandalos, 2004).

Despite the fact that there is no single definition of alternative assessments, their main goal is to "gather evidence about how students are approaching, processing, and completing real-life tasks in a particular domain" (Huerta-Macias, 1995, p. 9). Therefore, alternative assessments can be classified as formative or summative informal assessments created by teachers. Alternative classroom assessments are also called **authentic assessments** because they are aimed at measuring students' performance on tasks that are relevant to life outside of school (Popham, 2005). Note, however, that what characterizes an assessment as alternative or authentic is not its format but rather the type of task that students are asked to engage in during the assessment. For instance, a language arts teacher may ask her students to write a persuasive piece for submission to a newspaper as a way to assess students' writing skills. Yet the paper-and-pencil format of the assessment does not make it a traditional classroom assessment. Let's take a closer look at some of the most common alternative assessments.

Authentic Assessments

Assessments aimed at measuring students' performance on tasks that are relevant to life outside of school.

What are some examples of authentic assessments that you could use in your classroom?



Image Source/Getty Images, Inc.

Question	*Reflection*
My favorite parts of this writing are:	
To improve my writing, I want to learn more about:	
From this writing I learned:	
I chose to include this writing in my portfolio because:	

FIGURE 12.8 **Sample of fourth-grade student self-reflection for language arts.**

Portfolio Assessments

Portfolios are systematic collections of students' work over an extended period that typically include self-reflections on learning (Popham, 2005). Depending on the subject matter, portfolios may include written work as well as artwork, visual representations, videotapes, science reports, computer printouts, journal entries, and any other work that the teacher believes demonstrates students' knowledge, skills, or achievement (Knotek, 2005). *Process portfolios* provide a wide representation of students' work over time that demonstrates their progress in the area being taught (Belanoff & Dickson, 1991). However, similar to the distinction between formative and summative assessments, portfolios can also be compiled to show students' final achievement. In the latter case, they are called *best-work portfolios*, which include only samples that represent students' highest performance level. Best-work portfolios can help promote students' sense of competency (Spandel, 1997).

Portfolios

Systematic collections of students' work over an extended period that typically include self-reflections on learning.

The advantages of portfolio assessments are that they can be presented to parents as powerful evidence of their children's learning, promote students' metacognitive skills by engaging them in the self-evaluation of their learning, and promote a greater sense of autonomy than other assessment methods (Ezell & Klein, 2003; Juniewicz, 2003). Figure 12.8 shows a student self-reflection form for a fourth grade language arts portfolio.

Performance Assessments

Imagine your teacher asking you to conduct a science experiment in the science lab to show your skills. This type of alternative assessment, **performance assessment**, requires you to use knowledge and skills to complete a task or produce a product in more or less realistic contexts (Nitko, 2004). Students can write a paper explaining how to design an experiment to test how common household cleaners fight bacteria growth. Increasing levels of realism for the same type of task may ask students to use a computer simulation to test rates of bacteria growth or to actually conduct a science experiment in the school laboratory that shows bacteria growth.

Performance Assessment

A type of assessment that requires using knowledge and skills to complete a task or produce a product in more or less realistic contexts.

Performance assessments are common in content areas such as science, where students might demonstrate learning by conducting and reporting the results from their own experiments; athletics, where students might demonstrate learning by performing drills; and the performing arts, where students might demonstrate learning by participating in a school recital.

Note that a performance assessment is still considered a traditional assessment if it is contextualized as a school task rather than a real-life task. A classroom presentation about a historical event is a performance assessment, yet it is traditional in the sense that it does not ask students to demonstrate their learning within a real-world problem. Only when students perform under the highest level of realism are performance assessments called authentic assessments (Baker, O'Neil, & Linn, 1993; Meyer, 1992). Therefore, the terms *performance assessment* and *authentic assessment* should not be used as synonyms (McMillan, 2007).

Student Exhibitions and Journals

A less common type of alternative assessment is an exhibition, which requires students to display their learning products to an audience. The expectation is that, by preparing for these performances, students will stretch their abilities beyond those demonstrated through class projects and other more traditional assessments. When judged by a trained panel of peers and adults (e.g., teachers, parents, community members), exhibitions can help students understand the qualities of good work and how those qualities are manifested in their own work (Guskey & Bailey, 2001). The exhibition is typically a culmination of the students'

academic experience, so the presented work is expected to reflect the skills and knowledge gained over a relatively long period of time. Furthermore, exhibitions are intended to assess whether students can go beyond the classroom environment and work independently toward their goals. Exhibitions usually consist of an oral presentation and a *process-folio*, which is intended to capture the process of developing a project. Complete process-folios include the initial brainstorming ideas, drafts, sketches, and first critiques; collections of works by others that inspired students' products; self-critiques and critiques of peers, teachers, mentors, or outside experts; and self-reflections on how the student might build on the project in the future.

Student journals can be helpful alternative assessments when teachers need to gain a deeper understanding of students' thought processes and beliefs (Dunlap, 2006). Like portfolios, journals give students an opportunity to develop reflective and metacognitive skills by making them aware of their learning processes and achievements (Boud, 2001). To make journals effective assessment tools, however, you should keep in mind the following guidelines (Dunlap, 2006):

1. Provide students with cues or guided questions to help them focus their journal responses. Open-ended journaling may be a useful way to encourage students' creativity, but if you are interested in assessing specific learning processes or thoughts, you should be specific about what you want students to share with you.
2. Situate journal questions around students' actual experiences. For instance, a teacher who is interested in assessing the effectiveness of a group activity may want to ask "How did working with your group today help you learn?" rather than "What do you think about group work?"
3. Make sure your guiding questions specifically ask about the learning processes or thoughts that you are interested in assessing. Rather than asking "How much did you learn today?" a teacher who is interested in assessing the effectiveness of a graphic organizer may want to ask "Did the chart help you learn about trigonometry today? Why or why not?"
4. Ask a few students who are not members of your target audience to answer your journal question to ensure that it elicits the information you are trying to gather.
5. Use journaling when you have specific assessment questions to answer rather than as a routine self-assessment requirement. This will avoid burnout and maintain students' willingness to engage in journaling.
6. Change the wording of your prompts and questions, even if you are interested in assessing the same learning process or thought more than once. This will prevent students from getting bored and maintain the quantity and quality of their reflections.
7. Give students ample time to respond to self-assessment questions or allow them to respond in their own time. Reflection typically requires time and a stress-free environment to result in a meaningful response.
8. Provide examples of journal responses that show what you expect from students' responses. You can create your own responses to a question or ask permission of one of your students to share his/her responses with the class.
9. Encourage students to revisit their prior responses as a way to promote their awareness of growth over time as well as their strengths and areas needing improvement. This is why we include the "Think About It, Again!" activity at the end of each chapter.
10. Consider including students' journaling in your grading system, such as giving them points for producing complete and timely responses. This will communicate to them that their reflections are valuable and will maintain their motivation to reflect on their learning.

How to Create Effective Alternative Assessments

Portfolio assessments take significant time and effort to develop, making them less practical than other assessment methods. More problematic is the lack of strong evidence for

their reliability. Several studies show lack of interrater reliability: different raters (different teachers, for example) produce significantly different ratings when scoring the same portfolio (Cheung, 1995; Herman & Winters, 1994; Koretz, Stecher, & Deiber, 1993). Consequently, it is advisable to develop and use portfolio rubrics to improve their reliability and to use them in combination with other more traditional assessments (Figure 12.9). Classroom Tips: How to Make Portfolio Assessments More Effective offers strategies to increase the reliability of portfolios.

Like portfolios, performance assessments have not shown to be reliable measures of students' learning (Shavelson, Baxter, & Pine, 1992). Different performance assessments are found to yield different scores, and scores seem to be more related to students' aptitude than to what they were actually taught (Educational Testing Service, 1995; Linn, 1994; Supovitz & Brennan, 1997). In addition, performance assessments take significantly more

FIGURE 12.9 Sample high school portfolio grading rubric.

Source: Laurent Clerc National Deaf Education Center, Gallaudet University (2003).

PORTFOLIO CRITERIA		3 EXEMPLARY	2 PROFICIENT	1 NEEDS IMPROVEMENT	0 MISSING/ NOT EVIDENT
Organization	Section markers are well designed and labeled with dividers.				
	Evidence is logically organized.				
	Evidence is labeled and placed in the appropriate section.				
Evidence/content	All required evidence is included.				
	Evidence meets criteria.				
	Evidence reflects attention to detail: edited, free of errors, complete.				
	Evidence is interesting, thought-provoking, and demonstrates critical and creative thinking.				
	Evidence selected is representative of student's best knowledge and skills.				
	Evidence reflects student growth.				
Quality of reflection	Reflections indicate ability to analyze and critique own work.				
	Reflections are well-written including details and examples.				
	Reflections are linked to and supported by evidence in the student's portfolio.				
	Reflections identify and justify areas of growth and/or learning.				
	Reflections include steps for growth/improvement.				
	Reflections demonstrate complexity of self-assessment and meta-cognition.				
Overall appearance	Portfolio reflects time and care invested in preparation.				
	Portfolio is easily readable and pleasing to the eye.				
	Portfolio evidence is maintained in good condition.				
	Portfolio demonstrates creativity and originality.				
	Portfolio design is well balanced, artistic, and indicative of individuality.				
Goal-setting/ self-assessment	Student puts effort into achieving product goal.				
	Student identifies strengths and areas for improvement related to portfolio product.				
	GRADE				

CLASSROOM TIPS

How to Make Portfolio Assessments More Effective

- *Establish the purpose of the portfolio ahead of time.* Is the goal of the portfolio to promote students' self-assessment, sense of competency, or particular skills? Is the goal to show learning progress or students' best work?
- *Establish the consumer of the portfolio.* Who will be presented with the portfolio? If the consumers are the students themselves, teachers should plan periodic student–teacher conferences to review progress (McMillan, 2007). If the consumers are parents, teachers should plan student-led parent conferences so that they can demonstrate what they learned (Borba & Olvera, 2001).
- *Establish what type of evidence will be collected ahead of time and the procedure for selecting evidence to be included in the portfolio.* How many pieces will the portfolio have? Will it include students' artifacts, self-reflections, reproductions of student work outside the classroom? Will the student be involved in selecting the portfolio materials?
- *Establish the evaluation criteria ahead of time.* What knowledge and skills is the portfolio intended to demonstrate? How will you describe different levels of accomplishment and corresponding grades? Will students have the opportunity to evaluate their own work?

time to construct, administer, and score than more objective tests. On the other hand, research shows that performance assessments are more motivating than traditional paper-and-pencil assessments (Khattri & Sweet, 1996; Paris & Paris, 2001; Resnick & Resnick, 1996).

To overcome their limitations, performance assessments should clearly define the type of performance that will be assessed and the scoring criteria. Using a scoring rubric to grade performance assessments increases their reliability and validity (Stiggins, 2005) and enhances student achievement (Schafer, Swanson, Bené, & Newberry, 2001). Performance rubrics set the criteria used to judge performance, including the range in quality of the performance, with a corresponding description of how each quality level is differentiated from another and the score given for each level of quality (Meir, Rich, & Cady, 2006). Figure 12.10 shows an example of a performance rubric for an oral presentation.

FIGURE 12.10 **Sample performance assessment for a high school oral presentation.**

	EXEMPLARY	PROFICIENT	DEVELOPING	NEEDS IMPROVEMENT
CONTENT	Material relates to thesis Points are clearly articulated and support thesis	Sufficient information relates to thesis Points are made, yet there is little variation	Information is not clearly related to thesis	Thesis is unclear Information included does not support thesis
ORGANIZATION	Thesis clearly stated Appropriate examples Transitions between ideas Clear introduction and conclusion	Information presented in logical sequence Well organized Needs clear transitions between ideas	Concepts and ideas loosely connected Lacks clear transitions Flow and organizations are choppy	Development of thesis is vague No logical order to presentation
CREATIVITY	Original presentation of material Variety of materials and media	Some originality Variety of materials	Little originality Little variation of materials presented	Repetitive with little or no variety Lack of multimedia materials
SPEAKING SKILLS	Clear articulation Proper volume Even rate Eye contact Enthusiasm and confidence	Clear articulation Presentation is not polished	Some mumbling Little eye contact Uneven rate Little or no expression	Inaudible No eye contact Rate too slow or fast Speaker seems uninterested in topic
AUDIENCE ENGAGEMENT	Involves the audience Points made in creative way Holds the audience's attention	Presents facts in an interesting way Holds the audience's attention most of the time	Some related facts, yet went off topic Lost audience's attention	No clear point to presentation Audience lost interest
LENGTH OF PRESENTATION	Within allotted time	Within allotted time +/– 2–3 minutes	Within allotted time +/– 4–5 minutes	Too long or too short

Dance Performance Checklist

Directions: Indicate with a checkmark whether the student demonstrated each of the following skills while conducting a dance performance. Students will receive a score between 0 and 5, resulting from the sum of each checkmark.

Student Name _____

- ☐ The student pointed her toes during the dance.
- ☐ The student made eye contact with the audience during the dance.
- ☐ The student demonstrated good turning techniques.
- ☐ The student demonstrated good jumping techniques.
- ☐ The student changed facial expressions in correspondence to music changes.

Total Score _____

FIGURE 12.11 Sample performance assessment checklist.

Other performance grading methods include creating checklists of the required tasks that teachers can check as students perform, or specifying criteria for different performance levels (i.e., using a rating scale). A dance teacher may use the five-item checklist shown in Figure 12.11 or the rating scales shown in Figure 12.12 to assess a dance performance.

Dance Performance Checklist

Directions: Indicate with a checkmark the degree to which the student demonstrated each of the following skills while conducting a dance performance. Students will receive a score between 5 and 25, resulting from the sum of each checkmark.

Student Name _____

(1) The student pointed her toes during the dance.

1 _____ 2 _____ 3 _____ 4 _____ 5

Never | Less than average | Average | More than average | At all times

(2) The student made eye contact with the audience during the dance.

1 _____ 2 _____ 3 _____ 4 _____ 5

Never | Less than average | Average | More than average | At all times

(3) The student demonstrated good turning techniques.

1 _____ 2 _____ 3 _____ 4 _____ 5

Never | Less than average | Average | More than average | At all times

(4) The student demonstrated good jumping techniques.

1 _____ 2 _____ 3 _____ 4 _____ 5

Never | Less than average | Average | More than average | At all times

(5) The student changed facial expressions in correspondence to music changes.

1 _____ 2 _____ 3 _____ 4 _____ 5

Never | Less than average | Average | More than average | At all times

Total Score _____

FIGURE 12.12 Sample performance assessment 5-point rating scale.

Lastly, exhibitions present the same challenges as those described for portfolios and performance assessments. Because they depend on the judgment of the teacher or a panel, their objectivity, reliability, and validity will be at stake unless scorers are experienced and scoring rubrics are well constructed and aligned with learning objectives.

Get Connected!

ANIMATION ASSIGNMENT. . . Classroom Assessment Strategies

Go to your WileyPlus course and watch the animation on two teachers, a mentor and a mentee educator, who are using alternative forms of assessment in their classrooms. Be prepared to discuss the differing ways in which the teachers assess their students.



UNDERSTANDING THE ASSESSMENT CYCLE

Let's investigate how to integrate assessment into your classroom practice. To help you visualize this process, Figure 12.13 shows a classroom assessment cycle consisting of four stages: planning; administering; evaluating and revising; and communicating the results of assessments to relevant parties such as students, parents, and administrators.

Notice the tight relationship between assessment and instruction planning: Once assessment data has been collected and evaluated, you can use the information you gained to plan instruction and future assessments. Let's see what each of the assessment cycle stages entails.

Planning

The first step in classroom assessment consists of planning and focuses on finding answers to these questions: What should I assess? How should I assess? When should I assess?

What Should I Assess? To answer this question, teachers should take into consideration the standards from:

- The school district curriculum
- The state standards
- The national standards and benchmarks

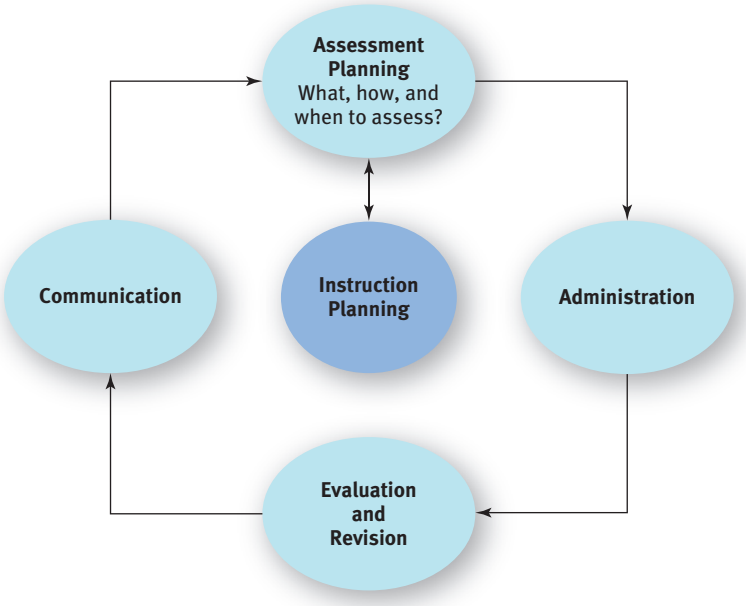


FIGURE 12.13 The assessment cycle.

To help make sense of these different sources of standards, teachers can create a table of specifications (see the earlier discussion of content validity) to plan the type of skills and knowledge they want their students to learn.

There are national standards created by professional organizations in each of the disciplines—math, science, English language arts, history, physical education, civics, economics, health, and social studies (Marzano & Kendall, 1996). Table 12.1 lists sources for national standards by discipline.

In addition to standards, there are benchmarks, which are more specific than standards. States typically set their own education standards and often leave the benchmarks to be set by the school districts (Butler & McMunn, 2006). **Standards** are broad statements of what should be taught at each grade level and for each content area. **Benchmarks** are more specific statements of the types of behaviors or products that students can produce to meet the standards. Depending on the state, standards and benchmarks may also be referred to as competencies, objectives, or goals. Benchmark statements typically include action verbs that can help the teacher determine the best method to use in assessing whether a student has met the standard. See Table 12.2 for an example of the difference between a standard and a benchmark. For Massachusetts, a language arts teacher may decide that one of her learning objectives is to have students write a letter to the local newspaper about an issue that affects them.

Standards

Broad statements of what should be taught at each grade level and for each content area.

Benchmarks

More specific statements of the type of behaviors or products that students can produce to meet the standards.

Louisiana states the general writing standard as, "Students will write competently for a variety of purposes and audiences" and includes the following benchmarks: "Write multi-paragraph compositions (150–200 words) that clearly imply a central idea with supporting details in a logical, sequential order. Use language, concepts, and ideas that show an awareness of intended audience and/or purpose (e.g., classroom, real-life, workplace) in developing complex compositions" (Louisiana Language Arts Content Standards, 2004).

TABLE 12.1

Professional organizations for national standards by discipline.

DISCIPLINE	PROFESSIONAL ORGANIZATIONS FOR NATIONAL STANDARDS
Arts	National Standards for Arts Education: What Every Young American Should Be Able to Do in the Arts
Civics	National Standards for Civics and Government
Economics	Content Statements for State Standards in Economics
Foreign Language	Standards for Foreign Language Learning: Preparing for the 21st Century
Geography	Geography for Life: National Geography Standards
Health	National Health Education Standards: Achieving Health Literacy
History	National Standards for History: Basic Edition
Language Arts	Standards for the English Language Arts
Mathematics	Curriculum and Evaluation Standards for School Mathematics
Physical Education	Moving into the Future: National Standards for Physical Education
Science	National Science Education Standards
Social Studies	Expectations of Excellence: Curriculum Standards for Social Studies

TABLE 12.2

The difference between standards and benchmarks.

WRITING STANDARD GRADES 5–8 IN MASSACHUSETTS	WRITING BENCHMARKS GRADES 5–8 IN MASSACHUSETTS
"Students will write with a clear focus, coherent organization, and sufficient detail."	Writing brief research reports with coherent organization, and clear focus and supporting details Writing a short explanation of a process that includes a topic statement, supporting details, and a conclusion Writing formal letters to correspondents such as authors, newspapers, businesses, or government officials. (Massachusetts English Language Arts Curriculum Framework, 2001).

Keep in mind that national and state standards may not be identical and may even differ from the school curriculum or adopted textbook. Importantly, the curricular standards and benchmarks may not be aligned with a particular textbook because textbook authors cannot cover all the possible standard and benchmark differences among different states. Therefore, selecting texts and instructional materials and planning instruction to ensure that all standards are being covered is a major task for the beginning teacher. For example:

- The national standard from the National Council of Teachers of English (NCTE) states that "Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience" (NCTE, 2007).
- The state of New Mexico's seventh-grade benchmark is for students to "Produce research reports and technical writings that communicate information effectively to a specific audience" (New Mexico Language Arts Standards, 2000).

Yet the school curriculum might specify that all seventh-graders choose a topic related to social studies to research and present to the class.

Once teachers are knowledgeable about the curricular standards and benchmarks, then they can start planning their learning objectives and corresponding classroom assessments that can demonstrate achievement of those objectives. Keep in mind that although many districts or schools may use the same standard across grade levels, the expectations of what students should be able to do to meet the standard will differ across grades (see Figure 12.14 on the next page).

How Should I Assess? The next step in planning your assessments consists of determining how to assess students' learning by choosing from a variety of assessment methods. Our review of traditional and alternative assessments showed that teachers have several options when it comes to deciding on how to assess their students and that each of the assessment options has its strengths and weaknesses. Take into consideration learning objectives to determine when a certain type of assessment is appropriate. If your objectives are that students acquire and understand a large body of information, traditional assessments such as a combination of multiple-choice and short-answer items are appropriate. If your objectives are that students develop their ideas and skills in relation to a specific task, a performance assessment may be more appropriate. Ideally, you want to develop the best assessment method for every objective, and this will likely require a combination of alternative

FIGURE 12.14 Assessment examples for the same standard in fourth, sixth, and eighth grades.

National Standard in Mathematics: Students will understand measurable attributes of objects and the units, systems, and process of measurement (National Council of Teachers of Mathematics, 2000).

Fourth-Grade Assessment
Use a ruler to answer this question.

S T

Which is closest to the length in inches of line segment *ST*?
A. 1 in.
B. 1 ½ in.
C. 2 in.
D. 2 ½ in.

Sixth-Grade Assessment
Mrs. Huang showed her students a map of Minnesota. According to the map scale, 1 inch of the map represents 100 actual miles. Which strategy can Mrs. Huang's students use to find the actual distance in miles between points on the map?

A. Measure the number of inches between points and then divide by 100
B. Measure the number of inches between points and then multiply by 100
C. Measure the number of inches between points and then subtract 100
D. Measure the number of inches between points and then add 100

Eighth-Grade Assessment
Lauren is designing her school's yearbook. She has a photo with a height of 4" and width of 6". She needs to enlarge the picture proportionally to fit a space with a height of 7". What will the new width of the photo need to be?

A. 4 ⅔ in.
B. 10 ½ in.
C. 11 ⅔ in.
D. 14 ½ in.
E. 17 in.

and traditional assessments (Shepard, 2000). Remember that teachers need to gather enough samples and sufficiently varied samples of what students know and are able to do if they are to make confident conclusions about student learning.

When Should I Assess? Research suggests that frequent assessments promote deeper learning because they provide regular information about students' progress (Crooks, 1988; Dempster, 1991; Glover, 1989). Frequent assessments motivate students to study regularly; they also reduce the anxiety associated with classroom assessments because more than a few assessments contribute to students' final grade (Sax, 1997). There is also evidence for the effectiveness of *cumulative testing*, assessments that ask students to apply information learned previously to answer a new question or problem. An example of cumulative testing in this text is the section Connect What You Learned to Other Chapters at the end of each chapter. Notice how each chapter keeps adding questions that relate to previous chapters in order to help you integrate new information with the knowledge you acquired from reading the preceding chapters.

Students learn more when they are assessed soon after they learn the instructional material and are then retested later (Dempster, 1993). This is why it works best to answer the questions in Test Your Knowledge and Understanding (at the end of each chapter of this text) immediately after you read the chapter. Completing Test Your Knowledge and Understanding, in combination with other tests or quizzes, will increase the likelihood that you will master the materials in this chapter. In sum, students should have many opportunities to review, practice, and get feedback on what is taught.

Administering

The second step in the assessment cycle consists of administering your assessments in a way that ensures that the results truly reflect what students know or are able to do. Teachers need to create an environment that is comfortable and minimizes students' potential distractions and anxiety. To this end, experts recommend the following practices:

- *Create a comfortable and organized environment.* Students will be more likely to demonstrate what they have learned when the assessment environment has acceptable temperature and lighting conditions. To minimize time off-task, make sure that students have the necessary materials to complete the assessment ahead of time. For individual traditional assessments, students should have their pen, pencils, paper, erasers, rulers, calculators, and so on at hand and a private space to work on that is clean and free of distractions. For projects or presentations, make sure that the necessary equipment is ready and in place before starting the assessment.
- *Keep the assessment environment as similar as possible to the learning environment.* Students who learn information in a specific emotional state or environmental context recall information better when they are in a matching emotional state or context (Overton, 1985; Schramke & Bower, 1997). This phenomenon, called **state-dependent learning** (Tulving & Osler, 1968), is the reason students perform better when tested in the same room in which they studied as compared to when they are tested in a different room. The idea of state-dependent learning is consistent with situated learning theory (see Chapter 8), which views learning as a phenomenon that cannot be separated from the context in which it occurs (Putnam & Borko, 2000; Rogoff, 1990).

State-Dependent Learning

The phenomenon of recalling information better when one is in an emotional state or context that matches the emotional state or context in which information was learned.

- *Monitor your students as they are being assessed.* Teachers should be available during the administration of classroom assessments and encourage students to ask for clarification when they are uncertain about a question or task. This is especially important for minority students, who may be less willing to ask questions during formal assessments (Cheng, 1987). In addition, teachers should monitor students' performance carefully. This will not only prevent cheating, which makes assessment invalid (Bracey, 2005), but also will allow you to become an available source of support when students' behavior suggests that they are lost or need clarification.
- *Give precise directions before and during your assessments.* To minimize anxiety, provide students with clear instructions and time limits for completing classroom assessments. This is particularly important for students who are underachievers or are anxious about tests (Elliott & Thurlow, 2000). For younger students or demanding projects, provide additional guidance and scaffolding by building subgoals within the larger time frame for completion. In a paper assignment, you might set a specific time for presenting a brief abstract of the main ideas first and have another checkpoint for presenting a rough draft of the paper before final submission. For objective assessments, specify how many grade points are assigned per question. For subjective assessments, specify the elements or characteristics of a range of quality performances with corresponding grade points in the form of a rubric. Clarifying student expectations will not only reduce anxiety but also increase the reliability of your assessments.

Evaluating and Revising

Teachers evaluate students' learning by scoring assessments based on answer keys, rubrics, performance scales, or checklists. The results of this evaluation can help teachers decide whether a particular student or the class as a whole needs to review certain concepts or not.

If the whole class has not done well on a particular assessment item, the problem could reside in the assessment or in insufficient or inappropriate instruction. One way to determine if the assessment was not effective is to ask students to explain how they interpreted it. In many cases, poor instructions or ambiguous wording of a question can make an assessment invalid.

Because valid and reliable assessment items are difficult to develop, it is important to analyze items after scoring, keep those that worked well, and take notes about the ones that did not work well and revise them in future assessments. As time goes by, you will eventually have developed a large and effective database of assessment items from which to draw in your practice. Assessment specialists call this an item bank or **test bank**.

Test Bank

A large and effective database of assessment items from which teachers can draw from when developing tests.

Consider evaluating the degree of difficulty of items when you are evaluating the effectiveness of an assessment. To calculate an *item difficulty index* (also known as p), divide the number of students that responded correctly to the item by the total number of students who took the assessment. If you have 30 students in your class and 15 of them answered the item correctly, your difficulty index is 0.5. In general, items with p values of 0.75 or higher are considered easy and those with values of 0.25 or lower are considered difficult.

According to assessment experts, effective assessments have most item difficulty indexes in the 0.40 to 0.60 range and only a few easy or difficult items. If none of your students got a certain item right ($p = 0$), it could mean either that your students have not mastered the concept/skill assessed yet or that the item was not well designed to accurately measure what your students had learned. If all your students got a certain item right ($p = 1$), it could mean that all have mastered the concept/skill assessed or that the item provided clues for any student to correctly answer the question, regardless of how much they learned.

Another analysis to consider during this stage is called item discrimination. The *discriminative power* of an item is its ability to discriminate between students who scored high and those who scored low on the *entire* test. Ideally, you want assessments to discriminate between students who have learned and those who have not learned a concept. Although as teachers we hope that all students get straight A's in all assessments, this is hardly ever the case.

If the students who did well in most of a test got a particular item wrong but the students who did poorly in most of a test got the same item right, that item is not allowing you to appropriately discriminate among them. You can calculate an item discrimination index (also known as D) by using the following formula:

$$D = \frac{\text{Number of High-Scoring Students Who Got the Item Right}}{\text{Total Number of High-Scoring Students}} - \frac{\text{Number of Low-Scoring Students Who Got the Item Right}}{\text{Total Number of Low-Scoring Students}}$$

Applying this formula gives you a number between −1 and 1. A positive D value indicates that a greater proportion of high-scoring students have correctly responded to the item. A negative D value indicates that a greater proportion of low-scoring students have correctly responded to the item and suggests that the item may need revision. D and p values can guide teachers' assessment revisions.

Communicating

The outcomes of classroom assessments may be communicated to students, parents, or administrators. Providing assessment feedback to students is crucial to promote learning and the motivation to learn (Olina & Sullivan, 2004). Although student–teacher conferences are more typically used for providing feedback about performance on projects or essays, they can also be useful to help students learn about their understanding of knowledge or skills assessed with multiple-choice tests. In addition, because conferences have the advantage of allowing for dialogue, they promote students' sense of autonomy by giving them an opportunity to react to

TABLE 12.3

Characteristics of effective feedback.

1. *Objectivity*: Feedback accurately represents what students have accomplished or missed in the assessment, rather than what the teacher may believe that students are able to do (Elawar & Corno, 1985; Sadler, 1989).
2. *Specificity*: Feedback clearly describes what students accomplished or missed in the assessment rather than being a generic judgment of their performance, such as telling students that they have done a good or fairly good job (Brookhart, 2001; Guskey, 2001).
3. *Positiveness*: Feedback has a positive tone and does not focus only on criticisms. Remember that a sense of competency can be nourished by communicating and celebrating students' success and progress (Stipek, 2002).

teacher comments. Personally communicating the results of classroom assessments helps correct students' misconceptions, and the positive comments about students' good performance motivates them to do better in the future (Bridgeman, 1974; Page, 1992). Therefore, it is important to think carefully about how to communicate student performance to ensure that feedback is constructive and that students can learn from their mistakes. The characteristics of effective feedback are summarized in Table 12.3.

Classroom assessments should also be communicated to students' parents, to help them decide whether and how they can support their children's learning. Communicating students' success to their parents, such as sending home a good report card, promotes parents' home-based reinforcement (Barth, 1979). In addition to report cards, teachers can report students' progress to their parents by attaching explanatory notes to the report card, making personal calls, scheduling parent–teacher conferences or student-led parent conferences, attending school open houses, and setting up home visits (Guskey & Bailey, 2001).

When communicating with parents about students' performance, make sure that you provide objective, specific, and positive feedback and that you create a friendly, open environment conducive to making parents your partner in helping their child succeed. Start and end with a positive comment about the student, actively listen to parents' concerns, plan strategies together that can help the student achieve your learning goals, and follow up on the issues discussed during the conference (Fromberg & Driscoll, 1985).

Last but not least, teachers should be careful to communicate grades in private. According to the **Family Educational Rights and Privacy Act** (**FERPA**), also called the Buckley amendment, students and their parents/guardians have the right to access any school records. The law also prohibits revealing student information to any third party unless it is done with the consent of the student (if at least 18 years of age) or his/her parent or guardian. Therefore, avoid posting student scores or grades with identifying information, asking one student to score another student's work, or using any practice that might reveal the scores of another student.

Family Educational Rights and Privacy Act (FERPA)

A *federal law* stating that educational agencies and institutions that receive funding under a program administered by the U. S. Department of Education must provide students and their parents/guardians with access to their education records, an opportunity to seek to have the records amended, and control over the disclosure of information from the records.

According to FERPA, parents and students who are at least 18 years old also have the right to review test scores and other school records. School personnel have the obligation to present and interpret the information in a way that students and parents can understand. This last prescription emphasizes the need to carefully plan your assessments in alignment with your instructional goals and to understand how every score has been derived (e.g., what is the criteria or norm used in grading) so that you can help students and parents make sense of your grading system. If your grading is not defensible because it lacks a good rationale, students and/or parents can eventually challenge your grading process. Classroom Tips: How to Put the Assessment Cycle into Practice summarizes some useful instructional principles from this section with corresponding classroom examples.

CLASSROOM TIPS

How to Put the Assessment Cycle into Practice

Principle	Classroom Examples
Align your assessments with your learning objectives and activities. To ensure the validity of your classroom assessments, design assessments to be consistent with the level of knowledge and skills that you intend to teach.	Ms. Gomez has taken the week before school starts to design the syllabi for her three courses. She started by writing her course objectives based on her state standards and benchmarks. Today, she plans to design her assessments to measure the knowledge and skills needed to meet her course objectives. Tomorrow she will plan corresponding lessons aimed at promoting such knowledge and skills.
Use a variety of assessment methods. Different types of assessments have different strengths and weaknesses, and students will respond to some better than others. So use a variety of assessment methods in your classroom.	Before school started, Mr. Erikson wrote his second-grade math objectives, taking the state and national standards into consideration. To assess how well his students meet such objectives, he plans on using drills; having students compile a portfolio with their work, including reflections on their progress; and assigning projects in which students need to apply math to solve real-world problems.
Share your assessment plans with your students. Help students regulate their learning by letting them know as early as possible about the purpose, type, and timing of classroom assessments.	At the beginning of each new unit in physical education, Mrs. Johns tells her students the learning objective and standards that will be met, the activities they will be engaging in to meet those standards, and how she will be assessing their learning.
Provide standardized administration conditions. To increase reliability, make sure that you have created assessment conditions that are identical for all students, unless students require specific accommodations due to an exceptionality.	Mrs. Baird teaches high school math classes. On assessment days, she creates a standardized environment by arranging students into rows with plenty of space between them, making sure that all students have clean desks and the same supplies, prohibiting the use of cell phones, and refusing to answer any question that is not shared with the rest of the class.
Evaluate assessments with a grading key or rubric. To prevent bias in scoring classroom assessments and increase their reliability, develop grading keys or rubrics criteria ahead of time to evaluate students' performance.	As part of a test, Ms. Tinkerson wrote an essay question regarding the causes of the Civil War. She then carefully designed a rubric to help her evaluate her students' mastery of the target concepts and their writing skill. During the test, she shares the grading rubric with her students.
Reflect and revise. Continually reflect on whether the classroom assessments you chose are the best methods to assess your learning objectives and engage in the thoughtful review of assessments as needed.	Mr. Morris has been teaching sixth-grade English for 20 years, and he still enjoys attending professional development workshops and seminars on classroom assessments. He feels that sharing his experiences with other teachers and learning about new assessment methods has helped him become a more reflective practitioner.
Make sure you can defend your grading system. Clearly communicate your assessment rationale and results so that students and parents can learn from the information and cooperate in promoting students' academic success.	Through several years of teaching, Ms. Gipson has found an effective method to make her grading system both understandable and defensible. She starts by sharing the system with her students on the first day of class and posting it in her classroom. In addition, she shares her grading scheme with students' parents both in her introductory letter and at Back to School night. Finally, she makes sure that her lesson plans include sufficient time to explain how students' assignments will be graded and why.

GRADING SYSTEMS

Grading is the process of taking the combination of assessments used in your classroom, translating their results into a scale that has evaluative meaning, and reporting the results in a formal way (Hogan, 2007). Grading happens during the evaluating and revising stage of the assessment cycle and is followed by communicating meaningful information about students' learning and achievement to relevant parties (i.e., students, parents, administrators) during the communication stage of the assessment cycle (Butler & McMunn, 2006).

ISSUES IN EDUCATION

Does retaining students help their future academic success?

When students fail a grade, they are typically held back and asked to repeat the same grade until they show mastery of the corresponding learning objectives. The rationale for retaining students is that they need to demonstrate learning of the knowledge and skills required at each grade level to be able to grow academically. Promoting unprepared students can only hurt because they will be behind the rest of the class. What do you think about this argument? A response to this question can be found at the end of the chapter.

Grades can serve the following three purposes:

- *Administrative:* helping determine students' ranking in a class, credits for graduation, and promotion to the next grade
- *Informational:* communicating to students and parents the teacher's overall conclusion about how well the student met instructional objectives and suggesting directions for future learning
- *Motivational:* promoting students' effort by extrinsically rewarding achievement

Teachers have choices when it comes to deciding on a grading system for their classrooms. Because experts recommend that districts develop grading policies to help teachers' decision making, some school districts have a standard system that they ask their teachers to adopt (Munk & Bursuck, 1998). Yet, even in this case, teachers will need to decide on many grading questions such as: Should I use students' homework as part of my grading system? Should I create a point or a percentage system? Should I consider students' ability and effort when grading? This section discusses classroom grading system practices to consider when deciding on your own grading system.

Criterion-Referenced and Norm-Referenced Grading

Criterion-referenced assessments measure students' performance relative to predetermined criteria or standards; and **norm-referenced assessments** compare students' performance to that of their peers or a group of age-mates across the nation. Norm-referenced assessments get their name from the fact that students' performance is compared to that of a *norm* group (see Chapter 13 for additional information about norm groups used in standardized tests). Table 12.4 shows an example of how to assign grades based on a norm-referenced assessment. As you see, the number of A's, B's, C's, D's, and F's are already predetermined.

Criterion-Referenced Assessments

Assessments that measure students' performance relative to predetermined criteria or standards.

Norm-Referenced Assessments

Assessments in which students' performance is compared to that of their peers or a group of age-mates across the nation.

TABLE 12.4

An example of a norm-referenced assessment grading system.

STUDENTS WHOSE TEST SCORE FALLS . . .	. . . IS GIVEN A LETTER GRADE OF . . .
Within the top 15% of the norm score	A
Within the next 20% of the norm score	B
Within the next 30% of the norm score	C
Within the next 20% of the norm score	D
Within the next 15% of the norm score	F

TABLE 12.5

A typical criterion-referenced assessment grading system.

STUDENTS WHOSE TEST SCORE FALLS . . .	. . . IS GIVEN A LETTER GRADE OF . . .
Within the top 10% of the criterion score	A
Within the next 10% of the criterion score	B
Within the next 10% of the criterion score	C
Within the next 10% of the criterion score	D
Within the next 60% of the criterion score	F

Teachers need only to rank the test scores to come up with a letter grade for each student. Specifically, norm-referenced grading involves the following steps:

1. Establish the percentage of students that will receive each grade. Table 12.4 shows that the teacher decided to give A's to the top 15% of her students.
2. Rank the scores from highest to lowest.
3. Calculate which test scores fall within each category and assign the corresponding grades.

Compare the grading system shown in Table 12.4 to the familiar criterion-referenced assessment grading scheme shown in Table 12.5. In this example, each student grade will depend on the percentage of material that has been mastered as compared to the maximum potential score. The scores of the classroom peers or any other reference group do not have an effect on students' final letter grade.

Criterion-referenced assessments are particularly useful when the knowledge domain is well defined. Criterion-referenced assessments are typically used for professional licensing exams and minimum competency exams, which require scoring above a certain mastery level to pass the test. Criterion-referenced grading involves the following steps:

1. Establish the criteria for assigning grades on the basis of the percentage of items answered correctly. Table 12.5 shows that the teacher decided to give A's to all students who answered 90% or more of the items correctly.
2. Calculate which scores fall within each letter grade and assign grades accordingly.

Although norm-referenced assessments are appropriate to meet the objectives underlying standardized testing, teachers mostly rely on criterion-referenced assessments, which are more likely to promote motivation by de-emphasizing competition and focusing on informational feedback (Haladyna, 2002; Stiggins, 2005). An additional advantage of criterion-referenced grading is that the grade is more meaningful to parents. It is much more useful to know that your child mastered 85% of the objectives of a unit than to know that he/she outperformed 85% of his/her classmates.

There are two situations in which norm-referenced grading may be appropriate. One case is when there is a limited-enrollment program such as an honors program, with only a few students selected from a large pool of applicants. The second case is when teachers need to evaluate advanced learning levels, in which all students have mastered required standards yet teachers wish to encourage students to learn as much additional information as possible.

Point and Percent Grading

Once you have made a decision about the type of assessments you will use in your classroom, you need to decide the weight that each one will have in your grading system. *Point grading systems* are those in which each classroom assessment is assigned a certain

TABLE 12.6

A point grading system example.

Tests	200 points
Performance assessment	100 points
Group projects	100 points
Homework	100 points
Total maximum points	500 points
Final grade (determined by accumulated points)	
A	500–450 points
B	400–449 points
C	350–399 points
D	300–349 points
F	Less than 300 points

maximum number of possible points, depending on its relative importance. Students accumulate points as they take different assessments; at the end of the grading period, points are transformed into percentages and/or letter grades. Take a look at the grading system shown in Table 12.6.

In this system, the teacher gives equal weight to traditional (e.g., tests) and alternative (e.g., performance and projects) assessments, with each counting for up to 200 points of students' total grade. In addition, she applies what is known about effective homework practices according to research by collecting, scoring, and including up to 100 points in her grading system for completed homework assignments (Cooper, Lindsay, Nye, & Greathouse, 1998; Stein & Carnine, 1999). Using the breakdown of letter grades shown in Table 12.6, the teacher can then transform students' final accumulated points into a corresponding letter grade. A student who accumulated a total of 490 points will receive an A because 490 points fall within the 450-500 bracket.

Alternatively, a teacher may decide on a *percentage grading system*, where each classroom assessment is assigned a certain number of maximum possible points on a 100-point grading system and then final grades are calculated by averaging the percentages of all assessments. If a student gets 9 out of 10 problems correct in a summative test (90%), completes 16 out of 20 homework assignments (80%), and gets a score of 36 out of 50 possible points on a performance assessment according to a scoring rubric (72%), the final grade will be the average of the three percentages (80.67%), resulting in a B according to the scheme in Table 12.7.

Although the percentage grading system is easy to use and to explain to students and parents, a limitation is that by averaging the percentage of all assessments, they are all given the same weight. Take the following case. A student gets 3 out of 5 problems right

TABLE 12.7

A percentage grading system example.

A	B	C	D	F
90–100	80–89	70–79	60–69	Below 60

in a quiz (60%) and solves 18 out of 20 problems correctly (90%) in a test, resulting in an average percentage grade of 75, the equivalent of a C. If we had used a point system instead, the grade would have been calculated as the total accumulated points (i.e., 21) divided by the maximum potential score of 25 and would have resulted in a B.

Use a percentage grading system only if your assessments are similar in length or when different assessments carry similar weights. Teachers can, however, assign different weights to help percentage grading more accurately reflect how much of the target knowledge and skills the student has mastered (Popham, 2005). In our previous example, a teacher may decide that tests have twice the weight of quizzes, in which case the final grade can be computed as 60% + 2(90%) = 80%, which corresponds to a B.

Participation and Attitude Grading

Assessment experts do not recommend using students' participation and attitude as part of a grading system (Linn & Miller, 2005; McMillan, Myran, & Workman, 2002). Grading systems that award students points for merely participating or turning in a project reduce

South River Elementary School
Grade 5
Student _____ Teacher _____ Principal _____ Quarter: 1 2 3 4
Achievement:

5	4	3	2	1
Student work is **consistently above** grade-level expectations for this quarter.	Student work **meets** grade-level expectations for this quarter.	Student work **shows progress** and **almost meets** grade-level expectations for this quarter.	Student work **shows progress** but is **not meeting** grade-level expectations for this quarter.	Student work **shows little or no progress** and is **not meeting** grade-level expectations for this quarter.

Personal Development and Work Habits
Study Skills
___ Participates in class
___ Listens to/follows directions
___ Manages time and materials
___ Shows effort in class work
___ Completes classroom assignments on time
___ Completes homework on time
Social Skills
___ Demonstrates respect for self and others
___ Performs effectively on a team
___ Practices self-control
Language Arts
Reading
___ Reads grade-level text accurately and fluently
___ Uses reading strategies when needed
___ Reads independently
___ Uses writing to respond to text
___ Draws inferences, conclusions, and generalizations and supports with evidence
___ Understands and explains the figurative and metaphorical use of words in context
Writing
___ Writes multiple-paragraph compositions using supporting facts, details, and/or examples
___ Uses the writing process (draft to final copy) to write research reports, persuasive letters, responses to literature, narratives, and summaries
___ Uses technology to research and enhance writing
___ Uses grade-level conventions correctly
___ Spells grade-level words correctly in written work
Listening and Speaking
___ Clarifies and supports spoken ideas with evidence and examples
___ Creates presentations about an idea, issue, or event and develops the topic with facts, details, and explanations

FIGURE 12.15
Sample elementary school report card.

learning and motivation (Feldman, Alibrandi, & Kropkf, 1998). Although many primary school teachers grade students' behavior and work habits in the classroom, it is recommended that these ratings are kept separate from their academic grades. A report card may include students' final grades in each subject using a letter grade system and be followed by a list of desirable behaviors with corresponding marks for satisfactory, needs improvement, and unsatisfactory performance. Figures 12.15 and 12.16 show sample report cards for elementary and middle school, respectively. Most schools provide report cards four or six times per year or every six to nine weeks of instruction.

Other grading practices that are discouraged are the following:

- *Assigning zero scores for missed assignments.* Experts recommend assigning a minimum score of 60 points (F grades typically range between 0 and 60 points) or allowing students to drop one missed or poor assignment because a zero score can skew the average grade beyond the point of recovery (McMillan, 2007).
- *Basing grades solely on students' improvement.* Because some students will already possess some of the knowledge and skills in the curriculum, basing grades on improvement will punish these students with lower grades and they will be likely to perform poorly at the beginning of the year in order to achieve higher improvement grades later on (Airasian, 2008).
- *Basing grades on students' effort.* Because effort cannot be objectively measured, you will not be able to justify differences in grades among students based solely on effort. Recall that when assessments are unreliable, they cannot be valid measures of learning. Moreover, experts argue that when effort is taken into consideration for grading purposes, students who perform at a higher level are punished because teachers typically assume that they do not have to invest as much effort as their lower-achieving classmates (Brookhart, 2004).
- *Giving extra credit.* Grades should represent the extent to which students have achieved learning goals as based on their performance on valid and reliable assessments that are fair for all students. Because extra-credit projects assigned to a few underachieving students are typically insufficient to demonstrate mastery of the content, they are difficult to justify. Studies show that extra credit is mostly given to students who fail to meet learning objectives, which means that students are no longer evaluated with the same criteria, an essential characteristic of good assessments (Hassel & Lourey, 2005). Instead of creating extra-credit assignments that cannot compensate for students' learning gaps, consider offering mastery opportunities or letting students redo work for partial credit. This approach will promote a mastery orientation to learning in your students and reinforce the view that grades are a communication tool, not a commodity (Winger, 2005).

American Southwest Middle School Report Card

Student Name _____ ID _____

Subject	Term 1	Term 2	Term 3	Term 4
Reading				
Writing				
Science				
Math				
Phys Ed				
Social Studies				
Spanish				
Art				

Grading Code
A: Excellent; B: Very Good; C: Fair; D: Below standards; F: Failure; NG: No grade

Cooperates with peers
Pays attention during class
Completes homework in a timely manner
Tries hard in face of challenge

Grading Code
S: Satisfactory; N: Needs improvement; U: Unsatisfactory

Attendance
Days absent _____ Days tardy _____

FIGURE 12.16 **Sample middle school report card.**

Now that you have had a chance to learn about classroom assessment and grading in detail, read the following classroom case and try to solve Mrs. Catlin's dilemma.

A Case Study: DIVERSITY IN THE CLASSROOM

Assessment Issues in a High School Classroom

"This chapter test has two short essays and ten multiple-choice questions. Remember to read the questions carefully and monitor your time," Mrs. Catlin instructs her eleventh grade American history class.

Cameron starts by reading the multiple choice questions and eliminating answers he knows are incorrect. When he gets to question 5, he pauses.

5. *"This, then, is held to be the duty of the man of wealth: to consider all surplus revenues which come to him simply as trust funds, which he is called upon to administer and strictly bound as a matter of duty to administer in the manner which, in his judgment, is best calculated to produce the most beneficial results for the community—the man of wealth thus becoming the mere agent and trustee for his poorer brethren."*

These sentiments are most characteristic of:

(A) Transcendentalism
(B) Pragmatism
(C) the Gospel of Wealth
(D) the Social Gospel
(E) Reform Darwinism

Cameron is familiar with the answers because the class recently studied Transcendentalism, Reform Darwinism, and the Gospel of Wealth, but he doesn't understand the quotation at the beginning of the question. He rereads the long sentence, but it doesn't help.

"Mrs. Catlin," he says, raising his hand. "I don't get this."

"Did you try rereading it?" she asks.

"Yeah, but it didn't help," Cameron explains.

"You can break the sentence down into smaller parts and pick out the key words," Mrs. Catlin suggests.

Cameron reads the sentence for a third time but can't figure out how to chunk it into parts. He underlines *judgment*, *administer*, and *community*, because they seem like important words and then chooses "Reform Darwinism."

"How did the test go?" Mrs. Catlin asks students before they are dismissed.

"The multiple-choice questions were tricky," Yvette says.

"Yeah, question 5 was impossible," Arjun agrees.

Demographics:
An Overview of the Students

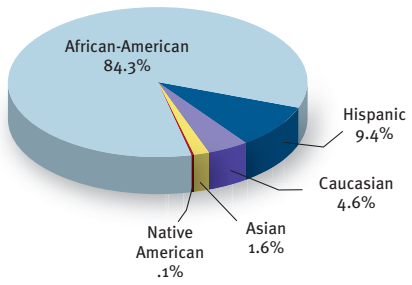
Maya Angelou High School
Washington, DC

61.4% Students eligible for free and reduced lunch

6.2% Students qualify for ESL instruction

12.5% Students receive special education services

Racial/Ethnic Groups



"I tried rereading it three times and it didn't help," Cameron reports.

"If most of us get question 5 wrong, will it still be part of our test score?" Arjun asks.

"Well, I want to base the test scores on 100 points," Mrs. Catlin replies. "I can't do that if we throw out some of the questions. Also, remember, your Civil War projects are due next Friday."

This year, Mrs. Catlin has been excited about integrating historical fiction and primary sources into her lessons. To introduce the Civil War, students read Ray Bradbury's short story "The Drummer Boy of Shiloh." They completed a webquest to find out information about the real "drummer boy" and then participated in small-group discussions about teenagers' experiences of war. For their project, she's given each student an image from the Civil War and has asked them to "become" one of the people in the photograph. They will write a diary entry from this person's perspective and present it to the class.

"Do you have any last-minute questions about the projects?" Mrs. Catlin asks.

"How long should the diary entries be?" Louis asks.

"They should be as long as it takes to convey what the person in the photograph is feeling. So I'll leave it up to you to decide."

"Okay," Louis says, looking slightly confused.

"Are we being graded on these projects?" Chelsea asks.

"Yes, they're an important part of your grade for this unit," Mrs. Catlin replies.

"How exactly will we be graded? I mean, what should I include? What are you looking for?" Chelsea asks again.

"I want you to apply what we've learned from primary documents and "The Drummer Boy of Shiloh" to your diary entry. Write about what the person in the photograph is feeling and experiencing during the Civil War," Mrs. Catlin tries to explain as the bell rings.

As Mrs. Catlin grades the students' chapter tests, during her planning period, she's dismayed to discover that the majority

of the class got question number 5 wrong. She also notices that her ELL students missed many of the multiple-choice questions. This surprises her because they've been analyzing primary sources all semester and seemed to have understood the documents in class.

Over lunch, Mrs. Catlin chats with her colleagues. "I'm really disappointed about how my students did on their chapter test, especially my ELL students. Of course, some of my students scored 100%. What do you do when that happens?" she asks.

"I try to identify *why* students didn't perform well. Was the wording of the questions confusing? Did I give them enough opportunities for review? Did they understand the chapter concepts? Then I plan my next lessons accordingly," explains Mr. Gust, who teaches a government and civics class.

"Yeah, perhaps the wording was confusing and maybe students need more time learning about the late 1800s," Mrs. Catlin admits. "But I can't backtrack now."

"I agree. It's hard to find time to reteach concepts. But you can keep this in mind and give mini-assessments along the way. For example, as you teach the Civil War, you can incorporate a short assessment question each day that students turn in, so you can gauge their level of understanding," Mr. Gust suggests.

"What do you think about the ELL students? I don't want their grades to suffer just because they don't have a lot of experience taking tests in English," Mrs. Catlin wonders.

"I have to say," Ms. Meehan jumps in, "my grading system includes participation and effort. When I complete a student's report card, I always consider their attitude. My ELL students are very diligent, pay attention, and ask questions, so this is reflected in their final grade."

"I would be wary of using a grading system that includes effort and participation because they are immeasurable and subjective. How can you objectively gauge the amount of effort a student puts into a project? I think it's more helpful to grade the project on a rubric and give students concrete feedback," Mr. Gust recommends. "Also, it's a disservice to ELL students and their families if they always get good grades but haven't mastered the grade-level content," he adds.

"That's a good point—I never thought of it in that way," Ms. Meehan responds.

"I try to simplify the wording of test questions, while keeping the original content," Mrs. Jett adds. "I find this helps *all* of my students. For example, I shorten sentences, remove unnecessary expository material, and use familiar words."

"That's a good idea," Mrs. Catlin agrees. "I wouldn't want to simplify chapter tests too much, because I want students to do well on the SATs. I guess I still have some issues to reflect on and changes to make," Mrs. Catlin concludes. "I'll let you'll know how it goes."

Reference

Bradbury, R. (2003). Bradbury Stories: 100 of his most celebrated tales. New York: William Morrow.

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the students' development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of her actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

DIVERSITY IN ASSESSMENT

The differences among individual students and group differences will affect how well students respond to different assessment types. In this section, we discuss some sources of diversity in classroom assessments.

A Variety of Teacher Practices

Teachers' assessment patterns differ from elementary to secondary school. Elementary teachers rely significantly more on informal assessments than secondary teachers (McMillan et al., 1999) and emphasize objectives in the affective domain significantly more than secondary teachers (Freeman & Hatch, 1989). To assess learning formally, elementary teachers use commercially made tests rather than their own tests (McMillan et al., 1999). In contrast, middle and high school teachers depend more on traditional assessments and typically make their own tests rather than relying on commercially made ones (Bol, Stephenson, O'Connell, & Nunnery, 1998).

Assessment Format and Cultural Diversity

Advocates of alternative assessments believe that their use is likely to decrease the achievement gap and increase the access to higher education for culturally and linguistically diverse students (Hiebert & Raphael, 1996). Yet several studies show that the achievement gap is still present when alternative assessments are used (Haertel, 1999; Klein et al., 1997; Madaus & O'Dwyer, 1999; Murphy, 1995; Terwilliger, 1997), and experts believe that, due to their heavy writing demands, alternative assessments may even result in lower scores for minority students than those resulting from traditional assessments (McDonald, 1993; Worthen, 1993). A couple of studies conducted with Caucasian, African-American, and Hispanic students found evidence of the opposite. In one study, although Caucasian students performed better than the other two groups on paper-and-pencil tests of language arts, the gap was reduced when a portfolio assessment was used (Supovitz & Brennan, 1997). Likewise, another study showed that Caucasians outperformed the cultural minority groups on paper-and-pencil science tests, whereas there was no difference among the three groups on a science performance assessment (Supovitz, 1998). These findings emphasize the need to consider multiple kinds of measures of student learning when planning classroom assessment.

Assessment and Student Exceptionalities

As you recall from Chapter 2, according to the Individuals with Disabilities Education Act (IDEA), students identified as having special needs need an individualized education program (IEP), which specifies the goals to be accomplished within the general learning objectives of the class. Therefore, teachers should be very familiar with all IEPs for exceptional children in their classroom when planning classroom assessments. Exceptional students are likely to need modifications to regular assessment procedures, such as providing written instructions for hard-of-hearing students, giving frequent breaks during long assessments to students with developmental delays, or allowing students with orthopedic impairments to use appropriate technology to support their demonstration of learning.

Assessment Preferences

Students will display assessment preferences in the classroom. Some studies show that students tend to prefer multiple-choice over constructed-response tests on the grounds that they are easier to prepare for and take (Traub & MacRury, 1990). Other studies show that it is only the students with poor learning skills and low confidence in their academic ability who prefer multiple-choice testing to the constructed-response type of assessment (Birenbaum & Feldman, 1998).

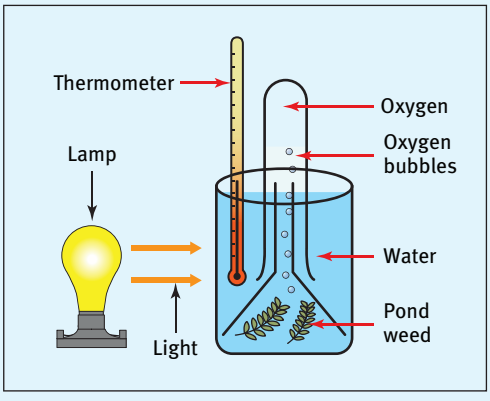
There is also evidence that students' approaches to learning (deep versus surface) affect their assessment preferences (Gijbels, van de Watering, Dochy, & van den Bossche, 2005; Heikkila & Lonka, 2006). Deep learners tend to prefer assessments that are intellectually challenging and that allow them to demonstrate their understanding; surface learners tend to prefer assessments that tap in memory of factual information (Entwistle & Tait, 1990). Nevertheless, depending on the type of assessment used, students shift between "surface," or memorizing, approaches and "deep," or understanding, learning approaches (Wilson & Fowler, 2005). In other words, even when students are motivated to gain a deeper understanding of a topic, they may adopt a surface approach to learning and focus on memorization if classroom assessments only tap recall of factual information. This finding emphasizes the need to align assessment methods with your learning objectives and instruction (Gijbels & Dochy, 2006).

REVISITING ISSUES IN EDUCATION

Can multiple-choice tests assess students' higher-order thinking?

Points to consider: Although multiple-choice items are generally developed to tap in the lower level of Bloom's taxonomy (i.e., recall of factual information), teachers can also generate multiple-choice tests of students' higher-order thinking skills such as application, analysis, synthesis, and evaluation (Braun & Mislevy, 2005). Higher-order multiple-choice items require more time and effort to construct. However, once developed, they can be scored easily and quickly. There is evidence that when selected-response tests are well written, they can measure higher-level skills as effectively as constructed-response tests (Martinez, 1999). For instance, teachers can present students with an interpretive exercise—where they are shown a picture, graph, table, or vignette—and ask them to apply learned information to interpret the visual representation, such as the example shown in Figure 12.17.

In addition, multiple-choice items may require students to select the *best* answer among the distracters. This option is more cognitively demanding because typically two or more choices are partially correct, so coming up with the best answer requires clear understanding of the underlying concepts and good evaluation skills.



For her science fair project, Aisha built an apparatus to collect oxygen produced by *Elodea*, an aquatic plant commonly known as "pond weed." Which factor was most responsible for the production of oxygen by *Elodea*?

A. Sugar was present in the liquid.
B. The liquid contained enough oxygen for the plant to absorb.
C. The presence of light stimulated photosynthesis.
D. The plant contained a large number of mitochondria.

FIGURE 12.17 **Sample interpretive exercise. This assessment requires students to apply information they have learned by interpreting a visual such as a graph or chart.**

REVISITING ISSUES IN EDUCATION

Does retaining students help their future academic success?

Points to consider: When students are retained, their self-esteem decreases and their chance of dropping out of school increases (Grissom & Smith, 1989; Roderick, 1994). Students who could have been retained but who were promoted to the next grade were found to do as well or better than those who were retained (Reynolds, 1992). One study found that a group of low achievers who were retained had poorer educational histories, a higher dropout rate, lower-paid jobs, and lower competency ratings from their employers than a comparable group who were promoted to the next grade (Jimerson, 1999). In contrast, the promoted low-achiever group had employment outcomes that were similar to those of a control group.

Although teachers should make sure that their assessments and grading clearly reflect mastery of target knowledge and skills, the negative effects of retaining students emphasize the need to provide failing students with appropriate support so that the likelihood of failing an entire grade are minimized. Some strategies are to provide tutoring, summer classes, or special remediation courses during the promoted year (Mantzicopoulos & Morrison, 1992; McCoy & Reynolds, 1999; Shepard & Smith, 1989).

SUMMARY

- Classroom assessment includes all processes involved in making decisions about students' learning progress. Classroom assessments serve important learning, motivational, and accountability functions and help teachers make informed decisions about their practice.
- Assessments can be classified into formal and informal, formative and summative, teacher-made and commercially-made, and traditional and alternative. Traditional assessments are those that use selected- or constructed-response items to assess learning; alternative assessments include portfolios, performance assessments, and student exhibits and journals.
- Effective assessments are valid, reliable, practical, and fair. Assessments are valid when they measure what they are intended to measure. Three kinds of validity are content, predictive, and construct validity. Reliability is the extent to which an assessment gives consistent, stable results for each student. Methods to establish the reliability of classroom assessments include test–retest, split-half, alternate-form, and interobserver reliability methods. Assessments are fair when they provide all students with an equal opportunity to demonstrate their knowledge and skills; they are practical when they are relatively easy to implement.
- Classroom assessment consists of a four-stage cycle: planning and development; administration; evaluation and revision; and communication to stu-

dents, parents, and administrators. Teachers should keep in mind the four characteristics of effective assessments when developing and revising their classroom assessments. Rubrics can increase the validity and reliability of constructed-response and alternative assessments by providing criteria to determine whether and how learning objectives have been met.

- Grading is the process of evaluating classroom assessments, translating their results into a scale that has evaluative meaning, and reporting the results in a formal way. Grading systems can be based on points or percents; or they can be criterion- or norm-referenced, depending on whether students' performance is graded relative to predetermined criteria or to the performance of a peer group. Assessment experts discourage the following grading practices: using students' participation and attitude as part of a grading system, assigning zero scores for missed assignments, basing grades solely on students' improvement or effort, and giving extra credit.

- Teachers' assessment practices are varied. Elementary teachers tend to place more emphasis on assessing affective objectives and rely more on informal assessments and commercially-made assessments than secondary teachers. When planning classroom assessments, teachers should be familiar with students' IEPs, consider multiple kinds of measures of student learning, and ensure that assessments are aligned with instructional objectives and activities rather than with students' assessment preferences.

KEY TERMS

accountability 452
alignment 456
assessment 450
authentic assessments 467
benchmarks 474
criterion-referenced assessments 481
distracters 460
evaluation 451
Family Educational Rights and Privacy Act (FERPA) 479
formal assessments 453
formative assessments 453
halo effect 459
informal assessments 453
measurement 451
norm-referenced assessments 481
performance assessment 468
portfolios 468
rubrics 465
standards 474
state-dependent learning 477
summative assessments 454
table of specifications (TOS) 455
test bank 478
testing 451
traditional assessments 460

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What is assessment and how is it different from evaluation, measurement, and testing?
2. What is the relationship among assessment, learning, and motivation?
3. What are the four characteristics of effective assessments?
4. How many types of assessment do you know, and what are the characteristics and the effectiveness of each?
5. What are the four steps of the assessment cycle?
6. How many grading systems do you know of, and what are their limitations?
7. What kind of diversity are you likely to find in classroom assessment?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with assessment theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. What are implications of the NCLB Act for classroom assessment (Chapter 1)?
2. How may IEPs relate to classroom assessment (Chapter 2)?
3. How would a Vygotskian assess student learning and why (Chapter 3)?
4. What are some strategies to avoid student self-handicapping in classroom assessments (Chapter 4)?
5. What type of assessments would behaviorist views of learning encourage and why (Chapter 5)?
6. How would cognitive theories of learning explain the need for creating a comfortable and familiar environment for classroom assessment (Chapter 6)?
7. What are some effective ways to assess students' problem-solving and critical thinking skills and why (Chapter 7)?
8. Can classroom assessments promote students' self-regulation? If so, how (Chapter 8)?
9. Which of the motivation theories that you learned can help explain the finding that performance assessments are more motivating than traditional paper-and-pencil assessments (Chapter 9)?
10. What types of assessments are more likely to support students' need for autonomy and why (Chapter 10)?
11. How would you plan classroom sitting arrangements to ensure assessment reliability (Chapter 11)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This Middle-School Classroom Apply Assessment Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"Good Morning, fifth-graders! I see everyone's ready for writing workshop to begin. But first, I want to share something with you." Mr. Howard's students are sitting on the rug next to their writing partners. The objective of the lesson is to learn about portfolios and their purpose.

"What are you gonna show us?" Crystal asks in anticipation.

"Well, I have something I made when I was a college student, preparing to become a teacher. Let me show you." Mr. Howard dramatically unlocks his leather briefcase and pulls out a large, red binder.

"What's that?" Melissa asks.

"It's called a best-work portfolio." He opens the binder and shows them how the materials have been neatly organized. "This portfolio is a record of my best projects so that I can show people what I've learned. For example, this is a research paper I wrote on how to teach reading."

"Can I see?" Allen asks.

"You'll have an opportunity to look at this portfolio more closely during reading time this afternoon. Right now, we're going to learn why people make portfolios and how they decide what work to include."

Mr. Howard uses a variety of informal and formal assessment tools to monitor students' progress and increase learning. He has found writing portfolios to be particularly effective in documenting students' skills and promoting reflective learning. Each quarter, Mr. Howard uses a six-traits rubric to evaluate students' writing and meets with them individually to discuss their progress. These scores are reported to parents on standards-based quarterly report cards. The six-traits scores help him identify topics for lessons and areas where students need additional practice. Using student-friendly rubrics, he evaluates the portfolios for their level of organization and self-reflection and notes these scores on report cards.

In Mr. Howard's experience, even students who have below-grade-level academic skills can excel in creating and maintaining portfolios. He teaches step-by-step procedures to help students organize, reflect, and share their portfolios as evidence of their learning. He also incorporates portfolios in student-led "progress conferences," which give students an opportunity to talk about their writing and show progressive samples to their families. Since implementing student-led conferences, Mr. Howard has noticed students' greater commitment to schoolwork and higher levels of self-confidence.

Next, Mr. Howard asks the fifth-graders "Do you think that when I was making my portfolio for school, I went through my papers and said, 'Hmmm, this one looks interesting; I'll throw that in there' or 'Here's one I like. Oh, here's another. Oh, this one's not really finished. But, I'll put it in anyways, cause you never know, someone might want to read it someday.'"

"That doesn't sound like you, Mr. Howard," Tessa responds.

"You're right," he agrees. "Then how do you think I decided what to include in my portfolio?" he asks the class.

Students respond: "Maybe you put in only really good writing." "Or the projects you felt most proud of." "Or maybe your teacher told you what to include."

"You're on the right track," Mr. Howard encourages the students. "Before we create a portfolio, we ask questions." He posts the portfolio questions on the board and has a student volunteer read them aloud. Then he guides them through a brief discussion and writes down the answers that the students brainstorm. "I will leave this poster up on the board because we will refer back to the questions frequently."

PORTFOLIO QUESTIONS	OUR ANSWERS
What is the portfolio for?	Our writing portfolios are to show our learning and to see how we're getting better at writing.
Who is the portfolio for?	The portfolios are for us, our teacher, and our parents.
What should I include in the portfolio?	We will include writing that shows our best work.
How will my portfolio be graded?	Portfolios will be graded using a rubric.

"Now that we're starting to have an idea of *why* we're going to make writing portfolios, I want to talk about *how* we're going to put them together. In November, we're going to have "progress conferences." Instead of your parents and me having a private meeting about your schoolwork, each one of you is going to be part of the discussion. During the meeting, you'll talk with your parents about your learning in math, reading, and writing and show them your portfolio. It will be a chance for you



Blend Images/Getty Images, Inc.

to demonstrate all that you've learned and set your own goals for the next quarter. Of course, you'll also want to take them on a tour of our classroom and serve them tea and cookies. That's why we're starting to prepare portfolios early in the year, so you can keep track of your progress."

"Do we have to come to the conference?" Autumn asks.

"Yes, this year in our school *all* students will be part of conferences and have portfolios to show to their parents. I know this is new to you, but don't worry, over the next few months we'll work as a class to prepare. You'll also have regular check-in meetings with me to talk about your writing and review your portfolio."

Over the course of the week, Mr. Howard guides students through the process of selecting a finished piece of writing for their portfolio. He creates a simple reflection form that is easy for fifth-graders to use. Next, he models how to write a self-reflection, followed by students' practice, and finally he asks them to read their reflections to their partners. Mr. Howard posts several examples on the board written by former students.

Portfolio Reflection

Date: October 15th

I chose to put this writing in my portfolio because:

This writing is about special memories with my grandma. I think this work shows how I'm writing with more voice and feeling.

As I worked on this piece, I learned:

How to use " " marks when people talk. I didn't know how to do that before.

Next, I want to learn:

How to write about my memories in a poem.

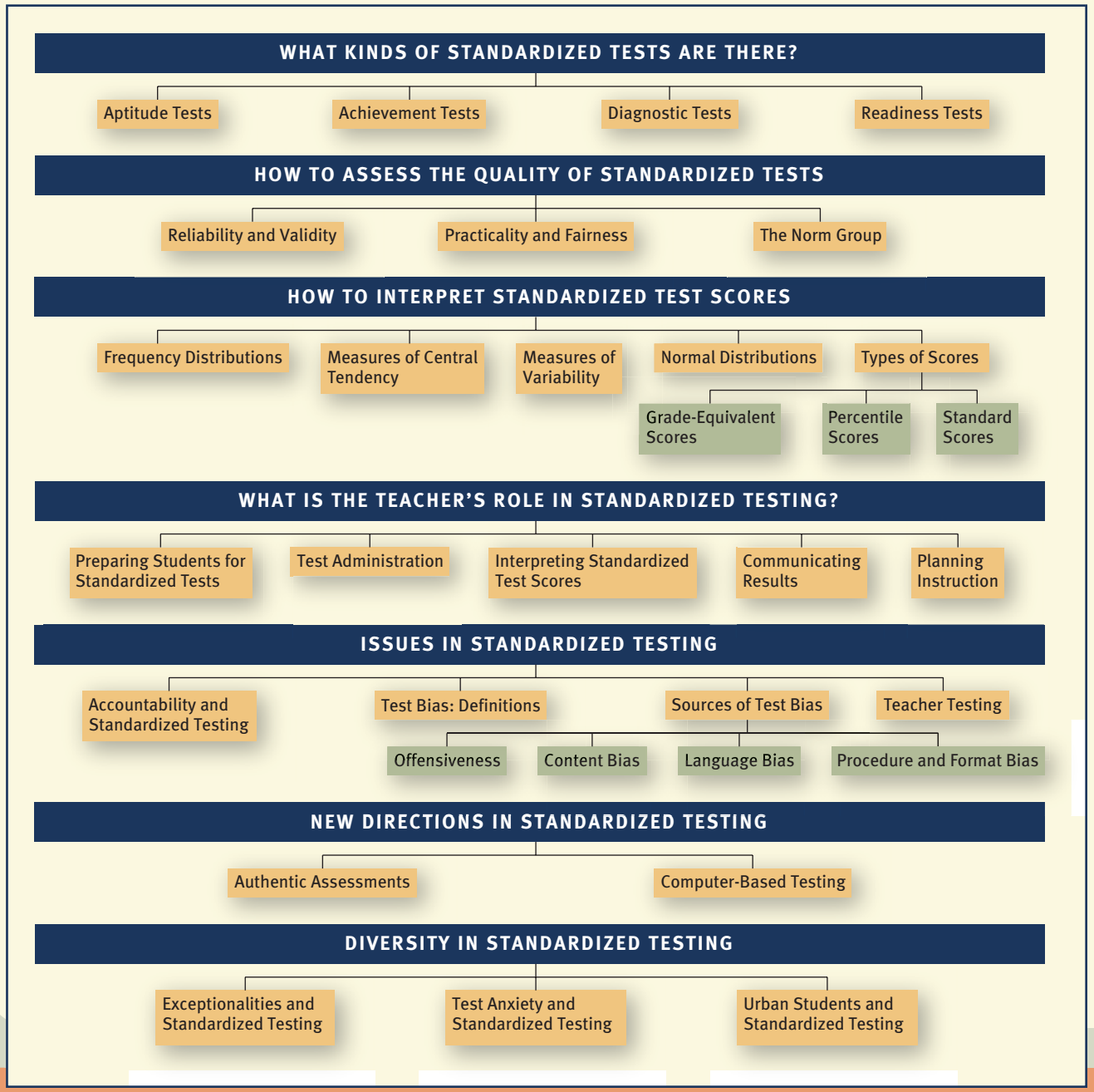
By November, students are very familiar with the process of selecting and organizing work for their portfolios. There is a neat row of binders lined up on the writing workshop shelf, and students are eager to show visitors their latest entry. In the classroom, there is a sense of student accountability for their own learning, because they have the tools and the knowledge to evaluate their own progress.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. Which of the following assessment types were present in the lesson: summative/formative, traditional/alternative, formal/informal?
2. Did the assessment practices promote students' learning and motivation? Explain.
3. Which of the assessment principles were applied during the lesson and how?
4. Did the teacher demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the lesson according to research by including both strengths and weaknesses.

13 Assessing Learning through Standardized Testing



Imagine You Are the Teacher

It's Mrs. Kirkland's first time administering a state-mandated standardized test in her classroom. In preparation for the test, she sent a special note to the parents, reminding them about the test date and asking them to help their child get a good night's sleep the night before the test and a good breakfast on the morning of the test administration. She was assigned to administer the test with Mr. Switzer. Together they spent the morning cleaning the classroom and arranging the desks so that each student had an individual working space.

As students enter the room, they sharpen their pencils and settle into their seats, which are clearly labeled with a nametag. Mrs. Kirkland then begins reading the directions for the test: "When filling in an answer, please fill the circle completely. If you need to change an answer, erase your original mark completely before making a new selection. Please make sure you are using a number 2 pencil." As a hand raises, Mrs. Kirkland pauses to ask: "Jarett, do you have a question?"

"Yeah, why are you reading all this? We've been taking these tests for five years now. You don't need to read this stuff again. Can't we just get started?"

Mrs. Kirkland responds "Well, all middle-grade students in our state are taking the same test. So teachers have to read the instructions to make sure that all students hear the exact same information. In this way, all students have an equal opportunity to do well on the test."

"Mrs. Kirkland, can we please continue and get it over with?" Cate asks. "I hate these tests! I'll feel a lot better once we're done."

"All right, everyone," inserted Mrs. Kirkland, "these tests are important because they let you, your parents, and us (teachers and principals) know how much you have learned this year. So, please do not rush through the tests. Take them seriously and do your best. Now, as I was saying, please make sure you are using a number 2 pencil . . ."

- What are Jarett's questions revealing?
- What are Cate's feelings revealing?
- What might Mrs. Kirkland do to better prepare her students for standardized testing?

Think about how you would respond to these questions as you read through the chapter.



Paul Simcock/Iconica/Getty Images, Inc.

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define standardized testing, its purposes, and the different types of tests.
2. Identify the characteristics of good standardized tests.
3. Explain what different standardized test scores mean and how to interpret them.
4. Describe the teacher's role in preparing students for and communicating the results of standardized testing.
5. Evaluate current issues such as test bias in standardized testing.
6. Discuss authentic assessments and computer-based testing.
7. Explain issues of diversity that affect testing and assessment.

Journal Activity ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. How are standardized tests different from other assessments?
2. Who uses the results of standardized tests and for what purposes?
3. Is it possible to do high-quality teaching in the current testing climate?
4. Can standardized tests fairly assess students from diverse language and cultural backgrounds?

WHAT KINDS OF STANDARDIZED TESTS ARE THERE?

Standardized Tests

Tests given to large samples of students under the same conditions, including test instructions, the testing environment, the amount of time to take the test, and the scoring procedures.

Standardized tests are those given to large samples of students (e.g., nationwide) under the same conditions, including test instructions, the testing environment, the amount of time to take the test, and the scoring procedures. Unlike teacher-made tests or test banks included in textbooks, standardized tests can only be purchased from test publishers by those qualified to use them. Standardized tests are an integral part of the U.S. education system and can serve different functions. One important function is to provide an objective assessment of student achievement across the country so that decisions on selection and placement in specific education programs can be made (Brennan, Kim, Wenz-Gross, & Siperstein, 2001). When these decisions are based on the scores of well-designed standardized tests, they are fair and justifiable because all students take the same test under identical conditions. For example, college admissions officers can make informed decisions by using the Scholastic Assessment Test (SAT) and the American College Testing Program (ACT) scores of students who may come from different backgrounds, regions, and high schools in the country.

Another important function of standardized achievement tests is to provide information about school effectiveness to parents, school board members, and state and federal officials (Linn & Miller, 2005). All 50 states have annual standardized assessments of student achievement aimed at determining whether students get promoted to the next grade, whether teachers and principals receive financial rewards or demotions, and whether schools receive financial support from the state or federal government.

Because the results of these tests are used to hold students, teachers, and school administrators accountable for achievement and may result in serious consequences, they are usually called **high-stakes tests**.

High-Stakes Tests

Tests that provide results that can be used to hold students, teachers, and school administrators accountable for achievement and which may result in serious consequences.

Standardized test results also have an evaluation function, such as helping identify areas that need improvement or assessing the success of a particular educational program (Hopkins, 1998; Schmoker, 1999). For example, a school district in Pennsylvania is implementing a new inquiry-based method to help middle school students learn science this year. The school district can compare the standardized test scores from last year and this year to determine any changes in student achievement. However, recall from Chapter 12 that standardized tests provide only partial information for evaluating teaching effectiveness. Therefore, the test results need to be considered in conjunction with other forms of classroom assessment.

Finally, standardized tests can have a diagnostic function, which consists of identifying students' strengths and weaknesses in a particular content area (Popham, 2005). A student who is not performing as expected might be given a battery of standardized tests to establish whether he/she has a learning disability or another exceptionality. In the next sections, we review the most common types of standardized tests used in schools, including aptitude, achievement, diagnostic, and readiness tests.

Aptitude Tests

Aptitudes are abilities in specific domain areas that develop over time. Aptitude test*s* are designed to assess students' abilities or skills and used to predict future academic achievement in the tested domains. Specific aptitude tests include tests of musical aptitudes, mechanical comprehension, cognitive skills (i.e., comprehension, reasoning) as well as the Differential Aptitude Tests (Bennett, Seashore, & Wesman, 1984), designed to measure high school students' and adults' aptitude to succeed in certain professional areas.

The most common aptitude tests given in school are intelligence tests, which are considered general aptitude tests for school learning. For instance, after trying different prereferral strategies, Mr. Madon concludes that the only way to keep Juana on-task is to provide instructional activities that are well beyond the typical fifth-grade level. In consultation with a multidisciplinary team, a decision is made to administer an intelligence test to examine the possibility that Juana may be gifted. Juana received very high scores across all test areas, showing that her academic potential could be better served by the schools' gifted program.

Intelligence tests can be administered either individually or in groups. Individual intelligence tests are administered and interpreted by trained psychologists. An example of an individual intelligence test is the Stanford-Binet Intelligence Scales (Thorndike, Hagen, & Sattler, 1986), which can be used with children as young as two years old and up to adulthood. Another example is the set of tests developed by Wechsler (1974, 1991), which includes different scales for different age ranges: the Wechsler Adult Intelligence Scale (WAIS III), the Wechsler Intelligence Scale for Children (WISC III), and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). Wechsler scales yield an overall score and verbal and performance scores. Figure 13.1 shows examples of items from the Wechsler tests.

Other individual intelligence tests are the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983), the Differential Abilities Scales (DAS-II), and the Learning Potential Assessment Device (LPAD; Feuerstein, 1979), designed to assess the difference between students' capacity to learn and their developed ability.

Group intelligence tests are more practical than individual intelligence tests because they are designed to assess several students simultaneously in a few of hours and administration does not need to be done by trained psychologists. However, because they tend to not be as accurate as individual intelligence tests, some states do not administer them. Examples of group intelligence tests are the Henmon-Nelson Test of Mental Abilities and the Otis-Lennon School Ability Test (OLSAT). Recall from

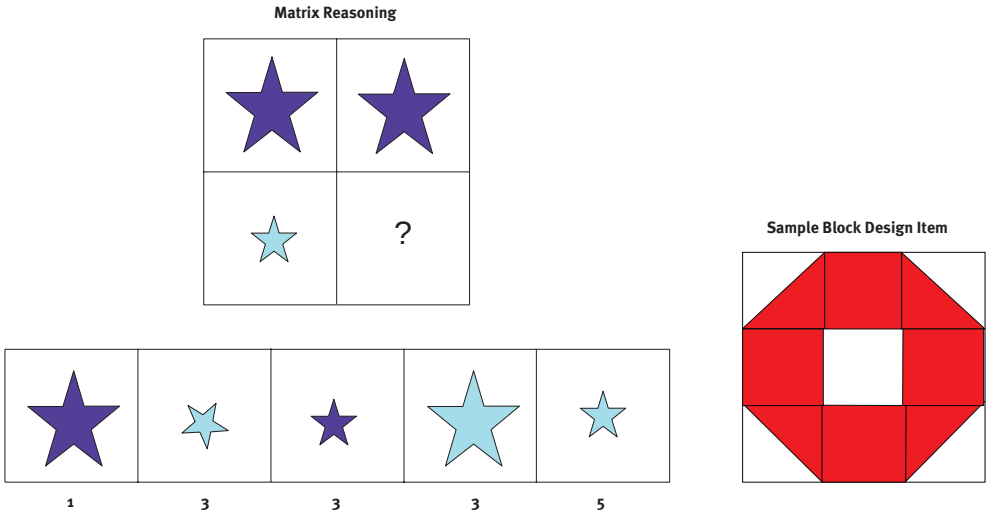


FIGURE 13.1 Sample items from the Wechsler intelligence scales.
Source: Sample items from the *Wechsler Intelligence Scale for Children*, Fourth Edition (WISC-IV). Copyright © 2003 NCS Pearson, Inc. Reproduced with permission. All rights reserved. "*Wechsler Intelligence Scale for Children*" and "*WISC*" are trademarks, in the US and/or other countries, of Pearson Education, Inc. or its affiliates(s).

Chapter 2 that intelligence tests yield an intelligence quotient (IQ), which is the number that results from dividing students' mental age by their chronological age times 100. Students' mental age is determined by comparing their score on the intelligence test to that of an average person of the same chronological age. A student who performs on an intelligence test at a level comparable to that of an average eight-year-old is said to have a mental age of 8.

IQ Scores

The scores used to interpret intelligence tests.

Due to several technical problems with the IQ calculation method just described (i.e., chronological age increases indefinitely, while mental age does not), people use deviation **IQ scores** to interpret intelligence test results instead. Deviation IQ scores above or below the average score of 100 are interpreted as being above or below the average intelligence score of people of the same age, respectively. You will learn more about how to interpret IQ scores later in the chapter when you read the section on interpreting standardized test scores.

Achievement Tests

Achievement tests are designed to assess what students have learned or the skills they have mastered (Aiken & Groth-Marnat, 2006). Standardized achievement tests can help teachers identify specific areas within an academic domain (e.g., mathematics, reading, social science) in which students need improvement. Sometimes the distinction between aptitude and achievement tests is not clear. The SAT may be considered an aptitude or an achievement test, depending on the purpose for which it is used. When used to predict success in college, it is considered an aptitude test. When used to measure students' prior knowledge in math, vocabulary, and reading comprehension, it is considered an achievement test. For instance, during the end-of-year parent conferences, Ms. Gibbs likes to share the results of students' achievement tests so that parents can better understand what knowledge and skills their child has mastered over the course of the year and in what areas the student will need to improve during the next academic year. Typical achievement tests are the national norm-referenced standardized tests, such as the Terranova Comprehensive Tests for Basic Skills, the Metropolitan Achievement Tests, and the Stanford Achievement Tests (McMillan, 2004).

A characteristic of achievement tests is that they include a battery of subtests to assess knowledge and skills corresponding to different subject matters at different grade levels. For instance, the Stanford battery for sixth grade includes subtests for reading, mathematics, language, listening, spelling, science, social studies, study skills, information use, and thinking skills. Due to the potential differences between the content and skills included in achievement test batteries and those that are part of the teacher's learning objectives, it is a good idea to carefully examine how appropriate achievement tests are for assessing your learning goals before using their results to make decisions in the classroom.

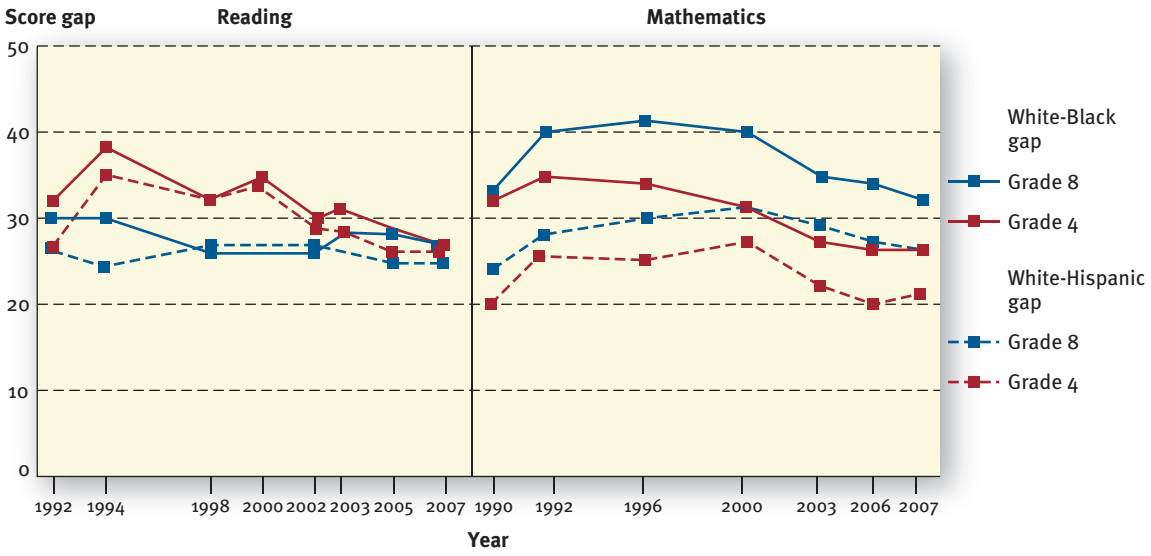


FIGURE 13.2 **Reading and mathematics achievement gaps for fourth- and eighth-grade students, 1990–2007.**
Source: National Center for Education Statistics (2008).

In addition to achievement batteries, school districts can purchase specific subject achievement tests for almost any subject. However, if you are considering using commercially available subject achievement tests, make sure that you examine the match between the district curriculum and the content assessed by the test. Recall from the prior chapter that assessments are only valid to the extent that they measure what they are intended to measure.

In 1969, the federal government began administering the **National Assessment of Educational Progress (NAEP)**. The purpose of the NAEP is to assess young Americans' knowledge and skills in reading, writing, literature, math, science, social studies, art, citizenship, and career and occupational development. Although states are not required to administer this test, the federal government has encouraged a voluntary test of fourth-, eighth-, and twelfth-grade students in all states in the hope that the NAEP will become America's national assessment of students' achievement. Compared to 1992, fourth- and eighth-grade students showed slight improvements in reading and math scores in 2007, whereas twelfth-graders showed a decline in reading and less than a quarter of them performed at or above proficiency levels in math (NAEP, 2007).

National Assessment of Educational Progress (NAEP)

A nationwide test used to assess young Americans' knowledge and skills in reading, writing, literature, math, science, social studies, art, citizenship, and career and occupational development.

The NAEP also provides a picture of the achievement gaps discussed in Chapter 2. Figure 13.2 shows the achievement gap between white and African-American and Hispanic fourth- and eighth-grade students on reading and mathematics for years 1990–2007. As can be seen in the figure, in reading, the achievement gap between white

ISSUES IN EDUCATION

Can schools close the achievement gap?

An area of debate in the standardized testing literature is whether schools will be able to close the historical achievement gap between white and African-American and Hispanic students. Some public education critics argue that schools have created the achievement gaps by subtle discriminatory practices (e.g., low expectations, low ability tracking). What do you think about this argument? A response to this question can be found at the end of the chapter.

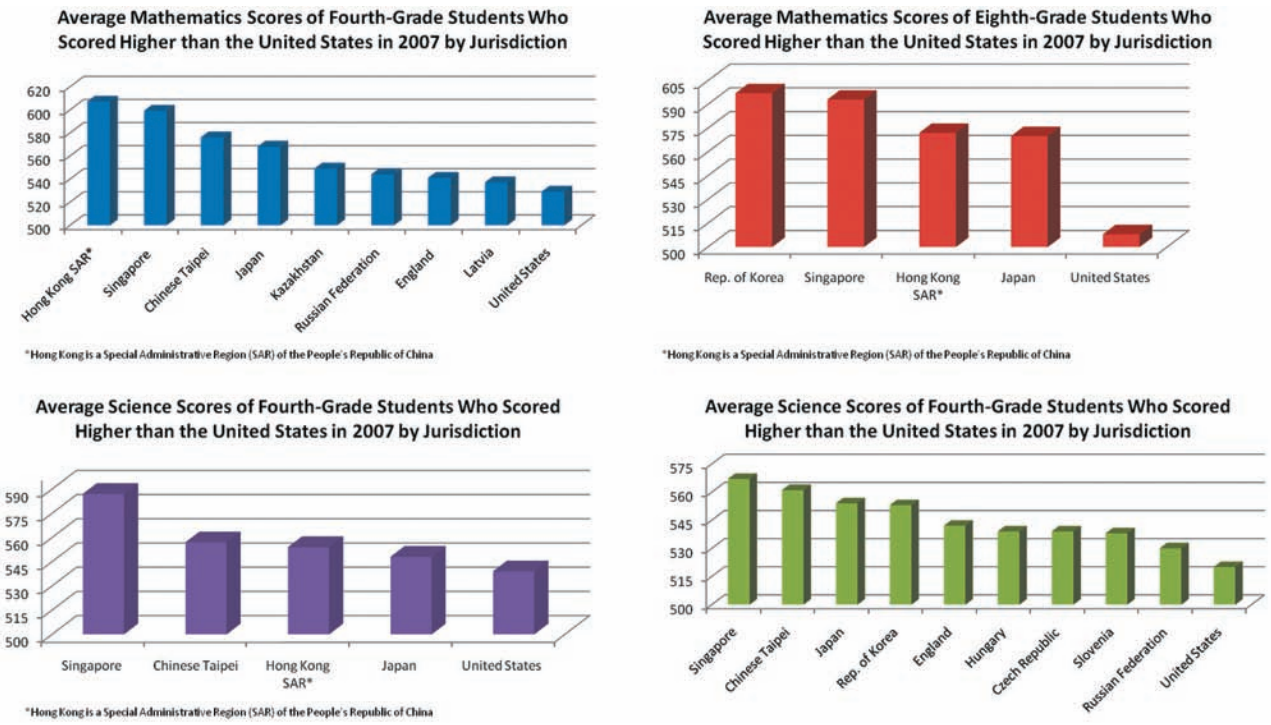


FIGURE 13.3 International data on student achievement.

and African-American fourth-graders was smaller in 2007 than in any previous assessment, but the white–Hispanic gap was no different in 2007 as compared with 1992. In math, the achievement gap between white and African-American fourth-graders was smaller in 2007 than in 1990, but the white–Hispanic gap in 2007 was no different from that in 1990. For eighth-graders, the NAEP showed significant achievement gaps in reading in 2007, a smaller mathematics gap in 2007 than in 2005 between white and African-American students, but no significant change in the white–Hispanic math gap.

Trends in International Mathematics and Science Study (TIMSS)

An international assessment that provides data on the mathematics, reading, and science achievement of students from the participating countries at either the fourth- or eighth-grade level or both.

In addition to the NAEP, international achievement tests have been used to make achievement comparisons across different countries. For instance, the **Trends in International Mathematics and Science Study (TIMSS)** provides data on the mathematics, reading, and science achievement of U.S. students compared to that of students in other countries for the years 1995, 1999, 2003, and 2007 at either the fourth- or eighth-grade level or both. Recent TIMSS results are shown in Figure 13.3.

- *Science.* U.S. fourth-graders are only outperformed by students from three countries (Chinese Taiwan, Japan, and Singapore). U.S. eighth-graders are outperformed by students from nine countries (including Asian countries, which have some of the highest scores). By high school, U.S. students rank below the international average, with students from Sweden, the Netherlands, Norway, and Switzerland ranking among the highest.
- *Reading.* American students do well compared to their counterparts in other countries during the elementary school years, but by the end of high school they have fallen behind students in many other countries.
- *Math.* Although U.S. students score above the international average, eight countries outperformed the United States in the fourth grade and four countries outperformed the United States in the eighth grade. The highest-ranked countries in math include Singapore, Japan, Chinese Taiwan, and Korea (Gonzáles et al., 2004).

In addition to ranking countries based on performance, results from international assessments such as the TIMSS are used to make inferences about factors affecting achievement and learning in the participating countries and to suggest policy recommendations. For example, it has been argued that our country's overall lower performance on science, math, and reading are the result of lower student expectations, insufficient instructional and homework time, excessive time spent with media, larger class sizes, and inefficient resource spending (Ravitch, 1995). However, experts point out several limitations to international test results, including the following (British Columbia Trustee Schools Association, 2008; Ercikan & Koh, 2005):

- National characteristics can make achievement results difficult to compare. For example, if reading instruction starts at age five in one country and age seven in another, the reading results of eight-year-olds across various countries may not provide fair comparisons.
- Results are strongly affected by which topics are taught and in which order. Students may know a lot about a topic that is not on a test and very little about a topic that is on the test but has yet to be taught.
- International tests tap on content that the participating countries agree is worth testing. This results in a one-size-fits-all measure that cannot be tailored to the curriculum or standards of any one country.
- Students from participating countries have significant cultural and linguistic differences that may challenge the reliability, validity, and fairness of the test.

Diagnostic Tests

Diagnostic tests are aimed at assessing the specific learning needs of students so that those needs can be met through regular or special instructional methods. Diagnostic tests are administered individually by trained professionals and mostly used for diagnostic purposes in reading and mathematics, especially in the primary grades (Berninger, Stage, Smith, & Hildebrand, 2001). Examples are the Detroit Test of Learning Aptitude (AGS Publishing, 2006), the Stanford Diagnostic Reading Test (Karlsen & Gardner, 1995), and the Durrell Analysis of Reading Difficulty (Durrell & Catterson, 1980).

Compared to achievement tests, diagnostic tests include more items and more subtests, allowing teachers to report students' scores in more specific areas (Thorndike, 2005). A diagnostic test in reading may report students' scores on vocabulary, reading comprehension, and letter recognition. An appropriate use of a diagnostic test in reading is to discover which specific reading components are impaired in a student who consistently performs below grade level on reading comprehension assessments. For instance, a diagnostic reading test shows that Carol (a struggling student in Ms. Austen's language arts class) has average reading fluency and accuracy, word knowledge above grade level, but reading comprehension below grade level. Based on these results, Ms. Austen decides to teach Carol several comprehension-monitoring strategies.

Why do experts discourage using readiness tests for grade placement?



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Readiness Tests

School readiness tests assess whether children have acquired the necessary cognitive skills to succeed in kindergarten or first grade. Examples are the Kindergarten Readiness Test, the Boehm Test of Basic Concepts, the Brigance Inventory of Early Development, the Gesell School Readiness Test, and the Metropolitan Readiness Test.

When readiness test scores are used in combination with other information, they can help identify developmental delays that may require immediate attention (Bracken & Walker, 1997). On the other hand, despite their popularity, readiness tests have been highly criticized because they are not strongly correlated with children's later academic achievement (La Paro & Pianta, 2000; Stipek, 2002).

According to many experts, the limited predictive validity of readiness tests relies on the fact that most of them are not based on theories of child development and that they have cultural and language biases, which may be the reason that children from low-income families, minority children, and children from homes where English is not the first language often get lower readiness scores (National Center for Fair and Open Testing, 1991). Thus, experts recommend not using the results of these tests to postpone children's formal schooling but rather to obtain information on how to adapt the school curriculum and environment to serve children's particular needs (Farran, 2001; Lidz, 1991).

HOW TO ASSESS THE QUALITY OF STANDARDIZED TESTS

In this section we discuss the characteristics of good standardized tests. Similar to the classroom assessments reviewed in the previous chapter, the quality of a standardized test can be evaluated by examining its validity, reliability, fairness, and practicality. Because we already discussed these qualities in detail, in this chapter we review them only briefly. In addition, if the standardized test is norm-referenced (i.e., students' scores are compared to those of a norm group), the quality of the test will also depend on the characteristics of the test norm group. Let's briefly review these characteristics.

Reliability and Validity

The first two qualities that teachers should evaluate to ensure that a standardized test is of good quality are its reliability and validity. Recall that tests are *reliable* when they are consistent, that is, when they give consistent, stable results for each student. Teachers can learn about the reliability of national or state standardized tests through test reports. If standardized tests are distributed by commercial assessment companies, such tests are invariably accompanied by technical manuals containing some sort of reliability evidence. Typically, test reliability is reported as a correlation coefficient, which can range from 0 to 1, with higher coefficients, such as in the 0.80s or 0.90s, being sought (Popham, 2009). The SAT, for example, has a reliability coefficient over 0.90.

Recall that tests are *valid* when they measure what they are intended to measure and conclusions about test scores are accurate. Content validity, the extent to which a test accurately measures the knowledge and skills that are part of learning objectives, is an important quality of achievement tests such as the state-mandated standardized tests used for accountability purposes (Aiken, 2003). Construct validity, the extent to which a test accurately measures a certain skill or attribute, is an important quality of aptitude or diagnostic tests such as the Wechsler Intelligence Test for Children or the Stanford Diagnostic Reading Test (Karlsen & Gardner, 1995). Finally, standardized tests have predictive validity when they are able to predict future performance. This type of validity is important for aptitude tests such as the SAT and ACT, which are used to predict students' success in college, or school readiness tests, which are used to predict whether children will be successful in kindergarten or first grade.

Test Bias

The difference in test scores that is attributable to demographic variables such as gender, cultural background, and age.

Practicality and Fairness

Because standardized tests are typically easy to administer and score, practicality is never an issue. On the other hand, an increasing concern about standardized assessment is **test bias**. Ms. Kerns teaches secondary math in New Mexico and knew

that her students were well prepared to take the NAEP, so she is surprised to hear many of them make negative comments after taking the test. "That test was really tricky!" complained Tracy. "Did you get the 'yacht' problem?" "No, I had no clue what that one was about, so I kinda skipped it." Morris replied. "I know! I couldn't get past the 'stem' thing" interjects Melissa. "Isn't that a part of a plant?" Ms. Kerns realizes that her students were frustrated not because they could not do the math but rather because they could not understand the context of some problems. Living in the desert all their lives had prevented them from developing the nautical knowledge necessary to solve the "yacht" problem. Because Ms. Kerns's students did not have the same opportunity to demonstrate their knowledge and skills as other students who could easily relate to the problem (perhaps because they lived along the coast or on an island), the "yacht" problem challenged the fairness of the national assessment.

To prevent bias, most test publishers have panels of experts who read test items carefully to determine whether they might be offensive to or biased against certain groups, such as women and cultural or linguistic minorities. However, this method is limited because it relies on the subjectivity of the experts. We discuss in more detail the potential sources of standardized test bias in the section on issues in standardized testing.

The Norm Group

Norm Group

A representative sample of the population that is tested and whose scores have been previously compiled for the purpose of making comparisons.

Norm-referenced tests allow educators to compare individuals' scores to those of a **norm group**, a representative sample of the population that is tested and whose scores have been previously compiled for the purpose of making comparisons. Let's examine this definition in more detail. A *sample* is a subset of a population (Kish, 2000). A sample of the school population in your state may consist of a random selection of 10% of the students in all schools. Samples are *representative* of the population to be tested when they include relevant characteristics of the population as a whole. In the previous example, imagine that your state department of education is interested in developing standardized tests to assess science learning for all fourth-grade students in the state. Once the test is constructed, the test developers will need to administer it to a sample of fourth-grade students in the state that is representative of the overall state's gender, ethnic, socioeconomic status (SES), and regional composition. If your state has a fairly even gender breakdown, the state norm group should include approximately the same number of boys and girls. If the population of students in your state is 30% African-American, 50% Hispanic, and 20% Anglo, then the norm group should also include this ethnic distribution. Before reading the next paragraph, think about the following question: What are the implications of using a standardized test when the norm group is not representative of the target population?

As you may have figured out, when norm groups are not representative of the student population that takes the test, comparisons between students' scores and those of the norm group are not appropriate. This is why teachers should carefully examine the characteristics of the norm group of standardized tests when evaluating their quality and results. Imagine the following scenario. A rural school district in the Southwest that is predominantly composed of low-income students with limited English proficiency is interested in using a certain achievement test to evaluate the quality of its teaching practices. After the first administration, it is obvious that students in the district are performing far below grade level. A close examination of the test's norm group shows that it was composed exclusively of urban students from affluent families in the Northeast, a population that is not representative of the rural school district.

Some standardized test scores are based on *state norms*, which are the standardized test scores of a representative group of students in a state. Other tests use *national norms*, which are the standardized test scores of a representative group from around the country. Nevertheless, not all standardized tests will use norm-referenced scoring. In fact, most states use criterion-referenced scoring in their accountability system, where students' scores are evaluated against predetermined standards rather than against the performance of

the norm group. A state may set a cutoff score (for example, 70%) that students need to reach to pass the test. Recall from Chapter 12 that experts recommend using criterion- rather than norm-referenced scoring for teacher-developed tests. Criterion-referenced assessments promote students' sense of competency, autonomy, and their natural tendency to learn by providing information about mastery of relevant knowledge and skills. In contrast, norm-referenced scores (grading on the curve) undermine students' sense of competency, autonomy, and intrinsic motivation by emphasizing competition among students and making one's performance contingent on the performance of others.

Get Connected!



COLLABORATIVE LEARNING ASSIGNMENT

Consult with a classmate and make a Venn diagram comparing and contrasting norm-referenced and criterion-referenced tests. Include characteristics of both types of tests as well as some advantages and disadvantages of using each type.

HOW TO INTERPRET STANDARDIZED TEST SCORES

For some standardized tests, the testing companies will mail back students' scores to the schools once they have scored them. For others, teachers need to know how to score the tests themselves by using scoring keys and rubrics distributed with the tests. In either case, after the test scores are calculated, you need to interpret them appropriately so that their results can inform your teaching practice. In this section, we discuss some basic statistical concepts to help you understand standardized test results, including frequency distributions, measures of central tendency and variability, and the characteristics of normal distributions. In addition, you should know how to interpret different standardized test scores (e.g., raw, percentile, grade-equivalent) to effectively communicate the results to students, parents, other teachers, and administrators.

Frequency Distributions

Frequency Distribution

A list of the number or proportion of student scores at each score level or interval.

Sometimes standardized test scores are shown as a **frequency distribution**, a list of the number or proportion of student scores at each score level or interval. Figure 13.4 shows an example of a frequency distribution on a hypothetical test. If you look

FIGURE 13.4 **A frequency distribution example.**

SCORE	FREQUENCY	RELATIVE FREQUENCY	CUMULATIVE FREQUENCY
60	5	5%	5%
61	10	10%	15%
62	15	15%	30%
63	25	25%	55%
64	20	20%	75%
65	10	10%	85%
66	5	5%	90%
67	4	4%	94%
68	3	3%	97%
69	2	2%	99%
70	1	1%	100%

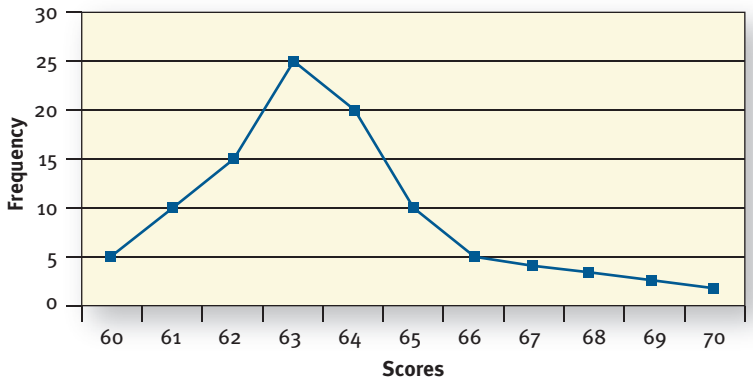


FIGURE 13.5 A line graph representing a frequency distribution.

at the first two columns, you will notice that there were five students who received a score of 60 and only one student who received a score of 70. The third column shows the *relative* frequency, which is the frequency for each score divided by the total number of students. You can calculate the total number of students in this distribution by adding the frequency column. In our example, the total number of students is 100, so the relative frequency of the score 64 is 20%. The fourth column shows the *cumulative* frequency, which can be calculated by cumulatively adding the relative frequencies from the lowest score to the highest score. By reading the cumulative frequency column, you can see that 90% of the students scored 66 and lower.

Now take a look at Figures 13.5 and 13.6, which represent the frequency distribution with two typical graphs. Figure 13.5 is called a *line graph* because it represents the frequency distribution with a line. Note that frequencies for each score are on the vertical axis and corresponding scores are in the horizontal axis. Figure 13.6, called a *bar graph* or **histogram**, represents frequencies as a set of vertical bars.

Histogram

Also called a bar graph; it represents frequencies as a set of vertical bars.

Measures of Central Tendency

In addition to understanding score frequency, teachers are interested in knowing the typical score (i.e., central tendency) in the score distribution. There are three main measures of central tendency. The **mean** is the arithmetic average of the scores; it is calculated by adding all the scores in the distribution and dividing by the total number of students. If three students had scores of 5, 6, and 10, the mean score would be $(5 + 6 + 10)/3 = 7$. The mean is a central tendency measure that takes into consideration *all* scores in the distribution.

Mean

The arithmetic average score of a distribution, calculated by adding all the scores in the distribution and dividing by the total number of students.

The **median** is the score that is in the middle of the ordered distribution of scores, which is why sometimes it is also called the geometric mean. In the previous example, the median score is 6 because it falls right in the middle of the three scores. You may

Median

The score that is in the middle of the ordered distribution of scores, which is why sometimes it is also called the geometric mean.

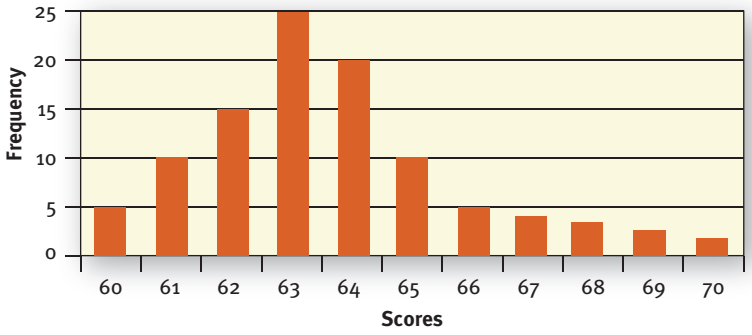


FIGURE 13.6 A bar graph representing a frequency distribution.

wonder how to calculate the median when the total number of scores is an even rather than an odd number. In this case, because there will be two rather than one middle value, the median is the average of the two scores that fall in the middle. For the scores of 6, 8, 10, and 11, the median would be 9, which is the average of 8 and 10. Unlike the mean, the median is a measure of central tendency that does not take into account all the scores in the distribution.

Mode

The most frequent value of a score distribution.

The third central tendency measure is the **mode**, which is the most frequent value of a distribution. Now go back to Figure 13.4 and try to find the mode of the distribution of scores before reading the next paragraph.

You probably noticed that the mode is 63, because it has the highest frequency in the distribution. The mode can only be used if some scores are repeated. Distributions are *bimodal* when they have two modes; they are *multimodal* when they have two or more modes. The main advantage of using the mode is its easy computation. On the other hand, when compared to the mean and the median, it is the central tendency measure that takes into consideration the least amount of information from the score distribution.

Let's review the three central tendency measures by calculating the mean, median, and mode for the following score distribution: 3, 3, 4, 4, 4, 5, 5, 6, 6, 7, 7, 7, 7, 8. The mean is the sum of the scores divided by the total number of scores (76/14 = 5.43). The median is 5.5, or the middle value between the seventh and eighth values in the ordered distribution. The mode is 7, the most repeated score.

Measures of Variability

Although measures of central tendency allow you to calculate the typical scores in the distribution, they do not give information about how the scores are distributed. Are the scores widely scattered (in which case students' performance is highly variable) or are they tightly clustered (in which case students' performance is roughly the same)? To answer this question, you can examine two measures of variability: the range and the standard deviation of scores. Take a look at Figure 13.4 again and find the minimum and maximum scores of this distribution before reading the next paragraph.

Range

The difference between the minimum and maximum scores, calculated by subtracting the minimum score from the maximum score in the distribution.

Standard Deviation

A measure of score variability showing how widely the scores vary in respect to the average score in the distribution.

You probably found that the minimum score is 60 and the maximum is 70. Therefore, the **range** of this distribution is 10, which can be calculated by subtracting the minimum score from the maximum score in the distribution. The range might be the first measure of variability that you consider, but it is not an optimal measure of variability because it takes into consideration only the maximum and minimum scores of the distribution. In contrast, the **standard deviation** takes into consideration all scores because it measures how widely the scores vary in respect to the average score in the distribution. The larger the standard deviation, the more spread out the scores are in the distribution. The smaller the standard deviation, the more clustered the scores are around the mean. The standard deviation, however, is not as easy to calculate as the range. Here are the steps that you should use to calculate the standard deviation for a score distribution:

1. Calculate the mean score ($\overline{X}$, pronounced "X bar") of the distribution.
2. Subtract the mean from each score ($X - \overline{X}$).
3. Square each difference $(X - \overline{X})^2$
4. Add all the squared differences $\Sigma(X - \overline{X})^2$
5. Divide the sum by the total number of scores $[\Sigma(X - \overline{X})^2]/N$
6. Find the square root $\sqrt{[\Sigma(X - X)^2]/N}$

Teachers should consider calculating the standard deviation of a set of scores if they are interested in getting the full picture of classroom performance. For instance, two distributions of scores might yield the same mean score, yet the score distribution might

differ greatly. Imagine that Ms. Kahn gave the same standardized math test to two classrooms (A and B). Each classroom has 25 students, who can get a maximum potential score of 12 points in the test. Students in classroom A received the following scores: 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 8, 8, 8, 8, and 8. Students in classroom B received the following scores: 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 8, 8, 8, 8, 8, 12, 12, 12, 12, and 12. Now try to guess which classroom will have the largest standard deviation before reading the next paragraph.

You probably guessed that the standard deviation for classroom A should be smaller than the one for classroom B. In fact, if you actually calculated the mean and standard deviations for classroom A and B, you would find that they both have a mean score of 5.2, yet their standard deviations are 1.76 and 4.25, respectively. The standard deviation is much smaller for classroom A because students' scores are pretty tightly bunched together (suggesting relatively even performance among students). In contrast, classroom B has a larger standard deviation because students' scores are spread apart, suggesting that some students mastered the content but others are performing very poorly on the test. As you see, although the standard deviation is a statistical concept that might be too abstract or technical to communicate to students and parents, it is important for the teacher to know how tightly students' scores are clustered around the mean test score in order to reflect on future instructional needs.

Normal Distributions

Normal distributions are those where most scores cluster around the average value in the distribution and have a bell-shaped curve such as the one shown in Figure 13.7. Notice that the distribution of scores is symmetrical: half the scores fall below the average score and the other half fall above. Another characteristic of normal distributions is that 68% of the scores fall within 1 standard deviation from the mean; 96% of the scores fall within 2 standard deviations from the mean; and only 4% of the scores fall above or below 2 standard deviations from the mean. In addition, when distributions of scores are normal, the mean, median, and mode are identical.

Normal Distributions

A bell-shaped distribution of scores where most scores cluster around the average value in the distribution and which has identical mean, median, and mode values.

To better understand how scores can be interpreted in normal distributions, let's assume that Peter got a score of 90 on a standardized test. If the mean score of all students who took the test is 100 and the standard deviation is 10, then Peter's score is only 1 standard deviation unit below the mean. Imagine now that everything else is kept the same except that the standard deviation of the scores is 5 instead of 10. This means

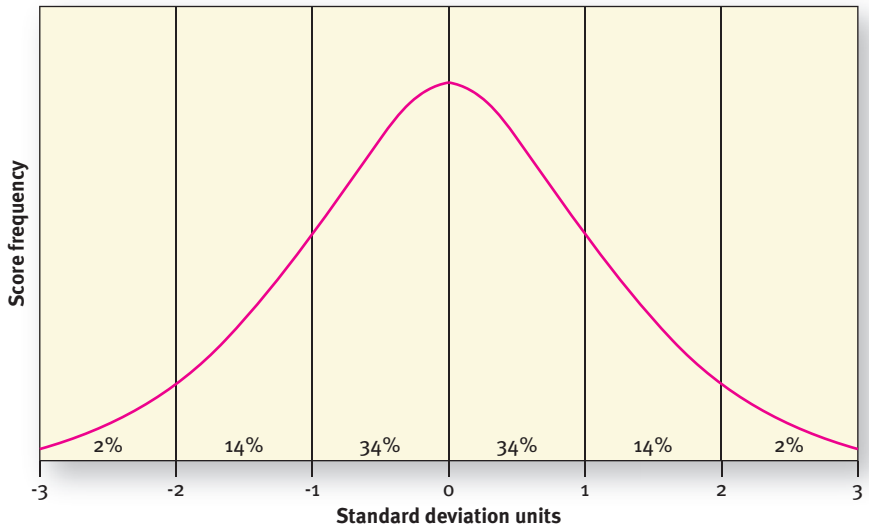


FIGURE 13.7 **A normal distribution.**

that Peter's score is now 2 standard deviation units below the mean, which is well below average. As you see, knowing both the mean and the standard deviation of a distribution of scores will allow you to interpret individual student scores more meaningfully, especially if the test scores form a normal distribution.

Normal distributions are typically found when the number of scores is very large, such as in the case of state or national standardized tests. The SAT scores are an example of a normal distribution, with a mean of 500 and a standard deviation of 100. Likewise, IQ scores are normally distributed, having a mean of 100 and a standard deviation of 15, which means that 68% of all IQ scores fall within the range of 85 and 115.

Types of Scores

Scores on the most widely used standardized tests are reported on forms that summarize and explain students' results. Therefore, it is useful to learn about the different types of scores that you may encounter on these forms. A **raw score** is the number of items that the student answered correctly on the test; by itself, it does not provide information about how a student performed as compared to other students or how difficult the test was. This is why test publishers provide teachers with other kinds of scores, including grade-equivalent, percentile, and standard scores. We discuss these next.

Raw Score

The number of items that the student answered correctly on the test.

Grade-Equivalent Scores. **Grade-equivalent scores** indicate a student's performance in relation to the grade level and month of the schoolyear, assuming a 10-month schoolyear. For example, a grade-equivalent score of 4.6 indicates a score that is equivalent to sixth months into the fourth grade of school, and a grade-equivalent score of 5.0 indicates a score that is equivalent to the beginning of the fifth grade. Grade-equivalent scores have the advantage of being easy to understand. On the other hand, they can be misleading when interpreted as appropriate grade placement rather than student progress. A score above a student's actual grade may be wrongly interpreted as an indication that the student is capable of consistently working at a higher level, suggesting the need for accelerated promotion. For example, Sophia's mom calls her daughter's fourth-grade teacher, Mr. Brazen, for a conference. She just received Sophia's standardized test scores in the mail and is very excited about the possibility that her daughter might be considered for advancement to a sixth-grade class. Sophia received a grade-equivalent score of 6.5 in the test. During the conference, Mr. Brazen clarifies that Sophia scored the same as a sixth-grader would have on the fourth-grade test; however, the score should not be interpreted to mean that Sophia should be in sixth-grade math. Why? A 6.5 grade-equivalent score is the score that a typical sixth-grade student in the fifth month would have received if he/she had taken the fourth-grade test. Sophia was not exposed to a sixth-grade math curriculum, and the fourth-grade test did not contain sixth-grade content. Consequently, all we can conclude from Sophia's 6.5 grade-equivalent score is that her achievement level in math is high relative to her fourth-grade peers. The score does not supply any information about how she would handle the math curriculum normally taught to students by the fifth month of sixth grade. Grade-equivalent scores do not provide a prescription for grade placement. When grade-equivalent scores are much higher or lower than the student's grade level, they are mainly a sign of exceptional performance. Because grade-equivalent scores are likely to be misinterpreted, experts recommend using other types of scores to report performance on standardized tests.

Grade-Equivalent Scores

A score that indicates a student's performance in relation to the grade level and months of the schoolyear assuming a 10-month schoolyear.

Percentile Scores. **Percentile scores** indicate the percentage of the distribution that lies at or below the student's score, thus providing information about the score's position with respect to the remainder of the scores in the distribution. Percentile scores range from 1 to 99. A student with a percentile score of 78 on a test performed as well as or better than 78% of the sample who made up the norm group for this particular test. Note that percentile scores refer to a percentage of people rather than a percentage of correct responses.

Percentile Scores

A score that indicates the percentage of the distribution that lies at or below the student's score.

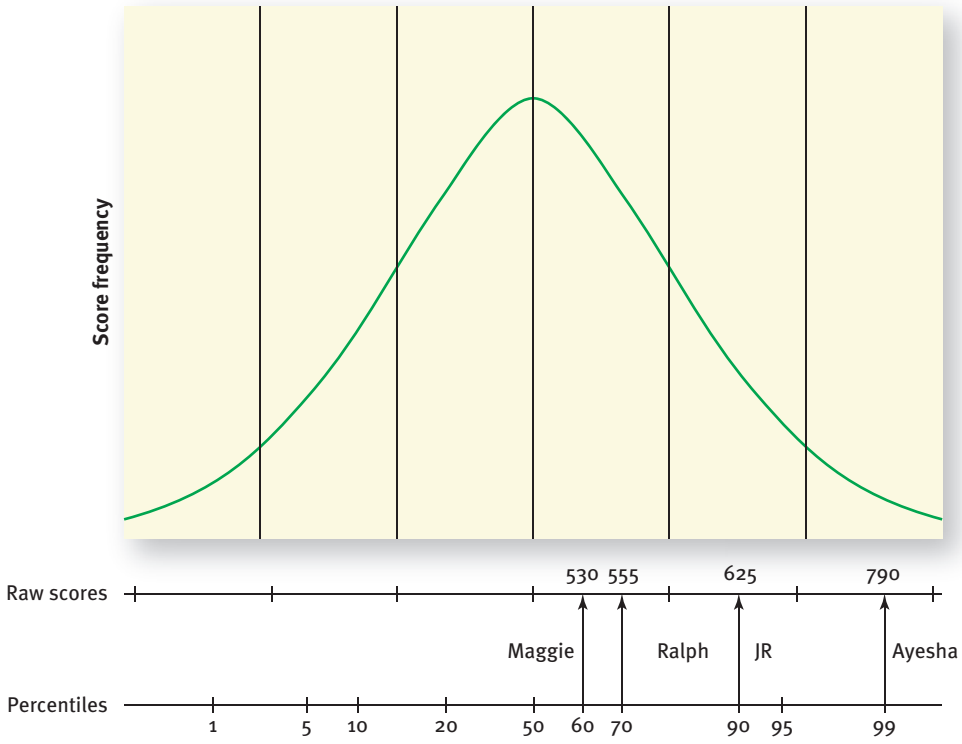


FIGURE 13.8 Correspondence between raw and percentile scores for four students.

Standard Scores

Scores expressed as deviations from the mean score, such as the stanines, *z*-scores, and *t*-scores.

Stanines

The short version for the term *standard nines*, a standard score that reports test performance on a 9-point scale that ranges from 1 to 9.

Another limitation of percentile scores is that they overestimate score differences in the middle range of the scores and underestimate score differences in the lower and upper ranges of scores. You can visually see this point in Figure 13.8, which shows the SAT raw scores and corresponding percentiles for four students. As you see, Maggie, Ralph, JR, and Ayesha received raw scores of 530, 555, 625, and 790 and ranked in the 60th, 70th, 90th, and 99th percentiles, respectively. Although the difference in ranking between Maggie and Ralph is about the same as the one between JR and Ayesha (10%), the difference between the actual scores of Maggie and Ralph (25 points) is much smaller than that between JR and Ayesha (165 points).

Standard Scores. **Standard scores** are expressed as deviations from the mean score, such as the standard deviation concept just discussed. Standard scores are useful because you can transform the raw scores of different types of tests into a common scale, thus allowing for comparisons across tests. Let's take a look at three common standard scores: stanines, *z*-scores, and *t*-scores. **Stanines**, which is the short version for the term *standard nines*, report students' test performance on a 9-point scale that ranges from 1 to 9. Stanines were developed by the U.S. military to provide a single-digit score that could be used to compare across tests. Stanines are typically interpreted as follows:

- Scores of 1, 2, and 3 are below average.
- Scores of 4, 5, and 6 are average.
- Scores of 7, 8, and 9 are above average.

Stanine scores have a mean of 5 and a standard deviation of 2 and refer to specific percentile scores in a normal distribution, as shown in Table 13.1. Note that each stanine score represents a range of test performance. For example, a stanine score of 8 covers test performance that is within the 89th to 95th percentile.

TABLE 13.1

Correspondence between percentile and stanine scores.

PERCENTILE SCORE	STANINE SCORE
96 and higher	9
89–95	8
77–88	7
60–76	6
40–59	5
23–39	4
11–22	3
4–10	2
3 and lower	1

***z*-scores**

A standard score that provides information about how many standard deviations a raw score is above or below the mean score of the distribution.

***z*-scores** provide information about how many standard deviations a raw score is above or below the mean score of the distribution. The *z*-score is calculated by subtracting the mean from the score and dividing by the standard deviation as shown in the following formula: $z\text{-score} = (X - \overline{X})/\text{SD}$. *z*-scores are useful because they allow us to transform the raw scores in any normal distribution into equivalent scores for a normal distribution that has a mean of 0 and a standard deviation of 1, making the scores easier to understand. The *z*-score indicates how far and in what direction that particular score is from the mean score as expressed in units of its distribution's standard deviation.

If a distribution of scores has a mean of 100 and a standard deviation of 20 and a student has a score of 110, then the z-score for this student will be $(110 - 100)/20 = 0.5$, which is a standard deviation of 0.5 above the mean. Likewise, if a distribution of scores has a mean of 200 and a standard deviation of 50 and a student has a score of 150, the *z*-score for this student will be $(150 - 200)/50 = -1$, which is 1 standard deviation below the mean.

Another way to standardize scores that avoids the inconvenience of using negative numbers consists of converting *z*-scores into *t*-scores. The *t*-score is a standard score in which the mean is set to 50 and the standard deviation is set to 10; it can be calculated with the following formula: $t\text{-score} = 50 + 10 \times (z\text{-score})$. A *z*-score of 2 corresponds to a *t*-score of 70; the raw scores of 110 and 150 in our previous examples correspond to *t*-scores of 55 and 40, respectively. Parents and students will typically find *t*-scores easier to understand when *z*-scores would otherwise lead to negative numbers. It seems counterintuitive to relate performance to negative numbers. Classroom Tips: How to Use Standardized Test Scores summarizes the definitions and uses for the different scores discussed in this section.

CLASSROOM TIPS

How to Use Standardized Test Scores

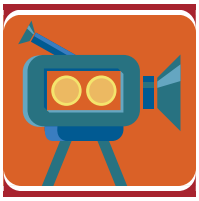
Score Type	Definition	How to Use This Score
Raw score	The number of items that a student answered correctly on the test.	Useful when combined with other scores that provide information about how a student performed as compared to other students or how difficult the test was.
Grade-equivalent score	Students' performance in relation to the grade level and months of the schoolyear, assuming a 10-month schoolyear.	Useful to estimate a student's developmental status in terms of grade level. Should not be used for grade placement.
Percentile scores	The percentage of the distribution (from 1 to 99) that lies at or below the student's score.	Useful to provide information about how a student performed as compared to other students.
Standard scores	Students' performance is expressed in terms of deviations from the mean score.	Useful to establish how well a student performed as compared to other students and to draw comparisons across tests with a common scale.
Stanines	A standard score with a mean of 5 and a standard deviation of 2 in which students' performance is given on a 9-point scale.	Useful to quickly provide an index of how well a student performed as compared to other students.
z-scores	The standard score that results from transforming the raw scores in any normal distribution into equivalent scores for a normal distribution with a mean of 0 and a standard deviation of 1.	Useful to make raw scores easier to understand by presenting them in terms of their distance (in standard deviation units) from the mean score.
t-*scores*	A standard score in which the mean is set to 50 and the standard deviation is set to 10.	Useful when *z*-scores lead to negative scores because *t*-scores are always positive and easier to interpret by parents and students.

WHAT IS THE TEACHER'S ROLE IN STANDARDIZED TESTING?

This section revisits the assessment cycle introduced in Chapter 12 with a focus on standardized testing. Recall that the assessment cycle consists of four stages: planning, administering, evaluating and reviewing, and communicating the results of assessments to relevant parties such as students, parents, and administrators. For the particular case of standardized testing, we discuss how teachers should prepare students for the test, administer the test, interpret the test scores, communicate the results to students and caregivers, and plan instruction based on the test results.

Get Connected!

VIDEO CASE ASSIGNMENT. . . Using the Strategies in Your Classroom: Hear from the Specialists (Tab 2)



Go to your WileyPlus course and view the video. Think about how you can apply the everyday classroom strategies discussed by Ms. Dean to the administration of standardized tests (e.g., learning objectives and communication with students and parents). Be prepared to discuss those strategies.

Preparing Students for Standardized Tests

Preparing students for standardized tests entails two responsibilities. First, teachers need to ensure that students have reached learning objectives, which depends on how effective instruction is. Second, teachers need to ensure that students can do their best to demonstrate their knowledge and skills during standardized testing. To this end, you should take the time to explain the purpose of the test, how the results will be used, and how the test is relevant to their learning. By giving information in a rational way, you will be more likely to motivate your students to do well on the test. For instance, when Jarett questions Mrs. Kirkland about the need to read the test instructions in Imagine You Are the Teacher, he is demonstrating a lack of understanding of the importance of standardizing the test administration procedures. It is likely that Jarett is also unaware of the rationale for taking the test, which will affect his motivation to do well on it.

Communicate a positive attitude toward the assessment and avoid making any comments regarding the high-stakes nature of standardized testing, which can only raise students' anxiety and compromise their performance. Even if you have negative feelings about high-stakes tests, resist the temptation of engaging your students in a discussion about their pedagogical, political, or financial implications. As the test day approaches, give students as much information as possible regarding the days, times, subjects, response format, and procedures to reduce their anxiety.

An effective way to prepare students for standardized tests is to give them frequent practice tests of the same type and format as the actual test. In this way, students will be more likely to have developed automaticity in test-taking procedures such as knowing how to respond to multiple-choice questions or how to fill the computer-scored answer sheets (Sax, 1989). Many states provide schools with practice tests and exercises designed to familiarize students with high-stakes testing procedures. In addition, you can teach basic test-taking strategies as part of your regular instruction without increasing your burden significantly. Classroom Tips: Helping Students Become More Effective Test-Takers lists some helpful test-taking strategies.

Because standardized test results can have serious consequences for students, teachers, and schools, many schools are also using test-taking skills programs (Payne, 1997). Although research finds that teaching test-taking strategies has only a small effect on students' scores (Educational Testing Service, 1994; Scruggs & Lifson, 1985), strategy instruction may help younger and lower-achieving students as well as students who have little test-taking experience (Walton & Taylor, 1996/97).

CLASSROOM TIPS

Helping Students Become More Effective Test-Takers

Read the test directions carefully.

Read all test items carefully.

Read all distracters in multiple-choice items.

Estimate how much time you need for each question.

Monitor test-taking time.

Attempt easier items first.

Eliminate options before answering.

When stuck on one question, mark it to return to later and move on.

Guess only when there is no penalty for guessing.

Check your answers once you are done.

Finally, an important element in preparing students for standardized test taking is to keep parents informed. Remember that parents are your partners and are the key to motivating students to do well. Circulate a newsletter informing parents about the purpose of the test and uses of the results, the testing dates and times (so that they avoid scheduling appointments on those days), and ask for their support in monitoring students' completion of assignments intended to help them prepare for the test (see Figure 13.9). Remind parents to support their children by ensuring the student gets a good night's sleep the night before the test, has a good breakfast before the test, and arrives at school on time the day of the test.

Test Administration

Most standardized tests include instructions about how the test should be administered, including how to set up the testing room, how to distribute the test and answer sheets, how much time students have to take the test, and what teachers should and should not do while students are taking the test. Teachers should follow these instructions closely to ensure that the test is, in fact, given under standardized conditions (Gay & Airasian, 2000). Recall that the validity of norm-based standardized test results depends, among other factors, on how well the testing conditions reflect the testing conditions of the norm group.

How might teachers support student success during the test administration phase?

Experts also recommend taking notes on any unusual student behavior during the test administration, such as when students seem to be mentally absent, responding randomly, or showing signs of extreme anxiety (Linn & Miller, 2005). These notes might help account for the performance of students when the results arrive.

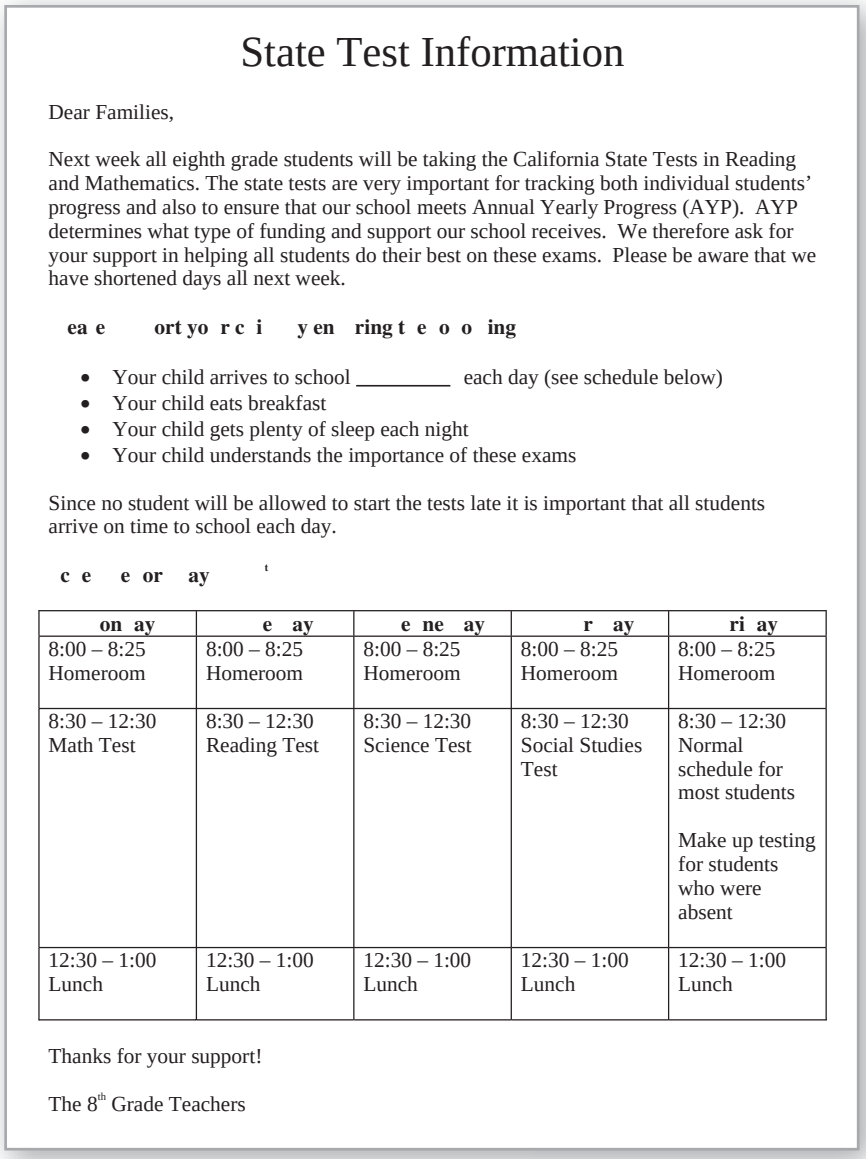


Will & Deni McIntyre/©Corbis-Bettmann

Ensure that students have adequate work space, appropriate lighting and temperature conditions, and that noise and distractions are minimized. To avoid being disturbed by outsiders, place a sign on the testing room indicating that testing is in progress (McMillan, 2004). To help students monitor their time, write on the board the starting and ending time of the test.

Interpreting Standardized Test Scores

The first step in interpreting standardized test results is to be aware of their limitations. Because all tests have some degree of error, use caution when interpreting small differences in test scores, especially those coming from percentile and grade-equivalent



State Test Information

Dear Families,

Next week all eighth grade students will be taking the California State Tests in Reading and Mathematics. The state tests are very important for tracking both individual students' progress and also to ensure that our school meets Annual Yearly Progress (AYP). AYP determines what type of funding and support our school receives. We therefore ask for your support in helping all students do their best on these exams. Please be aware that we have shortened days all next week.

ea e ort yo r c i y en ring t e o o ing

- Your child arrives to school _____ each day (see schedule below)
- Your child eats breakfast
- Your child gets plenty of sleep each night
- Your child understands the importance of these exams

Since no student will be allowed to start the tests late it is important that all students arrive on time to school each day.

c e e or ay

on ay	e ay	e ne ay	r ay	ri ay
8:00 – 8:25 Homeroom	8:00 – 8:25 Homeroom	8:00 – 8:25 Homeroom	8:00 – 8:25 Homeroom	8:00 – 8:25 Homeroom
8:30 – 12:30 Math Test	8:30 – 12:30 Reading Test	8:30 – 12:30 Science Test	8:30 – 12:30 Social Studies Test	8:30 – 12:30 Normal schedule for most students Make up testing for students who were absent
12:30 – 1:00 Lunch	12:30 – 1:00 Lunch	12:30 – 1:00 Lunch	12:30 – 1:00 Lunch	12:30 – 1:00 Lunch

Thanks for your support!

The 8th Grade Teachers

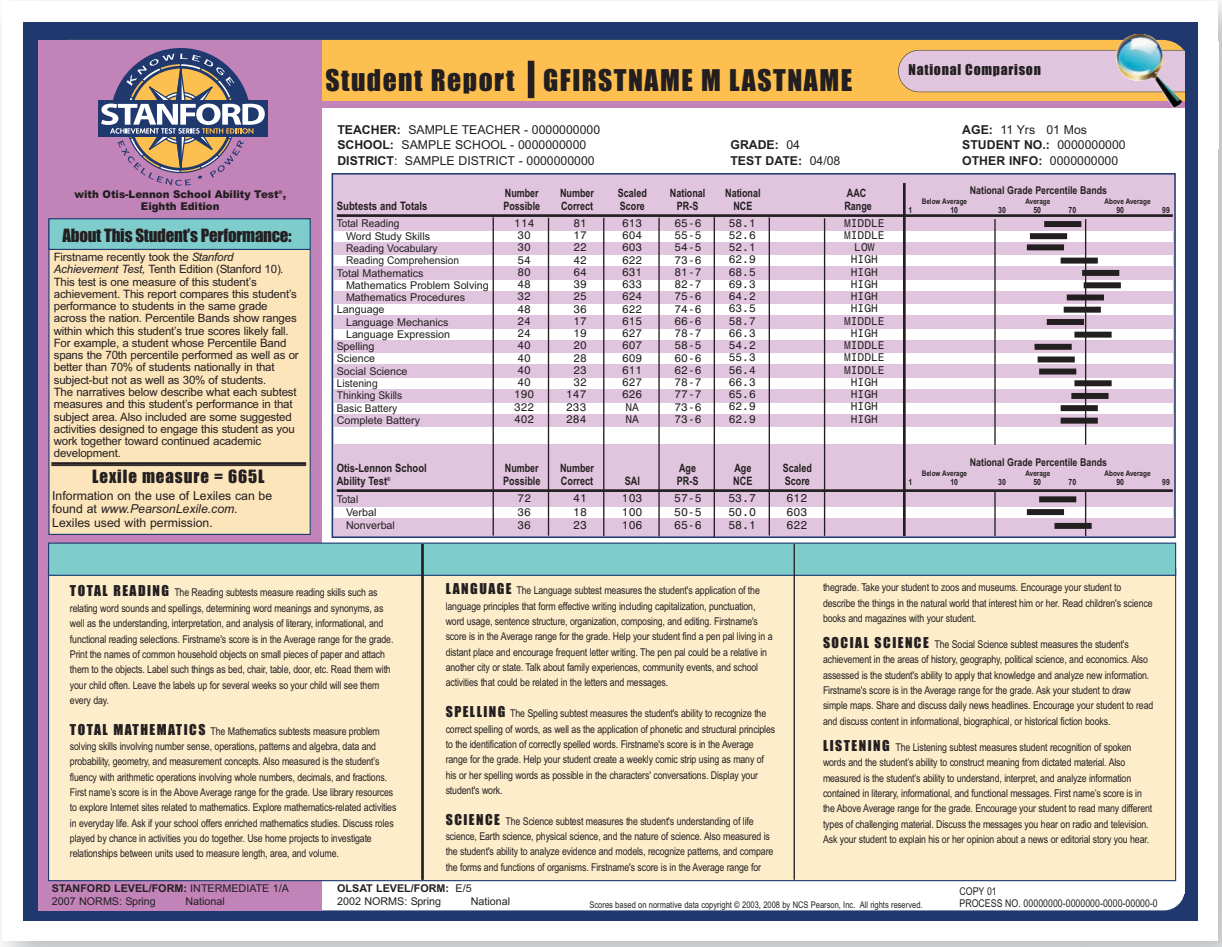
FIGURE 13.9 In how many ways can parents help with test preparation?

scores (Airasian, 2005). Experts suggest using other assessment information in conjunction with standardized test results to come up with a more accurate evaluation of students' performance (Kaplan & Saccuzzo, 2005; Neukrug & Fawcett, 2006).

When teachers interpret standardized tests, they typically compare students' performance to that of students from different schools, districts, states, and even countries. To help make comparisons, test publishers provide schools with reports such as the one shown in Figure 13.10.

As you see, this particular report includes the total number of items in each test and subtest and the student's raw score, national percentile scores (indicated as percentile rank or PR), stanine scores (indicated after the dash within each percentile rank score), and national percentile bands.

A good method for examining standardized test reports is to start with the highest level of information, such as the scores for the primary domains (e.g., math, reading, science, social studies), and then examine the scores on the subscales within each one of the primary domains (e.g., vocabulary and reading comprehension within reading). These scores will allow you to see the relative strengths and weaknesses of each student between



KNOWLEDGE STANFORD ACHIEVEMENT TEST SERIES TENTH EDITION EXCELLENCE • POWER

with Otis-Lennon School Ability Test®, Eighth Edition

About This Student's Performance:

Firstname recently took the *Stanford Achievement Test*, Tenth Edition (Stanford 10). This test is one measure of this student's achievement. This report compares this student's performance to students in the same grade across the nation. Percentile Bands show ranges within which this student's true scores likely fall. For example, a student whose Percentile Band spans the 70th percentile performed as well as or better than 70% of students nationally in that subject-but not as well as 30% of students. The narratives below describe what each subtest measures and this student's performance in that subject area. Also included are some suggested activities designed to engage this student as you work together toward continued academic development.

Lexile measure = 665L

Information on the use of Lexiles can be found at *www.PearsonLexile.com*. Lexiles used with permission.

Student Report | GFIRSTNAME M LASTNAME

National Comparison

TEACHER: SAMPLE TEACHER - 0000000000
SCHOOL: SAMPLE SCHOOL - 0000000000
DISTRICT: SAMPLE DISTRICT - 0000000000
GRADE: 04
TEST DATE: 04/08
AGE: 11 Yrs 01 Mos
STUDENT NO.: 0000000000
OTHER INFO: 0000000000

Subtests and Totals	Number Possible	Number Correct	Scaled Score	National PR-S	National NCE	AAC Range
Total Reading	114	81	613	65-6	58.1	MIDDLE
Word Study Skills	30	17	604	55-5	52.6	MIDDLE
Reading Vocabulary	30	22	603	54-5	52.1	LOW
Reading Comprehension	54	42	622	73-6	62.9	HIGH
Total Mathematics	80	64	631	81-7	68.5	HIGH
Mathematics Problem Solving	48	39	633	82-7	69.3	HIGH
Mathematics Procedures	32	25	624	75-6	64.2	HIGH
Language	48	36	622	74-6	63.5	HIGH
Language Mechanics	24	17	615	66-6	58.7	MIDDLE
Language Expression	24	19	627	78-7	66.3	HIGH
Spelling	40	20	607	58-5	54.2	MIDDLE
Science	40	28	609	60-6	55.3	MIDDLE
Social Science	40	23	611	62-6	56.4	MIDDLE
Listening	40	32	627	78-7	66.3	HIGH
Thinking Skills	190	147	626	77-7	65.6	HIGH
Basic Battery	322	233	NA	73-6	62.9	HIGH
Complete Battery	402	284	NA	73-6	62.9	HIGH

National Grade Percentile Bands: Below Average / Average / Above Average; 1 10 30 50 70 90 99

Otis-Lennon School Ability Test®	Number Possible	Number Correct	SAI	Age PR-S	Age NCE	Scaled Score
Total	72	41	103	57-5	53.7	612
Verbal	36	18	100	50-5	50.0	603
Nonverbal	36	23	106	65-6	58.1	622

National Grade Percentile Bands: Below Average / Average / Above Average; 1 10 30 50 70 90 99

TOTAL READING The Reading subtests measure reading skills such as relating word sounds and spellings, determining word meanings and synonyms, as well as the understanding, interpretation, and analysis of literary, informational, and functional reading selections. Firstname's score is in the Average range for the grade. Print the names of common household objects on small pieces of paper and attach them to the objects. Label such things as bed, chair, table, door, etc. Read them with your child often. Leave the labels up for several weeks so your child will see them every day.

TOTAL MATHEMATICS The Mathematics subtests measure problem solving skills involving number sense, operations, patterns and algebra, data and probability, geometry, and measurement concepts. Also measured is the student's fluency with arithmetic operations involving whole numbers, decimals, and fractions. First name's score is in the Above Average range for the grade. Use library resources to explore Internet sites related to mathematics. Explore mathematics-related activities in everyday life. Ask if your school offers enriched mathematics studies. Discuss roles played by chance in activities you do together. Use home projects to investigate relationships between units used to measure length, area, and volume.

LANGUAGE The Language subtest measures the student's application of the language principles that form effective writing including capitalization, punctuation, word usage, sentence structure, organization, composing, and editing. Firstname's score is in the Average range for the grade. Help your student find a pen pal living in a distant place and encourage frequent letter writing. The pen pal could be a relative in another city or state. Talk about family experiences, community events, and school activities that could be related in the letters and messages.

SPELLING The Spelling subtest measures the student's ability to recognize the correct spelling of words, as well as the application of phonetic and structural principles to the identification of correctly spelled words. Firstname's score is in the Average range for the grade. Help your student create a weekly comic strip using as many of his or her spelling words as possible in the characters' conversations. Display your student's work.

SCIENCE The Science subtest measures the student's understanding of life science, Earth science, physical science, and the nature of science. Also measured is the student's ability to analyze evidence and models, recognize patterns, and compare the forms and functions of organisms. Firstname's score is in the Average range for thegrade. Take your student to zoos and museums. Encourage your student to describe the things in the natural world that interest him or her. Read children's science books and magazines with your student.

SOCIAL SCIENCE The Social Science subtest measures the student's achievement in the areas of history, geography, political science, and economics. Also assessed is the student's ability to apply that knowledge and analyze new information. Firstname's score is in the Average range for the grade. Ask your student to draw simple maps. Share and discuss daily news headlines. Encourage your student to read and discuss content in informational, biographical, or historical fiction books.

LISTENING The Listening subtest measures student recognition of spoken words and the student's ability to construct meaning from dictated material. Also measured is the student's ability to understand, interpret, and analyze information contained in literary, informational, and functional messages. First name's score is in the Above Average range for the grade. Encourage your student to read many different types of challenging material. Discuss the messages you hear on radio and television. Ask your student to explain his or her opinion about a news or editorial story you hear.

STANFORD LEVEL/FORM: INTERMEDIATE 1/A
2007 NORMS: Spring National

OLSAT LEVEL/FORM: E/5
2002 NORMS: Spring National

Scores based on normative data copyright © 2003, 2008 by NCS Pearson, Inc. All rights reserved.

COPY 01
PROCESS NO. 00000000-0000000-0000-00000-0

FIGURE 13.10 A sample Stanford Achievement Test report.

Source: From Stanford Achievement Test - Tenth Edition. Copyright © 2003 Pearson Education, Inc. and/or its affiliates. Reproduced with permission. All rights reserved. Contact NCS Pearson, Inc., Educational Assessment, 1-800-228-0752.

domains and within domains and determine whether the results are consistent with other evidence about your students' performance. An evaluation of standardized test scores in combination with other classroom assessments can provide you with an opportunity to reflect on students' progress and plan how to improve instruction accordingly.

Communicating Results

Once the test results are returned and you have had a chance to interpret them in conjunction with other assessments, communicate the results to students and parents or caregivers. Your primary responsibility consists of interpreting the test results using nontechnical language and within the context of other performance indicators. Remember that the ultimate goal of communicating the results of standardized tests and any other type of assessment is to share information that can help parents and teachers work together toward students' academic success. Teachers should follow the Family Educational Rights and Privacy Act (FERPA) mandate for confidentiality and present the test results to students and caregivers in private (see Chapter 12 for a description of FERPA prescriptions).

Planning Instruction

Standardized test results can guide your planning either before or after classes have started. When standardized tests are given prior to instruction, their results can provide teachers with information about students' past ability or achievement, which can be used to determine the appropriate levels of instruction to begin the schoolyear.

However, be careful about setting expectations for a student or the entire class that are based solely on the results of a standardized test, as this may lead to the self-fulfilling prophecy discussed in Chapter 2.

When standardized tests are given after classes have started, their results can be used to evaluate your teaching effectiveness and to plan instruction accordingly. This point is illustrated in the assessment cycle figure presented in the previous chapter (Figure 12.10). After a standardized test is administered, evaluated, and communicated, it is time to use the test information to reflect on your methods, the curriculum, and the qualities of the test itself to plan and improve future instruction. Nevertheless, remember not to rely on a single test score to plan instruction; instead, supplement standardized test results with other evidence, such as formal and informal classroom assessments and past performance records. Classroom Tips: How to Support Effective Standardized Testing summarizes some principles from this section with corresponding classroom examples.

CLASSROOM TIPS

How to Support Effective Standardized Testing

Principle	Classroom Examples
Make sure that students are prepared to take the test. Learners are less anxious and better able to demonstrate their knowledge and skills when they are familiar with the test format and procedures.	Ms. Woodmen has decided to spend the week before the state standardized tests to get her third-graders used to the testing conditions. She rearranges the desks from their customary working groups into rows, she reads directions to daily activities like she would do for the test, and she has students practice filling in circles completely.
Communicate a positive attitude toward testing. Remember that negative feelings can only raise anxiety and hurt performance.	Mr. Anderson is aware about the limitations of standardized tests. Yet he makes an effort to create a positive attitude toward standardized tests in the classroom by explaining their usefulness in guiding his teaching and helping students better understand the areas in which they need to improve.
Follow test instructions carefully and report unusual observations. This will ensure that results are comparable with those of the norm group and therefore useful to teachers, administrators, and policymakers.	Mrs. Nann noticed that Ann was looking very pale and uncomfortable on the first morning of the state-mandated tests. While the test directions were being read, Ann ran to the trash can but got sick before she reached it. After the room was cleaned, the students resumed testing and Mrs. Nann made careful notes about Ann's reactions in the testing paperwork.
Consider the test's norm, reliability, validity, and fairness during interpretation. Whenever possible, gather as much information as possible about the properties of the test before interpreting particular students' outcomes.	Even though the manual that accompanies the standardized tests is technical and long, Mr. Wilson reads it carefully so that he can evaluate the quality of the test, understand the intended uses for the test scores, and interpret the test results accurately.
Provide appropriate accommodations. Use special education students' IEP to guide you about their accommodation needs, and implement language accommodations as permitted with ELLs.	During the math sections of the standardized tests, Ms. Baline makes sure that James and Anita have their calculators ready as required by their IEPs.
Make sure you understand testing results before communicating them to students and parents. Study each report of scores ahead of time and be ready to present non-technical yet informational feedback about students' progress.	Once standardized test scores are returned, Mr. Jacobs likes to write a letter to each parent explaining the test results. Knowing that the results may be too technical, he makes an effort to include graphs and uses common language in his explanations.
Take the test results into consideration to plan and improve instruction. Examine the students' strengths and areas of needed improvement in the test subscales, and use the information to guide the type and amount of instruction that each student needs.	Ms. Homer is preparing for the upcoming schoolyear by looking at her students' past test scores. She is pleased to see that all of her students performed at grade level in math last year, so she plans to only review last year's content before moving on to new information this year.
Do not rely solely on standardized test results to make decisions. Although standardized tests are developed by experts trained in test development, keep in mind that standardized tests will not tell us everything that students know and are able to do.	When preparing for the end-of-the-year conference with parents, Mrs. Quilian likes to provide several artifacts to illustrate her statements about students' strengths and weaknesses. Before conferences start, she gathers portfolios of student work, classroom grades, and standardized test scores for each student.

Get Connected!



ANIMATION ASSIGNMENT. . . Assessing Learning through Standardized Testing

Go to your WileyPlus course and watch the animation on how standardized tests play a role in the instruction of a teacher and the assessment of the students. Be prepared to discuss the impact of standardized testing on classroom practice.

ISSUES IN STANDARDIZED TESTING

Standardized testing is not without controversy. This section summarizes the main issues around standardized testing, including the accountability movement, test bias, and teacher testing.

Accountability and Standardized Testing

The accountability movement was considered an effective solution to the general concern that an increasing number of high school students were graduating with very low proficiency in literacy and math. Because public money is used to fund schools, there needs to be a mechanism to inform parents, citizens, educators, administrators, and policymakers about school and teacher quality as well as children's progress in key subjects. As you probably remember from Chapter 1, the No Child Left Behind (NCLB) legislation responded to this need by requiring that all states have in place annual tests of student performance in reading, math, and science in grades 3 through 8 (U.S. Department of Education, 2002). States have the option to either develop their own tests, contract with companies to develop their tests, or purchase commercial tests available through publishing companies. Standardized tests are typically developed by curriculum experts, who take into consideration national and state standards to construct questions that assess what students in each grade should know or be able to do in different subject areas.

According to NCLB, all schools are expected to make adequate yearly progress (AYP) on all state assessments. To this end, states must report test scores for each school disaggregated by subgroup (e.g., ethnicity, special education, SES, and ELL status). Thus, schools and districts are accountable for all subgroups making AYP. Schools with one or more subgroup not meeting their state's AYP criteria are subject to negative consequences. A school that fails to meet AYP for two or more years needs to identify the specific areas that need improvement and work with parents, teachers, and outside experts to develop a plan to raise student achievement. In addition, the school should offer supplemental educational services (e.g., after-school programs, summer remediation programs) and give parents the opportunity to transfer their children to a more successful school. If a school fails to meet AYP over more years, the consequences could include restructuring the internal organization of the school, appointing external expert advisors, extending the schoolyear or schoolday, changing the curriculum, or replacing school staff.

Many people question the current emphasis on standardized testing resulting from the accountability movement. Standardized testing is extremely costly and can detract from offering students a balanced curriculum (Kohn, 2000a). Some argue that teachers will feel pressure to raise test scores to prove that they are providing quality education, thus teaching only what is tested at the expense of other learning objectives, a phenomenon known as **teaching to the test** (Berliner & Biddle, 1997; Shepard, 1995).

Teaching to the Test

The practice of teaching only what is expected to be tested at the expense of other learning objectives.

Others argue that because NCLB gives states autonomy about setting the learning standards and procedures to determine what constitutes a subgroup (e.g., in one school a subgroup may include African-American students, but not in another

school), some schools would be held accountable for more subgroups than other schools. An additional criticism is that standardized tests fail to reflect the particular challenges of some schools, such as high-poverty schools where appropriate funding, rather than high-quality teaching, is lacking or urban areas of high mobility, where schools are held accountable for the performance of students who may have had only a few weeks or months of instruction (Orfield & Kornhaver, 2001; Starratt, 2003).

Importantly, experts have pointed out that high-stakes testing can motivate schools and districts to adopt undesirable policies to artificially inflate scores, such as assigning more children to special education, categorizing more students as ELL, encouraging students with learning disabilities to avoid taking standardized tests, or retaining more students than necessary (Allington & McGill-Franzen, 1992; Linn, 2000). In sum, the many criticisms surrounding NCLB question whether this law is the right mechanism to obtain meaningful information about students' education. Yet the accountability system is here to stay (Marshall, 2003; Scherer, 2001). Therefore, you should have a good understanding of the characteristics, functions, and interpretation of standardized tests. Expert teachers are aware of standardized tests' strengths and weaknesses and know how to use them (Linn & Gronlund, 2000).

Test Bias: Definitions

Test bias results when a test is unfair for members of some groups but not for others. Due to the extensive linguistic and cultural diversity in the United States, test bias has become one of the biggest concerns in standardized tests (Murphy & Davidshofer, 1994; Thorndike, 2005). However, experts disagree on the very definition of what constitutes test bias. Some believe that a test is biased if it results in different scores between groups. However, this definition is too simplistic, as shown by the following example. Imagine that we have two groups of students in a high school classroom. Group A is a cohort of students who read assigned material consistently before class, study together, hold daily discussions about the topics covered by the class, share notes, and attend class regularly. In contrast, group B is a cohort of students who do not read the assigned material before class and attend class sporadically. Now suppose that, to assess learning, the teacher gives both groups the same standardized test and the results indicate that group A outperformed group B significantly. Is this evidence enough to conclude that the test is biased against group B? Think about a possible answer to this question before reading the next paragraph.

As you see, this definition of bias is misleading because differences in group scores will also originate when the groups under consideration differ in the knowledge and skills that the test is meant to assess. In our example, group B underperformed group A simply because students in this group did not put the same time and effort into studying for the test.

A second definition of bias looks at the predictive validity of the specific test. According to this approach, a test is biased if it either overpredicts or underpredicts some criterion for members of one group versus members of another group. A college entrance examination would be biased against girls if it does a good job of predicting college grades for males but consistently underestimates the college grades for females. However, research does not show that this is the case regarding such actual examinations. Although many have argued that college admission tests may be biased against women and ethnic minorities, research on college admission testing shows that tests do an equally good job of predicting college performance across different groups, provided that the members of such groups are native English speakers (Brown, Reynolds, & Whitaker, 1999; Sattler, 2001; Young, 2003).

Now that you had a chance to think about the functions and issues standardized tests and the role of the teacher in standardized testing, read the following case study and try to solve the dilemma of Nunaka Valley Elementary School's teachers.

A Case Study:
DIVERSITY IN THE CLASSROOM

Diversity in Teacher Beliefs and Attitudes toward Standardized Testing

"As you all know, Alaska's standards-based assessments (SBAs) begin in April, so over the next few months we'll be reviewing problem-solving strategies and taking practice tests in reading, writing, math, and science. Today, you'll take a math practice test so that I can identify the areas where you may need extra help," Mr. Cardasis explains to his fourth-graders.

"Ah, not another test, we just took a math test last week," Christopher protests.

"And I had a test in reading this morning," Emma adds.

"It seems like all we do is test, test, test," Madison grumbles.

"I know you've had a lot of tests lately, but it's what we have to do. Believe me, I don't like tests either, but it's something the state requires. Tomorrow, we'll be able to get back to our fun learning activities. I'm sorry, I wish we didn't have to spend so much time testing, but it's just the way it is," Mr. Cardasis says apologetically. For the remainder of the math lesson the fourth-graders quietly complete the test, which consists primarily of word problems.

"That was too hard," Tyler complains afterwards.

"Yeah, I guessed on the last three problems," Chloe admits.

"Sometimes you have to guess," Mr. Cardasis replies. "We'll go over the test tomorrow."

"But I thought you said we're going to do something fun?" Madison reminds him.

"Well," Mr. Cardasis pauses. "We'll try to get to some fun activities, but testing is our big focus now. I know how you feel. It's not something I look forward to either."

After school, Mr. Cardasis attends a third- to fifth-grade planning meeting to discuss test-prep strategies. "How are the practice tests going so far?" Mrs. Iso, Nunaka Valley's testing coordinator, asks the group of teachers.

"My students seem burned out already," Mr. Cardasis begins. "They're complaining and saying the tests are too hard. I'm not sure what to do because the SBAs are still three months away."

Demographics:

An Overview of the Students

Nunaka Valley Elementary

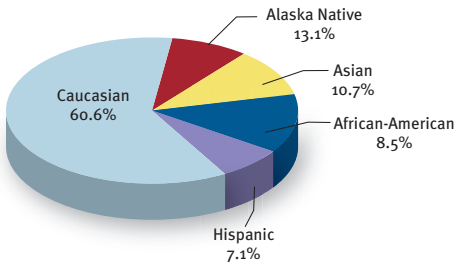
Anchorage, Alaska

56.6 % Students eligible for free and reduced lunch

10.8% Students qualify for ESL instruction

12.2% Students receive Special Education Services

Racial/Ethnic Groups



"I'm sorry to hear that. We can think of strategies to help motivate your students. As a teacher, it's important to effectively prepare them and model a positive attitude toward the tests," Mrs. Iso suggests.

"My third-graders really enjoyed playing a test-prep game in teams. First, I had the class answer questions about a pie graph. Then each team created their own graphing problem, incorporating their favorite sports. Not surprisingly, the Iditarod was a popular choice. They had a lot of fun," Mrs. Nappaaluk reports.

"I'm glad to hear you're using cooperative learning techniques," Mrs. Iso encourages. "Test-prep doesn't necessarily mean individual seatwork. I think it's important to get students talking and thinking critically about problem solving."

"Yeah, they asked me what games we'll be playing tomorrow. So I thought, as a group, we could come up with activities that will help prepare students for the tests," Mrs. Nappaaluk suggests. "I want them to feel confident and ready for the SBAs."

"Good idea. First, let's review the pacing calendar to make sure we're covering all the essential standards before April and then we can brainstorm activities," Mrs. Iso responds.

"I don't know how I'm going to teach statistics and probability before April, because right now the fifth-graders are still struggling with fractions," Mr. Peratrovich tells the group.

"I'm having a similar problem finding time for algebraic functions," Mrs. Nappaaluk admits.

"I think the best we can do is expose students to concepts that may be on the test so that they're not confused in April," Mrs. Iso recommends.

"Honestly," Mr. Cardasis begins. "I feel like that's just teaching to the test, and that's not my goal as an educator. We're all concerned about the school's test scores, but when we do so much test-prep, students miss out on valuable learning time. For example, I want to spend at least two weeks on measurement and geometry so I can include real-world applications; but

if I follow this pacing calendar, I won't have time. I think too much test-prep takes the fun and creativity out of learning and leaves students feeling anxious and disengaged."

"I realize that as professionals we may have different philosophies about standardized testing. But for now, testing is here to stay and we have the responsibility to teach our students the tools they need to succeed. You know, tests are used throughout life—to get a driver's license, for college, for graduate school, or to qualify for a job," Mrs. Iso replies.

Mr. Peratrovich jumps in: "I think it's important to remember that no test gives a complete picture of a student's knowledge, ability, or aptitude. But an effective assessment program that focuses on critical thinking skills should be part of our educational plan. We need to be accountable to our students and their families."

"I see your point," Mr. Cardasis begins. "I just don't want to lose sight of providing a well-rounded curriculum that not only gives students a foundation in the basics but also includes music, art, physical education, and other electives. I think it's a mistake for some subjects, like social studies, to be pushed aside, just because they not on the SBAs."

"Well, I think that's why we need to reevaluate what it means to prepare students for the test," Mrs. Iso proposes. "Asking students to discuss and debate issues, encouraging them to support their answers with evidence, and teaching them how to test hypotheses are all strategies that will help them on the test and throughout life."

"As a first-year teacher, I have the impression that the SBAs assess very basic knowledge and offer few opportunities for students to use higher-order thinking skills, such as analysis, synthesis, evaluation, and creativity," Ms. Kendall shares.

"It's true, the tests do not give students the opportunity to create extended projects or answer open-ended questions. But the multistep test questions do require students to analyze data, give their opinion, and justify their answers. Many of the math problems ask students to provide a written explanation of their thinking process," Mrs. Iso explains.

"I think it would be helpful for us to discuss effective strategies we'll use to prepare students for the test," Mr. Cardasis says. "Should students complete practice tests each week? Should they work in cooperative groups to practice problem solving? Should we target particular standards before April? Should we review specific types of reading questions? Should we emphasize estimation and number sense to help students validate their answers?"

"Those are all good strategies, which we can discuss more in-depth," Mrs. Iso recommends. "Remember to plan instruction based on your students' needs. What may work for one student or one teacher may not work for another. I think if we all focus our energy on providing high-quality, research-based instruction, students will learn the skills they need to succeed."

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the student's development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?



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What are some potential sources of standardized testing bias?

The third definition of test bias relies on the judgment of an expert panel, which is assumed to have the ability to analyze the content of a test and establish whether the test discriminates against different groups of individuals. Test publishers seem to favor this definition, as they routinely assess item bias with expert panels. The Educational Testing Service has all assessment materials reviewed by a sensitivity committee, which evaluates whether items may be biased against Asian/Pacific Island Americans, black Americans, Hispanic Americans, Native Americans/American Indians, individuals with disabilities, or women. The problem with this approach is that what constitutes bias depends on the subjectivity of the experts, thus challenging the reliability and/or validity of the expert panel decisions.

Sources of Test Bias

An alternative way to understand test bias is to examine the potential sources that may penalize a group of students unfairly. In this section, we discuss several sources that may challenge the fairness of standardized testing: offensiveness, content bias, language bias, and testing procedure and format bias (Anastasi & Urbina, 1997; Linn & Miller, 2005).

Offensiveness. A test is biased due to offensiveness when a particular group of students might be insulted by its content. An example is a test item that implies that boys are creative and successful problem solvers but girls need help with problems. Test items that students consider offensive may produce negative feelings that may affect their attitudes toward testing, and hence their test scores, which challenges the fairness of the test.

Content Bias. A test/item displays content bias when it results in different scores between different groups of students because the content of the item/test is less familiar to one of the groups, even though both groups have mastered the knowledge and skills measured by the test/item. For example, a math problem-solving item in which students are asked to compare the weights of several objects, including a football, might be biased against girls because girls are less likely to have experience handling a football. So they might find the item more difficult than boys (Scheuneman, 1982). The mismatch between test content and prior experience can also result in bias against certain cultural, regional, socioeconomic, or religious groups.

A recent research study showed that most Eskimo students chose the wrong answer to the following vocabulary item in a standardized test:

- "Which of the following would be most likely to take you to the hospital if you got hurt?"

The correct answer was *ambulance*, yet Eskimo students predominantly chose *airplane* because that is how people from their community are transported to the hospital in an emergency (Platt, 2004).

Likewise, the following test item from Toolkit98 (Regional Educational Laboratories, 1998) was shown to be biased against rural children:

- Four birds were sitting on a fence. A farmer threw a stone that hit one of the birds. How many birds were left on the fence?

Although item developers expected the right answer to be *three*, farm children knew that after the stone was thrown, *all* birds would fly away. Based on their prior experience, their answer was *zero* (Kusimo et al., 2000).

Culture-Free Test

A test without questions that are perceived to have a content bias towards certain cultures.

The cultural diversity of today's classrooms increases the potential for content bias and has led some psychologists to propose the development of **culture-free tests**. Nevertheless, these efforts have not been very successful. Students from cultural minor-

ity groups perform similarly on standard intelligence tests and the so-called culture-free tests (Sattler, 2001), and many experts argue that it is impossible to construct a culture-free test because the very acts of administering, taking, and interpreting tests are cultural in nature (Ogbu, 1994).

An alternative to attempting to develop culture-free tests is *culture-relevant testing*, which consists of using students' cultural background to increase the meaningfulness of test items (Bigelow, 1999; Gay, 1997; Sandoval, Scheuneman, Ramos-Grenier, Geisinger, & Frisby, 1999). The difficulty with this approach is that it is important to ensure that the meaning of the test items for one cultural group is the same as the one for the comparison group, and this might be problematic. Moreover, even within a single cultural group, there is great variation among students' experiences. For example, the cultural background and past experiences of Ana, a student whose family recently emigrated from Chile, are likely to be very different from those of Antonio, whose family emigrated from Cuba many generations ago. Yet Ana and Antonio are both students of Hispanic heritage.

Language Bias. A test item displays language bias when it results in different scores between different groups of students because the language of the test item is less familiar to one of the groups, even though both groups have mastered the knowledge and skills measured by the test item. Because standardized tests are typically administered in English, this type of bias will likely arise against English language learners (ELLs) who are tested in areas unrelated to language arts. Tests can be unfair to ELLs when students' knowledge demonstration is dependent on their understanding or expressing ideas in the less familiar language.

To avoid language bias, experts have proposed several solutions. One consists of giving students **language accommodations**, modifications to the environment or testing procedures designed to eliminate the effects of English proficiency on students' performance. For example, ELL students might be allowed to use an English dictionary or glossary while taking the test, receive extra time to complete the test, or given both accommodations (Abedi, Lord, Hofstetter, & Baker, 2000). Another solution consists of having a group of language experts simplify the language of test items to minimize the likelihood that students' ability to comprehend will interfere with their knowledge demonstration (Abedi & Lord, 2001).

Language Accommodations

Modifications to the environment or testing procedures designed to eliminate the effects of English proficiency on students' performance.

Research on these language accommodations, however, is not very promising. A recent study showed that allowing students extra time raised the scores of ELLs and non-ELLs alike, suggesting that it is not a valid language accommodation (Abedi et al., 2000). In addition, linguistic simplification was not found to make a significant difference in the overall performance of ELLs—only small differences in their performance on some test items (Abedi, Hofstetter, & Lord, 2004).

The third proposed solution to language bias is to translate the tests into students' first language. The problem with this approach is that translation may result in meaning changes across languages and dialects, thus raising concerns about the validity of these assessments. The Individuals with Disabilities Education Act (IDEA) requires that any assessment that is used to identify students with special needs be administered in students' first language. Yet there is no information on the reliability and validity of the translated tests and no norm group against which to compare students' performance (Lopez, 1997; Sattler, 2001).

There is also concern over testing students in their native language when English is the language of instruction because students may not understand the academic language of the content areas (e.g., math, science, social studies) in their native language. Therefore, native-language testing is advisable only for students who receive instruction in that language (Abedi et al., 2004). In sum, more research seems to be needed to find an appropriate solution to this standardized test issue.

Procedure Bias and Format Bias. Finally, there can be bias in the procedure for the testing and the format of the test itself. This occurs when the test includes procedures or formats that are differentially familiar to subgroups of examinees. This type of bias is

likely to arise when one group of students is less knowledgeable about testing procedures than others, such as children whose families have recently emigrated to the United States and come from an educational system where standardized testing is not common practice. The lack of familiarity with standardized testing procedures can, therefore, negatively affect this group's performance. However, this type of bias can be easily corrected by communicating clearly to students and parents the procedures, consequences, and expectations for standardized testing in this country.

Finally, testing format bias occurs when students of different cultural backgrounds or gender differ in their tendencies to guess on multiple-choice questions (Ben-Shakhar & Sinai, 1991; Gafni & Melamed, 1994). Groups that are less likely to guess when an answer to a question is unknown are penalized, thereby rendering the test unfair.

Standardized tests should provide equal opportunities for all students to demonstrate their abilities and knowledge. Therefore, when interpreting the results of standardized tests, teachers should think about the extent to which students' language background, experiences, and beliefs have prepared them to successfully take the test (Greenfield, 1997). In addition, teachers should reflect on the potential sources of bias reviewed in this section when they create their own assessment items in order to avoid some groups getting the items correct or incorrect for the wrong reasons. Some guiding questions to help teachers evaluate the tests they are creating for students are presented in Classroom Tips: How to Recognize Bias in Standardized Test Items.

Teacher Testing

Most states require teacher candidates to take a licensing exam. Although there is no national test in place yet, about 80% of the states that require licensing exams use the PRAXIS™ tests published by the Educational Testing Service (2009). This series consists of the following three components:

- PRAXIS I™—a preliminary screening of basic academic skills taken before undergraduate students are formally admitted to a teacher certification program
- PRAXIS II™—a set of exit exams taken before students are awarded a teaching certificate and covering students' specialty content areas and pedagogical knowledge (principles of learning and teaching)
- PRAXIS III™—tests of teaching performance (e.g., lesson plans, essays, portfolios, videos, class observations) administered during the first year of teaching and which can be used to make a licensing decision

CLASSROOM TIPS

How to Recognize Bias in Standardized Test Items

Offensiveness

Ask: Can the language or content of the item be construed as sexist, racist, or otherwise potentially offensive, inappropriate, or negative for some group of students?

Content bias

Ask: Does the item contain content that is differentially familiar to different groups of students?

Language bias

Ask: Does the item contain language that is differentially familiar to different groups of students, such as the use of dialects, difficult vocabulary, or complex syntax?

Testing format bias

Ask: Does the format or structure of the item present greater problems for students from one background than from others?

Testing procedure bias

Ask: Are the test instructions, procedures, and performance consequences differentially familiar to different groups of students?

States can require any or all of the PRAXIS™ tests for licensure. The PRAXIS™ tests support the current accountability movement by holding teachers accountable for meeting measurable educational outcomes. However, PRAXIS™ tests have been criticized for the lack of consistency across states regarding cutoff scores and test enforcement (Darling-Hammond & Baratz-Snowden, 2005). This is why there has been a recent call for a national test for teacher candidates (Keller, 2005; Wineburg, 2006).



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What is the relation between teacher certification exams and the accountability movement?

Critics argue that tests can only assess low-level knowledge and skills and that teachers' ability to manage the complexity of a classroom of diverse students depends on factors other than the knowledge assessed in standardized tests (Kohn, 2000b; Nagel & Peterson, 2001). Still, similar to the case of the accountability movement, despite the controversy around these tests, their use has been supported by the American Federation of Teachers, the second-largest professional organization of educators in the country (Blair, 2000). Another advanced certification program is the National Board for Professional Teaching Standards (NBPTS), which includes a one-year combination of in-class performance assessment, portfolio development, and videotaping. To learn more about PRAXIS™ tests and NBPTS, you can visit the websites at http://www. ets.org/ praxis and http://www.nbpts.org.

NEW DIRECTIONS IN STANDARDIZED TESTING

Due to the many issues surrounding standardized testing, new directions focusing on alternatives to traditional assessments are emerging. In this section we discuss two new directions in standardized testing: authentic assessments and computer-based testing.

Authentic Assessments

Critics of traditional standardized tests argue that these assessments focus on basic skills and facts that are not relevant to the real world. Asking students to solve questions individually, without the ability to use any resources or tools and under time pressure, does not reflect the conditions of solving problems in real life, where people collaborate with each other, draw from a variety of resources and tools, and use their high-order thinking and creativity (Chang & Chiu, 2005; Wolf, Bixby, Glenn, & Gardner, 1991).

A new direction was born out of these criticisms aimed at creating standardized authentic tests. Recall from Chapter 12 that authentic assessments are those that measure students' performance on tasks that are relevant to life outside of school and include performance assessments, portfolios, and exhibitions (Popham, 2005). Many states adopted authentic assessments as part or all of their statewide assessment system. This policy is usually reflected in the particular state's standards, as seen in the following examples.

- In 1990, Kentucky passed the Educational Reform Act, which set the objective that students apply the knowledge acquired in school to everyday life situations (National Commission on Testing and Public Policy, 1990).
- Vermont adopted a statewide assessment system that is portfolio-based (Vermont Department of Education, 2000).
- Kentucky includes writing portfolios and open-ended items where students need to explain their reasoning (Kentucky Department of Education, 2000).
- Maryland uses performance assessments in math, science, and writing (Maryland State Department of Education, 2001).

Newer versions of traditional national assessments are also moving in this direction; they include fewer multiple-choice items and more constructed-response items, where students are required to produce an essay, a solution to a problem, or a visual representation (e.g., graphs, diagrams) to demonstrate their knowledge. The SAT has moved to a more authentic assessment of writing by including a 20- to 30-minute written essay.

As you probably remember from the previous chapter, the downside of authentic assessments is that they have their own limitations when it comes to meeting the requirements of good assessments. First, it is not clear whether authentic assessments are valid assessments of learning standards. Even when a student successfully completes a certain hands-on performance assessment in science, it is still likely that the student will not display the necessary knowledge and skills to perform different science tasks (Shavelson, Baxter, & Gao, 1993). A second important limitation is that authentic assessments are found to be highly unreliable (Driessen, van der Vleuten, Schuwirth, van Tartwijk, & Vermunt, 2005; Herman & Winters, 1994; Jasper & Fulton, 2005). If authentic assessments are to be used to compare the performance across students, schools, districts, states, and even nations, special care to ensure rating reliability is needed. Third, although performances, exhibitions, and portfolios may be used on a schoolwide basis, they lack practicality at the district, state, and national level because they are too costly and cumbersome to administer (Wiggins, 1989). Finally, special concerns arise when attempts are made to standardize authentic assessments, that is, to make the experience uniform for all students (Worthen, 1993).

These limitations have made states such as Arizona, California, Kentucky, and Wisconsin shy away from their attempts to include authentic assessments in statewide tests. Until authentic assessments can be developed to be high-quality assessments, they should be combined with more traditional assessment types. Standardized tests seem to be the only type of assessment that can provide "big-picture," comparable, and reliable information of students' learning (Worthen & Spandel, 1991).

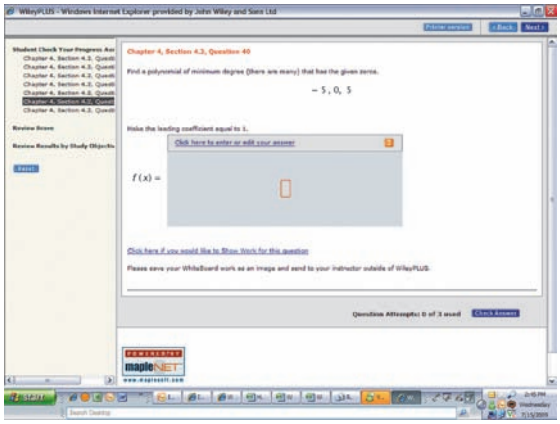
Computer-Based Testing

In its simplest form, computer-based testing consists of presenting students with the same standardized test that is typically administered in the paper-and-pencil format. Some of the advantages of computer-based testing over traditional paper-and-pencil testing are administration and scoring efficiency, reduced testing costs, improved test security resulting from electronic transmission and encryption, faster decision making as a result of immediate scoring and reporting, unbiased test administration and scoring, and fewer response entry and recognition errors (Asuni, 2008; Scheuermann & Guimarães Pereira, 2008). In addition, computer-based assessments show comparable validity and reliability to paper-and-pencil assessments using fewer items and less time (Anastasi & Urbina, 1997).

Adaptive Testing

The customized delivery of test items to different student performance levels.

What are the advantages and disadvantages of computer-based testing?



Laura Dwight Photography

Computers are able to present a variety of traditional assessments, including true–false, multiple-choice, fill-in-the-blank, and open-ended questions. Furthermore, simulation technologies can be integrated in computer-based testing to allow students to do hands-on performance tasks, such as conducting virtual science experiments, that are more efficient than actual classroom science performance tests (Fitzgerald et al., 2008).

A more useful use of computers is **adaptive testing**, the customized delivery of test items to different student performance levels (Olson, 2000; Wainer, 2000). In this situation, students start by answering one test item; then, depending on whether the student gave a right or wrong answer to the question, the computer presents new items of higher or lower difficulty, respectively. As students answer more items, the computer updates their performance profile. There are significant time savings with the use of adaptive testing because it can give more accurate information regarding

what students know or are able to do without wasting time on items that are either too easy or too difficult. In addition, adaptive testing allows students to recover from incorrect steps during problem solving (which is not possible in non-computer-based testing), and they avoid human error in rating (Kumar & Helgeson, 1995).

A new and promising use of computer-based testing consists of providing students with assessment formats that are difficult to administer in regular standardized testing conditions, such as the presentation of animations, simulations, videos, and audiotapes. These applications are not yet in place. However, when these applications begin to enter the world of standardized assessments, it is critical that they be reliable and fairly implemented and that students be competent and comfortable using computers to demonstrate their learning.

DIVERSITY IN STANDARDIZED TESTING

We already discussed how students' diverse language and cultural backgrounds may challenge the fairness and validity of standardized tests. This section expands on the topic of diversity in standardized testing by focusing on exceptional, high-anxiety, and urban students.

Exceptionalities and Standardized Testing

As you recall from Chapter 2, according to the Individuals with Disabilities Education Act (IDEA), students who have been identified as having special needs need an individualized education program (IEP), which specifies the goals that are to be accomplished within the general learning objectives of the class. Therefore, teachers should be familiar with all IEPs for exceptional children in their classroom so that they can align their assessments with the goals stated in the IEPs.

According to IDEA, students with exceptionalities must be included in general standardized testing, although appropriate accommodations should be provided (Spinelli, 2002). A child may need some of the following accommodations: having extra time; taking the assessment in more than one session; being assessed in a separate room; having the teacher read instructions; allowing the student to voice rather than write an answer; using an assistant; or having access to a work processor, braillewriter, or dictionary. The particular type of accommodation needed will depend on students' special needs. Reading a test to a student rather than asking the student to read the test him/herself may be appropriate for a student with a learning disability, and magnifying a printed test may be appropriate for a student who is visually challenged. Although many schools and districts have accommodation policies already in place that you should learn about (Pitoniak & Royer, 2001), an additional source of information about assessing special-needs students can be found in the National Center on Educational Outcomes' website cehd.umn.edu/nceo.

What types of accommodations might students with disabilities need to effectively take standardized tests?



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Test Anxiety and Standardized Testing

Another source of diversity in standardized testing is anxiety. You may recall from Chapter 9 that there are two types of anxiety, facilitative anxiety and debilitating anxiety. Facilitative anxiety is moderate and does not necessarily have negative performance effects. On the other hand, debilitating anxiety reaches levels where performance becomes compromised. It is not uncommon to find children who have developed debilitating anxiety during test-taking after having been criticized strongly about past failures (Covington & Omelich, 1987). Cate, one of Mrs. Kirkland's students in Imagine You Are the Teacher, is likely to have developed debilitating test anxiety.



Melanie Stetson Freeman/The Christian Science Monitor/Getty Images, Inc.

What are some of the difficulties and potential solutions associated with testing students whose native language is not English?

In addition, older students, students from some minority groups, and those from lower-SES backgrounds are also found to be likely to display test anxiety (Hill, 1984; Kirkland, 1971; Phillips, Pitcher, Worsham, & Miller, 1980). For example, some Asian-American students may display test anxiety due to the high family pressure to perform well in school (Pang, 1995). Therefore, teachers should consider strategies to minimize unnecessary anxiety surrounding standardized test situations:

- Promote a learning-oriented rather than performance-oriented approach in the classroom.
- Emphasize that assessments are opportunities to learn and self-evaluate.
- Send the message that making mistakes is a condition for learning and growth.
- Prepare your students well ahead of time for taking standardized tests by providing as much information as possible in terms of their content, format, and purpose and by engaging in frequent practice tests.

Urban Students and Standardized Testing

Due to the high diversity in urban environments, teachers should be especially aware of some of the standardized test limitations discussed in this chapter. First, urban students may come to the classroom without sufficient prior knowledge about the testing procedures and format, which, as you recall, can be a source of testing bias. As with high-anxiety students, this problem can be solved by providing clear test information in advance and giving students frequent assessments of the same type so that they can become familiar with their format and procedures.

Second, because many urban students will be ELLs, there will be the additional potential for language bias. As suggested before, teachers should use any language accommodations that are permissible, such as providing students with extra time during test-taking, reading directions aloud, or allowing the use of a dictionary.

REVISITING ISSUES IN EDUCATION

Can Schools Close the Achievement Gap?

Points to consider: On one hand, critics of public education argue that the achievement gap is the result of the overrepresentation of African-American and Hispanic students in low ability tracks, which are characterized by a superficial and unchallenging curriculum (Darling-Hammond, 2004). Recall from Chapter 2 that ethnic minority and low-income students are much more likely to fall into lower tracks than their counterparts, even when controlling for past achievement level (Burris & Welner, 2005; Le Tendre, Hofer, & Shimizu, 2003). These critics note that the achievement gap widens as schooling years increase, lending further support for the idea that African-American and Hispanic students are not well served by the current education system. Consequently, according to this view, the achievement gap can be closed by schools provided that serious efforts are made to provide equal educational opportunities to all students.

Others believe that the achievement gap has persisted despite schools' good-faith efforts to reform curricula and policy (Borman & Hewes, 2003). According to this view, the achievement gap can be closed, but schools alone cannot make the systemic changes that are necessary to do so. The social and economic disparities among different ethnic and racial groups in the United States have led to higher poverty rates among African-American and Hispanic families. Children who live in disadvantaged homes have less access to the necessary health care, nutrition, and materials that support intellectual growth (e.g., books, computers, museum visits, libraries).

Although it is the responsibility of every school administrator and teacher to provide quality education for all students, their efforts will need to be supported by wider health, nutrition, and unemployment programs to make a significant change in the lives of students who are being left behind (Mathis, 2005).

Third, lower-SES students or those who come from diverse cultural backgrounds may have difficulty relating to the content of some standardized test items, a potential source of content bias. Unfortunately, unless you design your own assessments, content bias can only be examined once the test has been administered. Yet it is important to look at a student's performance on different items when you are interpreting the scores from standardized tests.

Finally, some students may believe that standardized tests are punitive, thus failing to see them as an opportunity to learn. To avoid harboring negative standardized test beliefs (remember that these tests are here to stay!), teachers should create a learning-focused classroom environment. You can review Chapter 11 for some useful guidelines.

SUMMARY

- Standardized tests are those given to large samples of students under the same conditions in order to allow for appropriate content and scoring comparisons. They can serve selection and placement, accountability, program evaluation, and diagnostic functions. The most common standardized tests used in schools are aptitude, achievement, diagnostic, and readiness tests. Aptitude tests are used to predict future academic achievement; achievement tests are used to assess what knowledge and skills students have learned; diagnostic tests are used to identify the specific learning needs of students; and readiness tests are used to assess whether children have acquired the necessary skills to succeed in kindergarten or first grade.
- Good standardized tests have construct, content, or predictive validity; produce consistent, stable, results for each student (reliability); provide all students with an equal opportunity to demonstrate their knowledge and skills (fairness); and are relatively easy to administer and score (practicality). Good standardized tests are also based on a norm group that is representative of the population to be tested.
- Statistics used to interpret standardized test results include frequency distributions and measures of relative and cumulative frequency; measures of central tendency (i.e., mean, median, mode); and measures of variability (i.e., range and standard deviation). Among the variety of scores that can be used on standardized tests are raw scores, grade-equivalent scores, percentile scores, and standard scores such as stanines, *z*-scores, and *t*-scores. Normal distributions are bell-shaped and are typically found when the number of scores is very large, such as in the case of state-mandated tests.
- The roles of the teacher in standardized testing are preparing students for the test, administering the test, interpreting test scores, communicating test results, and using the standardized test results to plan instruction. Standardized testing is closely tied to the current accountability movement. Advocates of the movement argue that standardized tests efficiently assess the quality of education; critics point out that standardized testing is costly, narrows the curriculum, and fails to reflect the particular challenges of some schools. Another current standardized test issue is test bias, which occurs when a test is unfair for members of some groups but not for others. Although there is no agreement on its definition, experts identify several potential sources of test bias: offensiveness, content bias, language bias, and testing procedure and format bias.
- Teacher testing is also used in the pursuit of teacher accountability, with most states requiring teacher candidates to take a licensing exam. A current trend in standardized testing is the effort to create standardized authentic tests to assess knowledge and skills that are relevant to the real world. Yet authentic assessments are criticized for having limitations when it comes to meeting the requirements of good assessments. Another trend in standardized testing is computer-based testing, which has the advantages of being more efficient than paper-and-pencil testing and adapting test items to different student performance levels.

- Some states have adopted authentic assessments as part or all of their statewide assessment system in an effort to better reflect the conditions of solving problems in real life. The low validity, reliability, and practicality of authentic assessments, however, are strong limitations when it comes to meeting the requirements of good assessments.
- Teachers need to consider specific needs of students when administering standardized tests. Students with disabilities may need special accommodations to complete the test. Students with test anxiety should be prepared prior to the test and given guidance on reducing anxiety. Teachers in urban schools should be aware of potential bias sources when it comes to standardized tests.

KEY TERMS

adaptive testing 526
culture-free tests 522
frequency distribution 506
grade-equivalent score 510
high-stakes tests 499
histogram 507
IQ scores 500
language accommodations 523
mean 507
median 507
mode 508
National Assessment of Educational Progress (NAEP) 501
norm group 505
normal distribution 509
percentile scores 510
range 508
raw score 510
standard deviation 508
standard scores 511
standardized tests 498
stanines 511
teaching to the test 518
test bias 504
Trends in International Mathematics and Science Study (TIMSS) 502
z-scores 512

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What are standardized tests and what purposes do they serve?
2. What are some of the different types of standardized tests?
3. What are characteristics of good standardized tests?
4. What statistics are used to interpret group performance on standardized tests?
5. What type of scores can be used to report performance in standardized tests?
6. What is the teacher's role in standardized testing?
7. What is test bias and how many sources of bias do you know?
8. What are some advantages of computer-based standardized testing?
9. What are some special considerations for using standardized tests with urban and exceptional students?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some suggested questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the theories and research discussed in this chapter?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. What particular challenges does the current accountability movement pose for teachers (Chapter 1)?
2. Which types of student diversity may affect the validity and fairness of standardized test assessments (Chapter 2)?
3. How would you relate Vygotsky's ZPD to the Learning Potential Assessment Device assessment method (Chapter 3)?
4. What parenting style would be more likely to elicit debilitating test anxiety in students (Chapter 4)?
5. How would you justify the idea of providing students with frequent practice tests using behaviorist learning principles (Chapter 5)?
6. How might students' metacognitive skills help their performance on standardized tests (Chapter 6)?
7. What are some current trends in state and national assessment of high-order thinking (Chapter 7)?
8. What are some limitations to standardized tests according to sociocognitive and constructivist views of learning (Chapter 8)?
9. How might scoring low on a readiness test affect children's motivation to learn (Chapter 9)?
10. How would you evaluate standardized tests' ability to support students' sense of competency and autonomy (Chapter 10)?
11. What elements of a well-managed classroom are necessary to support students' success on standardized tests (Chapter 11)?
12. In which ways are traditional teacher-made assessments different from commercially-made standardized tests (Chapter 12)?

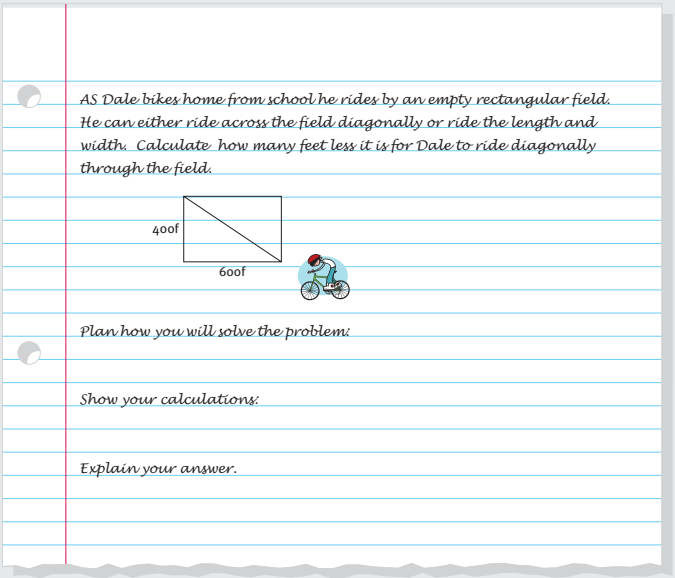
A Case Study: PUTTING IT ALL TOGETHER

How Does This Middle School Teacher Ensure Effective Standardized Testing?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

Mrs. Rodriquez teaches math at Navarro Middle School, located in the Rio Grande Valley of southern Texas, where 91% of the students are Hispanic. Under the accountability provisions in the No Child Left Behind Act, Navarro is annually evaluated for making adequate yearly progress (AYP) for all subgroups of students. Mrs. Rodriquez knows state testing policies can be confusing for new teachers, students, and parents, so she works closely with her colleagues to create a supportive school environment that prepares students to perform their best. At Navarro, a large subgroup is designated as limited English proficient (LEP). In Texas, LEP students take both the Reading Proficiency Test in English (RPTE), which is designed to measure their annual growth in English reading proficiency, and the Texas Assessment of Knowledge and Skills (TAKS) test, either in English or Spanish, to provide a comprehensive assessment of their skills.

For the past two years at Navarro, students designated as LEP have been struggling to meet AYP in math on the TAKS test. In Texas, like many states, LEP students can receive accommodations, called linguistically accommodated testing (LAT), based on their needs. LAT accommodations include the teacher reading the test question aloud, providing an oral translation of a word, using a bilingual dictionary, and using pictures so students can understand what the test question is asking.



Upon analyzing the TAKS test data from the previous schoolyear, Navarro math teachers discover that LEP students performed well on computational problems but consistently scored low on higher-order problems. The teachers conclude that these low scores are due not to students' lack of comprehension but to their lack of practice with problem solving in the classroom. They decide to make higher-order problem solving a focus for the schoolyear and start planning how to incorporate daily practice into their curriculum.

The math teachers are aware that successful problem solving involves a series of cognitive processes. These include reading the problem for understanding, paraphrasing it, planning how to solve it, estimating the answer, computing the math, and checking to make sure the plan was appropriate and the answer is correct. Mathematical problem solving also requires self-regulation strategies. As students solve problems, they must tell themselves what to do; ask questions; and evaluate, monitor, and verify what they do. The teachers' goal is for students to independently apply these cognitive processes and strategies to problems they encounter. To begin the problem-solving initiative, the teachers create student-friendly assessment tools to use in their classes. From experience, they know the TAKS test will ask students to write constructed responses to explain their thinking and to show their calculations.

To answer constructed-response questions, students will need to practice not only how to calculate answers but also how to explain their thinking. Therefore, teachers create a simple rubric so students can easily self-evaluate their answers.

A typical problem may be:

Math Explanation Rubric

DID I . . .	☑ YES	☑ NO
Restate the problem in my opening sentence?		
Include important numbers?		
Answer the problem?		
Explain how I got my answer (which problem-solving strategy or operation I used)?		
Totals		

Number of *Yes* checks	1	2	3	4
Grade	60%	75%	85%	100%

To give students practice with this new problem-solving format, teachers plan to start all of their math classes with a "Solution of the Day" lesson. In the beginning of the year, teachers will use this time to explicitly teach students how to solve

problems and guide them step-by-step through the process. The teachers plan to model both correct and incorrect problem-solving behaviors. Modeling of correct behaviors will help students understand how good problem solvers use specific processes and strategies, while modeling of incorrect behaviors will encourage them to monitor the problem-solving process and correct errors.

As the year progresses and students become more proficient and independent problem solvers, the instructional goal will be to present more complex, multistep problems. The teachers want students to practice solving a wide range of problems in various formats so that students feel prepared and confident when it comes time to take the TAKS test. Like most state tests, TAKS is untimed, so teachers encourage students to take plenty of time on each problem and to recheck their work. Teachers realize regular progress checks will be important to determine whether the strategies are helping students' performance. It will also be crucial to give students corrective feedback so that students know whether they are effectively using the problem-solving routine and finding correct solutions. They hope that by the spring quarter students will automatically monitor and evaluate their work as they answer questions.

For the past three years, Navarro Middle School has implemented a schoolwide support plan to prepare students and parents for the TAKS test. The plan has four major components. First, teachers and administrators ensure that the school's instructional calendar is aligned with the state testing schedule. They align the scope and sequence of the content standards in each subject so that important concepts and lessons are taught before the test is given.

Second, Navarro offers a range of after-school enrichment programs, such as sports, arts, and music, which motivate students and involve them in meaningful cooperative activities. Teachers observe higher student attendance rates and better focus on academic learning during the schoolday with the introduction of the after-school clubs.

Third, during the spring quarter, the school institutes an hour of "Yes! We can do it" test-prep on Friday mornings. During this hour, students review test-taking strategies, apply them to a short practice test, and then review the test and their use of strategies as a class. Students complete the practice test in the same classroom with the same teacher and group of students with whom they will take the TAKS test. Students who are designated as LEP and those who have IEPs receive accommodations, so both students and teachers are familiar with how the TAKS test will be administered.



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Fourth, the school communicates all testing-related information to parents in Spanish and English. They provide translators at parent–teacher conferences and school meetings so parents are well informed about the test and feedback on their child's progress. Faculty at Navarro find that this comprehensive support plan helps all their students, and particularly their LEP students, be prepared to demonstrate skills they have mastered.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What types of standardized tests were discussed in the case (aptitude, achievement, diagnostic, readiness) and what are their respective functions?
2. How did the teachers implement each one of the assessment cycle steps (preparation, administration, evaluation, communication)?
3. Which of the standardized testing principles from Classroom Tips: How to Support Effective Standardized Testing were applied in the case and how?
4. Did the teachers demonstrate an awareness of students' diversity?
5. Evaluate the overall effectiveness of the teacher practices by including both strengths and weaknesses.

14 An In-Depth Guide to Using Technology in the Classroom



Imagine You Are the Teacher

MS. SUINA FELT LUCKY TO BE teaching in a classroom that had computers with Internet access for all her students because her personal goal is to integrate more technology into the classroom. Today's lesson plan includes an activity intended to help her students develop better technology skills.

"Hey, Ms. Suina, what are we supposed to do today?" asks PG.

"Good morning, PG! What does the projector say?"

PG looks up on the screen, "Oh yeah. Let's see . . . 'Create with our partner something that helps you review for the astronomy test. Make sure you use the computer!' Can we make a *Jeopardy* game with PowerPoint, Ms. Suina? [PG turns to his partner, Ryan.] Ryan, I'll show you how to do some really cool stuff."

"Sure, you can choose any software that you would like for this assignment," Ms. Suina replies.

As the two boys move to a computer, Sara and Jessica ask if they can use the program Flash (animation software) to create a cartoon that explains the seasons of the earth. Ms. Suina is not familiar with Flash but knows that the girls have much more advanced computer skills than she has. "I think that is an excellent idea!" she encourages.

Clarisse raises her hand "We don't know what to do, Ms. Suina. We don't know any of those programs. Can we just write some review questions on the computer like when we wrote our paragraphs for the science fair?"

"Most definitely, that would count as using the computer for the assignment," replies Ms. Suina. "Luke, Marcy, you may also want to try using the word processor to make up some review questions. What do you think? You remember how to use the program, don't you?"

Luke shrugs his shoulders as he looks at Marcy, whose face is blushing with embarrassment. "Here, have a seat. I'll get the program started for you," Ms. Suina offers as she starts up the word-processing program.

Once all students get started, Ms. Suina opens the web-based school attendance program and sighs. She sees that Jenny's mother has called to let her know that her daughter



Comstock/SUPERSTOCK

is sick and that Logan is absent due to a dentist appointment. After marking Sophia and Isaiah tardy, she shuts the program.

"Ms. Suina, we can't remember how to make the audiofiles for Flash. Can you show us?" asked Sara.

"Hmm . . . Well, I'm going to have to review that myself. Can you work on something else in the meantime?" Ms. Suina replies uncomfortably. She then starts a Google search, hoping to quickly find an answer to the girls' question.

- **Is the assignment an effective method to develop students' technology skills?**
- **What does Luke and Marcy's body language suggest?**
- **What could you do to improve Ms. Suina's lesson?**

Think about how you would respond to these questions as you read through the chapter.

CHAPTER LEARNING GOALS

After you study this chapter, you will be able to:

1. Define technology and its functions in the classroom.
2. Explain some of the classroom challenges that technology presents to teachers.
3. Describe the role of technology according to different learning theories.
4. Provide examples of using technology across the curriculum.
5. Describe technology tools that teachers use for instruction, management, and assessment.
6. Apply research-based principles when making decisions about technology integration for a diversity of students.

Journal Activity

ASSESS YOUR PRIOR KNOWLEDGE AND BELIEFS

Take a few minutes to write responses to these questions in your journal. Do not worry if you don't have an answer for some questions. At the end of this chapter, you will revisit your responses with the information that you learned.

1. Think about your experience using technology. To what extent did technology support your learning?
2. What are current technology trends and how do they affect teaching and learning?
3. In your opinion, what are the promises and pitfalls of technology in the classroom?
4. Do you think that teachers should receive special training about how to adequately use technology in the classroom? Why or why not?

THE ROLE OF TECHNOLOGY IN THE CLASSROOM

Ms. Suina's classroom is buzzing with the use of technology. Although not all classrooms use technology to the extent that Ms. Suina does, her classroom gives us a good idea of what a classroom looks like when technology is used for learning. In this section, we define technology, discuss the role of technology in learning, and review some of the current technology trends that have an impact on the classroom. Let's begin with a definition of technology.

Defining Technology

You may be surprised to find out that although technology is synonymous to computers in the minds of many, the term *technology* broadly includes all tools that are used for learning and teaching. This means that even the more traditional low-tech tools such as paper, pencil, textbooks, and chalkboard are tools for learning. However, this chapter focuses on the newer, high-tech kinds of technology for learning and teaching: interactive multimedia programs, personal digital assistants (PDAs), and even iPods.

What are the best ways to use technology for learning and teaching in the classroom? Before we answer this important question, let's make a distinction between two important uses of technology in the classroom:

1. The first function is to support students' learning and typically is referred to as **instructional technology**. Word processors, spreadsheets, and multimedia instructional programs are some examples of instructional technology.
2. The second function is to support the many tasks that teachers need to perform in the classroom, such as developing assessments with word processors, creating PowerPoint presentations, keeping track of students' grades with spreadsheets, and writing and sending letters to parents via e-mail.

Instructional Technology

Technology that supports students' learning such as word processors, spreadsheets, and multimedia instructional programs.

In this chapter, we examine both uses of technology: technology that students use to learn and technology that teachers use to assist them in their profession. But the computer and the PowerPoint application and the iPod are not inherently helpful to students or teachers. What really matters is whether these tools are used in a way that will help students or teachers achieve their goals. Clearly, presenting an explanation on a computer will not result in better learning than presenting the same explanation in a textbook, even though computers are much newer technologies than textbooks. How can teachers decide when technology is likely to promote learning? Before answering this question, let's distinguish between the technology itself (which we call instructional media) and how the technology has been designed to promote learning (which we call instructional methods).

Distinguishing between Instructional Media and Methods

Due to the variety of technology tools, a useful first step in examining the role of technology in learning is to make the classic distinction between instructional media and instructional methods (Clark, 2001; Moreno, 2006; Salomon, 1979/1994). When examining the role of **instructional media** in learning, we focus on the physical system or vehicle used to deliver information to students or teachers—such as a textbook, instructional video, or computer program.

When examining the role of the **instructional method** in learning, we focus on techniques that are embedded in different technologies to promote learning—such as advance organizers, scaffolding, or self-explanation methods.

Instructional Media

The physical system or vehicle used to deliver information to students or teachers—such as a textbook, instructional video, or computer program.

Instructional Method

The techniques that are embedded in different technologies to promote learning—such as advance organizers, scaffolding, or self-explanation methods.

Media and methods can be combined in many ways. Some instructional technologies include identical methods (e.g., graphic organizers) but differ in that they are delivered with different media (graphic organizers in a PowerPoint program or graphic organizers in a textbook). Likewise, there are technologies that use the same delivery media yet differ in the type of instructional methods embedded in the lesson, such as when the same interactive multimedia program is designed to include either a pure-discovery or a guided-discovery method of learning. This distinction will be most useful when you evaluate the promise of instructional technology in the classroom.

Many studies have shown that it is the quality of the methods embedded in a particular technology that affects students' learning, not the novelty of the delivery medium (Moreno, 2006). When new technologies (e.g., online problem-based discussions) are compared to traditional technologies (e.g., problem-based discussions in the classroom), there are no benefits that can be attributed to the technology itself (Clark, 2001).

Technology Trends

Some of the older technologies have made teaching and learning possible for almost every individual because they have become relatively inexpensive over time (e.g., paper, pencils, chalk, chalkboards). More recent technologies are less accessible but, with time, are expected to become more popular among schools, teachers, and students. For example, when computers first made their appearance in schools in the 1970s, they were often placed only in computer labs, and special teachers or lab assistants had to be assigned to teach students computer basics. Now, many high-end multimedia computers are in classrooms, with regular teachers becoming responsible for computer instruction. As shown in Figure 14.1, the number of classrooms connected to the **Internet**, or **World Wide Web**, a system of computer networks that operates across the world, grew from 3% to 92% in less than 10 years. Being connected to the Internet allows teachers to find unlimited teaching resources that can be integrated into the curriculum (Kleiner & Lewis, 2003).

Internet (or World Wide Web)

A system of computer networks that operates across the world.

Due to the rapid spread of computers in school and at home, students are growing up in a world that is technologically very different from that of their parents and grandparents. Don Tapscott (1999), author of *Growing Up Digital,* noted the beginning of this phenomenon a decade ago in an interview:

> . . . kids know more than their teachers about the most powerful learning invention of all time. This is the first generation to grow up interacting with media rather than simply being broadcast to. Because children are authorities on digital technology, things are different. Our wired kids are no longer interested in an education model that has teachers simply being factoid fountains at the front of the class. (quoted in Norman, 2000, p. 50)

The advent of computers and computer-literate children produced many changes in the teaching and learning strategies used by educators (McClintock, 1999). Let's examine some current technology trends.

Multimedia

The characteristic of learning environments that combine different media such as text, graphics, animation, sounds, videos, and photos.

Hypertext

Interactive text where certain words or terms contain a hyperlink that can be selected to find more information.

Hypermedia

A system where students can learn by exploring multiple representations of knowledge that are interconnected by a network of links.

Multiple Knowledge Representations. First, emergent technologies have expanded the forms in which ideas can be represented. **Multimedia**, as its name implies, integrates different media—such as text, graphics, animation, sounds, videos, and photos—in one presentation. Although many people hope that printed books will be around for a long time, there are strong pressures by the government, libraries, universities, schools, and book publishers to make print materials available in electronic format, with an increasing number of electronic texts being presented in the form of **hypertext**, interactive text where certain words or terms contain a hyperlink that can be selected to find more information. When multimedia and hypertext are combined, the resulting product is called **hypermedia**, a

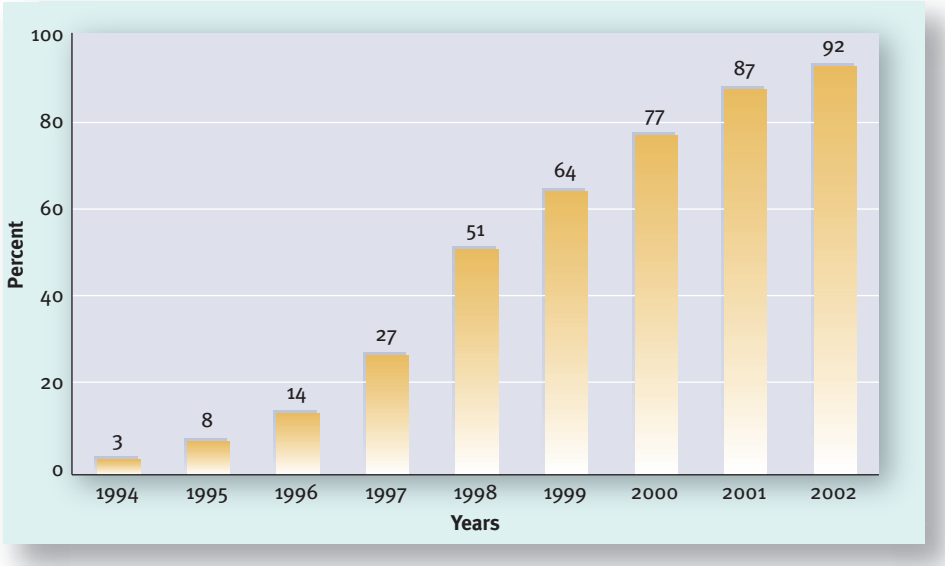


FIGURE 14.1 Increase in Internet accessibility in public classrooms.



FIGURE 14.2 **A screenshot from an e-lesson on speed, distance, and velocity.**
Source: From www.adaptivecurriculum.com.

system in which students can learn by exploring multiple representations of knowledge that are interconnected by a network of links. In fact, most of the recent educational software and educational applications on the Internet consist of hypermedia systems.

Electronic instructional materials are also called **e-materials**, and learning from electronic materials is called **e-learning**. Unlike learning from older media such as text and lectures, e-learning can be quite challenging because there are too many different paths for constructing knowledge and too many representations that need to be integrated with one another. Take a look at Figure 14.2. This hypermedia example was taken from Adaptive Curriculum (www.adaptivecurriculum.com), an online system for mathematics and science education. Middle school students who learn about speed, velocity, and distance with these e-materials will need to interpret position–time graphs and velocity–time graphs as they explore the motion of a truck; they will need to make observations after changing the starting point, speed, and direction of the vehicle; finally, they will need to read the program explanations and engage in self-assessments. Complex e-learning environments such as the Adaptive Curriculum online system are becoming increasingly popular. As you will read in the next sections, one of the challenges that this technology trend presents to the classroom teacher is the need to ensure that students develop the skills that are necessary to make the best use of these highly complex instructional programs.

E-Materials

Electronic instructional materials.

E-Learning

Learning from electronic materials.

Ubiquitous Communication. The second and probably most influential technology trend is how it has changed the ways in which people communicate. Communication is easier and faster than ever via the ubiquitous cell phone and e-mail systems. Although they are not a substitute for face-to-face communication, teachers and students' families can communicate easily via the Internet to support students' learning. Some schools have a web-based record-keeping system. Parents are given a user ID and password to see their children's grades, any comments that the teacher has entered concerning coursework, the number of absences and tardy days, a list of upcoming assignments, syllabi, and the teacher's e-mail address. Because these systems also include the parents' e-mail address and phone number, teachers can access their contact information rapidly, without needing to rely on the school administration.

Furthermore, because students complete assignments in electronic format, teachers can keep track of their work and share assessments with students and their families more efficiently. For instance, as part of her math grading system, Ms. Bagley's students create digital portfolios in their personal webpages, which can be accessed via the Internet during parent–teacher conferences. Once a month, her students are asked to

FIGURE 14.3
Examples of current digital tool uses in the classroom.

- Teachers can use iPods and podcasting to distribute lectures for review and present music for required listening or paintings for viewing (Vess, 2006).



- iPods can record a student presentation in class or an interview with grandparents for a class project and can also help download foreign-language audios and videos (Blaisdell, 2006).



- Cell phones can be used for downloading homework, for creating videos, and for blogging discussions with teachers (Kolb, 2006; Royal, 2007).



- PDAs and cell phones can be used to replace computer labs in schools without enough money for digital cameras or Internet access (Garland, 2006; Johnson & Kritsonis, 2007).

select assignments that demonstrate how they mastered specific course objectives and link them to their webpage with a short reflection about their progress. Across the hall, Mr. Matts, a language arts teacher, runs an almost paperless classroom. He has a class website where his students submit all of their assignments. Mr. Matts can then grade the assignments and return the graded rubrics to the student via e-mail. However, teachers should be aware that not all students will have access to computers at home and not all schools will have the resources to run technology-based classrooms.

Technology has also extended students' opportunities to collaborate with peers all over the world by providing an electronic structure to communicate and share academic work via the Internet. This is done via e-mail, chatrooms (communications conducted in real time), and bulletin boards (electronic message sites). Some examples include the following:

- E-mail to communicate with pen pals in foreign countries in elementary school
- Web-cams to conduct conversations with a sister school in France during French class
- Blogs and chatrooms on the NASA website to talk with astronauts and scientists about school projects

An important support function of the Internet is to provide a common database for information searches. Students can access large amounts of information through search engines such as Google (www.google.com) or Yahoo (www.yahoo.com).

Digital Tools. Another trend in technology is the widespread use of digital tools such as word processors, calculators, spreadsheets, graphic organizers, iPods, and PDAs. Teachers can now use these tools not only to support students' learning but also for their own classroom management and assessment needs. Figure 14.3 provides examples of recent uses of digital tools in the classroom.

ISSUES IN EDUCATION

Should teachers support technology integration in their classrooms?

Many teachers, administrators, and policymakers embrace technology integration as a means of motivating students and helping them prepare for the demands of the high-tech 21st century. However, critics have argued that today's emphasis on technology integration may end up isolating students at their computers with no educational gain. What do you think about this argument? A response to this question can be found at the end of the chapter.

THE CHALLENGES OF TECHNOLOGY FOR THE CLASSROOM TEACHER

Most teachers integrate technology into their classrooms in a variety of ways:

- Engaging students in Internet inquiries about their personal interests
- Using word processors to motivate students who have trouble writing essays and stories on paper
- Creating individualized instruction by using computer tutors and instructional programs that allow students to learn with varied scaffolding levels and choices
- Using spreadsheets to keep track of students' attendance and performance records

In classrooms where all students are provided with computers, teachers become more student-centered, constructivist, and flexible, and they develop lessons that are more focused on collaboration and inquiry (Swan et al., 2006; Zucker & McGhee, 2005). Providing ubiquitous access to computers at school can improve students' motivation, engagement in learning, attendance, and behavior (Zucker & McGhee, 2005). For example, the Maine's Learning Technology Initiative (MLTI) provided each student and teacher in grades 7–12 with a laptop and wireless network access as well as providing professional development and technical assistance to teachers. A study of the program's effectiveness found preliminary evidence that MLTI can be effective in raising test scores (Muir, Knezek, & Christensen, 2004). Many students who no longer had school-provided laptops in ninth grade said that "the quantity and quality of their school work had declined once they no longer had laptops" (Silvernail & Lane, 2004, p. 26).

Another state initiative in which teachers are provided with a computer for every two students, Internet access, professional development, and ongoing support in integrating technology into teaching practice is the Enhancing Missouri's Instructional Networked Teaching Strategies (eMINTS). One study found that participating eMINTS students earned, on average, higher scores in the mathematics and social studies state assessments than students in comparison groups (eMINTS National Center, 2004).

Despite these promises, the use of technology in the classroom is not without criticism. Take a few minutes to think about the following question before reading the next sections: What are some challenges that current technology trends might pose to the classroom teacher?

Developing Technology Knowledge and Skills

Recall from Chapter 1 that teaching is a highly complex profession that draws on many kinds of knowledge and skills. Technology knowledge and skills are increasingly important for the classroom teacher as new tools for teaching and learning continue to be developed. In Imagine You Are the Teacher, Ms. Suina put herself in a very uncomfortable situation by allowing Sara and Jessica to use a technology (i.e., Flash) that she had no experience with. When Sara asked for help, Ms. Suina was unable to provide it.

Yet proficiency with current software and hardware is not the only necessary condition to effective teaching with technology. Teachers also need to evaluate the pedagogical value of technology for teaching specific content in a variety of contexts and for a diversity of learners (Hughes, 2005; Neiss, 2005; Zhao, 2003). Traditional teacher education programs often focus too much on learning general software tools (Coughlin & Lemke, 1999). Among the many problems with this approach is the rapid rate of technology change, which makes knowledge about the tools quickly outdated. Another problem is that many technologies are not designed for education or by educational experts; therefore, they fail to address teachers' pedagogical needs (Mishra & Koehler, 2006).

The good news is that recent national educational technology standards for teachers have moved away from merely acquiring knowledge of technology tools to developing high-order goals that are essential for effective teaching with technology (Glenn,

2002). This new emphasis can be seen in Figure 14.4, which lists the five National Educational Technology Standards for Teachers (NETS•T) of the International Society for Technology in Education (ISTE, 2008).

STANDARD	DESCRIPTION	PERFORMANCE INDICATORS
Facilitate and inspire student learning and creativity	Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.	• Promote, support, and model creative and innovative thinking and inventiveness. • Engage students in exploring real-world issues and solving authentic problems using digital tools and resources. • Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes. • Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.
Design and develop digital learning experiences and assessments	Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the national technology standards for students.	• Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity. • Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress. • Customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources. • Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching.
Model digital work and learning	Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.	• Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations. • Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation. • Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital media and formats. • Model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning.
Promote and model digital citizenship and responsibility	Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.	• Advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources. • Address the diverse needs of all learners by using learner-centered strategies and providing equitable access to appropriate digital tools and resources. • Promote and model digital etiquette and responsible social interactions related to the use of technology and information. • Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital communication and collaboration tools.
Engage in professional growth and leadership	Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.	• Participate in local and global learning communities to explore creative applications of technology to improve student learning. • Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others. • Evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning. • Contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community.

FIGURE 14.4 **Descriptions of the five technology standards for teachers.**

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Fostering Technology Skills in the Classroom

The second challenge for the teacher is to ensure that students have developed the necessary skills to take advantage of the technologies in the classroom. Bruning, Shraw, Norby, and Ronning (2004) identified the following six skills that students need to develop to use technologies effectively:

- Locating and judging information
- Communicating effectively using technology
- Proceduralizing knowledge
- Contextualizing knowledge
- Adapting a mastery orientation toward technology-based learning
- Using self-monitoring and self-regulation skills when using technology

Classroom Tips: Strategies to Overcome Common Technology Pitfalls summarizes these skills with corresponding student pitfalls and strategies to overcome them.

CLASSROOM TIPS

Strategies to Overcome Common Technology Pitfalls

Student Skill	Potential Pitfalls	Teacher Strategies
Locating and judging information	Following links randomly. Attending to seductive details. Getting lost in searches. Becoming overwhelmed with too much information. Selecting low quality information.	Limit the number of questions, searches, and sites. Teach search and summarization strategies. Allow careful preparation for searching. Teach self-monitoring of search and summarizing success.
Communicating effectively	Lack of effective writing skills. Lack of media design skills. Lack of understanding of communication purposes. Uncertainty about roles in learning communities. Receiving negative feedback on communication attempts.	Arrange authentic communication opportunities. Teach writing and media design strategies. Encourage the use of graphic and other organizers to plan communication. Create safe environments for online communication.
Proceduralizing knowledge	Not practicing skills sufficiently. Lack of step-by-step feedback. Lack of awareness of skills' role in larger tasks.	Provide repeated practice opportunities to proceduralize program knowledge. Engage students in discussions about skills needed to achieve goals. Help students link procedural skills to conceptual understanding.
Contextualizing knowledge	Failing to understand program structures (how browsers, operating systems, word processors are organized). Failing to apply knowledge and skills to solve new problems.	Complement development of procedural skills with conceptual instruction. Provide graphic organizers to help students link program features.
Adopting a mastery orientation toward e-learning	Failing to use alternative strategies in face of difficulty. Losing motivation to continue or complete projects.	Help students set and monitor progress toward intermediate and long-term goals. Remind students of the utility of learning. Give frequent feedback on progress.
Self-monitoring and self-regulating	Not understanding learning goals. Not monitoring progress toward goals. Producing low-quality products. Participating erratically in activities and projects.	Help students select motivating projects. Help students set goals and subgoals. Teach self-regulation skills. Create opportunities to share products and receive feedback from peers. Provide frequent feedback on progress.

The ISTE has also developed National Educational Technology Standards for Students (NETS•S), which are listed in Figure 14.5. These standards specify the technological knowledge and competencies that teachers should promote in their classrooms for students to learn effectively and live productively in an increasingly digital world (ISTE, 2007).

STANDARD	DESCRIPTION	COMPETENCIES
Creativity and innovation	Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.	Apply existing knowledge to generate new ideas, products, or processes. Create original works as a means of personal or group expression. Use models and simulations to explore complex systems and issues. Identify trends and forecast possibilities.
Communication and collaboration	Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.	Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media. Communicate information and ideas effectively to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures. Contribute to project teams to produce original works or solve problems.
Research and information fluency	Students apply digital tools to gather, evaluate, and use information.	Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks. Process data and report results.
Critical thinking, problem solving, and decision making	Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions.
Digital citizenship	Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.	Advocate and practice safe, legal, and responsible use of information and technology. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity. Demonstrate personal responsibility for lifelong learning. Exhibit leadership for digital citizenship.
Technology operations and concepts	Students demonstrate a sound understanding of technology concepts, systems, and operations.	Understand and use technology systems. Select and use applications effectively and productively. Troubleshoot systems and applications. Transfer current knowledge to learning of new technologies.

FIGURE 14.5 Descriptions of the six technology standards for students.

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Evaluating the Potential of Technology for the Classroom


Laura Dwight Photography

What skills do students need to benefit from today's technology?

Imagine the following scenario. Mrs. Romero begins her fifth-grade unit on ecosystems by asking students to learn the new vocabulary they will need. To this end, she provides her students with a list of the new terms to learn and gives them a science website where they can find the definitions of the new terms. The next morning, she is shocked to find out that students had played with the interactive graphs, pop-ups, and maps but were unable to apply any of the vocabulary that they should have learned.

As this scenario illustrates, another challenge that teachers face is the need to critically evaluate each technology in terms of its potential to achieve academic goals. As with any other tool, technology can be implemented well or poorly, and teachers need to be careful consumers who make informed decisions about when to use technology tools to their advantage. It is likely that the website chosen by Mrs. Romero included a lot of "seductive details" (see Chapter 9) that distracted her students from the objective of the assignment.

The majority of teachers feel uncomfortable with technology and are poorly prepared to evaluate and integrate technology in the classroom. One study showed that only one-third of teachers felt prepared to use technology in their classroom (Smerdon et al., 2000), and a more recent national survey revealed that one of every five teachers is still learning the basics, with only 17% of teachers considered to be at an advanced level of technology use (U. S. Department of Education, 2004). Although it has been recommended that school districts set aside 30% of their technology budgets for teacher training and development, only 6% of such funds were found to be allocated for this purpose during the 2003–2004 schoolyear (Market Data Retrieval, 2004). The information in this chapter will help you to overcome this challenge by providing you with scientifically based information that you can use to critically examine the potential value of different technologies.

Managing the Use of Portable Technologies in the Classroom

Students' increasing use of portable technologies poses new management challenges to the classroom teacher. Recent reports show that between 65% and 75% of students in the United States between the ages of 13 and 18 own a cell phone capable of text messaging (Raskauskas & Stoltz, 2007; "Teens Targeted," 2007). Among the many issues related to students' use of cell phones in the classroom reported by teachers are the following:

- Disrupting classroom and distracting student (Gilroy, 2004; Johnson & Kritsonis, 2007; Kiernan & Aizawa, 2004).
- Taking inappropriate videos and pictures of teachers or students and publishing them on the Internet (Dodds & Mason, 2005; Garland, 2006).
- Causing students to fear being taped by peers, with a consequent reduction in their willingness to participate in class discussions (Honawar, 2007).
- Cheating by taking a picture of tests that will be administered later to a different group of students or covertly relaying test questions to an outside accomplice (St. Gerard, 2006; Taylor, 2008).
- Playing games available on their cell phones and using cells phones to call parents when unhappy about a teacher decision (Dodds & Mason, 2005).
- Using the cell phone to call in a bomb threat (Garland, 2006).
- Using the cell phone for engaging in electronic bullying (Raskauskas & Stoltz, 2007).

Additional issues arise with students' use of iPods or MP3 players. Due to their small size and large storage capacity, teachers have a difficult time knowing when students are playing music during instruction, and many students report using them to cheat during tests (Blaisdell, 2006; National Education Association, 2007).

A recent survey sent to 200 school districts in the United States shows that the majority of the participating schools have policies in place to help teachers manage the use of portable technologies in the classroom (Obringer & Coffey, 2007). Some

schools require students to turn off and put away their portable technologies while in class. Others opt for confiscating these devices. Still, keep in mind that the potential misuses of these portable technologies have not been fully addressed by many schools; therefore, before you start planning your management system, it is a good idea to learn about your school's policy. Figure 14.6 shows a sample of a letter informing parents about the school's policy on students' use of portable devices.

FIGURE 14.6 **A sample letter to parents informing them about the school policy on student electronic devices.**

HOME OF THE Eagles!

Madras Middle School

240 Edgeworth Road • Newman, GA 302635 • 770-254-2744
Principal, Lorraine Johnson • Assistant Principal, Chase Puckett • Assistant Principal, Nadene Smith

Dear Parents,

The Coweta County Board of Education voted on September 11, 2007, to change the School System's policy regarding student possession of cell phones and similar electronic communication devices. Prior to the Board's vote, student possession of a cell phone on school campuses was strictly prohibited. Effective September 12, 2007, students are now permitted to have cell phones, though student use of cell phones and other electronic communication devices is strictly prohibited during the instructional school day. Furthermore, the Board's policy requires principals to apply very strict consequences to any students who use cell phones during school hours.

The School Board's new policy is:

- Students may possess cell phones, pocket pagers, or similar electronic devices.
- Students observed using cell phones, pocket pagers, or electronic communication devices during the instructional day, except for health or unusual reasons approved by the Board of Education, will face serious consequences and will forfeit their ability to have such devices:
    - Upon any infraction of the policy, cell phones will be confiscated immediately. Phones confiscated will only be released to parents.
    - On the first infraction the phone will be confiscated and the student will be warned.
    - On the second infraction the student will be given three days of in-school suspension.
    - On the third infraction the student will be referred to Student Support Services for further disciplinary action.
- The instructional day is defined as the time period between a student's arrival on campus and the final dismissal bell for all students. The instructional day includes lunch periods and class changes. School buses are extensions of the instructional day, and use of the devices mentioned above is prohibited while students are on buses or while waiting for buses at the end of the day. The final bell or dismissal time will vary from school to school. Each principal will define the dismissal time at each school for students. The final bell for Madras Middle School will be 3:45 p.m. (after buses leave).
- The use of cell phones includes making phone calls, receiving phone calls, ringing or other sounds, playing music or video, text messaging, use of cell phone cameras, or any other electronic function. Cell phones should remain off at all times to avoid student infractions.

The Board made this change in policy in part to respect the wishes of many parents who want their children to keep cell phones for communication after school hours. However, we ask parents to recognize that the school system must strictly prohibit cell phone use in order to operate our schools in an orderly way and to maintain the academic integrity of your child's school.

If you have any concern about your child's ability to follow this policy, I recommend that cell phones and electronic devices be left at home. However, if you choose to allow your child to have a cell phone, please stress that the phone must remain "off" at all times. We will stress these rules to students at school. The above policy is effective immediately, and we will work to make sure students and parents fully understand the new policy over the next two weeks.

As always, I appreciate your support. If I can answer any questions, please do not hesitate to call me.

Sincerely,

Lorraine Johnson

Lorraine Johnson
Principal

Madras Middle School
Personal Responsibility In Developing Excellence

HOW DOES TECHNOLOGY RELATE TO LEARNING THEORY?

When used judiciously, technology can help students develop an essential repertoire of skills for their future academic and everyday lives. The key, therefore, is to ask yourself whether and how a particular technology may help you achieve your learning objectives before you decide on integrating it into your classroom. The answer to this question will depend, in part, on your particular views of learning. So let's start by examining the role of technology tools according to learning theories.

Technology and Behaviorism

Most of the existing educational software is based on behaviorist principles, especially those that stem from operant conditioning (Jonassen, 2000). Remember from Chapter 5 that, according to Skinner (1953), operant conditioning is learning in which behavior changes in frequency or duration as the result of a consequence (i.e., reinforcer, punishment). Skinner believed that teachers can help students develop a variety of complex academic skills and behaviors over time through *shaping*, the process of reinforcing successive approximations toward a target behavior. Skinner (1968) argued that operant conditioning principles such as using reinforcement to shape students' learning could be applied to a computer-based approach called **programmed instruction**.

Programmed Instruction

A computer-based method that uses operant conditioning principles, such as using reinforcement to shape students' learning.

According to Skinner, programmed instruction is more effective than classroom instruction because teachers are unable to reinforce and shape the behavior of many students of varied ability levels in the classroom at the same time. The promise of programmed instruction is to allow each student to learn at his/her own pace and difficulty level and provide immediate reinforcement when students' answers are correct (Skinner, 1968). The first implementations of programmed instruction were delivered in either book form or in the form of simple teaching machines. Either form starts with instruction on a unit (e.g., adding single digit numbers). In the next step, the machine or workbook asks the student to complete fill-in-the-blank problems. A student who answers correctly is rewarded and moves to the next unit. A student who answers incorrectly is asked to study correct worked-out answers and try again until mastery is reached.

One example of technology that is currently in use and based on behaviorist principles is drill-and-practice programs, which are aimed at reinforcing students' existing skills. **Drill-and-practice programs** present students with a set of problems or questions that they can answer at their own pace while receiving immediate feedback (Lever-Duffy, McDonald, & Mizell, 2003). The Internet offers many websites with drill-and-practice programs, such as www.math.com/students/practice.html for math and www.chemistry-drills.com for chemistry.

Drill-and-Practice Programs

A computer-based method in which a set of problems or questions are answered at one's own pace while receiving immediate feedback.

Although this instructional technology seems to emphasize rote learning, it helps to promote the accurate and efficient mastery of basic factual knowledge and skills. For example, students can develop automaticity in math procedures. The most recent drill-and-practice math programs include not only the traditional symbolic representations of numbers and operations (e.g., $2 + -5 = ?$) but also problems that are contextualized in interesting and challenging scenarios, which can increase students' motivation to learn (Pintrich & Schunk, 2002). Although the effects are small, drill-and-practice programs are shown to improve students' skills and to promote positive attitudes toward learning (Attewell, 2001; Cognition and Technology Group at Vanderbilt, 1996).

Technology and Cognitive Views of Learning

Recall from Chapter 6 that cognitive psychologists use an information-processing model to explain thinking and learning (Atkinson & Schiffrin, 1968; Newell & Simon, 1972). In particular, this learning view emphasizes the following classroom needs:

- To ensure that students are accurately perceiving stimuli that is necessary to learn
- To attract and maintain students' attention to relevant information during learning

- To minimize unnecessary processing of information in working memory
- To promote meaningful encoding of new information into long-term memory
- To help students develop metacognitive and self-regulation skills

When does technology support these needs? The research program of Mayer and Moreno (Mayer & Moreno, 2003; Moreno & Mayer, 2007) provides a good answer to this question. These researchers developed a set of instructional design principles that teachers can use to evaluate the learning potential of new technologies before integrating them into their classrooms. These principles are summarized in the next two sections. First, we review principles that are aimed at preventing students' cognitive overload by minimizing *extraneous* processing: the processing of information that is not necessary to make a lesson intelligible. Second, we examine principles that are aimed at promoting *generative* processing: the combination of hands-on and minds-on activity that leads to the generation of meaningful encoding of new information.

When Does Technology Minimize Extraneous Processing?

One of the greatest strengths of new technologies is their ability to present multiple representations of knowledge, such as multimedia programs that include words, diagrams, graphs, tables, animations, videos, and pictures to describe a problem. Multimedia can increase the likelihood that students will accurately perceive the concepts to be learned because they offer more than one way to make sense of new information (Moreno & Mayer, 2007). Nevertheless, this advantage can turn into a learning hindrance. Recall that there is only so much information that humans can consciously process at any one time. When the multiple representations of the learning environment exceed students' working memory capacity, cognitive overload is likely to occur. Although instructional designers are always tempted to conclude that more is better, presenting too many pieces of information may overload students' cognitive resources and hurt learning. According to cognitive views of learning, teachers need to critically examine the cognitive demands imposed by any new technology on the learner before making decisions about using such technology in the classroom. Here are some principles that can guide you in your reflection, with corresponding examples used in the research.

Multimedia principle: Students learn better from verbal explanations and corresponding pictures than from words alone or pictures alone. Example: A scientific explanation about how a bicycle pump works with a corresponding animation promotes deeper learning than the explanation alone or the animation alone (Mayer, 2001). The theoretical foundation of the multimedia principle is dual-code theory, which states that humans process and encode verbal and nonverbal information through independent channels (Clark & Paivio, 1991).

Modality principle: Students learn better when dynamic visual displays (e.g., animations, videos, simulations) are accompanied by narrated explanations rather than written explanations. Example: Students who learn about the process of photosynthesis with animations and the corresponding narrated explanations of a pedagogical agent learn better than those who learn with identical animations and on-screen text explanations because concurrent animations and on-screen text overload students' visual attention (Moreno, Mayer, Spires, & Lester, 2001).

Temporal contiguity principle: Students learn better when corresponding words and pictures are presented simultaneously rather than sequentially. Example: Students learn better about the process of lightning formation when presented with an explanation and simultaneous animation showing the causal chain of events rather than when given an explanation first and asked to watch a subsequent animation (Mayer, Moreno, Boire, & Vagge, 1999).

Spatial contiguity principle: Students learn better from representations that mutually refer to each other when they are presented physically close rather than separated. Example: Students learn electronic spreadsheet procedures better when a tutorial is included on the computer rather than when the tutorial is presented in a separate booklet (Moreno & Mayer, 1999a).

Redundancy principle: Students learn better when redundant on-screen text is removed from narrated dynamic displays (e.g., animations, videos). Example: Students perform worse on problem-solving transfer tests when redundant on-screen text was added to narrated explanations of plant growth in an environmental science game (Moreno & Mayer, 2002).

Signaling principle: Students learn better when instructional programs signal relevant information, such as by highlighting, outlining, and pointing to words or visual elements on the screen. Example: Students who view an animation showing how an airplane achieves lift learn better when the explanation includes signals in the form of headings preceding each instructional section (Mautone & Mayer, 2001).

Segmentation principle: Students learn complex knowledge and skills better when long presentations are broken into learner-controlled segments. Example: Teachers in training who study videos of expert teachers learn better when they pause and watch smaller segments of the video (Moreno, 2007).

Coherence principle: Students learn better when instructional programs exclude information that is not necessary to make the lesson intelligible. Example: When music, video clips showing sensational lightning storms, or video clips of interesting facts about the dangers of lightning (e.g., blowing a football player's shoes off) are added to a scientific explanation of lightning formation, students' learning is hindered (Mayer, Heiser, & Lonn, 2001; Mayer & Jackson, 2005; Moreno & Mayer, 2000a).

Pretraining principle: Students learn better when learning environments provide pretraining on the names, locations, and behavior of key components before presenting a lesson that is complex, fast-paced, or unfamiliar. Example: Students who learn about a car's braking system with a brief pretraining in which they can click on any brake part (e.g., piston, drum) to learn about the part outperform those who learn with no pretraining (Mayer, Mathias, & Wetzell, 2002).

To summarize, these principles are consistent with cognitive views of learning because they minimize the processing of unnecessary information (i.e., redundancy, coherence), help students focus their attention on relevant information (i.e., signaling, pretraining), and make more efficient use of students' limited cognitive resources (i.e., multimedia, modality, segmentation, temporal and spatial contiguity). Classroom Tips: When Multimedia Learning Environments Minimize Extraneous Processing summarizes the principles you just learned with corresponding visual examples.



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What might be the cognitive and motivational advantages of asking students to learn with self-paced learning environments?

When Does Technology Promote Meaningful Learning?

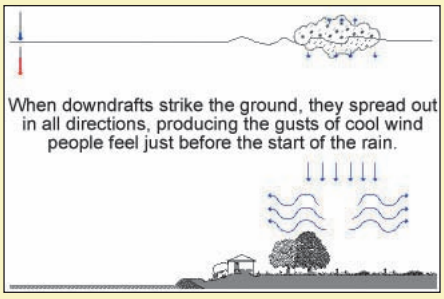
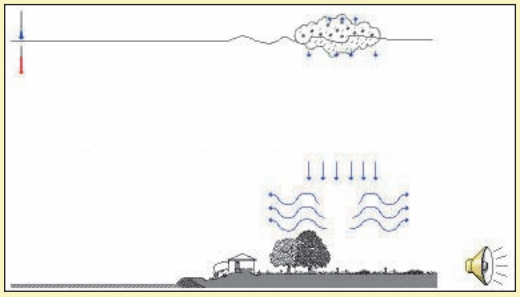
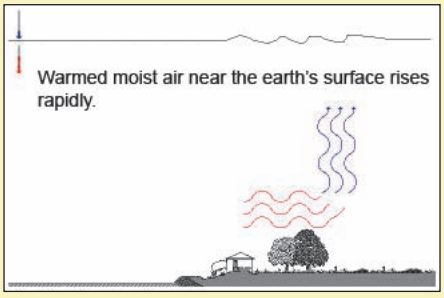
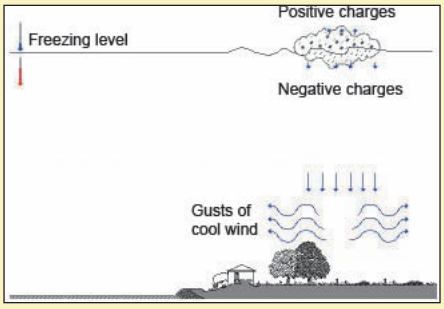
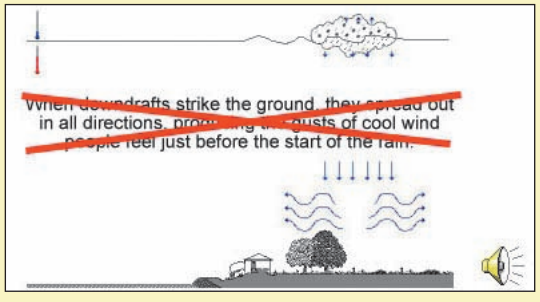
Even when instructional technologies do not impose unnecessary distractions or demands on students, they may not be effective unless they include methods that help students engage in productive mental activities. Consequently, a second question that you should ask when making technology integration decisions is whether the technology is designed to foster the meaningful processing of learning materials. There are at least four more principles that, when applied to computer-based instruction, can accomplish this goal (Moreno & Mayer, 2007).

Personalization principle: Students encode information more deeply when explanations are presented using a conversational style and they are addressed as participants rather than observers of the learning environment. Learning environments that activate students' personal schemas are more likely to result in the meaningful integration of new information with students' prior knowledge (Moreno & Mayer, 2000b, 2004). For instance, students learn better when a pedagogical agent presents personal learning goals ("Your goal is to . . .") rather than generic goals ("The goal of this program is to . . .") and when feedback is personalized ("Your choice for this problem should include. . . .") rather than generic ("The solution to this problem should include. . . .").

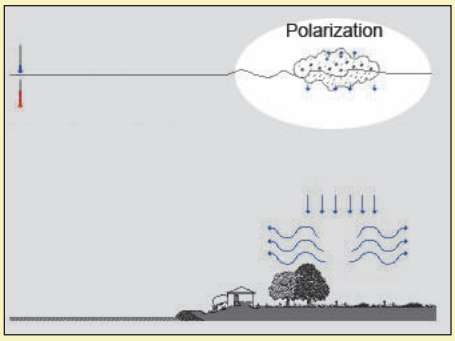
Guided-activity principle: Students learn better when they interact with a pedagogical agent who guides their cognitive processing as they manipulate and experiment with learning materials. Compared to receiving direct instruction, students who are allowed to become actively engaged in the selection, organization, and integration of multimedia materials construct a deeper understanding of the principles of a science lesson (Moreno et al., 2001).

CLASSROOM TIPS

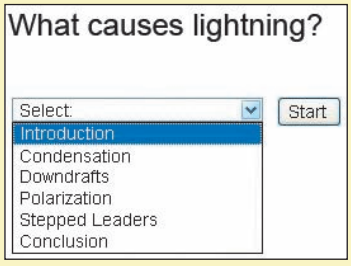
When Multimedia Learning Environments Minimize Extraneous Processing

Cognitive Principle	Visual Example
Multimedia principle: ***Students learn better when*** presented with verbal explanations and corresponding pictures rather than with words alone or pictures alone.	
Modality principle: ***Students learn better when*** dynamic visual displays (e.g., animations, videos, simulations) are accompanied by narrated explanations rather than written explanations.	
Temporal contiguity principle: ***Students learn better when*** corresponding words and pictures are presented simultaneously rather than sequentially.	
Spatial contiguity principle: ***Students learn better when*** representations that mutually refer to each other are presented physically close rather than separated	
Redundancy principle: ***Students learn better when*** redundant on-screen text is removed from narrated dynamic displays (e.g., animations, videos).	

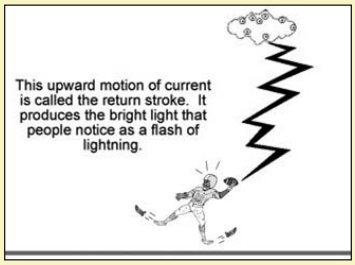
Signaling principle:
Students learn better when instructional programs signal relevant information, such as by highlighting, outlining, and pointing to words or visual elements on the screen.



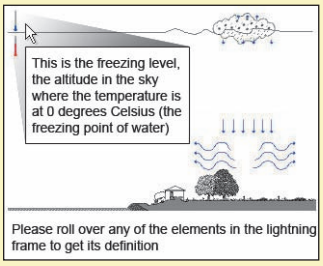
Segmentation principle:
Students learn better when complex knowledge and skills and long presentations are broken into learner-controlled segments



Coherence principle:
Students learn better when instructional programs exclude information that is not necessary to make the lesson intelligible.



Pretraining principle:
Students learn better when learning environments provide pretraining on the names, locations, and behavior of key components before presenting a lesson that is complex, fast-paced, or unfamiliar.



Feedback principle: Students learn better with principle-based feedback rather than corrective feedback alone (feedback that only informs students about the correctness of their response). According to this principle, the effectiveness of instructional technology is also dependent on the relationship between the quality of feedback given by the system and students' prior knowledge (Moreno, 2004). When students lack significant prior knowledge to guide their meaning-making process, the free exploration of a complex learning environment with minimal feedback can hinder learning (Moreno & Durán, 2004). In one study, middle school students who learned to add and subtract integers with principle-based feedback showed greater gain on difficult problems, learned faster during training, and showed a greater pre-test to post-test reduction in the use of conceptual bugs than those who learned with corrective feedback alone (Moreno & Mayer, 1999b).

Reflection principle: Students encode information deeper when they are prompted to become more mentally active during the lesson. Another strength of new instructional technologies is that they are highly interactive, a quality that can result in more

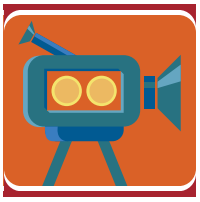
active and meaningful learning. Yet, unless students are asked to provide explanations for the results of their actions or to evaluate their work before submitting it for feedback, their interactions will not promote learning (Moreno & Mayer, 2005; Moreno & Valdez, 2005). In other words, hands-on activity must be coupled with minds-on activity.

The reflection principle seems to provide a special learning advantage when students are not likely to reflect on relevant aspects of the materials, either because the instructional media is passive (i.e., noninteractive) or because the interactivity embedded in a computer lesson can be performed in a superficial or automatic fashion. For instance, Sahila is staring intently at the book on her desk and jumps when the bell rings. When she comes back from recess and sits down to write her summary paper, she cannot remember what she read because her mind was on her date with Kevin last night. Likewise, Webb cannot remember how to work out the math problems on his worksheet. Even though he spent the prior math class using an instructional program to practice the same operations, he clicked through all of the screens, finishing with minutes to spare.

To summarize, past research shows that how instructional technology is designed can have important effects on students' learning. Specifically, we can draw the following two conclusions when adopting a cognitive view of learning:

1. When their working memory or prior knowledge limitations are not taken into consideration in the design of technology-based instruction, students may become overwhelmed.
2. When methods aimed at promoting active learning are absent in technology-based instruction, students may process information mindlessly.

Get Connected!



VIDEO CASE ASSIGNMENT. . . Using the Strategies in Your Classroom: Hear from the Specialists (Tab 3)

Go to your WileyPlus course and view the video. After watching the video, be prepared to discuss how technology can be used to scaffold learning within students' zones of proximal development both in the classroom and at home. What are the advantages and disadvantages of using technology? Based on your evaluation, provide a description of how you use technology in your classroom.

These conclusions apply to any instructional technology, regardless of the medium. A textbook, a PowerPoint presentation, a lecture, and computer-based instruction should not present redundant or extraneous information, should allow students to learn at their own pace, and should include methods that have been shown to support the active processing of new information. Classroom Tips: Evaluating the Potential of Instructional Technologies summarizes the cognitive principles reviewed, with corresponding questions to guide teachers' evaluation process.

Technology and Sociocognitive Views of Learning

Understanding how the design of technology affects students' individual thinking processes is important. However, cognitive views of learning are limited because they do not take into consideration how technology supports learning from others. Sociocognitive views of learning expand on cognitive views by focusing on the role of technology in promoting social learning. Recall from Chapter 8 that social learning occurs when people learn from observing the behavior of others and the environmental outcomes of the behavior of others (Bandura, 2000). What technologies support social learning? Take a few minutes to think about your own experiences learning from others.

According to sociocognitive views of learning, live and symbolic models can be very powerful social learning tools. Of special relevance to this chapter are symbolic models, real and fictional characters that we observe through the media—characters in stories in books, magazines, newspapers, films, videos, cartoons, and television (Kirsh, 2006). Physical education teachers can use videos or DVDs to demonstrate complex motor procedures that in real life may be difficult to observe and analyze, such as tennis serves or

CLASSROOM TIPS

Evaluating the Potential of Instructional Technologies

Principle	Guiding Questions
Multimedia	Does the technology present verbal explanations and corresponding pictures rather than words alone or pictures alone?
Modality	Are dynamic visual displays accompanied by narrated explanations rather than written explanations?
Temporal contiguity	Are corresponding words and pictures presented simultaneously rather than sequentially?
Spatial contiguity	Are representations that mutually refer to each other presented physically close rather than separated?
Redundancy	Are dynamic visual displays accompanied by redundant written text and narrated explanations rather than narration alone?
Signaling	Is the selection of relevant information supported by signaling techniques?
Segmentation	Are students able to pause and break down dynamic visual displays into smaller segments?
Coherence	Does the technology present adjunct information that is not necessary to make the lesson intelligible?
Pretraining	Does the technology pretrain students on the names, locations, and behavior of key components of the lesson?
Personalization	Are explanations given in a conversational style, with students being addressed as participants rather than observers of the learning environment?
Guided activity	Are students allowed to become actively engaged in the selection, organization, and integration of new information?
Feedback	Does the technology provide principle-based feedback rather than corrective feedback alone?
Reflection	Does the technology prompt students to become mentally active during the lesson, such as asking students to elaborate on the materials or evaluate their work?

golf swings. The advantage of video technology is that videos can be shown repeatedly, can be paused, and can be slowed down to analyze movements accurately.

Many disciplines can make productive use of symbolic modeling:

- Art education teachers can demonstrate how artists use a drawing or painting technique.
- Social studies teachers can show historical films to help students learn about the emotional and social context surrounding events in U.S. history.
- Science teachers can show scientists conducting experiments in a laboratory.
- Language arts teachers can present students with samples of model essays.

Keep in mind what you learned in Chapter 8 here: Prestigious models, competent models, coping models (those who had to struggle to achieve mastery), and those that share similar characteristics with students (i.e., peer models) are most effective. Teachers should also consider using models of specific genders when their objective is to reduce stereotyping or gender bias in the classroom, such as showing a successful female mathematician or male nurse during a discussion of career choices. Similar to any other technology decision, the type of media (e.g., newspaper article, video), model characteristics (e.g., age, gender, ethnicity), and behavior being modeled (e.g., procedure, speech, interaction with others) should be driven by teachers' learning objectives.

Sesame Street, an educational television program using puppets and live characters, is a good example of a television program that is aimed at teaching children cognitive and social skills through modeling. *Sesame Street* (which first aired in 1969) and other children's educational TV programs are examples of "edutainment." These programs are based on the assumption that the combination of education and entertainment

optimizes learning by making it more engaging (Sommerer, 2001). In *Sesame Street*, children learn cognitive skills through direct instruction by the characters but also learn social skills indirectly by watching the characters display the skills with others. Preschool children who watched *Sesame Street* were more likely to display positive interpersonal skills (e.g., resolving conflicts, making positive comments) and less likely to stereotype than a control group of children who did not watch the program (Cole et al., 2003).

Likewise, Linebarger, Kosanic, Greenwood, and Doku (2004) compared the literacy skills of kindergarten and first-grade children who viewed 17 episodes of an educational television program called *Between the Lions* to those of a comparable group of children who did not watch the episodes. The program is aimed at developing children's literacy by modeling reading, writing, and speaking skills using a wide range of texts. The researchers found that children who viewed the *Between the Lions* episodes and were not at risk for reading failure, showed higher performance on word recognition, letter–sound matching, and phonemic-awareness tasks than their counterparts.

Technology and Constructivist Views of Learning

At the heart of constructivist views of learning is the idea that students actively construct their knowledge from their personal experiences with others and with the environment (Simpson, 2001). In Chapter 8 we discussed two types of constructivism, individual and social constructivism. Individual constructivism is largely inspired by the work of Piaget (1954), which we reviewed in Chapter 3. According to this constructivist perspective, the role of technology is to provide instructional materials and environments where students can make intellectual choices for themselves as they construct knowledge in their minds. Recall that Piaget argued that cognitive development is the process of encountering a contradiction about one's beliefs and becoming motivated to resolve the cognitive conflict by finding new information that can restore equilibrium.

Social constructivism is largely based on the work of Vygotsky (1978), also reviewed in Chapter 3. According to this learning perspective, it is by sharing individual perspectives with others that learners are able to construct understandings together that would not be possible to construct individually (Gauvain, 2001). Vygotsky (1978) clearly states the essential role of social collaboration in learning: "Learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers" (p. 90). Before reading the next paragraph, think about examples (perhaps from your own experience) of technologies that can facilitate individual and social constructivism.

Inquiry-based learning includes technologies that support individual constructivism by presenting students with opportunities to carry out experiments, process data collected by sensors, and interpret the results of different graphical representations. Cognitive tutors and collaborative computer-based environments are technologies that can help students construct meaningful understandings by interacting with others. Let's take a look at some examples of these constructivist technologies.

Inquiry-Based Technologies. With the support of computer software, students can engage in the inquiry process by conducting virtual experiments, engaging in online investigations, and pursuing scientific activities that are similar to those performed by actual scientists (Goldman, Duschl, Ellenbogen, William, & Tzou, 2002). Inquiry-based instructional programs typically use a guided-discovery method, which consists of providing hints and directions when students are at an impasse in solving a problem or answering a question (Mayer, 2004). Yet most experts emphasize the need of additional teacher guidance when instructional technologies require multiple skills such as reading graphs, analyzing data, planning experiments, and running simulations (de Jong & van Joolingen, 1998; Toomey & Ketterer, 1995).

BGuILE is an inquiry-based computer environment for learning biology (Reiser et al., 2001). This software provides access to data and tools that students can use to test hypotheses and record and communicate their findings. For instance, middle school students can investigate what is killing some animals in the Galápagos Islands by interacting with the

Struggle for Survival module in the BGuILE software. The program is designed to scaffold students' inquiry activities as they complete relevant tasks using prompts, hints, or reminders (Reiser, 2002; Davis & Linn, 2000). Studies of the *Struggle for Survival* module showed that the unit promotes scientific reasoning (Sandoval, 2003; Sandoval & Reiser, 2004).

WebQuest is a technology that engages students in collaborative inquiry. Teachers can use WebQuests to promote inquiry-based learning and collaborative learning simultaneously. WebQuests are teacher-designed environments that provide useful information, resources, and guidance to accomplish a variety of academic activities. They are a good way to introduce students to Internet searching and to collaborating with each other on projects. Many WebQuests are designed so that different members of a collaborative group work on different roles. You can learn more about WebQuests by visiting http://webquest.org/index.php.

Another characteristic of many inquiry-based programs is that they include **microcomputer-based laboratories (MBLs)** and microworlds. MBLs allow students to build on their knowledge and correct misconceptions by presenting sensors and probes for a variety of scientific variables (Nakhleh, 1994; Trumper & Gelbman, 2002). MBLs are typically attached to a computer to display the results of their measures. Examples are temperature probes, which can be placed in a chamber of hot water to produce a graph showing how temperature changes as the water cools; motion detectors, which produce real-time graphs of distance, velocity, and acceleration for objects moving toward or away from the motion detector; and sound probes, which can be used to compare the loudness and frequency of sounds from two different instruments playing the same note.

Microworlds are simulations that visually demonstrate how things work in the real world. Simulations are most useful when they demonstrate processes that are invisible (e.g., the seasons of the earth) or difficult to perceive accurately because in real life the process would be too quick (e.g., the movements of a dancer) or too slow (e.g., the long-term changes in an ecosystem). Simulations also present a training advantage when safety during practice is at stake, such as the case of a flight simulator or a surgery simulator to train pilot and medical students, respectively. Microworlds can be powerful tools to foster cognitive development because students are able to test their misconceptions in vivo (Grabe & Grabe, 2001; Nickerson, 1995). Two popular examples in social studies are Oregon Trail, which allows students to learn new content and skills while they virtually travel from Missouri to Oregon as the original pioneers did (Forcier & Descy, 2005); and Sim City 2000®, where students can virtually experience the effects of population growth in large cities.

Cognitive Tutors. **Cognitive tutors** are intelligent tutoring systems that develop cognitive models of students' knowledge and thinking as they interact with the computer program. In these technology-based environments, students receive the benefits of individualized instruction, including practice with immediate feedback, online help, and coaching. Tutors monitor students' problem solving to determine what they know and don't know, allowing instruction to be directed at what still needs to be mastered and ensuring that students' learning time is spent efficiently.

The instructional method underlying cognitive tutors is apprenticeship, in which a learner first observes how the tutor performs a task (e.g., problem solving, essay writing), then performs the task with the help of the tutor's prompts and hints, which are gradually faded as the learner shows mastery of the skills (Bonk & Cunningham, 1998). The most widely used cognitive tutor program is probably Carnegie Learning's Cognitive Tutor, which combines individualized computer lessons with collaborative, real-world problem-solving activities. Studies have shown significant student achievement gains in classrooms that adopted the Carnegie Learning tutoring program (Aleven & Koedinger, 2002; Corbett, Koedinger, & Hadley, 2001; Morgan & Ritter, 2002). You can learn more about cognitive tutors by visiting www.carnegielearning.com. Figure 14.7 shows a screenshot of Carnegie Learning's algebra tutor.

Some tutorial programs take the form of **integrated learning systems (ILSs)**, software packages that can be bought by school districts to keep track of student performance (Underwood, Cavendish, Dowling, Fogelman, & Lawson, 1996). ILSs are much more comprehensive than individual tutoring programs because they can cover content for an entire



Ziqy Kaluzny/Stone/Getty Images, Inc.

What is the role of the classroom teacher when instructional technologies require the use of multiple skills?

Microcomputer-Based Laboratories (MBLs)

Virtual sensors and probes typically included in inquiry-based computer environments that can be used to measure a variety of scientific variables.

Microworlds

Simulations that visually demonstrate how things work in the real world.

Cognitive Tutors

Intelligent tutoring systems that develop cognitive models of students' knowledge and thinking as they interact with the computer program.

Integrated Learning Systems (ILSs)

Software packages that keep track of student performance.

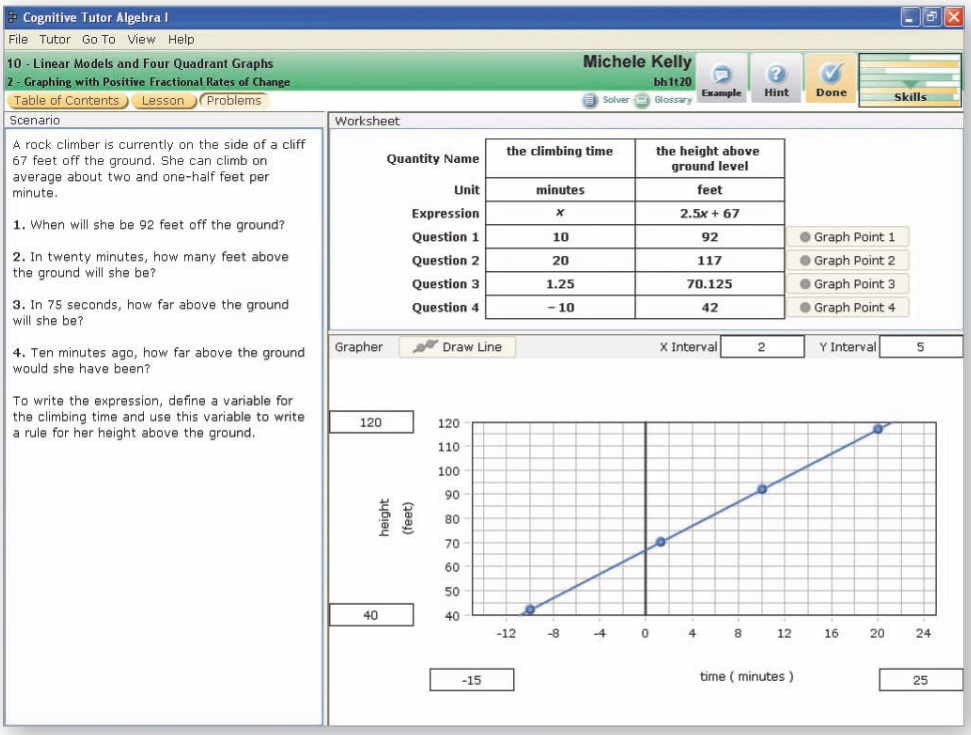


FIGURE 14.7 A screenshot of Carnegie Learning's algebra tutor.

K–8 curriculum. ILSs are designed to present instruction at students' own pace and provide immediate feedback, remediation, or enrichment activities. Studies comparing the performance of ILS and non-ILS students, however, do not show clear results. Some show benefits for mathematics but not for reading (Underwood et al., 1996), whereas others show no differences (Estep, McInerney, Vockell, & Kosmoski, 1999–2000) or only improved teacher support in classroom management and assessment tasks (Van Dusen & Worthen, 1995).

Problem-Based Learning Tools. The Cognition and Technology Group at Vanderbilt University (CTGV, 2000) developed a problem-based learning tool that is a videodisc learning environment for fifth- and sixth-grade mathematics learning. The series, called The Adventures of Jasper Woodbury, presents learners with real-world situations that require applying knowledge in various domains (e.g., math, science, history) to solve the problem. Over three to five class periods, students are typically arranged in small groups to view a Jasper adventure, reexplore the video to find the data needed to solve the problem, and present their solutions to their fellow classmates.

After discussing the pros and cons of different solutions to a Jasper adventure, students work on extension problems that engage them in "what if" thinking by revisiting the original adventures from new points of view. For example, after proposing the use of an ultralight airplane to rescue a wounded eagle in one of Jasper's adventures, students may be asked to rethink how the presence of headwinds or tailwinds would affect their original solution.

Anchored Instruction

Problem-based learning environments that include an anchor, a rich, interesting problem situation around which students focus their thinking.

A distinctive characteristic of the Jasper series is that it consists of **anchored instruction**, which is problem-based learning including an anchor—the rich, interesting problem situation around which students focus their thinking. These adventures are aimed at helping students solve problems in authentic contexts and develop transferable knowledge and skills. Jasper-trained classrooms performed significantly better than control classrooms on a test where students were required to plan a solution to a word problem and to break the problem into subgoals (CTGV, 1996, 2000). The videodisc series is an example of technology as a vehicle to promote active problem solving in realistic contexts. However, more research is needed to better understand how the series helps problem solving. Because the Jasper series includes several methods for problem solving (inquiry methods, cooperative learn-

ing, and anchored instruction), it is not clear whether and how each one of these components contributes to students' learning.

Current trends in electronic communications are also providing increasing opportunities to create communities of learners through the Internet. An example is the program Adventure Learning, where students from different schools can participate in common virtual field trips across the world, communicate with experts, and collaborate with peers in problem-based learning activities. You can learn more about adventure learning by visiting www.thinkquest.org/library.

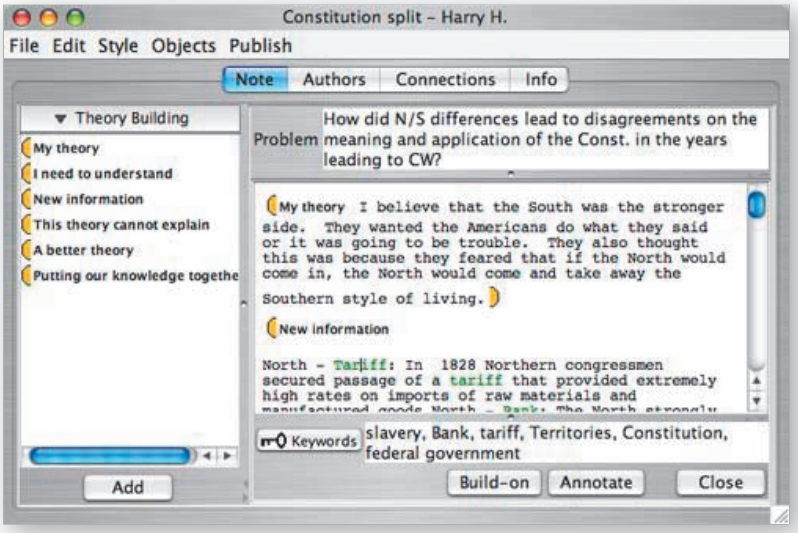


FIGURE 14.8 **A screenshot of the Knowledge Forum® student interface.**

Knowledge-Building Communities. This technology consists of a computer-based system in which students collaborate with other students to build knowledge about any topic that is being studied. The system creates an ongoing shared database that can be accessed by students and teachers at any time. A well-known knowledge-building community system is Knowledge Forum®, which provides students and teachers with a collaborative space in which to share ideas and data (Scardamalia, 2004). Students start with an empty knowledge base that develops from a question or issue that is the center of their meaning negotiation. Then students submit ideas, reorganize the knowledge, and ultimately construct new collective understandings. Knowledge Forum® displays the individual contributions of each student with a knowledge map and provides scaffolds for reflection and theory building (see Figure 14.8). A study that used an earlier version of Knowledge Forum® called CSILE showed significant advances in textual, graphical, and computer literacy, as well as in depth of inquiry and collaboration processes (Scardamalia, Bereiter, & Lamon, 1994).

How Effective Is Instructional Technology?

Many studies have tried to establish the effectiveness of technology in teaching and learning. One meta-analysis (a study of prior studies) found that computer-based instruction did not have a positive effect on student performance across all areas (Kulik, 1994). A study by Apple Classrooms of Tomorrow (Apple Computer, 1995) found that the use of technology facilitated cooperative learning and reasoning but had no effects on students' math, reading, and vocabulary performance. Other reviews show small positive effects (Aviram, 2000; Blok, Oostdam, Otter, & Overmaat, 2002; Healy, 1998), and some studies even show that technology use may be detrimental to achievement. A national study on math achievement found that students whose teachers used computer programs for drill and practice scored lower on standardized tests (Wenglinsky, 1998), and research on hypermedia tools demonstrated that students can end up disoriented, anxious, frustrated, and confused (Morrell, Marchionini, & Neuman, 1993).

The lack of consistent evidence for either a positive or negative technology effect on students' achievement has been called the "no significant difference" by Russell (1999), an expert who studied and summarized instructional technology research from 1945 onward. The research, however, shows more positive results when a more detailed analysis of the types of technologies and students is done. Computer-based learning shows greater effects for simulation programs than for drill-and-practice programs (Khalili & Shashaani, 1994), for learning complex cognitive skills than for learning subject matter (Liao, 1992), for elementary than for middle or high school students, and for low- than for high-achieving students (Bangert-Drowns, Kulik, & Kulik, 1985; Kulik, Kulik, & Bangert-Drowns, 1985). There is also evidence favoring specific digital tools such as word

processors (Bangert-Drowns, 1993; Goldberg, Russell, & Cook, 2003; Norton & Sprague, 2001) and calculators (Waits & Demana, 2000).

The inconclusive results of this research suggest that there is still a long way to go before the use of technology can fundamentally change learning and teaching (Cuban, 2001; McCain & Jukes, 2000; Thornburg, 2002). Most experts agree that part of the problem is that the use of technology presents too many challenges to teachers. Specifically, its proper use by students can take a significant amount of time; meeting curriculum standards and developing appropriate assessments can be difficult; specific training on how to guide students to effectively use the tools is needed; and when technologies are highly interactive, they can make the balance between classroom management and student exploration difficult (Tomei, 2003). Nevertheless, when pedagogical strategies and teacher guidance are present, students can become sophisticated users of technology (Kumrow, Vogt, & Kazlauskas, 2002). Classroom Tips: How to Effectively Integrate Technology into the Classroom shows a set of principles that you can use to increase the effectiveness of any technology tool in the classroom. We present examples of tools for meeting a variety of learning objectives in the next section.

CLASSROOM TIPS

How to Effectively Integrate Technology into the Classroom

Principle	Classroom Examples
Use technology that is aligned with your learning objectives. Despite external pressures and/or availability, teachers should carefully evaluate whether and how technologies may help them achieve academic goals before deciding on their integration.	After testing his sixth-grade science students, Mr. Hixon realizes that most of them are having difficulties with representing data. To help them do so, he teaches his students how to use a graphing program that plots data in several different forms. He then asks them to represent their data by hand without the help of the program.
Learn as much as you can about technologies before integrating them into your classroom. Teachers' self-efficacy and competency in the use of technology is essential to guarantee students' success with instructional technology tools.	Mrs. Rosenberg plans to show a DVD of *Macbeth* to her tenth-grade English classes and is glad she showed up early to get the equipment. The school has just received a new projection system to replace the older TV and DVD players. Mrs. Rosenberg spends the time before class learning how to operate the laptop and projector before students arrive.
Teach skills that can help your students become successful in a technology era. Because effective technology use requires many different competencies, teachers should help students develop the necessary skills to successfully learn from technology before integrating them into the classroom.	Mr. Selvaki wants his fifth-graders to use the Internet in their class work throughout the schoolyear. He begins the year by teaching his students how to critically use the World Wide Web. To this end, he gives them a list of "don'ts," including not clicking on advertisements, not allowing pop-ups, and not partipating in chatrooms or exchanging e-mails with strangers.
Monitor students as they use technology in the classroom. This will ensure that students are developing relevant knowledge and skills and will minimize the likelihood of student frustration. Teacher guidance is essential in learning with and from technology.	During computer lab time, Mrs. Pedna typically spends the entire class roving the lab to troubleshoot problems. To help monitor students more effectively, she creates a "help sheet" that includes a How-to list for basic computer procedures such as logging in and out, initiating programs, and saving documents.
Use well-established principles as criteria for evaluating the effectiveness of technology. Use research-based information to guide your decision-making process about integrating technology into the classroom.	Mr. Elmer has decided to incorporate Inspiration software into his history class to help students create timelines. Before deciding on Inspiration, he spent time reading professional journals regarding which software programs would best address his students' needs.
Use technology to help students practice basic skills. Although not an end in itself, drill-and-practice software can help students develop automatic procedural and free cognitive resources to engage in high-order thinking.	Ms. Gate is a ninth-grade remedial math teacher. To help her students learn basic math principles at their own pace, she asks them to use a drill-and-practice tutorial that keeps track of their performance and presents increasingly more difficult problems as they demonstrate mastery of easier problems.
Emphasize technology to foster high-order skills. Capitalize on the finding that the best use of instructional technology consists of using it as a tool to develop high-order thinking.	Rather than relying solely on science textbook worksheets and tests, Mr. Diamond gives his students assignments in which they need to gather data through the Internet to respond to a set of high-order questions that require analyzing, evaluating, and predicting science phenomena.

TECHNOLOGY AND LEARNING ACROSS THE CURRICULUM

Think about your own experiences as a student. How many different tools did you use to help you learn? How many different tools did your teachers use to support their practice? The objective of this section is to provide you with a variety of examples of current technologies for learning and teaching.

Technology Tools for Learning

Adriano and his classmates feel a sense of accomplishment after completing their group project on early American explorers. They used Inspiration software to organize their information about Hernando de Soto. Then they used Excel to list all the questions they needed to research and the name of the group members who were assigned to find the answers. Adriano researched de Soto's first expedition into the southeastern United States and along the Mississippi River by searching websites using Google and Encarta Encyclopedia; he used Microsoft Word to record his findings. Once all group members had the information they needed, they used Microsoft Publisher to create a brochure about de Soto's adventures. Then the group used the school's camera to film a short skit about the first time de Soto saw the Mississippi River. They used iMovie to edit their film. It required a lot of work, but Adriano and his peers learned many technology skills during the process and are proud of their final product.

As you see from this example, students draw from a variety of tools to support their learning needs. In some cases, the technology may have applications across content areas (e.g., word processor); in other cases, the technology may be suited only for developing knowledge or skills in a specific domain (e.g., science simulation). Following are some examples of technology tools for learning.

Tools for Representing Knowledge. The goal of this type of tool is to help students represent knowledge in multiple formats and organize complex relationships among concepts. The program Inspiration allows students in grades 6 and above to represent ideas in the form of concept maps. Kidspiration is the software's K–5 version. Students can also use authoring tools such as PowerPoint, Flash, and HyperStudio. Authoring tools, also known as *authorware*, are programs that help write hypermedia applications by integrating different objects such as text, graphics, and sounds. Students can create different objects, relate them to one another, and sequence them in an appropriate order to produce attractive representations of their knowledge. Other programs, such as iMovie and Adobe Premiere, can be used to help students create and edit video representations of their work.

Tools for Organizing Knowledge. Students can use electronic databases or spreadsheets such as Appleworks or Microsoft Excel to input, manipulate, and organize information in text and numerical formats. Once a database is created, students can conduct searches, find patterns, calculate statistics, and plot or graph results. Similar to calculators, database programs support thinking because they allow students to process large amounts of information without overloading their working memory capacity (Sweller, 1999). However, to be effective, students need explicit instruction on spreadsheet operations and how to apply them to solve problems (Forcier & Descy, 2005).

Microsoft's Encarta Researcher (see Figure 14.9) supports students' need to organize their sources of information in research projects. Other organizational tools include programs that help students with outlining and note taking to organize classroom information and, for younger children, color-coded calendars and checklists of school-related activities.



FIGURE 14.9 Students can research parts of the world using Encarta's Geography section.

Technology across the Curriculum

In addition to tools for representing and organizing information (which can be used in a wide variety of subjects), there are software programs and applications aimed at helping students acquire knowledge and skills in specific domains across the curriculum. In this section, we review technologies that support reading, writing, mathematics, science, social science, visual arts, and music.

Tools for Reading. Technology tools that support the process of learning to read range from those that teach letter and sound recognition to those that promote reading comprehension. Teachers should match the type of software to their learning objectives and the particular needs of each student. Available software includes the following:

- Earobics is a computer program that teaches phonemic awareness through a series of games and activities.
- Reading Blaster is a drill-and-practice computer program that presents students with opportunities to practice spelling and letter–sound relationships.
- The Living Books series includes CD-based books that read stories to children and scaffold their understanding of written patterns and punctuation concepts.
- READ 180 is a learning program in which students view a video with background knowledge on a topic and then read hypertext about the same topic with the possibility of looking up new vocabulary words, organizing their ideas, and adding graphics and video.
- Accelerated Reader is a program whereby students read basal texts on paper and respond to comprehension questions on the computer.

Research on reading tools shows that vocabulary can be enhanced by anchoring students' learning in motivating learning contexts. This might include playing a videodisc story of a popular book that includes the vocabulary students are learning (Bender & Larkin, 2003; Xin, Glaser, & Rieth, 1996).

Tools for Writing. Using the computer keyboard to input words is one of the first computer skills that students learn. Most schools include keyboarding instruction as part of their curriculum. Software applications such as Type to Learn and Mario Teaches Typing help to develop automatic typing skills. Word-processing programs help students to develop writing skills, presumably because once students develop automaticity in word processing, they have more working memory resources to develop and organize their ideas (Quinlan, 2004). Students who use word-processing tools make fewer spelling and grammatical errors, are more likely to write and revise their work, and display more positive attitudes toward writing (Roblyer, 2006).

A review of the effects of word processing on writing, however, shows that unless there is teacher guidance, students who use word processors may produce longer but not higher-quality written products (Bangert-Drowns, 1993). Because writing is a complex cognitive activity that requires significant planning time, some programs now include prewriting tools such as outlining aids, mapping idea tools, and even metacognitive prompts to help students reflect on their drafts (Bonk & Reynolds, 1992; MacArthur, 1996). Additional tools to engage students in collaborative writing can be found on the Internet. Programs such as Kidforum and Through Our Eyes offer opportunities for interactive debates and online mentoring.

Tools for Mathematics. Technology-based tools for math range from traditional calculators to state-of-the-art interactive multimedia programs such as The Adventures of Jasper Woodbury and math Cognitive Tutors, described previously. The use of calculators is controversial among educators because many claim that students learn to overrely on calculators to solve problems and eventually become unable to do "math in their head." It is recommended, therefore, to combine the use of calculators with the development of strong estimation and basic mathematical reasoning skills. Some experts also recommend teaching the calculator's 10-key keypad to make students more proficient with their calculators (Belson, 2003).

Although most computer applications in mathematics are drill and practice, many K–6 packages include more engaging content and graphical interfaces (see Figure 14.10), such as these:

- The ClueFinders series is aimed at solving mysteries using math and problem solving;
- Illuminations is a set of online math lessons based on the principles and standards of the National Council of Teachers of Mathematics.

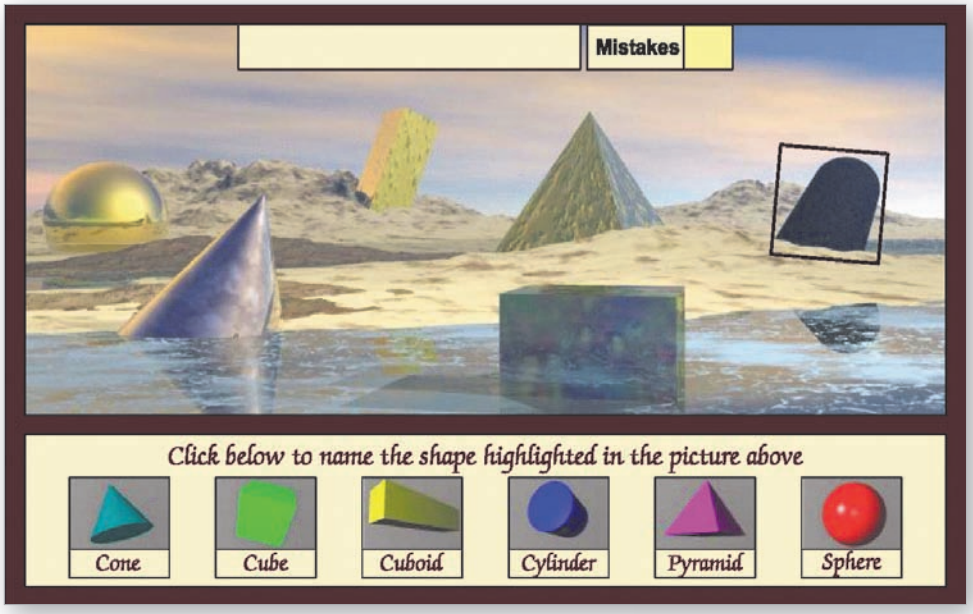


FIGURE 14.10 **Teachers can use interactive math games such as Buried 3D Shapes to help students develop knowledge and skills at their own pace.**
Source: www.primaryresources.co.uk.

- The Math Blaster series offers instructional games in which players practice number patterns, math operations, and problem solving.
- Hot Dog Stand is a program that focuses on math operations and estimation as students virtually run a small business.

Tools for Science and Social Science. Similar to mathematics, technology tools for science and social science range widely. The more traditional tools are texts and electronic encyclopedias, which take advantage of people's dual coding by presenting corresponding scientific explanations and visual representations (Clark & Paivio, 1991). Encarta Encyclopedia includes movies, pictures, and sounds to help students understand the concepts they are investigating.

Constructivist tools typically include not only multiple representations of the scientific information for students to explore but also interactive games and activities in which they can experiment with virtual materials individually or collaboratively. For example, the Web-Based Integrated Science Environment (WISE) project developed by the University of California at Berkeley (Linn, 1997) offers middle and high school students an interface whereby they can locate information on the Internet, input and organize their findings and conclusions in an electronic notebook, and participate in online discussions. Other science and social science programs include the following:

- Microsoft Dinosaurs combines dynamic graphics, animations, and explanations about the location and evolution of dinosaurs over time with a search engine, vocabulary support, and a set of games to further students' learning (Shepardson & Britsch, 1996).
- Where in the World Is Carmen Sandiego? is a series in which students learn about geography, culture, and map reading while tracking down Carmen on the basis of clues about where she and her accomplices are hiding.
- Science Seekers is a series of science lessons in which students learn basic scientific principles while engaged in solving real-life environmental problems, such as the protection of endangered species and conservation.



FIGURE 14.11 This work was created by a high school student enrolled in an electronic art class using Photoshop. Photoshop is one of the technology tools that many students will need to know how to use for careers in media and art.

Tools for Visual Arts and Music. Electronic sketchpads as well as drawing and paint packages, such as those included in multimedia authoring programs or Hyperstudio and Photoshop (see Figure 14.11), can promote students' visual imagery (Chia & Duthie, 1993). At art sites, students can also study and discuss a variety of styles of visual art from both famous and unknown painters and illustrators. Some examples include the following:

- The Art Lesson teaches art basics to students in grades K–4.
- Mexico's Day of the Dead shows art projects from Mexico and provides background historical information for students in grades 4–9.
- A Lifetime of Color shows a timeline of art from 15,000 B.C. through the 20th century.
- Other sites that allow students to engage in interactive activities are The Art Teacher Connection, AskERIC Lesson Plans, and Crayola.

Art education teachers can also access online museums to introduce students to a variety of artists and works and to analyze cultural influences on art. Some examples are the following:

- www.childrensmuseum.org allows students to engage in an art workshop and create an online multimedia puppet show.
- www.metmuseum.org contains more than 3,500 images from the Metropolitan Museum of Art in New York.
- www.icom.org/vlmp provides online museum resources from all over the world.

In music, digital oscilloscopes and electronic keyboards can help students understand musical concepts and develop pitch discrimination (Magnusson, 1996), and MIDI systems (musical instrument digital interface) allow students to virtually play musical instruments and record their products electronically. These interactive tools can be powerful supports of students' musical thinking development (Chen, 2005).

Now that you have learned about the promise and challenges of technology integration and are more familiar with the many different tools that are available to the classroom teacher, read the following Case Study and try to solve Mr. Schorr's dilemma about integrating technology into his classroom.

Get Connected!

COLLABORATIVE LEARNING ASSIGNMENT



Pick a partner and each of you make a list of the top 10 reasons to use technology in the classroom and a list of 10 cautions to consider when deciding what technology to use and how to use it in the classroom. Share and compare your lists.

TECHNOLOGY TOOLS FOR TEACHING

Teachers, too, can benefit from technology tools to make their tasks more efficient. Specifically, technology can support instruction, classroom management, and assessment. Recall Imagine You Are the Teacher. Here, Ms. Suina uses two technology tools: an overhead projector to display the classroom assignment and the web-based school attendance program. As you read the following applications of technology, keep in mind that although many technology tools seem like an effective solution to simplify the complexity of teaching, they also challenge teachers to become experts in combining various tools and systems (Mergendoller, 1996). Just as your students need time, practice, and informational feedback to master new skills, you, too, will need to become fluent in the use of technology tools before they can significantly change your teaching–learning environment. For instance, when Mrs. Manilla first began teaching, she recorded all her grades in a paper-based grade book. During a professional development course, she learned how to use Microsoft Access (see Figure 14.12). Since then, Mrs. Manilla has created an electronic database where typing any student's name provides immediate information about their grades, behavioral records, instructional modifications, parental contact information, and a record of the times she has communicated with the parents.

What are the advantages of electronic whiteboards for learning?



NewsCom

Instructional Tools

Teachers can present new information to their students by using PowerPoint presentations. This computer application allows teachers to present clear outlines or summaries, which can also be combined with graphs, pictures, video clips, and even previously scanned student work. Other state-of-the-art technologies that teachers can use to support instruction are electronic whiteboards, which have the same function as the traditional blackboards except that anything that is written on the board can be saved and later distributed

A Case Study: DIVERSITY IN THE CLASSROOM

Technology Integration Issues in an Elementary School Classroom

Mr. Schorr plans to integrate technology into the fifth-grade curriculum. As a first-year teacher at Walt Whitman Elementary, he is eager to have his students get hands-on experience using computers as soon as possible. Thanks to a New York nonprofit organization, PENCIL, which facilitates partnerships between local business leaders and school principals, Walt Whitman has a new computer lab and wireless Internet throughout the school. Previously, the lab was a hodgepodge of educational software installed on outdated equipment, but over the summer refurbished computers, an interactive whiteboard, and a multimedia projector were installed.

The principal, Mrs. Vassil, has an impressive vision for the lab. She wants computers to be used for peer-to-peer collaborative projects, inquiry-based investigations, typing lessons, WebQuests, multimedia presentations, the after-school technology club, and as a way for teachers to communicate more frequently with parents. However, she is still trying to obtain additional funding for professional development sessions to train teachers in how to effectively integrate technology into the curriculum. She has found it difficult to schedule adequate time for staff members to learn new software, plan effective technology lessons, and meet state standards at the same time. The goal for the lab's first year is for students to use the computers as much as possible and for teachers to use a variety of educational software.

Demographics:
An Overview of the Students
Walt Whitman Elementary

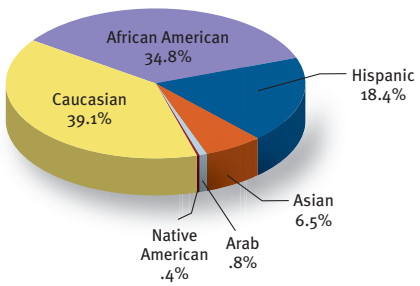
Prospect Heights Brooklyn, New York

63.5% Students eligible for free and reduced lunch

16.2% Students qualify for ESL instruction

13.1% Students receive Special Education Services

Racial/Ethnic Groups



Upon reviewing the fifth-graders' recent writing assessment, Mr. Schorr decides to use computers to help students improve their writing. The majority of his fifth-graders are competent at brainstorming, researching information, and writing the first draft of a multiparagraph assignment. The challenge is for students to clarify and organize their ideas. He's noticed that the revision process can be frustrating when essays are handwritten because students spend unnecessary time writing multiple drafts and lose track of editing changes. Mr. Schorr hopes that by using computers, students can be actively involved in the cognitive process of revision rather than feeling overwhelmed by the mechanical aspect of putting words down on paper. Also, he plans to print out multiple copies of their work to use during peer editing and will encourage students to share their writing with classmates, family members, and the larger school community.

To generate excitement about the project, Mr. Schorr starts a Walt Whitman School blog where students can post completed assignments. He writes an example entry about his older brother teaching him how to skateboard and includes a picture of himself doing a kick-flip when he was 12 years old. To protect students' identity, they will use their initials to identify their writing and only registered users, such as classmates and family members, will be able to access the blog.

"Is that really you, Mr. Schorr?" Anisa asks in disbelief.

"Sure is," he confirms.

"That's a cool sticker you got on your board," Gavin says admiringly.

"Yes, my brother and I had a big sticker collection," Mr. Schorr remembers. "You'll be able to post your own writing on our blog."

"Writing's a cinch on the computer. You can add details, move paragraphs around, make up new sentences. That's how I do all my homework at home," Diego says with excitement.

"Did you know that if you right-click with the mouse you can get all those words? Oh, what's that called?" Andrea asks.

"Hmm, let me see," Makayla says as she looks at her screen. "Synonyms!"

"Yeah, my dad taught me all about synonyms," Andrea says proudly.

"That's great! I'm glad so many of you have experience using computers," Mr. Schorr encourages. "This past week, you brainstormed ideas and wrote a handwritten draft of your story. Today, you'll be adding details. I want you to *show*, rather than tell, what's happening. So, first type up your rough draft and then start adding interesting details. By the end of the week, you'll be able to e-mail your story to your parents, so they can see what you're learning in school."

"My mom loves getting e-mail from me," Julian exclaims.

As Mr. Schorr circulates through the lab, he notices some students are effortlessly typing their drafts, while others seem confused and are still searching through the programs.

"I'm sorry to interrupt, but I'm going to quickly review how to open, close, and save word documents," Mr. Schorr announces.

"Ah, come on, Mr. Schorr. We already know that, we're not babies," Evan complains.

"Yeah, I learned that when I was in kindergarten," Julian exaggerates.

"If you already know these skills, you may continue your work. If not, please follow along as I show you on the presentation whiteboard," Mr. Schorr compromises. Six or seven students watch his presentation.

Midway through the lesson, Mr. Schorr uses a checklist to assess student's progress. Half the class has finished typing, and students are busy adding details and synonyms. The rest of the class is struggling. Some students are laboriously using the hunt-and-peck method to type, while others are confused by spellcheck.

"Oh, this always happens to me," Valerie says in frustration when she accidentally deletes a paragraph. "Now I'll have to start all over again," she sighs. "I can't do this."

"That's easy to fix," Mr. Schorr says as he quickly shows her how to undo the last action.

"Wait, how did you do that?" Valerie asks.

"Let me show you again more slowly, and then you can practice," he says.

Next, Godwin tells Mr. Schorr quietly, "We don't have Internet at home, so I won't be able to e-mail my story to my mom."

"Well, you can print it out and give it to her," Mr. Schorr suggests, but Godwin looks disappointed.

Jailine waves her hand impatiently, "I can't even read my writing 'cause it's so small."

"Oh, all you need to do is change the font. Here, let me show you," Mr. Schorr offers.

During lunch, he reflects on the lesson. He realizes that some fifth-graders have e-mail accounts and send videos and photos to their friends, while others do not even know how to type or use basic programs. He had assumed the majority of his students had computers and Internet access at home, but he's learned many do not, and they feel embarrassed to reveal this in front of their peers.

Mr. Schorr is passionate about teaching his students computer literacy skills, yet he realizes there are many questions that need to be addressed before he can accomplish his goals. He decides to make an appointment with the principal to talk about how he can effectively teach computer literacy.

Reference

PENCIL (Public Education Needs Civic Involvement in Learning): http://pencil.org

CASE ANALYSIS GUIDING QUESTIONS

STEP 1: Identification

Identify and briefly describe the main issues in the classroom case.

Guiding question: Which student/teacher/administrator/parent behaviors are likely to have an impact on the students' development, learning, motivation, classroom behavior, and/or assessment and why?

STEP 2: Evaluation

Evaluate the teacher's decision-making process in the case by describing the pros and cons of his actions.

Guiding question: Are the teacher's strategies likely to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why or why not?

STEP 3: Solution

Describe alternative strategies you would use in the case with a corresponding rationale based on what you know from educational psychology theory and research.

Guiding question: Are there any alternative strategies that can be used to overcome the development, learning, motivation, classroom behavior, and/or assessment challenges identified in step 1 and why?

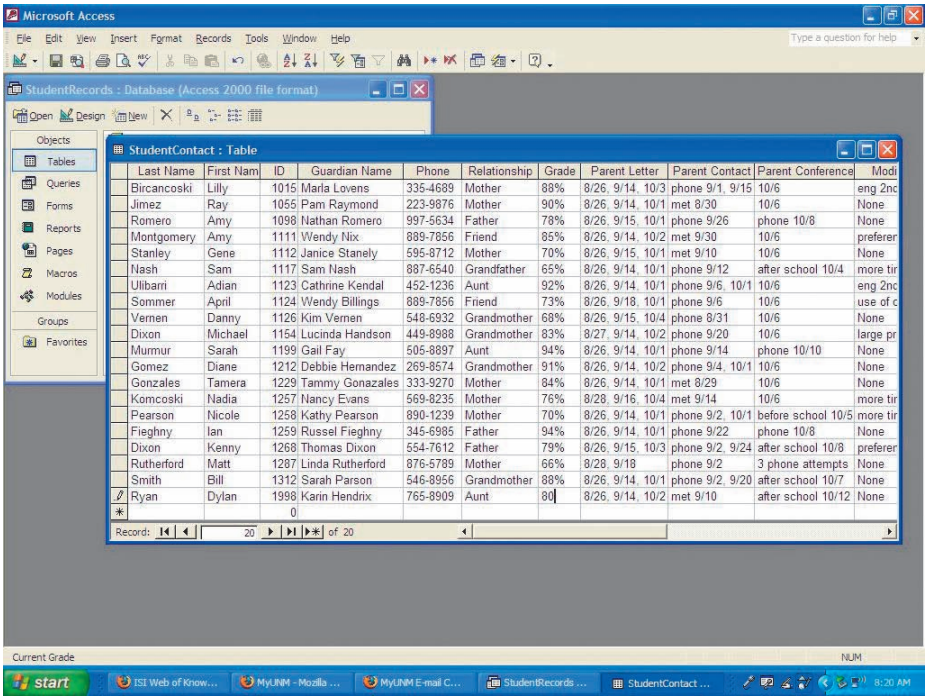


FIGURE 14.12 A screenshot of Microsoft Access electronic database.



FIGURE 14.13 A high school teacher's website sample screen.

to students, and liquid crystal displays (LCDs), which are replacing the traditional overhead projectors and TV monitors. LCDs are able to display any visual information from a computer, DVD, or the Internet.

Management Tools

Teachers can also use technology to make their classroom management tasks more efficient. To help with organization, teachers can now keep records of students' academic progress and attendance using database or spreadsheet programs and PDAs, which include calendars, appointment and phone books, and other useful organizational tools. Many schools have adopted a centralized information system whereby teachers and administrators access student records and update information related to their achievement and behavior (O'Lone, 1997). Recall also that teachers can manage home–school communication much more effectively due to people's increasing access to the Internet and use of voice mail and e-mail systems. Many schools use electronic hotlines via the World Wide Web to keep parents informed about schedules and events, and some teachers create their own websites to help parents stay informed about the curriculum and assignments (see Figure 14.13).

Despite these advances, keep in mind that many parents may still prefer the more traditional communication formats, especially when they do not have e-mail accounts or access to the Internet (Langdon & Vesper, 2000). Additional classroom management tools include specialized software to teach anger control or monitor conflict resolution in the classroom (Allen, 1996) and software that supports the design of classroom layout and seat arrangements (Holzberg, 1995).

A controversial area where technology is being used to manage student behavior is the inclusion of web-cams in the classroom. The heated debate stems from two conflicting views. On one hand, it has been argued that web-cams serve two important goals: They can prevent behavioral problems at schools because students know they are being observed, and they allow parents to monitor their children at any time. On the other hand, opponents argue that web-cams do not prevent misbehavior because students can always find a place to misbehave that is out of reach of the cameras. Importantly, web-cams are said to violate students' right to privacy as protected by the Fourth Amendment, which, among other things, guarantees a person's right against unreasonable searches and seizures without probable cause. Do you think that having web-cams in the classroom is a good idea? The debate is still on.

Assessment Tools

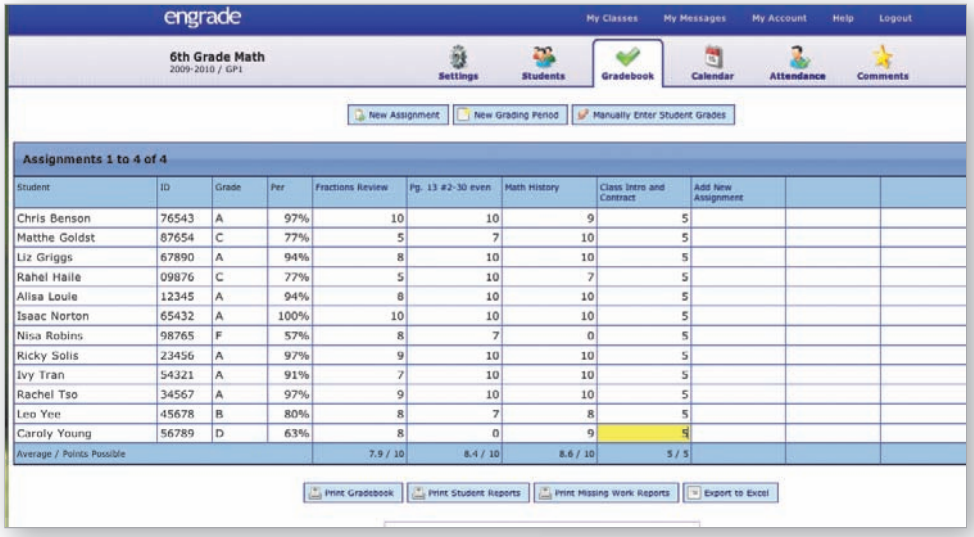
Teachers can do most grade recording and calculations using either generic spreadsheet programs (e.g., Microsoft Excel) or software packages that are specifically designed for grading. When using a spreadsheet, you can create a row for each one of your students and a column corresponding to each assignment. Spreadsheet software can calculate weighted scores, percentages, and even translate point or percentage grades into letter grades.

In addition, there are many **electronic gradebook** options with varied costs and features, ranging from free downloadable programs available through the Internet to programs that entire schools can use after paying a moderate license fee. These packages are superior to standard spreadsheets because they include templates for individual and classroom grade reports that can be customized to the needs of the teacher (see Figure 14.14). For specific program information, search the Internet under the keyword "gradebook." Research finds that electronic gradebooks help the speed, accuracy, organization, and customization of classroom grading (Guskey & Bailey, 2001).

Electronic Gradebook

A computer program that keeps track of student grades.

In addition, teachers can benefit from using electronic test banks made available by textbook publishers, or they can construct test banks themselves using database programs such as Microsoft Works or Apple Works. These programs are capable of storing the type of item (e.g., multiple-choice, essay), learning standard targeted, model responses or answer keys, and difficulty levels. Moreover, there are electronic



Student	ID	Grade	Per	Fractions Review	Pg. 13 #2-30 even	Math History	Class Intro and Contract	Add New Assignment		
Chris Benson	76543	A	97%	10	10	9	5			
Matthe Goldst	87654	C	77%	5	7	10	5			
Liz Griggs	67890	A	94%	8	10	10	5			
Rahel Haile	09876	C	77%	5	10	7	5			
Alisa Louie	12345	A	94%	8	10	10	5			
Isaac Norton	65432	A	100%	10	10	10	5			
Nisa Robins	98765	F	57%	8	7	0	5			
Ricky Solis	23456	A	97%	9	10	10	5			
Ivy Tran	54321	A	91%	7	10	10	5			
Rachel Tso	34567	A	97%	9	10	10	5			
Leo Yee	45678	B	80%	8	7	8	5			
Caroly Young	56789	D	63%	8	0	9	5			
Average / Points Possible				7.9 / 10	8.4 / 10	8.6 / 10	5 / 5			

FIGURE 14.14 A screenshot from the electronic grade book Engrade, a free web-based tool for teachers that provides real-time, protected, online class information to parents and students.

systems that construct and administer tests, grade students' tests, give feedback and references for further learning, and keep track of performance by reviewing materials until mastery levels are accomplished (Boggs, Shore, & Shore, 2004). Nevertheless, because computers are not capable of using common sense or judgment in their analysis, decisions based on computerized scores should also rely on the teacher's interpretation (Morrison & Lowther, 2005).

Computer-Based Portfolio

A portfolio that includes students' work in the form of electronic files.

A technology-based assessment of increasing interest to educators is the digital or **computer-based portfolio**, which includes students' work in the form of electronic files (Hartnell-Young & Morriss, 2007). There are a variety of electronic portfolio software programs available (e.g., HyperStudio, FileMaker Pro). Because computers are able to store large files, electronic portfolios allow for the inclusion of multimedia items such as videos, simulations, and even programs or websites developed by students. Figure 14.15 shows an electronic portfolio for a sixth-grade social studies class in which the student designed a personal website including the standards addressed by the unit of study, sample work, and a link to her reflection about the work.

Another advantage of electronic portfolios is that they can be easily distributed with CDs, DVDs, videotapes, or printed versions of the files. On the other hand, electronic

Savannah's Portfolio on India
3rd Quarter



Standards Shown in India Portfolio

Educational Technology: Technology as a tool for productivity
- Use content specific tools software, and simulations to support learning and research.
- Apply productivity/ multimedia tools and peripherals to support personal and group productivity and collaboration and learning throughout the curriculum

Educational Technology: Technology as a tool for research
- Select and use appropriate tools and information technology resources to accomplish a variety of tasks and solve problems

Language Arts – Writing
- Write using various forms to communicate for a variety of purposes and audiences.

Sepoy Rebellion Opinion Paper

Group Debate on Partition

India Independence Report

Pictures from India Research Report

Reflection on History Portfolio

FIGURE 14.15 **Sample page of an electronic portfolio for a social studies class.**

portfolios are not practical. Because they can be large, complex, and time-consuming to grade, they are likely to put a heavy load on teachers (Moersch & Fisher, 1995).

There is a variety of specialized software to help teachers construct and administer tests online, and an increasing number of states are starting to evaluate the effectiveness of computer-based testing (Roblyer, 2006). Because online testing has the advantages of adapting the difficulty and sequence of test items to the ability of the student and providing immediate feedback to students, teachers, and administrators, it is argued to be the next generation in preparing for and taking state-mandated tests (Borja, 2003; Edwards, 2003).

A recent technology-based tool for assessment is the remote personal response system, or clicker. **Clickers** are similar to TV remote controls. They use infrared or radio-frequency technology to transmit and record students' responses to questions. A small, portable receiving station collects and records each student's unique, identifiable signals. Clickers allow for the active participation of all students and provide immediate feedback to the teacher about any misunderstandings of the material to be learned. Clickers have been making inroads in college and university courses since the late 1990s, especially for courses with large enrollments in which the student–instructor interaction is limited. Students' responses can be saved and then displayed in a variety of formats (e.g., histograms) or fed to spreadsheet programs for analyses that may inform subsequent instructional planning.

Clickers

Devices similar to TV remote controls that use infrared or radio frequency technology that transmit and record students' responses to questions.

Finally, individualized education program (IEP) software offers many advantages for schools and students because it provides banks of commonly used IEP goals and objectives; templates of official forms; and database systems to maintain records of students' needs, goals, and interventions (Smith & Kortering, 1996). Current examples are IEPplus and IEPMaker.

DIVERSITY AND TECHNOLOGY

The principles we have reviewed in this chapter can be helpful guidelines for evaluating the potential of different technologies for learning. Yet because each student in the classroom is unique in multiple ways, the choice of technology has to be driven by students' individual needs as well. This section discusses two important sources of student diversity that you should consider when making decisions about integrating technology in the classroom.

Special-Needs Students and Assistive Technologies

Some of the most important advances offered by technology have been made on behalf of students with disabilities, who are now better able to successfully perform in the inclusive classroom (Woodward & Cuban, 2001). Technology that is developed to give individuals with disabilities the ability to have access to academic materials and activities and communicate more easily with teachers and peers is called **assistive technology** (AT). AT ranges from more traditional technologies such as eyeglasses, which enable people with imperfect sight to better experience the world visually, to augmentative communication devices, which assist students who are unable to vocally express their ideas by translating typed words into speech. Classroom Tips: Using Assistive Technology to Support Students' Special Needs lists examples of AT for students with learning disabilities.

Keep in mind, however, that just as a disability label is not sufficient to provide direction for the type of instruction that a particular student may need, it also may not determine the type of AT that can support a particular student. Students with the same disability may need more or less support from AT to succeed, depending on their unique intellectual, emotional, and physical characteristics. Teachers should work with special educators and specialists to determine which technology tools will be best for each student. ATs are required by the federal Individuals with Disabilities Education Act (IDEA) (Heward, 2006).

Assistive Technology

Technology that is developed to help individuals with disabilities have access to academic materials and activities and communicate more easily with teachers and peers.

Assistive technology devices support students with special needs in communicating and fully participating in the classroom.



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CLASSROOM TIPS

Using Assistive Technology to Support Students' Special Needs

Special Education Category	Assistive Technology Examples
Communication disorders	KidAccess: A system of stickers and magnets with pictures that children can use to make choices, understand and express emotions, and organize their day. Communication boards: A flat surface with buttons and pictures that children can use to indicate their answer to a question or to make a request. Electronic communicators: Systems whereby children can select preprogrammed words and phrases that are played with a synthesized voice. Co:Writer and Write:OutLoud: Computer programs that help students produce written documents by providing word-prediction and text-to-speech interaction. Augmentative and alternative communication tools: Aids that supplement, replace, or enhance speech or writing. Software to aid speech assessment and instruction (e.g., Video Voice, Tiger's Tale).
Emotional and behavioral disorders	Individualized computer programs that teach at students' own pace. Spreadsheets to help students monitor their own behavior. Working It Out Together: A video-based CD designed to teach peer mediation by showing actual conflicts played out by real students. Internet mentoring and online therapy.
Hearing impairments	Hearing aids and radio transmitters that amplify the teacher's speech. Text telephones: Teletypewriter or telecommunication devices for the deaf, similar to current text-messaging systems. E-mail, fax, and chatting systems for communicating with text and videophones and videoconferencing systems for communicating with sign language. Automatic speech recognition software to convert speech to text and vice versa.
Visual impairments	Recorded books: Readings on tape, CD, and other auditory media. Braille technologies: A system of raised dots that represent letters and punctuation. TeleBraille machines to type and send text over phone lines and Braille notetakers. Screen readers: Software that reads aloud what appears on a screen. Optical character recognition devices: A system that uses a scanner and software to improve the contrast in printed documents and enlarge their display. Audio calculators: Computers that allow students to voice numbers and calculations.
Physical impairments	Alternative keypads such as graphic pads and fist/foot keyboards, touch-screen monitors, mouth- or foot-controlled switches.
Autism	Picture exchange communication systems: Pictorial representations to help children express ideas and develop communication skills. DynaMyte Keyboards: Systems that translate students' picture selections into speech. Speech–language software to support children's development of speech skills (e.g., Earobics, Baldi, Fast ForWord).
Learning disabilities	External memory aids such as talking calculators, which provide auditory feedback for basic calculations. Software that focuses on basic phoneme identification (e.g., Earobics, Away We Go!). Software that assists with basic writing skills (e.g., spellcheck and grammarcheck).
Mental retardation	Drill-and-practice software (e.g., Access to Math, Fast ForWord, Kid Pix). Toys and switches to teach basic computer and assistive technology skills. Games that teach goal setting, attention, and cause–effect relationships (e.g., Lemonade Stand, NASCAR 2002). Software that supports the development of life skills (e.g., Personal Success). KidAccess, communication boards, and electronic communicators. Software that teaches reading skills (e.g., Fast ForWord, Simon Sounds It Out). Start-to-Finish Books series: A system including a book, CD, and audiocassette tape to teach basic reading skills. Software that teaches math skills (e.g., Access to Math, Match Time, Basic Coins).

In addition, technology can be an excellent way to support the learning and motivation of gifted students. According to Del Siegle, an expert in giftedness and technology, this group of exceptional students shows the following characteristics (Henshon, 2007):

- They are attracted to a variety of technologies.
- They possess a wide range of technology skills.
- They often learn new software without formal training.
- They spend their free time developing new technology skills.
- They often assist others with technology problems.
- They incorporate a variety of technologies into the products they produce.

Technology, therefore, can be used to accelerate or enrich the learning of gifted students. Online courses can be used when classes conflict with their school schedule, when more advanced classes are necessary to meet their needs, or when the pace of traditional instruction is too slow. In the classroom, teachers can expose these students to specialized technologies related to their interests. Students interested in photography may enjoy working with a digital camera and a photo-editing program; students interested in music may enjoy using a music composition program; students interested in writing can use desktop publishing programs to produce professional-looking publications; students interested in science can satisfy their inquisitive minds with virtual laboratories; and students with an engineering inclination may enjoy creating a computer from spare parts, fixing a broken calculator, or installing a car stereo. In sum, technology can help this group of exceptional students develop their talents at a higher level of professional sophistication at an earlier age. Nevertheless, because differences in technology skills *within* this group of students are likely to exist, teachers should never assume that all gifted students will use technology effectively. Some gifted students may need specialized training or guidance to ensure that the technology is serving a learning objective.

Get Connected!

ANIMATION ASSIGNMENT. . . Technology in the Classroom: An In-Depth Guide to Learning with Technology



Go to your WileyPlus course and watch the animation of students using educational software in the classroom. Be prepared to discuss the use of technology in the classroom and the role of the teacher in facilitating the students' development of technological skills.

Diversity in Computer Access

An additional consideration when making decisions about the integration of computers into the classroom is that not all students have the same access to computers. Children who come from families with more economic resources are significantly more likely to have computers at home than children from a lower socioeconomic group. This phenomenon is known as the **digital divide** (Becker, 2000; Education Commission of the States, 2000; Holloway, 2000). In addition, boys are likely to spend more time on computers than girls (Volman & van Eck, 2001). Although we emphasize that diversity *within* these groups should not be dismissed, teachers need to be aware of these trends to avoid equity issues in the classroom. For instance, in Imagine You Are the Teacher, Ms. Suina does not take into consideration the different levels of computer experience among her students. Rather than helping Luke and Marcy gain the knowledge and skills necessary to feel confident in using computers, she ordered them to use a word processor and offered no guidance, which also explains Luke's and Marcy's embarrassment.

Digital Divide

The gap between students who have access to digital technology and those with very limited or no access; it includes the imbalance in resources and skills needed to effectively participate as a digital citizen.

Some experts argue that the increased use of technology, specifically computers, can widen the learning gap between rich and poor students and between males and females (Comstock & Scharrer, 2006). The digital divide seems also to apply to different ethnic

groups. Although 80% of white children have Internet access at home, only 67% and 61% of Latino and African American children do, respectively (Rideout, Roberts, & Foehr, 2005). To address these inequities, experts offer the following recommendations to teachers:

1. Critically evaluate technology for potential ethnic, cultural, or gender bias.
2. Provide models that effectively use technology for a variety of ethnic and cultural backgrounds and both genders.
3. Use technology as a tool to promote higher-order thinking, regardless of students' background and gender.
4. Seek government or community grant support to fund the purchase of computers for low-income families.
5. Develop or participate in initiatives that facilitate the development of computer knowledge and skills in after-school and summer programs (Gipson, 1997; Sheffield, 1997).

REVISITING ISSUES IN EDUCATION:

Should Teachers Support Technology Integration in Their Classrooms?

Points to consider: As you now know from the research reviewed in this chapter, merely increasing the use of technology in the classroom does not increase learning (Roblyer, 2006). The question is not whether to integrate or not to integrate technology but rather to critically evaluate whether the necessary conditions for learning effectively with technology are met before making decisions about technology integration. Technologies may hurt learning when students lack the skills that are necessary to effectively learn with technology, when computer activities are not aligned with academic objectives, when educational programs are not sensitive to students' needs and limitations, and when teachers lack the training that is necessary to integrate technology successfully.

In addition, some experts caution teachers about the negative effects of making the assumption that more technology use is better. One study of 15-year-old students across 31 nations showed that the more access students had to technology in school and at home, the lower their achievement scores were, suggesting that the increasing use of technology may be distracting students from learning (Fuchs & Woessmann, 2004).

It has been argued that saturating our society with computers, digital devices, and other high-tech gadgets is distancing children from direct contact with the living world (Dodici, Draper, & Peterson, 2003; Hammel, 1999; Stoll, 1995). The many downsides of technology (e.g., global warming; nuclear waste; overuse of pesticides, automobiles, and portable devices) suggest that what is needed is not to better develop children's technical skills but rather to help them learn to use technological advances wisely. According to this view, educators can help restore the balance we need to create a more humane society by helping students develop knowledge and respect for what humans cannot manufacture (i.e., nature) and the ability to judge the benefits and dangers that technology can pose to the world. To this end, Monke (2005) suggests the technology integration progression shown in Table 14.2.

TABLE 14.2

A technology integration progression.

Early elementary school	Place priority on children's direct encounters with the world and other living beings and use simple technology tools in the classroom.
Late elementary school and middle school	Gradually integrate computers and other abstract environments for learning in the curriculum.
High school	Give the use of digital technologies a prominent place in students' learning process and, in later years, spend considerable time helping students develop the technical skills they will need when they graduate.
All developmental levels	Help students understand the functionality and principles of any software/hardware used in the classroom and have them reflect on technology's role in human affairs.

SUMMARY

- The term *technology in the classroom* refers to all human-made tools that serve a learning or teaching function. When used to support students' learning, human-made tools are typically referred to as instructional technology. Experts distinguish between the media and methods of instructional technology. Whereas media are the vehicles used to deliver information, instructional methods are the techniques embedded in the media to promote learning. Current technology trends include multimedia and hypermedia environments for learning, ubiquitous communication, digital tools, and portable technologies.
- Among the challenges that technology poses for teachers are to keep informed about the most recent technological advances and to develop the necessary skills to use and teach technology effectively; to foster the necessary skills that students need in our high-tech society; to critically evaluate the potential of new technologies when considering their integration into the curriculum; and to manage students' use of portable technologies in the classroom.
- Behaviorist applications of technology focus on shaping students' behavior using reinforcement in the form of immediate feedback. Cognitive applications of technology focus on reducing cognitive load during learning and increasing students' active processing of new information. Sociocognitive applications of technology focus on creating observational learning tools such as symbolic models. Constructivist applications of technology focus on supporting the individual or social construction of knowledge. Research shows that instructional technology in itself does not promote learning. Yet teachers can be important guides in helping students to develop the skills that are necessary and to learn from technology efficiently.
- Technology can support students' work by providing tools for representing and organizing knowledge and for specific academic subjects such as reading, writing, math, science, social science, visual arts, and music.
- Technology can support teachers' work by providing them with instructional, management, and assessment tools. Technology provides effective ways to represent and present new information to students; it can effectively support planning, organization, and communication with students and parents; and it provides tools to develop, administer, score, and grade students' work.
- The integration of technology into the classroom includes the use of assistive technology for students with special needs and should provide all students with opportunities to develop the necessary experience, skills, and knowledge to help reduce the digital divide.

KEY TERMS

anchored instruction 556
assistive technology 569
clickers 569
cognitive tutors 555
computer-based portfolio 568
digital divide 571
drill-and-practice programs 547
e-learning 539
electronic gradebook 567
e-materials 539
hypermedia 538
hypertext 538
instructional media 537
instructional method 537
instructional technology 537
integrated learning systems (ILSs) 555
Internet (or World Wide Web) 538
microcomputer-based laboratories (MBLs) 555
microworlds 555
multimedia 538
programmed instruction 547

TEST YOUR KNOWLEDGE AND UNDERSTANDING

Using what you learned from this chapter, provide short answers to the following questions. These review questions will help you assess your understanding of the chapter.

1. What are the uses of technology in the classroom?
2. What is the difference between instructional media and instructional method?
3. What are some current technology trends and how might they affect the classroom?
4. What are some challenges that teachers face when making decisions about integrating technology into the classroom?
5. What is the role of technology according to behaviorist, cognitive, sociocognitive, and constructivist theories of learning?
6. When do instructional technologies minimize the risk of cognitive overload?
7. What are some characteristics of instructional technologies that promote meaningful learning?
8. How effective is instructional technology according to research?
9. In what ways can technology support learning?
10. In what ways can technology support teaching?
11. How might student diversity affect technology use in the classroom?

Journal Activity

THINK ABOUT IT, AGAIN!

Now that you have completed the study of this chapter, open your journal and respond to the questions at the beginning of the chapter again ("Assess Your Prior Knowledge and Beliefs"). Don't look at your original responses. This time, apply the theories and research that you learned. When you are done, compare your new answers to your original thoughts and write a brief essay reflecting on the change that you experienced after studying this chapter. Here are some guiding questions for your reflective essay:

- How was your first response different from your new response?
- Were your beliefs consistent with the reviewed theories and research?
- What were the most useful concepts that you learned about?
- What new concepts would you like to learn more about?

CONNECT WHAT YOU LEARNED TO OTHER CHAPTERS

The following questions will help you integrate what you learned in this chapter with relevant topics covered in previous chapters.

1. What are some issues that teachers may need to reflect on when deciding about integrating technology into inclusive classrooms (Chapter 1)?
2. How has technology affected the participation of students with disabilities in the inclusive classroom (Chapter 2)?
3. Which of the technologies reviewed in this chapter apply Vygotsky's ZPD (Chapter 3)?
4. What types of technology are more likely to support/hinder students' social development (Chapter 4)?
5. How would you justify the use of clickers using behaviorist learning principles (Chapter 5)?
6. What is the role of students' metacognition in learning with technology (Chapter 6)?
7. What are some ways in which technology might promote students' high-order thinking (Chapter 7)?
8. Why are simulations and microworlds considered technology applications of constructivist views of learning (Chapter 8)?
9. What might be some advantages and disadvantages of using technology to increase student motivation (Chapter 9)?
10. What type of technologies can be used to support students' sense of belongingness, competency, and autonomy (Chapter 10)?
11. What technological tools can teachers use to help students understand the rationale and value of classroom rules (Chapter 11)?
12. How could you use technology to support each one of the tasks in the assessment cycle (Chapter 12)?
13. What are the pros and cons of computer-based standardized testing (Chapter 13)?

A Case Study: PUTTING IT ALL TOGETHER

How Does This High School Classroom Apply Technology Principles?

Here is a classroom case based on authentic teacher experiences. Read the case carefully. Then answer the open-ended questions that follow by applying the theories and research discussed in this chapter.

"We'll be working in the lab tomorrow, so please bring your observation/data notebooks. First, you will be measuring pine needle length and the amount of foliar ozone symptoms for the white pine specimens we collected today. Then, using microscopes, you'll look at healthy and damaged portions of needles to investigate them at the cellular level. On Friday, we will enter the data into an Excel spreadsheet and upload it to the Forest Watch® website. Next week, we'll be able to compare data from forests across New England."

Mrs. Schwingle has been teaching an environmental studies class at Merrimack Valley high school for over 10 years. Since he attended a Forest Watch summer training workshop at the University of New Hampshire two years ago, she has found new ways for students to engage in meaningful scientific research and to collaborate with scientists. The program integrates field observations, lab work, and satellite data to assess air pollution damage in forest stands across New England. She has observed how hands-on measurement activities and the use of technology have increased students' interest and participation in the class. This year, Mrs. Schwingle has expanded the Forest Watch program to engage students in critical thinking about local and global environmental issues. She uses technology as a medium for students to present their findings to community members and to connect with fellow students in the region.

Before introducing the Forest Watch program and additional technologies into his classroom, Mrs. Schwingle invested considerable time learning how to effectively use the technologies himself. First, she spent a day observing middle school students collecting data for Forest Watch and discussed implementation with their teacher. Second, she attended two training workshops at the university to learn about data collection and how to analyze satellite images to monitor environmental change. Third, she attended the district's Intel® Teach program to learn how to facilitate students' use of Excel, PowerPoint, and Publisher. Finally, she attended the district's staff development training on assistive technologies (AT) for students with exceptionalities.

Before the start of the schoolyear, Mrs. Schwingle was aware that one student enrolled in her class was visually impaired and would need specific accommodations. She ordered a CD version of the environmental studies textbook and a high-powered magnifying glass for her to use when making observations. At the AT training, he learned that the district will provide the student with a voice recognition program that allows her to give commands and enter data using her voice rather than a mouse or keyboard. Mrs. Schwingle had the opportunity to try out the program during the workshop and believes that it will allow her to participate in most of the activities. She will also have a classroom assistant to help her understand and contribute to class.

At the beginning of the year, in collaboration with the high school's algebra teacher, Mrs. Schwingle introduced students to data entry, graphing, and analysis using Excel. Students had the opportunity to use Excel to graph data in both classes, thereby learning the versatility of the program. The teachers first modeled how to present data, and then students worked together in pairs with Excel. To begin, Mrs. Schwingle had students graph simple data, such as daily humidity levels. Later in the year, they were able to graph tree ring data to interpret when, where, and how quickly climates have changed. When Mrs. Schwingle introduced the Forest Watch program in November, students were already familiar with Excel and able to analyze graphs and recognize patterns in data.

Mrs. Schwingle's vision for the environmental studies class is to connect students' observations of local forest health to larger environmental issues, and she wants to give students the opportunity to engage with community members and other students in the region who are monitoring climate conditions. To facilitate these connections, Mrs. Schwingle invited the president of the local Sierra Club chapter to the classroom. Students prepared for the talk by writing questions for the speaker about local environmental issues and nonprofit organizations. At this presentation, the Sierra Club chapter president discussed the significance of students' data collection and how important it was for them to share their findings with the general public. Students in Mrs. Schwingle's class will soon have the opportunity to present their data at the annual Climate Connection conference in April at the University of New Hampshire.

In preparation for the Climate Connection conference, Mrs. Schwingle wants to teach students how to create multimedia presentations to effectively demonstrate their knowledge of forest monitoring. Throughout the Forest Watch program, students have taken digital photographs, made video clips, taken measurements, and written observations of their lab and field work. The students will work in cooperative teams to compile this data into cohesive presentations. The conference is organized in such a way that students, teachers, scientists, and members of the public have the opportunity to give demonstrations in a small workshop setting, which includes time for a question-and-answer period as well as extended discussion.



Roy Morsch/©Corbis

Mrs. Schwingle's objective is for all students in the group to learn the technology skills and to participate in all aspects of the multimedia presentation. To meet this objective, she guides the whole class step-by-step through the process and uses a very clear rubric that outlines the requirements of the assignment. For example, on the first day, she models how to write a basic storyboard that outlines presentation. Next, the groups write their own storyboards and check to ensure they have included all components of the assignment, such as title, description, tools, data, observations, analysis, and conclusion.

The student with impaired vision uses voice recognition software and help from her classroom assistant when contributing to the group. Next, Mrs. Schwingle teaches how to incorporate graphs and digital media into the PowerPoint program, and groups insert media into their presentations. The step-by-step modeling ensures students are completing each component of the assignment and provides them with a framework they can use in the future.

Mrs. Schwingle realizes that the completed multimedia PowerPoint presentation represents only one aspect of students' understanding of a subject because she believes the process of preparing for the presentation is equally as beneficial to students' learning process. In her experience, when students are given the opportunity to teach material to others it deepens their own understanding, so she arranges a field trip to the local elementary school, where her students can deliver their PowerPoint presentations to the fifth grade classes.

It's a good challenge for Mrs. Schwingle's students to explain terms like *ozone damage* and *tip necrosis* in simple language that fifth-graders can understand. She overheard one of her students explain, "Well, *tip necrosis* is just a fancy word that means the pine needle is brown at the tip. It's like when you are roasting marshmallows and the ones at the end of the stick get brown from the fire. When a white pine has been exposed to ozone pollution, the tip is brown instead of green. I'm sure you've heard of the ozone layer in the earth's atmosphere, but did you know there is also ground-level ozone pollution?"

"No, I've never heard of ozone pollution," the fifth-grader responds.

"Well, it's caused by the exhaust from smokestacks, cars, and trucks. See, I brought an example of tip necrosis, so you can see for yourself." She hands the fifth-grader a pine needle and a magnifying glass.

"Yep, it's really brown. There must have been a lot of ozone pollution near this tree," the fifth-grader concludes.

"You're right. The pine tree is next to a highway. That's why we're monitoring the health of the forest. We go out to check on it every month."

When Mrs. Schwingle overhears these types of conversations she knows her students are really engaged with science and sharing their knowledge with others.

APPLICATION AND REFLECTION QUESTIONS

Please answer the following questions using information taken directly from the case. For each response, make sure you base your answer on relevant educational psychology theories and research.

1. What technology functions were salient in the classroom case?
2. Which learning theories were supported in the teacher's use of technology and how?
3. What strategies did the teacher use to develop students' technological skills?
4. Did the teacher demonstrate an awareness of diverse technological needs among his students?
5. Evaluate the overall effectiveness of the lesson according to the technology principles that you learned by including both strengths and weaknesses.

Appendix

Correlation Guide to the PRAXIS II™ Principles of Learning and Teaching Assessment and INTASC Standards

PRAXIS II	EDUCATIONAL PSYCHOLOGY TEXTBOOK	INTASC
I. Students as learners (approximately 35% of test)		
A. Student development and the learning process	Chapter 3: Cognitive and Language Development (entire chapter) Chapter 4: Personal. Social, and Moral Development (entire chapter)	Principle #2: The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.
1. Theoretical foundations about how learning occurs: how students construct knowledge, acquire skills, and develop habits of mind	Chapter 5: Behavioral Views of Learning (entire chapter) Chapter 6: Cognitive Views of Learning (entire chapter) Chapter 8: Socio-Cognitive and Constructivist Views of Learning (entire chapter)	Principle #2 (KNOWLEDGE): The teacher understands how learning occurs—how students construct knowledge, acquire skills, and develop habits of mind—and knows how to use instructional strategies that promote student learning.
EXAMPLES OF IMPORTANT THEORISTS		
• Jean Piaget	Chapter 3: Cognitive and Language Development/Cognitive Developmental Theories (p. 78)	
• Lev Vygotsky	Chapter 3: Cognitive and Language Development/Cognitive Developmental Theories (p. 78)	
• Howard Gardner	Chapter 2: Understanding Diversity in the Classroom/Individual Differences: Intelligence (p. 44)	
• Robert Sternberg	Chapter 2: Understanding Diversity in the Classroom/Individual Differences: Intelligence (p. 44)	
• Albert Bandura	Chapter 8: Sociocognitive and Constructivist Views of Learning/What is the socio-cognitive view of how we learn? (p. 283)	
IMPORTANT TERMS THAT RELATE TO LEARNING THEORY:		
• Accomodation and Assimilation	Chapter 3: Cognitive and Language Development (p. 79)	
• Conservation	Chapter 3: Cognitive and Language Development (p. 81)	
• Constructivism	Chapter 8: Socio-Cognitive and Constructivist Views of Learning (p. 298)	

• Inner Speech	Chapter 3: Cognitive and Language Development (p. 90)	
• Scaffolding	Chapter 3: Cognitive and Language Development (p. 91)	
• Zone of proximal development	Chapter 3: Cognitive and Language Development (p. 90)	
• Learning	Chapter 5: Behavioral Views of Learning (entire chapter) Chapter 6: Cognitive Views of Learning (entire chapter) Chapter 8: Socio-Cognitive and Constructivist Views of Learning (entire chapter)	
• Memory	Chapter 6: Cognitive Views of Learning (entire chapter)	
• Schemas	Chapter 3: Cognitive and Language Development (p. 79) Chapter 6: Cognitive Views of Learning (p. 211)	
• Transfer	Chapter 7: Complex Cognitive Processes (p. 268)	
• Self-efficacy	Chapter 8: Sociocognitive and Constructivist Views of Learning (p. 284) Chapter 9: Theories of Motivation and Affect (p. 344) Chapter 10: Motivation and Affect in the Classroom (p. 383)	
2. Human development in the physical, social, emotional, moral, speech/language, and cognitive domains	Chapter 3: Cognitive and Language Development (entire chapter) Chapter 4: Personal. Social, and Moral Development (entire chapter)	Principle #2 (KNOWLEDGE): The teacher is aware of expected developmental progressions and ranges of individual variation within each domain (physical, social, emotional, moral, and cognitive), can identify levels of readiness in learning, and understands how development in any one domain may affect performance in others.
B. Students as diverse learners	Chapter 2: Understanding Diversity in the Classroom (entire chapter) Chapter 3: Diversity in Language Development (p. 104) Chapter 4: Diversity in Personal, Social, and Moral Development (p. 145) Chapter 5: Diversity and Behaviorism (p. 184) Chapter 6: Diversity in Information Processing (p. 215) Chapter 7: Diversity in Complex Cognitive Processes (p. 273) Chapter 8: Diversity in Social Learning and Constructivist Learning (p. 316)	Principle #3: The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
1. Differences in the ways students learn and perform	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #2 (DISPOSITIONS): The teacher appreciates individual variation within each area of development, shows respect for the diverse talents of all learners, and is committed to help them develop self-confidence and competence. Principle #3 (KNOWLEDGE): The teacher understands and can identify differences in approaches to learning and performance, including different learning styles, multiple intelligences, and performance modes, and can design instruction that helps use students' strengths as the basis for growth.

	Chapter 2: Understanding Diversity in the Classroom (p. 44) Chapter 11: Classroom Management: Creating a Successful Learning Environment (entire chapter)	Principle #3 (PERFORMANCE): The teacher creates a learning community in which individual differences are respected.
2. Areas of exceptionality in student's learning • Talent/Giftedness • Learning Disabilities • ADHD • Functional and mental retardation • Autism	Chapter 2: Understanding Diversity in the Classroom (p. 49)	Principle #3 (KNOWLEDGE): The teacher knows about areas of exceptionality in learning—including learning disabilities, visual and perceptual difficulties, and special physical or mental challenges.
3. Legislation and institutional responsibilities relating to exceptional students	Chapter 2: Understanding Diversity in the Classroom (p. 49)	
• Americans with Disabilities Act (ADA); Individuals with Disabilities Education Act (IDEA); Section 504 Protections for Students • Inclusion, mainstreaming, and "least restrictive environment"	Chapter 2: Understanding Diversity in the Classroom (p. 49)	
4. Approaches for accommodating various learning styles, intelligences, or exceptionalities	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #1 (PERFORMANCE): The teacher can represent and use differing viewpoints, theories, "ways of knowing," and methods of inquiry in his/her teaching of subject matter concepts.
	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #3 (PERFORMANCE): The teacher identifies and designs instruction appropriate to students' stages of development, learning styles, strengths, and needs.
5. Process of second-language acquisition and strategies to support the learning of students for whom English is not a first language	Chapter 2: Understanding Diversity in the Classroom (p. 28) Chapter 3: Cognitive and Language Development (p. 79)	Principle #3 (KNOWLEDGE): The teacher knows about the process of second language acquisition and about strategies to support the learning of students whose first language is not English.
6. Understanding the influence of individual experiences, talents, and prior learning, as well as language, culture, family, and community values on students' learning	Chapter 7: Complex Cognitive Processes (p. 238)	Principle #1 (KNOWLEDGE): The teacher understands how students' conceptual frameworks and their misconceptions for an area of knowledge can influence their learning.
	Chapter 4: Personal. Social, and Moral Development (entire chapter)	Principle #2 (KNOWLEDGE): The teacher understands that students' physical, social, emotional, moral, and cognitive development influence learning and knows how to address these factors when making instructional decisions.
	Chapter 2: Understanding Diversity in the Classroom (entire chapter) Chapter 3: Cognitive and Language Development (entire chapter) Chapter 4: Personal. Social, and Moral Development (entire chapter)	Principle #3 (KNOWLEDGE): The teacher understands how students' learning is influenced by individual experiences, talents, and prior learning, as well as language, culture, family, and community values.
	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #3 (KNOWLEDGE): The teacher has a well-grounded framework for understanding cultural and community diversity and knows how to learn about and incorporate students' experiences, cultures, and community resources into instruction.

	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #3 (DISPOSITION): The teacher is sensitive to community and cultural norms. The teacher makes students feel valued for their potential as people, and helps them learn to value each other.
C. Student Motivation and the Learning Environment	Chapter 9: Theories of Motivation and Affect (entire chapter) Chapter 10: Motivation and Affect in the Classroom (entire chapter)	Principle #5: The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
1. Theoretical foundations of human motivation and behavior	Chapter 9: Theories of Motivation and Affect (entire chapter)	Principle #5 (KNOWLEDGE): The teacher can use knowledge about human motivation and behavior drawn from the foundational sciences of psychology, anthropology, and sociology to develop strategies for organizing and supporting individual and group work.
2. How knowledge of human motivation and behavior should influence strategies for organizing and supporting individual group work in the classroom	Chapter 11: Classroom Management: Creating a Successful Learning Environment (entire chapter)	Principle #5 (KNOWLEDGE): The teacher understands the principles of effective classroom management and can use a range of strategies to promote positive relationships, cooperation, and purposeful learning in the classroom.
3. Factors and situations that are likely to promote or diminish student's motivation to learn and how to help students to become self-motivated.	Chapter 9: Theories of Motivation and Affect (entire chapter) Chapter 10: Motivation and Affect in the Classroom (entire chapter)	Principle #5 (KNOWLEDGE): The teacher recognizes factors and situations that are likely to promote or diminish intrinsic motivation, and knows how to help students become self-motivated.
4. Principles of effective classroom management and strategies to promote positive relationships, cooperation, and purposeful learning	Chapter 10: Motivation and Affect in the Classroom (entire chapter) Chapter 11: Classroom Management: Creating a Successful Learning Environment (entire chapter)	Principle #5 (PERFORMANCE): The teacher analyzes the classroom environment and makes decisions and adjustments to enhance social relationships, student motivation and engagement, and productive work.
II. Instruction and assessment (approximately 35% of test)		
A. Instructional strategies	Chapter 7: Complex Cognitive Processes (entire chapter)	Principle #4: The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
1. Major cognitive strategies: • Critical thinking • Inductive and deductive thinking • Problem structuring and problem solving • Invention • Encoding and retrieval	Chapter 6: Cognitive Views of Learning (entire chapter) Chapter 7: Complex Cognitive Processes (entire chapter)	Principle #4 (KNOWLEDGE): The teacher understands the cognitive processes associated with various kinds of learning (e.g., critical and creative thinking, problem structuring and problem solving, invention, memorization, and recall) and how these processes can be stimulated.
2. Major categories, advantages, and appropriate uses of instructional strategies	Chapter 8: Sociocognitive and Constructivist Views of Learning (entire chapter)	Principle #4 (KNOWLEDGE): The teacher understands principles and techniques, along with advantages and limitations, associated with various instructional strategies (e.g., cooperative learning, direct instruction, discovery learning, whole group discussion, independent study, interdisciplinary instruction).

3. Principles, techniques, and methods associated with major instructional strategies • Direct instruction • Student-centered	Chapter 8: Sociocognitive and Constructivist Views of Learning (entire chapter)	
4. Methods for enhancing student learning through the use of a variety of resources and materials • Computers, Internet resources, Web pages, email • Audiovisual technologies, such as videotapes and CDs • Local experts • Field trips • Libraries • Museums	Chapter 8: Sociocognitive and Constructivist Views of Learning (entire chapter) Chapter 14: An In-depth Guide to Using Technology in the Classroom (entire chapter)	Principle #4 (Knowledge): The teacher knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes and discs, local experts, primary documents and artifacts, texts, reference books, literature, and other print resources).
B. Planning instruction	Chapter 7: Complex Cognitive Processes/ what are complex cognitive processes? (p. 236) Chapter 11: Classroom Management: Creating a Successful Learning Environment/Planning (p. 410) Chapter 12: Assessment in the Classroom/ Understanding the assessment cycle (p. 473)	Principle #7: The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.
1. Techniques for planning instruction, including addressing curriculum goals, selecting current topics, incorporating learning theory, subject matter, curriculum development, and student development and interests	Chapter 2: Understanding Diversity in the Classroom (entire chapter) Chapter 11: Classroom Management: Creating a Successful Learning Environment/Planning (p. 410) Chapter 12: Assessment in the Classroom/ Understanding the assessment cycle (p. 473)	Principle #4 (Performance): The teacher carefully evaluates how to achieve learning goals, choosing alternative teaching strategies and materials to achieve different instructional purposes and to meet student needs (e.g., developmental stages, prior knowledge, learning styles, and interests).
	Chapter 3: Cognitive and Language Development (entire chapter) Chapter 4: Personal. Social, and Moral Development (entire chapter) Chapter 5: Behavioral Views of Learning (entire chapter) Chapter 6: Cognitive Views of Learning (entire chapter) Chapter 7: Complex Cognitive Processes (entire chapter) Chapter 8: Sociocognitive and Constructivist Views of Learning (entire chapter) Chapter 12: Assessment in the Classroom/Understanding the assessment cycle (p. 473)	Principle #7 (Knowledge): The teacher understands learning theory, subject matter, curriculum development, and student development and knows how to use this knowledge in planning instruction to meet curriculum goals.
2. Techniques for creating effective bridges between curriculum goals and students' experiences	Chapter 2: Understanding Diversity in the Classroom (p. 57)	Principle #4 (Performance): The teacher constantly monitors and adjusts strategies in response to learner feedback.
C. Assessment strategies	Chapter 12: Assessment in the Classroom (entire chapter)	Principle #8: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

1. Types of assessments	Chapter 12: Assessment in the Classroom (entire chapter) Chapter 13: Assessing Learning through Standardized Testing (entire chapter)	Principle #8 (Knowledge): The teacher understands the characteristics, uses, advantages, and limitations of different types of assessments (e.g., criterion-referenced and norm-referenced instruments, traditional standardized and performance-based tests, observation systems, and assessments of student work) for evaluating how students learn, what they know and are able to do, and what kinds of experiences will support their further growth and development.
2. Characteristics of assessments	Chapter 12: Assessment in the Classroom/What makes an assessment effective? (p. 455) Chapter 13: Assessing Learning through Standardized Testing/How to assess the quality of standardized tests (p. 504)	
3. Scoring assessments	Chapter 12: Assessment in the Classroom/ Traditional assessments (p. 460) Chapter 12: Assessment in the Classroom/ Alternative assessments (p. 467) Chapter 13: Assessing Learning through Standardized Testing (p. 506)	
4. Use of assessments	Chapter 12: Assessment in the Classroom/ Understanding the assessment cycle (p. 473)	Principle #2 (Performance): The teacher assesses individual and group performance in order to design instruction that meets learners' current needs in each domain (cognitive, social, emotional, moral, and physical) and that leads to the next level of development.
	Chapter 12: Assessment in the Classroom/ Traditional assessments (p. 460) Chapter 12: Assessment in the Classroom/ Alternative assessments (p. 467)	Principle #8 (Performance): The teacher appropriately uses a variety of formal and informal assessment techniques (e.g., observation, portfolios of student work, teacher-made tests, performance tasks, projects, student self-assessments, peer assessment, and standardized tests) to enhance her or his knowledge of learners, evaluate students' progress and performances, and modify teaching and learning strategies.
5. Understanding of measurement theory and assessment-related issues	Chapter 12: Assessment in the Classroom/What makes an assessment effective? (p. 455) Chapter 13: Assessing Learning through Standardized Testing/How to assess the quality of standardized tests (p. 504)	Principle #8 (Knowledge): The teacher understands measurement theory and assessment-related issues, such as validity, reliability, bias, and scoring concerns.
6. Interpreting and communicating results of assessments	Chapter 12: Assessment in the Classroom/ Understanding the assessment cycle/Communicating (p. 478) Chapter 13: Assessing Learning through Standardized Testing/What is the teacher's role in standardized testing? (p. 513)	Principle #8 (Performance): The teacher maintains useful records of student work and performance and can communicate student progress knowledgeably and responsibly, based on appropriate indicators, to students, parents, and other colleagues.
III. Communication techniques (approximately 15% of test)		
A. Basic, effective verbal and nonverbal communication techniques	Chapter 11: Classroom Management: Creating a Successful Learning Environment (p. 406) Chapter 12: Assessment in the Classroom (entire chapter)	Principle #6: The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

	Chapter 12: Assessment in the Classroom/A classification of classroom assessments (p. 453)	Principle #6 (Knowledge): The teacher recognizes the importance of nonverbal as well as verbal communication.
B. Effect of cultural and gender differences on communications in the classroom	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #6 (Knowledge): The teacher understands how cultural and gender differences can affect communication in the classroom.
C. Types of communications and interactions that can stimulate discussion in different ways for particular purposes	Chapter 8: Sociocognitive and Constructivist Views of Learning/Social constructivism in the classroom (entire chapter)	Principle #6 (Performance): The teacher knows how to ask questions and stimulate discussion in different ways for particular purposes, for example, probing for learner understanding, helping students articulate their ideas and thinking processes, promoting risk-taking and problem-solving, facilitating factual recall, encouraging convergent and divergent thinking, stimulating curiosity, helping students to question.
IV. Profession and community (approximately 15% of test)		
A. The reflective practitioner	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #9: The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.
1. Types of resources available for professional development and learning: • Professional literature • Colleagues • Professional associations • Professional development activities	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #1 (Disposition): The teacher realizes that subject matter knowledge is not a fixed body of facts but is complex and ever-evolving. S/he seeks to keep abreast of new ideas and understandings in the field.
	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #9 (Knowledge): The teacher is aware of major areas of research on teaching and of resources available for professional learning (e.g. professional literature, colleagues, professional associations, professional development activities).
2. Ability to read, understand, and apply articles and books about current research, views, ideas, and debates regarding best teaching practices	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #1 (Knowledge): The teacher understands major concepts, assumptions, debates, processes of inquiry, and ways of knowing that are central to the discipline(s) s/he teaches.
	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter) Chapter 14: An In-depth Guide to Using Technology in the Classroom (entire chapter)	Principle #1 (Performance): The teacher can evaluate teaching resources and curriculum materials for their comprehensiveness, accuracy, and usefulness for representing particular ideas and concepts.
3. Ongoing personal reflection on teaching and learning practices as a basis for making professional decisions	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #1 (Knowledge): The teacher can relate his/her disciplinary knowledge to other subject areas.
	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter)	Principle #9 (Performance): The teacher is committed to seeking out, developing, and continually refining practices that address the individual needs of students.

B. The Larger Community	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher (entire chapter) Chapter 2: Understanding Diversity in the Classroom (p. 57) Chapter 11: Classroom Management: Creating a Successful Learning Environment/ Collaborating with parents and other teachers	Principle #10: The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.
1. Role of the school as a resource to the larger community	Chapter 1: Educational Psychology: Becoming an Effective Classroom Teacher Chapter 2: Understanding Diversity in the Classroom (p. 57)	Principle #10 (Knowledge): The teacher understands schools as organizations within the larger community context and understands the operations of the relevant aspects of the system(s) within which s/he works.
2. Factors in the students' environment outside of school	Chapter 2: Understanding Diversity in the Classroom (p. 57)	Principle #3 (Disposition): The teacher is sensitive to community and cultural norms. The teacher makes students feel valued for their potential as people, and helps them learn to value each other.
	Chapter 2: Understanding Diversity in the Classroom (entire chapter)	Principle #10 (Knowledge): The teacher understands how factors in the students' environment outside of school (e.g., family circumstances, community environments, health and economic conditions) may influence students' life and learning.
3. Develop and utilize active partnerships among teachers, parent/guardians, and leaders in the community to support the educational process	Chapter 2: Understanding Diversity in the Classroom (p. 57)	Principle #10 (Performance): The teacher makes links with the learners' other environments on behalf of students, by consulting with parents, counselors, teachers of other classes and activities within the schools, and professionals in other community agencies.
	Chapter 2: Understanding Diversity in the Classroom (p. 57) Chapter 11: Classroom Management: Creating a Successful Learning Environment/ Collaborating with parents and other teachers (p. 419)	Principle #10 (Performance): The teacher establishes respectful and productive relationships with parents and guardians from diverse home and community situations, and seeks to develop cooperative partnerships in support of student learning and well being.
4. Major laws related to students' rights and teacher responsibilities	Chapter 2: Understanding Diversity in the Classroom (entire chapter) Chapter 11: Classroom Management: Creating a Successful Learning Environment (entire chapter) Chapter 12: Assessment in the Classroom/Communicating (entire chapter) Chapter 13: Assessing Learning through Standardized Testing/What is the teacher's role in standardized testing? (entire chapter)	Principle #10 (Knowledge): The teacher understands and implements laws related to students' rights and teacher responsibilities (e.g., for equal education, appropriate education for handicapped students, confidentiality, privacy, appropriate treatment of students, reporting in situations related to possible child abuse).

Glossary

Ability Grouping A method in which students of similar abilities are placed into groups so that instruction can be matched to the group needs

Accommodation A cognitive process that takes place when an individual changes an existing schema so that it can explain the new experience because the new information doesn't fit well with existing schemas

Accountability The idea that schools and teachers must demonstrate their effectiveness in terms of student learning

Achievement Gap A term used to describe the difference in academic achievement between African American or Latino students and white, middle SES students

Achievement Motivation The need to achieve in academics

Active Listening Listening with interest and acceptance

Adaptive Testing The customized delivery of test items to different student performance levels

Advance Organizers Organizational structures that are provided before new complex information is learned

Affect The mental state that results from our moods, feelings, and emotions

Affiliation The tendency to cooperate, reciprocate, and maintain loyal relationships with peers

Agency Students' control of their own learning

Algorithm A set of clearly defined steps that lead to a solution for a problem

Alienation The state or experience of being isolated from a group or an activity to which one should belong or in which one should be involved

Alignment The correspondence among the teacher's instructional objectives, the classroom activities used to achieve those objectives, and the type of assessments used to measure learning

Allocated Time The available instructional time during which students have an opportunity to learn

Analogical reasoning Using examples that are familiar to students and which share similar attributes with a new concept to be learned

Anchored Instruction Problem-based learning environment that include an anchor, a rich, interesting problem situation around which students focus their thinking

Antecedents Contextual conditions that are typically present when students display the behavior you wish to modify

Anxiety A negative affective state that involves a vague, highly unpleasant feeling of fear and apprehension

Applied Behavior Analysis A systematic approach to applying operant conditioning principles to modify student behavior

Apprenticeship A one-on-one relationship in which a less capable person or "apprentice" is paired with a more experienced person, also called the mentor or tutor

Arousal The psychological and physical conditions that are needed to be prepared to respond or act

Assertive Style Expressing feelings, standing up for the legitimate rights of one's self and others, insisting that behavior be corrected, and resisting being coerced or manipulated

Assessment All processes involved in making decisions about students' learning progress

Assimilation A cognitive process that takes place when individuals use their existing schemas to make sense of the events in the world, involving trying to relate something new to something that we already know

Assistive Technology Technology that is developed to help individuals with disabilities have access to academic materials and activities and communicate more easily with teachers and peers

Attachment A motivation to seek a strong, affectionate bond with another person because of a need for relatedness

Attention The process of allocating cognitive resources to a stimulus or task at hand

Attributional Training A method aimed at helping one gain awareness of how one's actions affect outcomes

Authentic Assessments Assessments aimed at measuring students' performance on tasks that are relevant to life outside of school

Autonomy The idea of having an internal locus of control, the belief that one can change the conditions of the environment

Autonomous Morality The second stage of moral development at which a child starts perceiving rules as being flexible and subject to negotiation

Aversive Stimuli Stimuli that produce negative emotional responses

Behaviorism A perspective that psychology should be concerned with the study of human behavior rather than with the study of the human mind

Benchmarks More specific statements of the type of behaviors or products that students can produce to meet the standards

Bilingual Education Instructional programs where students are provided instruction in their first language as well as in the language of the majority

Bully A student who oppresses or harasses other students in a physical or psychological way

Centration The tendency to focus on the most perceptually obvious aspect of an object

Chunking The process of combining separate items into larger interconnected units

Classical Conditioning A behaviorist learning theory in which individuals learn by association, pairing automatic responses to new stimuli

Classification The ability to group objects on the basis of common characteristics

Classroom Management The skills and strategies that teachers use to organize instruction and maximize the productive use of their instructional time

Classroom Procedures The routines for accomplishing recurring classroom tasks, such as how students will turn in homework, go to the restroom, or transition from one activity to another

Classroom Rules The "dos and don'ts" of classroom behaviors and corresponding consequences

Clickers Devices similar to TV remote controls that use infrared or radio frequency technology that transmit and record students' responses to questions

Cognitive Constructivism A type of constructivism that focuses on how individuals construct knowledge in their minds

Cognitive Modeling A type of modeling that includes the following six steps: explaining why the to-be-learned skill is important; modeling the procedure in its entirety; modeling each one of the procedure steps separately using different contexts; having students practice the procedure steps with guidance; having students practice the entire procedure with guidance; having students practice the entire procedure without guidance

Cognitive Overload When working memory capacity becomes exhausted and learning cannot occur

Cognitive Rigidity The lack of flexibility in thinking about perspectives that are different from one's own

Cognitive Styles Characteristic ways of processing information that develops unconsciously around underlying personality trends

Cognitive Tutors Intelligent tutoring systems that develop cognitive models of students' knowledge and thinking as they interact with the computer program

Collective Self Individuals' sense of worth of the groups to which they belong, such as their family, peer group, ethnic group, class, or team

Collective Self-Efficacy The belief that working as a team can have a positive impact on achievement

Community of Learners A method in which students not only co-construct knowledge but also work together in the design of their learning environment and curriculum

Complex Cognitive Processes Using or transforming previously acquired knowledge and skills

Computer-Based Portfolio A portfolio that includes students work in the form of electronic files

Concept A category used to group similar objects, events, ideas, or people

Conceptual Change The process of changing a misconception that requires changing existing schemas

Conditional Knowledge Knowing when and why to apply declarative and procedural knowledge

Conditioned Response A response that has been learned through classical conditioning

Conditioned Stimulus A stimulus that elicits the response after classical conditioning takes place

Conflict Resolution A step-by-step cognitive process, guiding individuals who are part of a conflict towards a mutually agreeable solution to their problem

Conservation The idea that the amount of a substance remains the same regardless of its container shape or how many pieces and shapes the substance is transformed into

Constructivism The idea that students actively construct their knowledge from their personal experiences with others and the environment

Contingency Contracting A method that consists of making a written or verbal contract between the teacher and a student, where the student agrees to behave in a mutually acceptable way and the teacher agrees to provide a corresponding, mutually acceptable incentive

Continuous Reinforcement A reinforcement schedule in which reinforcement (either positive or negative) is provided after every occurrence of the target behavior

Conventional Morality A moral development level at which internalization is intermediate in the sense that individuals abide by rules that are believed to be internal, but in reality these rules are essentially the standards of others

Cooperative Learning A method in which small groups work together to make sense of new information or solve a new problem

Co-Regulation Fading teacher guidance gradually to provide students with more opportunities to control the task as they become more confident

Correlational Research A type of research that describes whether and to what extent there is a relationship between two or more events or factors

Cortex The largest human brain component, it is a 1/8-inch-thick wrinkled-looking region that encompasses 85% of an adult's brain weight and contains the largest number of neurons

Creative Thinking Generating new ideas, combining ideas in a novel way, or coming up with unique ways to solve problems

Criterion-Referenced Assessments Assessments that measure students' performance relative to predetermined criteria or standards

Critical Period A period of special sensitivity to specific types of learning that shapes the capacity for future development

Critical Thinking The process of systematically examining available information and coming up with conclusions that are based on evidence

Cueing Using signals to indicate that a certain response is desirable or undesirable

Cultural Competence Mastering complex awarenesses and sensitivities, various bodies of knowledge, and a set of skills that, taken together, underlie effective cross cultural teaching

Cultural Deficit Model A model used to explain the achievement gap as the result of a home culture that fails to prepare students to succeed academically as compared to the mainstream culture

Culture-Free Test A test without questions that are perceived to have a content bias towards certain cultures

Decision Making The process of evaluating alternative options and making choices among them

Declarative Knowledge A type of knowledge can be subdivided in two specialized memories: *semantic memory* or general knowledge about the world, and *episodic memory* or knowledge about our own life experiences

Defiant Student A student characterized by being noncompliant and hostile to teachers and/or peers

Deficiency Needs Basic physiological needs necessary for survival

Deliberate Practice Practicing under the guidance of a skilled mentor who provides informational feedback for a long period of time to become more skilled in a domain

Democratic Leadership working with students cooperatively, helping them develop strategies to accomplish projects, and promoting the sharing of ideas

Descriptive Research A type of research that describes what is occurring in a certain situation without altering the situation

Detention Keeping students in school outside of school hours

Dialects A special form of a language with distinctive pronunciations and grammatical structures

Differential Reinforcement Reinforcing behaviors that are more appropriate than or incompatible with the undesirable behavior

Differentiated Instruction Providing different learning environments to different students that are sensitive to individual levels of readiness

Digital Divide The gap between students who have access to digital technology and those with very limited or no access; it includes the imbalance in resources and skills needed to effectively participate as a digital citizen

Discipline An action designed to address misbehavior

Discovery Learning Finding a solution to a problem or an explanation for a phenomenon rather than simply memorizing rules and explanations

Discrimination The ability to respond to certain stimuli but not to other, similar stimuli

Dispositional Interest Stable interest in a topic or subject

Distracters A list of answer choices in a multiple choice question that are used to divert the student from the correct answer

Divergent Thinking The generation of many non-standard answers to a problem or question

Drill-and-Practice Programs A computer-based method in which a set of problems or questions are answered at one's own pace while receiving immediate feedback

Dual Processing combining visual and auditory information

Educational Psychology The scientific discipline concerned with the development, evaluation, and application of principles and theories of human learning

Egocentrism The inability to consider the world from a perspective other than one's own

Elaboration Using one's prior knowledge to expand on a new idea, thereby storing more information than what was originally presented

E-Learning Learning from electronic materials

Electronic Gradebook A computer program that keeps track of student grades

E-Materials Electronic instructional materials

Enactive Learning Learning by experiencing the consequences of one's own actions

Encoding The cognitive process by which new information is elaborated or organized and saved into long-term memory

Equilibrium The natural tendency to find consistency in one's thinking

Ethic of Care The three step progression in moral reasoning focus from self-interest, to specific individuals and relationships, and finally to principles of responsibility and care for all individuals

Evaluation The judgment process involved in assessing students' learning

Exemplars Highly typical examples of a category or class

Experimental Research A type of research that studies causal relationships between variables

Experts People who have developed extensive knowledge and skills in a particular domain

Exploratory Behaviors Behaviors aimed at resolving a cognitive conflict or learning more about a personally interesting topic

Extinction The gradual disappearance of a learned response

Extrinsic Motivation The motivation to be involved in a learning activity as a means to an end

Fading An operant conditioning method that moves from reinforcing every desirable behavior to reinforcing desirable behaviors every now and then, continuing until the lowest rate of reinforcement that maintains the desirable behavior is found

Family Educational Rights and Privacy Act (FERPA) A *federal law* stating that educational agencies and institutions that receive funding under a program administered by the U. S. Department of Education must provide students and their parents/guardians with access to their education records, an opportunity to seek to have the records amended, and control over the disclosure of information from the records

Fixed Reinforcement A reinforcement schedule that allows us to predict when the reinforcement will follow the desirable behavior

Flow The motivational state characterized by becoming extremely focused and absorbed in an activity, losing track of time, and completely ignoring anything else that is happening in the environment outside of such activity

Formal Assessments Assessments that are typically created in advance to establish what students have learned

Formative Assessments Assessments that provide information to teachers and students while teaching and learning are still occurring

Frequency Distribution A list of the number or proportion of student scores at each score level or interval

Functional Fixedness Being unable to think about functions or uses for an object other than those for which the object was originally designed

Gender Traits and behaviors that a particular culture believes to be appropriate for men and women

General Intelligence (*g*) The term used for the theory that intelligence is a single trait that people have in varying degrees

Generalization The tendency for a new stimulus that is similar to the original stimulus to produce a similar response

Grade-Equivalent Scores A score that indicates a student's performance in relation to the grade level and months of the school year assuming a 10-month school year

Group-Oriented Contingency Contracting Establishing management contingencies to more than one student in a group

Growth Needs Human needs that are not necessary for survival but are necessary for success

Guided Discovery Finding a solution to a problem or an explanation for a phenomenon with the help of teacher hints and directions

Guided Participation Engaging in learning activities with a more capable other who provides the mediation and encouragement needed to acquire new knowledge and skills

Halo Effect A tendency to attribute additional positive characteristics to someone who has one salient quality, such as physical attractiveness

Heteronomous Morality The first stage of moral development characterized by obeying externally imposed rules only to avoid the consequences of not obeying such rules

Heuristics Informal "rules of thumb" or intuitive methods that may solve a problem but are not guaranteed to do so

High-Stakes Tests Tests that provide results that can be used to hold students, teachers, and school administrators accountable for achievement and which may result in serious consequences

Histogram Also called a bar graph; it represents frequencies as a set of vertical bars

Hot Cognition The idea that emotion is centrally implicated in cognitive reasoning processes

Hypermedia A system where students can learn by exploring multiple representations of knowledge that are interconnected by a network of links

Hypertext Interactive text where certain words or terms contain a hyperlink that can be selected to find more information

Identity Achievement The identity status that results from having explored realistic options, having made specific choices, and becoming committed to pursuing those choices

Identity Diffusion The identity status that results from engaging in a disorganized examination of different choices and consequently failing to make clear choices about their future, which may lead to apathy and confusion

Identity Foreclosure The identity status that results from following the steps of others, usually parents, without examining any alternative path for one's own life

Images A mental representation that keeps the same structure or appearance than the original information

I-Messages Clear, direct statements identifying what the student transgression was, how the misbehavior affects the teacher's ability to accomplish her learning goals, and how the misbehavior makes the teacher feel

Inclusion A comprehensive approach to educating exceptional children in regular classrooms with a coordinated web of services

Individualized Education Program (IEP) An instructional plan mandated by the Individuals with Disabilities Education Act (IDEA) that is devised by the general and special education teachers, resource professionals, and parents to meet the needs of exceptional students

Individuals with Disabilities Education Act (IDEA) A series of major special education laws which prescribe a free, appropriate public education for every child

Informal Assessments Spontaneous methods of gathering information about students' knowledge and skills

Information Processing Model The classic model used by cognitive psychologists to explain cognition and learning; the name comes from using the computer as a metaphor to understand the human mind, where the human mind is analogous to a computer in that new information can be input, processed, stored, and later retrieved

Inner Speech The phenomenon of talking out loud to ourselves

Inquiry-Based Learning A method in which teachers ask students to answer a thought-provoking question or problem and students formulate hypotheses, collect data to test their hypotheses, draw conclusions from their tests, and reflect on the original question and their thinking process

In-School Suspension A method where students are placed in a quiet room inside the school building for one or more days to work on the same activities that non-suspended students are working at, under the supervision of an adult

Insight The ability to use reflection to solve problems

Instructional Media The physical system or vehicle used to deliver information to students or teachers—such as a textbook, instructional video, or computer program

Instructional Method The techniques that are embedded in different technologies to promote learning—such as advance organizers, scaffolding, or self-explanation methods

Instructional Technology Technology that supports students' learning such as word processors, spreadsheets, and multimedia instructional programs

Integrated Learning Systems Software packages that keep track of student performance

Intelligence Quotient (IQ) A global index of people's intelligence derived from one of several different standardized tests attempting to measure intelligence

Intermittent Reinforcement A reinforcement schedule in which reinforcement is provided only after some occurrences of the target behavior

Internalization The appropriation of the language and culture of one's community

Internet (or World Wide Web) A system of computer networks that operates across the world

Interstate New Teacher Assessment and Support Consortium (INTASC) A multi-state collaboration to set standards in each of the areas of professional teacher knowledge

Interval Reinforcement A reinforcement schedule where reinforcement is based on the passage of time

Intrinsic Motivation The motivation to be involved in a learning activity for its own sake

IQ Scores The scores used to interpret intelligence tests

IRE Pattern The classroom discussion method in which the teacher *initiates* a discussion by asking a question, one or more students *respond* to the question, and the teacher *evaluates* students' answers

Language Accommodations Modifications to the environment or testing procedures designed to eliminate the effects of English proficiency on students' performance

Language Acquisition Device (LAD) An inborn linguistic processor put in place at birth and activated as children listen and respond to the naturally occurring verbal input of those surrounding them

Language Minority A minority group whose primary language is different than that of the majority group

Lateralization The specialization of the two brain hemispheres

Law of Effect Behaviors that are followed by a positive outcome are strengthened and behaviors that are followed by negative outcomes are weakened

Learned Helplessness The psychological state associated with the belief that personal actions cannot make a change in one's learning outcomes

Learning Any relatively permanent change in our thoughts, feelings, or behavior that results from experience

Learning Preferences Individuals' approaches to studying and learning differ from cognitive styles in that they are conscious inclinations that may be subject-specific

Least Restrictive Environment (LRE) A setting where exceptional students have the opportunity to be educated with non-exceptional peers to the greatest extent possible

Logical Consequences Requesting the perpetrator of an undesirable behavior to conduct a certain behavior to revert the negative effects of their misconduct

Long-Term Memory A storage system that can hold large amounts of information for an unlimited amount of time

Maintenance Rehearsal Refreshing the information held in the phonological loop by repeating it to yourself

Mastery Goal A goal that focuses on improvement and increased understanding

Mean The arithmetic average score of a distribution, calculated by adding all the scores in the distribution and dividing by the total number of students

Meaningful Learning Making connections between new information and prior knowledge

Measurement The quantification of students' knowledge and skills using some type of scale

Median The score that is in the middle of the ordered distribution of scores, which is why sometimes it is also called the geometric mean

Mediation When a more capable individual interprets a child's behavior and helps transform the behavior into a representation that has the same meaning to the child and others

Mental Representations Ways in which information might be encoded in long-term memory and which can be operated on by a variety of mental processes

Metacognition An individual's cognition about his/her cognition or "knowing about knowing"

Microcomputer-Based Laboratories (MBLs) Virtual sensors and probes typically included in inquiry-based computer environments that can be used to measure a variety of scientific variables

Microworlds Simulations that visually demonstrate how things work in the real world

Minor Interventions Appropriate for behaviors that are infrequent and/or do not disrupt class activities and include strategies such as verbal and non-verbal cues, ignoring students' misbehavior, and warning about a potential logical consequence if behavior does not cease

Misbehaviors Any student action that has the potential to disrupt classroom learning and activities

Misconceptions Invalid concepts that students construct using their experiences, expectations, beliefs, and emotions

Mnemonics Strategies to improve memory by encoding simple information in meaningful ways

Mode The most frequent value of a score distribution

Modeling The cognitive, affective, and behavioral changes originated from observing others' behaviors and explanations

Moderate Interventions Appropriate for behaviors that are recurrent and/or disruptive of the classroom momentum

Moral Internalization The process of gradually incorporating external moral codes as our own internal moral codes

Moratorium The identity status that results from pausing on any identity decision and remaining on hold when it comes to exploring alternative choices for one's personal development

Motivated Reasoning The phenomenon that people become emotionally-biased in their thinking when they have a strong emotional stake in an issue

Motivation The psychological processes that direct and sustain students' behavior towards learning

Multimedia The characteristic of learning environments that combine different media such as text, graphics, animation, sounds, videos, and photos

Naïve Theories Theories that develop without instruction or with very little guidance from more knowledgeable others

National Assessment of Educational Progress (NAEP) A nationwide test used to assess young Americans' knowledge and skills in reading, writing, literature, math, science, social studies, art, citizenship, and career and occupational development

Negative Transfer When using what was learned in the past hinders new learning or solving new problems

Neo-Piagetians A group that brings an information processing view to Piaget's original theory

Neurons The cells that are in charge of storing and transmitting information

Neutral Stimulus A stimulus that does not have a natural automatic response associated to it

No Child Left Behind (NCLB) Officially known as the Elementary and Secondary Education Act, this law requires that all children in grades 3 through 8 score at the proficient level or above on tests of math, reading/language arts, and science by year 2014, with negative consequences for schools and districts that fail to show progress toward those goals

Norm Group A representative sample of the population that is tested and whose scores have been previously compiled for the purpose of making comparisons

Normal Distributions A bell-shaped distribution of scores where most scores cluster around the average value in the distribution and which has identical mean, median, and mode values

Norm-Referenced Assessments Assessments where students' performance is compared to that of their peers or a group of age-mates across the nation

Novelty Effect Any type of short-lived increase in student engagement and learning that is due to the newness or originality of the learning experience

Object Permanence The understanding that objects remain in the environment, even when they cannot be seen or perceived by other senses

Operant Conditioning The study of how animals learn to operate on their environments

Organization Providing an orderly structure to multiple pieces of information

Outcome Expectancy An individual's belief in a positive relationship between performance and the outcome of such performance

Overgeneralization Wrongly extending the meaning of a word to more concepts than it should

Overlapping Addressing behavioral issues without interrupting instruction

Pacing A method that prevents cognitive overload by breaking down a larger instructional unit into smaller segments or by allowing students to learn at their own pace

Parenting Styles Ways of raising children that differ along dimensions of expectations and responsiveness

Peer Mediation A method that consists of using a cadre of trained peer mediators to act as third parties in a negotiation between other peers who have a conflict

Percentile Score A score that indicates the percentage of the distribution that lies at or below the student's score

Perception The cognitive process that gives meaning to sensory input

Performance Assessment A type of assessment that requires using knowledge and skills to complete a task or produce a product in more or less realistic contexts

Performance-Avoidance Goal The goal to avoid looking bad and receiving unfavorable judgments from others

Performance Goal A goal that focuses on competence or ability and achieving a certain end result

Phonology The correct pronunciation of words

Portfolios Systematic collections of students' work over an extended period that typically include self-reflections on learning

Positive Transfer When using what was learned in the past facilitates learning something new or solving a new problem

Possible Self The vision of one's self in the future

Postconventional Morality A moral development level at which an individual's internal moral principles may outweigh the rules of society

Pragmatics Social conventions used to communicate effectively with others

Preconventional Morality A moral development level that shows no internalization of moral values; it is determined by the consequences of an action rather than by the inherent goodness or badness of the action

Premack Principle People have a hierarchy of reinforcers and more preferred activities reinforce less preferred activities

Prereferral A process where interventions are first attempted in general education before a student is referred for a special education evaluation to reduce the likelihood of inappropriate referrals

Presentation Punishment Presenting an aversive stimulus when an undesirable behavior is displayed

Pretend Play The use of objects that are available in the environment to represent another object that is not available in the environment during play

Prevention Arranging the classroom environment conditions before the occurrence of a disruption

Primary Reinforcers Reinforcers that provide immediate satisfaction or enjoyment and which are directly tied to our most basic needs

Principle of Least Intervention Using the simplest intervention that works to manage the classroom

Principles Descriptions of established relationships between events

Problem-Based Learning A method in which students work in collaborative groups to solve a complex, ill-defined problem

Problem Solving The type of thinking people apply to achieve a desired end state that is different from an initial state

Problem-Solving Conference A strategy rooted in the idea that students acquire meaningful understandings through their efforts at solving authentic problems

Procedural Knowledge The knowledge of how to perform tasks

Productions If/then rules stating an action to be performed and the condition under which such action should be undertaken

Programmed Instruction A computer-based method that uses operant conditioning principles, such as using reinforcement to shape students' learning

Prompting The presentation of an additional cue following the first cue with the goal of shaping or changing behavior

Proposition The smallest unit of meaning and can be thought of as an assertion that is subject to be true or false

Prosocial Goals Goals related to making and keeping friends or being helpful to peers and teachers

Prototype The best representation of a certain category or class

Psychosocial The interaction between individuals' emotional needs and their social environment

Range The difference between the minimum and maximum scores, calculated by subtracting the minimum score from the maximum score in the distribution

Ratio Reinforcement A reinforcement schedule where reinforcement occurs after a certain number or proportion of desirable behaviors is performed

Raw Score The number of items that the student answered correctly on the test

Reasoning The process of logically drawing conclusions from evidence

Reciprocal Causation The interrelationship between students' environment, their personal beliefs, and their behavior

Reciprocal Teaching A method aimed at promoting comprehension by means of summarizing, generating questions, clarifying, and predicting

Reflection The process of thinking critically about one's thinking and practices, learning from the process, and applying what is learned to improve learning for all students

Reinforcement The process of applying reinforcers with the goal of increasing that behavior

Relatedness The need to feel connected or associated with others

Removal Punishment Removing desirable stimuli to try to stop an undesirable behavior

Resilience The ability to not only survive but thrive in aversive environments

Response Cost Removing tangible reinforcers and privileges that were previously acquired

Response Set (or Mental Set) The tendency to approach problems in the same way they have been experienced in the past

Retrieval Pulling information from long-term memory into working memory

Rote Learning Being able to remember something, yet, what is remembered has no meaning attached to it

Rubrics Scoring scales that describe the criteria for grading subjective assessments

Satiation When too much reinforcement of a desirable behavior decreases the occurrence of the desirable behavior

Scaffolding An instructional method in which support is given to students early on in the learning process, as they navigate their ZPD

Schema Activation Any instructional activity where students are primed to activate prior knowledge from their long-term memory that is closely related to a new concept to be learned

Schemas Mental networks of organized information

Schemata Networks of connected facts and concepts that provide a structure for making sense of new information

Script A schema representation for a procedure

Secondary Reinforcers Reinforcers that derive from their association with primary reinforcers

Seductive Details Interesting details that are not necessary to understand a lesson and which can distract students from the main goal of the lesson

Self-Actualization The motivation to develop one's full potential as a human being

Self-Concept An individual's self-description of his/her competencies

Self-Efficacy The belief about one's capability to perform or achieve a certain goal

Self-Evaluation Judging if the outcome of one's actions or strategies is acceptable or unacceptable

Self-Fulfilling Prophecy The process by which people's expectations about a person lead them to elicit behavior that confirms their expectations

Self-Handicapping Undermining one's own chances of success in a task

Self-Instruction A method aimed at reminding one's self about appropriate actions or strategies

Self-Monitoring A method used to help students become aware of the occurrence and consequences of their disruptive behavior

Self-Recording Monitoring a process of learning by recording incremental accomplishments

Self-Regulated Learning The ability to control all aspects of one's learning, from advance planning to evaluating performance afterward

Self-Schemas All the information about ourselves that make us the person we are, stored in long-term memory

Self-Worth (or Self-Esteem) An individual's overall view of himself or herself as a person

Semantics The knowledge of word meanings

Sense of Self An individual's knowledge, beliefs, and feelings about who they are, what their existence means, and the goals they set in life

Sensory Memory The information store that briefly holds stimuli from the environment until they can be processed

Seriation The ability to order objects on the basis of increasing or decreasing length, volume, or weight

Setting Event The creation of an environment that is conducive to certain target behaviors, where it's the environment rather than verbal or non-verbal behavior that cues the subject to behave in a certain way

Sex The biological differences of men and women

Shaping An operant conditioning method that teaches new behaviors by reinforcing successive approximations towards the target behavior

Situated Cognition Theory The idea that an individual's context of learning plays a fundamental role in shaping the type of concepts and thinking developed by such individual

Situational Interest Spontaneous and transitory interest that is activated by the environment rather than the learner

Social Constructivism A type of constructivism where learners share individual perspectives with others to construct understandings together that would not be possible to construct individually

Social Goal A goal that focuses on achieving in one's social life

Social Learning Learning from observing the behavior of others

Social Responsibility Goals Goals where students express their adherence to social rules and expectations, such as striving to be responsible, dependable, and academically successful

Sociocognitive Theory A theory that focuses on learning that is the result of observing others or observing the consequences of the behaviors of others

Socioeconomic Status (SES) A categorization of individuals based on their economic, educational, and occupational characteristics

Specialization The idea that the workings of the mind are associated with the structure of the brain

Standard Deviation A measure of score variability showing how widely the scores vary with respect to the average score in the distribution

Standards Broad statements of what should be taught at each grade level and for each content area

Standard Score Scores expressed as deviations from the mean score, such as the stanines, Z-scores, and T-scores

Standardized Tests Tests given to large samples of students under the same conditions, including test instructions, the testing environment, the amount of time to take the test, and the scoring procedures

Stanines The short version for the term *standard nines*, a standard score that reports test performance on a 9-point scale that ranges from 1 to 9

State-Dependent Learning The phenomenon of recalling information better when one is in an emotional state or context that matches the emotional state or context in which information was learned

Stereotype A rigid, overly simplistic, and inevitably inaccurate representation of any particular group of individuals

Stereotype Threat A phenomenon in which a member of a certain group performs more poorly and shows physiological anxiety reactions due to the fear of confirming a negative stereotype about his/her group

Storing The cognitive process by which a copy of new information is saved into long-term memory

Study Strategies Techniques that students use to increase their understanding of classroom materials

Summative Assessments Assessments that provide information about student performance at the end of instruction and which are typically used for grade assignment and promotion decisions

Symbolic Thought The use of symbols to represent the actual objects and events around them

Synapse The space between neurons where electric connections happen

Syntax The organization of words into grammatically correct sentences

Table of Specifications (TOS) A table that includes a list of the learning objectives and different levels of understanding that need to be assessed

Task Analysis Setting goals and devising a strategic plan to accomplish such goals

Teaching Efficacy A teacher's belief in his/her ability to make a significant change in students' lives

Teaching to the Test The practice of teaching only what is expected to be tested at the expense of other learning objectives

Test Bank A large and effective database of assessment items from which teachers can draw when developing tests

Test Bias The difference in test scores that is attributable to demographic variables such as gender, cultural background, and age

Testing Using a standardized process or device to obtain quantified information about a behavior or cognitive process

Theory A scientific explanation for why events happen in a certain way and which helps make predictions about such events in the future

Time-on-Task The number of minutes spent on learning activities

Time-out Removing students from the class and physically isolating them from their classmates

Token economies An economy that uses tokens, something that lacks inherent value but can be used in exchange of things that have inherent value

Tracking Ability grouping that occurs across all academic areas

Traditional Assessments Assessments that measure students' knowledge and skills in paper-and-pencil format such as exams and quizzes

Transfer The ability to extend what has been learned in one context to new contexts

Trends in International Mathematics and Science Study (TIMSS) An international assessment that provides data on the mathematics, reading, and science achievement of students from the participating countries at either the fourth-, eighth-grade level, or both

Unconditional Positive Regard A teacher's attitude of total acceptance towards students

Unconditioned Stimulus A stimulus that produces automatic physiological and/or emotional responses

Unconditioned Stimulus The automatic response to an unconditioned stimulus

Undergeneralization Restricting the meaning of a word to include fewer concepts than it should

Variable Reinforcement An unpredictable reinforcement schedule

Vicarious Learning The process of learning by observing the consequences of another's actions and adjusting behavior accordingly

Visualization Creating mental pictures to help remember information

Wait Time The time given to answer a question

Withitness Being attentive to everything that is happening within a specific area

Working Memory (Short-Term Memory) The memory system of the information processing model where information that has been attended to and perceived is held temporarily and processed

Zero-Tolerance Policy A policy where consequences are automatically and immediately applied, without consideration of the circumstances surrounding students' behavior

Zone of Proximal Development (ZPD) The cognitive level at which children are able to solve problems under adult guidance, or in collaboration with more capable peers

Z-Scores A standard score that provides information about how many standard deviations a raw score is above or below the mean score of the distribution

References

Abbeduto, L., & Symons, F. (2008). *Taking sides: Clashing views in educational psychology* (5th ed.). New York: McGraw-Hill.

Abed-El-Khalick, F., & Akerson, V. L. (2004). Learning as conceptual change: Factors mediating the development of preservice elementary teachers' views of nature of science. *Science Education, 88,* 785–810.

Abedi, J., & Lord, C. (2001). The language factor in mathematics testing. *Applied Measurement in Education, 14*, 219–234.

Abedi, J., Hofstetter, C., & Lord, C. (2004). Assessment accommodations for English language learners: Implications for policy-based empirical research. *Review of Educational Research, 74,* 1–28.

Abedi, J., Lord, C., Hofstetter, C., & Baker, E. (2000). Impact of accommodation strategies on English language learners' test performance. *Educational Measurement: Issues and Practice, 19,* 16–26.

Abela, J. R., & Alessandro, D. U. (2002). Beck's cognitive theory of depression: A test of the diathesis–stress and causal mediation components. *British Journal of Clinical Psychology, 41,* 111–128.

Ackerman, P. L., Beier, M. E., & Boyle, M. O. (2005). Working memory and intelligence: The same or different constructs? *Psychological Bulletin, 131*, 30–60.

Ackerman, P. L., Kyllonen, P. C., & Roberts, R. D. (1999). *Learning and individual differences: Process, trait, and content determinants.* Washington, DC: American Psychological Association.

Adams, G., & Engelmann, S. (1996). *Research on direct instruction: 20 years beyond DISTAR.* Seattle, WA: Educational Achievement Systems.

Adamson, R. E. (1952). Functional fixedness as related to problem solving: A repetition of three experiments. *Journal of Experimental Psychology, 44,* 288–291.

AGS Publishing. (2006). *Detroit tests of learning aptitude* (4th ed.). Circle Pines, MN: Author.

Aiken, L. R. (2003). *Psychological testing and assessment* (11th ed.). Boston: Allyn & Bacon.

Aiken, L. R., & Groth-Marnat, G. (2006). *Psychological testing and assessment* (12th ed.). Boston: Allyn & Bacon.

Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology, 94*(3), 545–561.

Airasian, P. (2005). *Classroom assessment* (5th ed.). New York: McGraw-Hill.

Airasian, P. W. (2008). *Classroom assessment: Concepts and applications* (6th ed.). Boston: McGraw-Hill

Airasian, P. W., & Walsh, M. E. (1997). Constructivist cautions. *Phi Delta Kappan, 78*(6), 444–449.

Alberti, R. E., & Emmons, M. L. (2001). *Your perfect right* (8th ed.). San Luis Obispo, CA: Impact.

Alberto, P. A., & Troutman, A. C. (1999). *Applied behavior analysis for teachers* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Alberto, P. A., & Troutman, A. C. (2006). *Applied behavior analysis for teachers* (7th ed.). Upper Saddle River, NJ: Prentice-Hall.

Alder, N. (2002). Interpretations of the meaning of care: Creating caring relationships in urban middle school classrooms. *Urban Education, 37*(2), 241–266.

Alderman, M. K. (1990). Motivation for at-risk students. *Educational Leadership, 48*(1), 27–30.

Alderman, M. K. (1999). *Motivation for achievement: Possibilities of teaching and learning.* Mahwah, NJ: Erlbaum.

Aleven, V., & Koedinger, K. R. (2002). An effective metacognitive strategy: Learning by doing and explaining with a computer-based Cognitive Tutor. *Cognitive Science, 26*(2), 147–179.

Alexander, G. A., Graham, S., & Harris, K. R. (1998). A perspective on strategy research: Progress and prospects. *Educational Psychology Review, 10,* 129–154.

Alexander, J. M., Carr, M., & Schwanenflugel, P. J. (1995). Development of metacognition in gifted children: Directions for future research. *Developmental Review, 15*, 1–37.

Alexander, P. A. (1997). Mapping the multidimensional nature of domain learning: The interplay of cognitive, motivational, and strategic forces. *Advances in Motivation and Achievement, 10*, 213–250.

Alexander, P. A., (2003a). The development of expertise: The journey from acclimation to proficiency. *Educational Researcher, 32*, 10–14.

Alexander, P. A. (2003b). Profiling the developing reader: The interplay of knowledge, interest, and strategic processing. In C. M. Fairbanks, J. Worthy, B. Maloch, J. V. Hoffman, & D. L. Schallert (Eds.), *The fifty-first yearbook of the National Reading Conference* (pp. 47–65). Oak Creek, WI: National Reading Conference.

Alexander, P. A. (2006). *Psychology in learning and instruction.* Upper Saddle River, NJ: Pearson/Merrill/Prentice Hall.

Alexander, P. A., Kulikowich, J. M., & Schulze, S. K. (1994). How subject-matter knowledge affects recall and interest. *American Educational Research Journal, 31,* 313–337.

Alexander, P. A., & Jetton, T. L. (1996). The role of importance and interest in the processing of text. *Educational Psychology Review, 8,* 89–121.

Algozzine, B., & White, R. (2002). Preventing problem behaviors using schoolwide discipline. In B. Algozzine & P. Kay (Eds.), *Preventing problem behaviors: A handbook of successful prevention strategies* (pp. 85–103). Thousand Oaks, CA: Corwin.

Allal, L., & Ducrey, G. P. (2000). Assessment of or in the zone of proximal development. *Learning and Instruction, 10*, 137–152.

Allen, D. (1996). Teaching with technology. Tools to master classroom organization. *Teaching PreK–8, 27*(1), 23–25.

Allen, L. V. Z., & Migliore, E. T. (2005). Supporting students and parents through a school-university partnership. *Middle School Journal, 36*(3), 17–23.

Allington, R. L., & McGill-Franzen, A. (1992). Does high-stakes testing improve school effectiveness? *ERS Spectrum, 10*, 3–12.

Alparsian, C., Tekkaya, C., & Geban, O. (2004). Using the conceptual change instruction to improve learning. *Journal of Biological Education, 37*, 133–137.

Altermatt, E., Jovanovic, J., & Perry, M. (1998). Bias or responsivity? Sex and achievement-level effects on teachers' classroom questioning practices. *Journal of Educational Psychology, 90*(3), 516–527.

Alvermann, D. E., O'Brien, D. G., & Dillon, D. R. (1990). What teachers do when they say they're having discussions of content area reading assignments: A qualitative analysis. *Reading Research Quarterly, 25*, 296–322.

Al-Yagon, M., & Mikulincer, M. (2004). Socioemotional and academic adjustment among children with learning disorders: The mediational role of attachment-based factors. *Journal of Special Education, 38*, 111–123.

Amabile, T. (1993). Commentary. In D. Goleman, P. Kafman, & M. Ray (Eds.), *The creative spirit*. New York: Plume.

Amabile, T. M., & Hennessey, B. A. (1992). The motivation for creativity in children. In A. K. Boggiano & T. S. Pittman (Eds.), *Achievement and motivation: A social-development perspective* (pp. 54–72). Cambridge, UK: Cambridge University Press.

American Association for the Advancement of Science (AAAS). (1993). *Benchmarks for science literacy*. Washington, DC: Author.

American Institutes for Research (AIR) & SRI International. (2005). *Getting to results: Early student outcomes in new and redesigned high schools*. Menlo Park, CA: SRI International.

American Psychological Association Zero Tolerance Task Force. (2008). Are zero tolerance policies effective in the schools? An evidentiary review and recommendations. *American Psychologist, 63*(9), 852–862.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*, 261–271.

Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed.). Englewood Cliffs, NJ: Prentice Hall.

Anderman, E. M. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology, 94*, 795–809.

Anderman, E. M., & Maehr, M. L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research, 64*, 287–309.

Anderman, E. M., & Midgley, C. (2004). Changes in self-reported academic cheating across the transition from middle school to high school. *Contemporary Educational Psychology, 29*, 499–517.

Anderman, E. M., & Wolters, C. A. (2006). Goals, values, and affect: Influences on student motivation. In P. A. Alexander & P. H. Winnie (Eds.), *Handbook of educational psychology* (2nd ed.). Mahwah, NJ: Erlbaum.

Anderman, E. M., Anderman, L. H., & Griesinger, T. (1999). The relation of present and possible academic selves during early adolescence to grade point average and achievement goals. *Elementary School Journal, 100*, 3–17.

Anderman, E. M., Urdan, T., & Roeser, R. (2005). The Patterns of Adaptive Learning Survey. In K. A. Moore & L. H. Lippman (Eds.), *Why do children need to flourish? Conceptualizing and measuring indicators of positive development* (pp. 223–235). New York: Springer

Anderman, E., & Maehr, M. (1994). Motivation and schooling in the middle grades. *Review of Educational Research, 64*, 287–309.

Anderman, L. H., & Anderman, E. M. (1999). Social predictors of changes in students' achievement goal orientations. *Contemporary Educational Psychology, 25*, 21–37.

Anderson, C. W., & Smith, E. L. (1987). Teaching science. In V. Richardson-Koehler (Ed.), *Educators' handbook: A research perspective* (pp. 84–111). New York: Longman.

Anderson, C. W., Holland, J. D., & Palincsar, A. S. (1997). Canonical and sociocultural approaches to research and reform in science education: The story of Juan and his group. *Elementary School Journal, 97*, 359–384.

Anderson, J. R. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.

Anderson, J. R. (1993). Problem solving and learning. *American Psychologist, 48*, 35–44.

Anderson, J. R. (1995). *Learning and memory: An integrated approach*. New York: Wiley.

Anderson, J. R. (2005). *Cognitive psychology and its implications* (6th ed.). New York: Freeman.

Anderson, J. R., & Bower, G. (1983). *Human associative memory*. Washington, DC: Winston.

Anderson, L., & Krathwohl, D. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Anderson, L., & Krathwohl, D. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Addison Wesley Longman.

Anderson, R. H., & Pavan, B. N. (1993). *Nongradeness: Helping it to happen*. Lancaster, PA: Technomic.

Andre, T., & Windschitl, M. (2003). Interest, epistemological belief, and intentional conceptual change. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 173–197). Mahwah, NJ: Erlbaum.

Anguiano, R. P. V. (2004). Families and schools: The effect of parental involvement on high school completion. *Journal of Family Issues, 25*, 61–85.

Antil, L. R., Jenkins, J. R., Wayne, S. K., & Vadasy, P. F. (1998). Cooperative learning: Prevalence, conceptualizations, and the relation between research and practice. *Review of Educational Research, 35*(3), 419–454.

Apple Computer. (1995). Changing the conversation about teaching, learning, and technology: A report on 10 years of ACOT research. Cupertino, CA: Author.

Applebee, A., Burroughs, R., & Stevens, A. (2000). Creating continuity and coherence in high school literature curricula. *Research in the Teaching of English, 34*(3), 396–429.

Apthorp, H. S., D'Amato, E. D., & Richardson, A. (2003). *Effective standards-based practices for Native American students: A review of research literature* (rev. ed.). Aurora, CO: Mid-Continent Research for Education and Learning.

Archer, S. L. (1982). The lower age boundaries of identity development. *Child Development, 53*, 1551–1556.

Aronson, E. (2000). *Nobody left to hate: Teaching compassion after Columbine*. New York: Worth.

Aronson, E., & Bridgeman, D. (1979). Jigsaw groups and the desegregated classroom: In pursuit of common goals. *Personality and Social Psychology Bulletin, 5,* 438–446.

Aronson, E., & Patnoe, S. (1997). *The jigsaw classroom: Building cooperation in the classroom* (2nd ed.). New York: Longman.

Aronson, E., Wilson, T., & Akert, R. (2005). *Social psychology* (5th ed.). Upper Saddle River, NJ: Pearson.

Aronson, J., Fried, C., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38,* 113–125.

Aronson, J., Lustina, M. J., Good, C., Keough, D., Steele, C. M., & Brown, J. (1999). When white men can't do math: Necessary and sufficient factors in stereotype threat. *Journal of Experimental Social Psychology, 35,* 29–46.

Arter, J., & McTighe, J. (2001). *Scoring rubrics in the classroom.* Thousand Oaks, CA: Corwin.

Assor, A., & Connell, J. P. (1992). The validity of students' self-reports as measures of performance affecting self-appraisals. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* (pp. 25–46). Mahwah, NJ: Erlbaum.

Astor, R. A., Pitner, R. O., Benbenishty, R., & Meyer, H. A. (2002). Public concern and focus on school violence. In L. A. Rapp-Paglicci, A. R. Roberts, & J. S. Wodarski (Eds.), *Handbook of violence* (pp. 262–302). New York: Wiley.

Asuni, N. (2008). *TCExam: Computer-based assessment.* Retrieved March 12, 2009, from: http://www.tecnick.com/public/code/cp_dpage.php?aiocp_dp=tcexam

Athanasou, J. A., & Olasehinde, O. (2002). Male and female differences in self-report cheating. *Practical Assessment, Research & Evaluation, 8*(5). Retrieved November 7, 2007, from http://PAREonline.net/getvn.asp?v=8&n=5

Atkinson, R., & Schiffrin, R. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), *The psychology of learning and motivation: Advances on research and theory* (Vol. 2). San Diego: Academic Press, 89–195.

Attewell, P. (2001, July). The first and second digital divides. *Sociology of Education, 74,* 252–259.

Au, K. (2001). What we know about multicultural education and students of diverse backgrounds. In R. F. Flippo (Ed.), *Reading researchers in search of common ground* (pp. 101–117). Newark, DE: International Reading Association.

August, D., & Hakuta, K. (1999). *Improving schooling for language-minority children: A research agenda.* National Research Council Committee on Developing a Research Agenda on the Education of Limited-English Proficient and Bilingual Students. Washington, DC: National Academy Press.

August, D., & Shanahan, T. (2006). *Developing literacy in second-language learners: Report of the National Literacy Panel on language-minority children and youth.* Mahwah, NJ: Center for Applied Linguistics, Lawrence Erlbaum Associates.

August, D., & Shanahan, T. (2007). *Developing literacy in second-language learners.* Mahwah, NJ: Erlbaum.

Austin, J. L., Lee, M., & Carr, J. P. (2004). The effects of guided notes on undergraduate students' recording of lecture content. *Journal of Instructional Psychology, 31,* 314–320.

Ausubel, D. P. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology, 51,* 267–272.

Ausubel, D. P. (1968). *Educational psychology: A cognitive view.* New York: Holt, Rinehart and Winston.

Ausubel, D. P., Novak, J. D., & Hanesian, H. (1978). *Educational psychology: A cognitive view* (2nd ed.). New York: Holt, Rinehart, & Winston.

Ausubel, D., & Fitzgerald, D. (1962). Organizer, general background, and antecedent learning variables in sequential verbal learning. *Journal of Educational Psychology, 53,* 243–249.

Ausubel, D., & Youssef, M. (1963). Role of discriminability in meaningful parallel learning. *Journal of Educational Psychology, 54,* 331–336.

Aviram, A. (2000). From "computers in the classroom" to mindful radical adaptation by education systems to the emerging cyber culture. *Journal of Educational Change, 1*(4), 331–352.

Azevedo, R. (2007). Understanding the complex nature of self-regulatory processes in learning with computer-based learning environments: An introduction. *Metacognition and Learning, 2,* 57–65.

Baddeley, A. (2001). Is working memory still working? *American Psychologist, 56,* 851–864.

Bae, Y., Choy, S., Geddes, C., Sable, J., & Snyder, T. (2000). *Trends in educational equity of girls and women.* Washington, DC: National Center for Education Statistics.

Bahrick, H. P., & Phelps, E. (1987). Retention of Spanish vocabulary over eight years. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13,* 344–349.

Baker, E. L., O'Neil, H. F., Jr., & Linn, R. L. (1993). Policy and validity prospects for performance-based assessment. *American Psychologist, 48*(12), 1210–1218.

Baker, G. (1994). *Planning and organizing for multicultural instruction.* Menlo Park, CA: Addison-Wesley.

Baker, K. (1998). Structured English immersion: Breakthrough in teaching limited English. *Phi Delta Kappan, 80*(3), 199–204.

Baker, L. (1989). Metacognition, comprehension monitoring, and the adult reader. *Educational Psychology Review, 1,* 338.

Baker, L. (2002). Metacognition in comprehension instruction. In C. Block & M. Pressley (Eds.), *Comprehension instruction: Research-based best practices* (pp. 77–95). New York: Guilford.

Baker, S., Gersten, R., Dimino, J. A., & Griffiths, R. (2005). The sustained use of research-based instructional practice: A case study of peer-assisted learning strategies in mathematics. *Remedial and Special Education, 25,* 5–24.

Baldwin, J. D., & Baldwin, J. I. (2001). *Behavior principles in everyday life* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Baltes, P. B., & Staudinger, U. (2001). *Wisdom: The orchestration of mind and virtue.* Boston: Blackwell.

Bandalos, D. L. (2004). Can a teacher-led state assessment system work? *Educational Measurement: Issues and Practice, 23*(2), 33–40.

Bandalos, D. L., Yates, K., & Thorndike-Christ, T. (1995). Effects of math self-concept, perceived self-efficacy, and attributions for failure and success on test anxiety. *Journal of Educational Psychology, 87,* 611–623.

Bandura, A. (1965). Influence of models' reinforcement contingencies on the acquisition of imitative responses. *Journal of Personality and Social Psychology, 1,* 589–595.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117–148.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science, 9*, 75–78.

Bandura, A. (2000). Social-cognitive theory. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 7, pp. 329–332). Washington, DC: American Psychological Association.

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*, 164–180.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41*, 586–598.

Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology, 66,* 3–11.

Bangert-Drowns, R. L. (1993). The word processor as an instructional tool: A meta-analysis of word processing in writing instruction. *Review of Educational Research, 63*(1), 69–93.

Bangert-Drowns, R. L., Kulik, J. A., & Kulik, C.-L. C. (1991). Effects of frequent classroom testing. *Journal of Educational Research, 85*(2), 89–99.

Bangert-Drowns, R. L., Kulik, J. A., & Kulik, C-L. C. (1985). Effectiveness of computer-based education in secondary schools. *Journal of Computer-Based Instruction, 12*(3), 59–68.

Banks, J. A. (1991). Multicultural literacy and curriculum reform. *Educational Horizons, 69,* 135–140.

Banks, J. A. (2006). *Cultural diversity and education* (5th ed.). Boston: Allyn & Bacon.

Banks, J. A., & Banks, C. A. M. (Eds.). (2004). *Handbook of research on multicultural education* (2nd ed.). New York: Macmillan.

Banks, J. A., & Banks, C. A. M. (Eds.). (2007). *Multicultural education: Issues and perspectives* (6th ed.). Hoboken, NJ: Wiley.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462–479.

Barker, M. (1995). A plant is an animal standing on its head. *Journal of Biological Education, 29*(3), 203–208.

Barnett, S. M., & Ceci, S. J. (2002). When and where do we apply what we learn? A taxonomy for far transfer. *Psychological Bulletin, 128*(4), 612–637.

Barnett, W. S. (1998). Long-term cognitive and academic effects of early childhood education on children in poverty. *Preventative Medicine, 27*, 204–207.

Barr, R. D., & Parrett, W. H. (2001). *Hope fulfilled for at-risk and violent youth* (2nd ed.). Boston: Allyn & Bacon

Barrish, M. M., Saunders, M., & Wolf, M. M. (1969). Good behavior game: Effects of individual contingencies for group consequences on disruptive behavior in the classroom. *Journal of Applied Behavior Analysis, 2*, 119–124.

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality and Social Psychology, 80,* 706–722.

Barrows, H. S., & Kelson, A. C. (1995). *Problem-based learning in secondary education and the problem-based learning institute* (Monograph 1). Springfield, IL: Problem-Based Learning Institute.

Barsalou, L. W. (2000). Concepts: An overview. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 2, pp. 242–248). New York: Oxford University Press.

Barth, R. (1979). Home-based reinforcement of school behavior: A review and analysis. *Review of Educational Research, 49*, 436–458.

Barth, R. (2002). The culture builder. *Educational Leadership, 59*(8), 6–12.

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology.* New York: Macmillan.

Basso, K. (1972). To give up on words: Silence in western Apache culture. In P. Giglioli (Ed.), *Language and social context* (pp. 67–86). New York: Penguin.

Batshaw, M. L. (2003). *Children with disabilities* (5th ed.). Baltimore, MD: Brookes.

Battistich, V., Schaps, E., & Wilson, N. (2004). Effects of an elementary school intervention on students' "connectedness" to school and social adjustment during middle school. *Journal of Primary Prevention, 24*(3), 243–262.

Battistich, V., Solomon, D., Watson, M., & Schaps, E. (1997). Caring school communities. *Educational Psychologist, 32*, 137–151.

Bauer, J. J., & McAdams, D. P. (2000). Competence, relatedness, and autonomy in life stories. *Psychological Inquiry, 11*, 276–279.

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest, 4,* 1–44.

Baumeister, R. F., Smart, L., & Boden, J. M. (1996). Relation of threatened egotism to violence and aggression: The dark side of high self-esteem. *Psychological Review, 103*, 5–33.

Baumrind, D. (1989). Rearing competent children. In W. Damon (Ed.), *Child development today and tomorrow* (pp. 349–378). San Francisco: Jossey-Bass.

Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *Journal of Early Adolescence, 11*(1), 56–95.

Beal, C. R., Walles, R., Arroyo, I., & Woolf, B. P. (2007). On-line tutoring for math achievement testing: A controlled evaluation. *Journal of Interactive Online Learning, 6,* 43–55.

Bear, G. (2005). *Developing self-discipline and preventing and correcting misbehavior.* Boston, University of Delaware: Pearson Education.

Becker, B. E., & Luthar, S. S. (2002). Social-emotional factors affecting achievement outcomes among disadvantaged students: Closing the achievement gap. *Educational Psychologist, 37*(4), 197–214.

Becker, H. J. (2000). Who's wired and who's not: Children's access to and use of computer technology. *Children and Computer Technology, 10*(2), 44–75.

Becker, W. C., Englemann, S., & Thomas, D. R. (1975). *Teaching 1: Classroom management.* Chicago: Science Research Associates.

Bednarz, S. W. (1995). Using mnemonics to learn place geography. *Journal of Geography, 94*, 330–338.

Begg, I., Anas, A., & Farinacci, S. (1992). Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth. *Journal of Experimental Psychology: General, 121,* 446–458.

Beghetto, R. A., & Kaufman, J. C. (2007). The genesis of creative greatness: Mini-c and the expert-performance approach. *High Ability Studies, 18,* 59–61.

Behrmann, M. (2000). The mind's eye mapped onto the brain's matter. *Current Directions in Psychological Science, 9,* 50–54.

Belanoff, P., & Dickson, M. (1991). *Portfolios: Process and product.* Portsmouth, NH: Heinemann, Boynton/Cook.

Belcher, D. C., & Hatley, R. V. (1994). A dropout prediction model that highlights middle level variables. *Research in Middle Level Education, 18*(1), 67–78.

Belfiore, P. J., & Hornyak, R. S. (1998). Operant theory and self-monitoring in adolescents. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 184–202). New York: Guilford.

Bell, J. H., & Bromnick, R. D. (2003). The social reality of the imaginary audience: A grounded theory approach. *Adolescence, 38*, 205–220.

Belson, S. I. (2003). *Technology for exceptional learners*. Boston: Houghton Mifflin.

Bembenutty, H. (2007). Self-regulation of learning and academic delay of gratification: Gender and ethnic differences among college students. *Journal of Advanced Academics, 18*, 586–616.

Benard, B. (1991, September). Prevention should emphasize protective factors. *Western Center News, 4*, 1–4.

Benard, B. (2004). *Resiliency: What have we learned?* San Francisco, CA: WestEd.

Bender, W. N., & Larkin, M. J. (2003). *Reading strategies for elementary students with learning difficulties*. Thousand Oaks, CA: Corwin.

Benjamin, A. (2005). *Differentiated instruction using technology: A guide for middle and high-school teachers*. Larchmont, NY: Eye on Education.

Bennet, W. (1993). *The book of virtues*. New York: Simon & Schuster.

Bennett, C. I. (1999). *Comprehensive multicultural education: Theory and practice* (4th ed.). Boston: Allyn & Bacon.

Bennett, C. I. (2007). *Comprehensive multicultural education* (6th ed.). Boston: Allyn & Bacon.

Bennett, G. K., Seashore, H. G., & Wesman, A. G. (1984). *Differential aptitude tests: Technical Supplement*. San Antonio, TX: Psychological Corporation.

Benoit, D. A., Edwards, R. P., Olmi, D. J., Wilczynski, S. M., & Mandal, R. M. (2001). Generalization of a positive treatment package for child noncompliance. *Child and Family Behavior Therapy, 23*, 19–32.

Ben-Shakhar, G., & Sinai, Y. (1991). Gender differences in multiple-choice tests: The role of differential guessing tendencies. *Journal of Educational Measurement, 28*, 23–35.

Bereiter, C. (1995). A dispositional view of transfer. In A. McKeough, J. Lupart, & A. Marini (Eds.), *Teaching for transfer: Fostering generalization in learning* (pp. 21–34). Mahwah, NJ: Erlbaum.

Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature and implications of expertise*. Chicago: Open Court.

Bereiter, C., & Scardamalia, M. (2006). Education for the knowledge age: Design-centered models of teaching and instruction. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed. pp. 695–713). Mahwah, NJ: Erlbaum.

Berg, B. L. (2007). *Qualitative methods for the social sciences* (6th ed.). Boston: Allyn & Bacon.

Bergan, J. R., & Caldwell, T. (1995). Operant techniques in school psychology. *Journal of Educational and Psychological Consultation, 6*, 103–110.

Bergin, D. A., Ford, M. E., & Hess, R. D. (1993). Patterns of motivation and social behavior associated with microcomputer use of young children. *Journal of Educational Psychology, 85*, 437–445.

Berk, L. E. (1985). Research in review: Why children talk to themselves. *Young Children, 40*, 46–52.

Berk, L. E. (1986). Relationship of elementary school children's private speech to behavioral accompaniment to task performance. *Developmental Psychology, 20*, 671–680.

Berk, L. E. (2002). *Infants, children, and adolescents* (4th ed.). Boston: Allyn & Bacon.

Berk, L. E. (2006). *Child development* (7th ed.). Boston: Allyn & Bacon

Berk, L. E., & Garvin, R. A. (1984). Development of private speech among low-income Appalachian children. *Developmental Psychology, 20*, 271–286.

Berko Gleason, J. (2005). *The development of language* (6th ed.). Boston: Allyn & Bacon.

Berliner, D. C. (1986). In pursuit of the expert pedagogue. *Educational Researcher, 15*(7), 5–13.

Berliner, D. C. (1994). Expertise: The wonder of exemplary performances. In J. Mangieri and C. C. Block (Eds.), *Creating powerful thinking in teachers and students: Diverse perspectives* (pp. 161–186). Fort Worth, TX: Harcourt Brace College.

Berliner, D. C. (2000). A personal response to those who bash education. *Journal of Teacher Education, 51*, 358–371.

Berliner, D. C. (2001). Learning about learning from expert teachers. *International Journal of Educational Research, 35*(5), 463–483.

Berliner, D. C., & Biddle, B. (1997). *The manufactured crisis*. White Plains, NY: Longman.

Berndt, T. (1999). Friends' influence on students' adjustment to school. *Educational Psychologist, 34*, 15–28.

Berndt, T. J. (1986). Children's comments about their friendships. In M. Perlmutter (Ed.), *Cognitive perspectives on children's social and behavioral development: The Minnesota symposia on child psychology* (Vol. 18, pp. 189–212).

Berndt, T. J. (1996). Friendship quality affects adolescents' self-esteem and social behavior. In W. M. Bukowski, A. F. Newcomb, & W. W. Hartup (Eds.), *The company they keep: Friendship during childhood and adolescence* (pp. 346–365). New York: Cambridge University Press.

Berndt, T. J., Hawkins, J. A., & Jiao, Z. (1999). Influences of friends and friendships on adjustment to junior high school. *Merrill Palmer Quarterly, 45*, 13–41.

Berndt, T. J., Laychak, A. E., & Park, K. (1990). Friends' influence on adolescents' academic achievement motivation: An experimental study. *Journal of Educational Psychology, 82*, 664–670.

Berninger, V. W., Stage, S. A., Smith, D. R., & Hildebrand, D. (2001). Assessment for reading and writing intervention. In J. J. W. Andrews, D. H. Saklofske, & D. Hildebrand (Eds.), *Handbook of psychoeducational assessment*. (pp. 195–223) San Diego: Academic Press.

Berscheid, E., & Reis, H. T. (1998). Attraction and close relationships. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 193–281) (4th ed.). New York: McGraw-Hill.

Berson, M. J., Cruz, B. C., Duplass, J. A., & Johnston, J. H. (2007). *Social studies on the Internet* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Berzonsky, M. D., & Kuk, L. S. (2000). Identity status, identity processing style, and the transition to university. *Journal of Adolescent Research, 15*, 81–98.

Betrancourt, H., & Lopez, S. R. (1993). The study of culture, ethnicity, and race in American psychology, *American psychologist, 48,* 629–637.

Betts, J., Zau, A., & Rice, L. (2003). *Determinants of student achievement: New evidence from San Diego*. Retrieved June 1, 2005, from http://www.ppic.org

Betz, C. (1994). Beyond time-out: Tips from a teacher. *Young Children, 49,* 10–14.

Bialystok, E. (1991). *Language processing in bilingual children.* New York: Cambridge University Press.

Bialystok, E. (1994). Representation and ways of knowing: Three issues in second language acquisition. In N. C. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 548–569). London: Academic Press.

Bialystok, E. (2001). *Bilingualism in development: Language, literacy, and cognition.* Cambridge, UK: Cambridge University Press.

Bidell, T. R., & Fisher, K. W. (1992). Beyond the stage debate: Action, structure, and variability in Piagetian theory and research. In R. J. Sternberg & C. A. Berg (Eds.), *Intellectual development* (pp. 100–140). Cambridge, UK: Cambridge University Press.

Biemiller, A., Shany, M., & Inglis, A., Meichenbaum, D. (1998). Factors influencing children's acquisition and demonstration of self regulation on academic tasks. In D. Schunk & B. Zimmerman (Eds.), *Developing self regulated learners* (pp. 203–224). New York: Guilford Press.

Bierman, K. (2004). *Peer rejection: Developmental processes and intervention strategies.* New York: Guilford.

Bigelow, B. (1999). Why standardized tests threaten multiculturalism. *Educational Leadership, 56,* 37–40.

Biggs, J. (2001). Enhancing learning. A matter of style or approach? In R. J. Sternberg & L. F. Zhang (Eds.), *Perspectives on cognitive, learning, and thinking styles* (pp. 7–102) Mahwah, NJ: Erlbaum.

Birch, H. G., & Rabinowitz, H. S. (1951). The negative effect of previous experience on productive thinking. *Journal of Experimental Psychology, 41,* 121–125.

Birch, S. A. J. (2005). When knowledge is a curse. *Current Directions in Psychological Science, 14,* 25–29.

Birenbaum, M., & Feldman, R. (1998) Relationships between learning patterns and attitudes towards two assessment formats. *Educational Research, 40*(1), 90–98.

Bishop, J., Bishop, M., Gelbwasser, L., Green, S., & Zuckerman, A. (2003). Nerds and freaks: A theory of student culture and norms. In Diane Ravitch (ed.), *Brookings papers on education policy* (pp. 347–414). Washington, DC: Brookings Institution.

Bitter, G. G., & Legacy, J. M. (2006). *Using technology in the classroom* (brief version). Boston: Allyn & Bacon.

Bivens, J. A., & Berk, L. E. (1990). A longitudinal study of elementary school children's private speech. *Merrill-Palmer Quarterly, 6,* 443–463.

Bjork, R. A., & Richardson-Klavhen, A. (1989). On the puzzling relationship between environmental context and human memory. In C. Izana (Ed.), *Current issues in cognitive processes: The Tulane Floweree Symposium on Cognition* (pp. 313–344). Hillsdale, NJ: Erlbaum.

Bjorklund, D. F. (2000). *Children's thinking* (3rd ed.). Belmont, CA: Wadsworth.

Black, M. M., & Krishnakumar, A. (1998). Children in low-income, urban settings. Interventions to promote mental health and well-being. *American Psychologist, 53*(6), 635–646.

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2004). Working inside the black box: Assessment for learning in the classroom. *Phi Delta Kappan, 86*(1), 9–21.

Black, R. S., & Howard-Jones, A. (2000). Reflections on best and worst teachers: An experiential perspective of teaching. *Journal of Research and Development in Education, 34*(1), 1–12.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57,* 111–127.

Blair, C., Gamson, D., Thorne, S., & Baker, D. (2005). Rising mean IQ: Cognitive demand of mathematics education for young children, population exposure to formal schooling, and the neurobiology of the prefrontal cortex. *Intelligence, 33,* 93–106.

Blair, J. (2000). AFT urges new tests, expanded training for teachers. *Education Week, 19*(32), 11.

Blaisdell, M. (2006). In iPod we trust. *T.H.E. Journal, 33*(8), 30–36.

Blanchard, F. A., Lilly, T., & Vaughn, L. A. (1991). Reducing the expression of racial prejudice. *Psychological Science, 2,* 101–105.

Bless, H. (2000). The interplay of affect and cognition: The mediating role of general knowledge structures. In J. P. Forgas (Ed.), *Feeling and thinking: Affective influences on social cognition* (pp. 201–222). New York: Cambridge University Press.

Block, K. K., & Peskowitz, N. B. (1990). Metacognition in spelling: Using writing and reading to self-check spelling. *Elementary School Journal, 91,* 151–164.

Blok, H., Oostdam, R., Otter, M., & Overmaat, M. (2002). Computer-assisted instruction in support of beginning reading instruction: A review. *Review of Educational Research, 72*(1), 101–130.

Bloom, B. (1998). Language acquisition in its developmental context. In W. Damon (Ed.), *Handbook of child psychology* (pp. 309–370) (5th ed., Vol. 2). New York: Wiley.

Bloom, B. S. (1985). *Developing talent in young people.* New York: Ballantine Books.

Bloom, B. S., & Broder, L. J. (1950). *Problem-solving processes of college students.* Chicago: University of Chicago Press.

Bloom, B. S., Engelhart, M. D., Frost, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives. Handbook I: Cognitive domain.* New York: McKay.

Bloom, B. S., Hastings, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning.* New York: McGraw-Hill.

Bloomquist, M. L., & Schnell, S. V. (2002). *Helping children with aggression and conduct problems: Best practices for intervention.* New York: Guilford.

Blumenfeld, P. C., Kempler, T. M., & Krajcik, J. S. (2006). Motivation and cognitive engagement in learning environments. In R. K. Sawyer (Ed.), *Cambridge handbook of learning sciences* (pp. 475–488). New York: Cambridge University Press.

Blumenfeld, P. C., Marx, R., & Harris, C. J. (2006). Learning environments. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed. pp. 297–341). New York: Wiley.

Blumenfeld, P. C., Puro, P., & Mergendoller, J. R. (1992). Translating motivation into thoughtfulness. In H. Marshall (Ed.), *Redefining student learning: Roots of educational change* (pp. 207–239). Norwood, NJ: Ablex.

Bodrova, E., & Leong, D. J. (2007). *Tools of the mind* (2nd ed.). Geneva: International Bureau of Education, UNESCO.

Boekaerts, M. (2006). Self-regulation and effort investment. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed.). New York: Wiley.

Boekaerts, M., Pintrich, P. R., & Zeidner, M. (Eds.). (2000). *Handbook of self-regulation.* San Diego: Academic Press.

Boggs, S., Shore, M., & Shore, J. (2004). Using e-learning platforms for mastery learning in developmental mathematics courses. *Mathematics and Computer Education, 38*(2), 213–221.

Bohn, C. M., Roehrig, A. D., & Pressley, M. (2004). The first days of school in the classrooms of two more effective and four less effective primary-grades teachers. *Elementary School Journal, 104*(4), 269–288.

Bol, L., Stephenson, P., O'Connell, A., & Nunnery, J. (1998). Influence of experience, grade level, and subject area on teachers' assessment practices. *Journal of Educational Research, 91*(8), 323–330.

Bolin, F. S. (1990). Helping student teachers think about teaching. *Journal of Teacher Education, 41*(1), 10–19.

Bonds, M., & Stoker, S. (2000). *Bully-proofing your school: A comprehensive guide for middle schools.* Longmont, CO: Sopris West.

Bonk, C. J., & Cunningham, D. J. (1998). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 25–50). Mahwah, NJ: Erlbaum.

Bonk, C. J., & Reynolds, T. H. (1992). Early adolescent composing within a generative-evaluative computerized prompting framework. *Computers in Human Behavior, 8*(1), 39–62.

Boom, J., Brugman, D., & van der Heijden, P. G. M. (2001). Hierarchical structure of moral stages assessed by a sorting task. *Child Development, 72*, 535–548.

Borba, J. A., & Olvera, C. M. (2001). Student-led parent teacher conferences. *The Clearing House, 74*, 333–336.

Borfeld, H., & Whitehurst, G. H. (2001). Sensitive periods in first language acquisition. In D. B. Bailey, Jr., J. T. Bruer, F. J. Symons, & J. W. Lichtman (Eds.), *Critical thinking and critical periods* (pp. 173–192). Baltimore: Brookes.

Borja, R. (2003). Prepping for the big test. *Education Week, 22*(35), 23–26.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal, 26*(4), 473–498.

Borko, H., & Putnam, R. T. (1996). Learning to teach. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology.* New York. Macmillan, pp. 673–705.

Borko, H., & Shavelson, R. J. (1990). Teachers' decision making. In B. Jones & L. Idols (Eds.), *Dimensions of thinking and cognitive instruction.* Hillsdale, NJ: Erlbaum, pp. 311–345.

Borkowski, J. G., Weyhing, R. S., & Carr, M. (1988). Effects of attributional retraining on strategy-based reading comprehension in learning-disabled students. *Journal of Educational Psychology, 80*, 46–53.

Borland, J. H. (Ed.). (2003). *Rethinking gifted education.* New York: Teachers College Press.

Borman, G. D., & Hewes, G. M. (2003). The long-term effects and cost-effectiveness of success for all. *Educational Evaluation and Policy Analysis, 24*, 243–266.

Borman, G. D., & Overman, L. T. (2004). Academic resilience in mathematics among poor and minority students. *Elementary School Journal, 104*(3), 177–195.

Bornas, X., & Servera, M. (1992). Cognitive training programs to reduce impulsivity-related achievement problems: The need of in-classroom interventions. *Learning and Instruction, 2*(2), 89–100.

Bornstein, M. H., Cote, L. R., Maital, S., Painter, K., Sung-Yun, P., Pascual, L., Pecheux, M. G., Ruel, J., Venuti, P., & Vyt, A. (2004). Cross-linguistic analysis of vocabulary in young children: Spanish, Dutch, French, Hebrew, Italian, Korean, and American English. *Child Development, 75*, 1115–1140.

Bouchard, T. J., & McGue, M. (1981).Familial studies of intelligence: A review. *Science, 212*, 1055–1059.

Boud, D. (2001). Using journal writing to enhance reflective practice. *New Directions for Adult and Continuing Education, 90*, 9–17.

Bourne, E. J. (1995). *The anxiety and phobia workbook.* Oakland, CA: New Harbinger.

Bourne, L. E. (1982). Typicality effects in logically defined categories. *Memory & Cognition, 10*, 3–9.

Bouwmeester, S., Vermunt, J. K., & Sijtsma, K. (2006). Development and individual differences in transitive reasoning: A fuzzy trace theory approach. *Developmental Review, 27*, 41–74.

Bower, G. H., Clark, M. C., Lesgold, A. M., & Winzenz, D. (1969). Hierarchical retrieval schemes in recall of categorized word lists. *Journal of Verbal Learning and Verbal Behavior, 8*, 323–343.

Bowey, J. (1986). Syntactic awareness and verbal performance from preschool to fifth grade. *Journal of Psycholinguistic Research, 15*, 285–308.

Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory.* London: Routledge.

Bozzone, M. (1995). Which is best: Bilingual or English-only? *Instructor, 104*(6), 15.

Braaksma, M. A. H., Rijlaarsdam, G., & van den Bergh, H. (2002). Observational learning and the effects of model-observer similarity. *Journal of Educational Psychology, 94*, 405–415.

Braaksma, M., Rijlaarsdam, G., van den Bergh, H., & van Hout-Walters, B. (2004). Observational learning and its effects on the orchestration of writing processes. *Cognition & Instruction, 22*(1), 1–36.

Bracey, G. (2005). A nation of cheats. *Phi Delta Kappan, 86*(5), 412–413.

Bracey, G. W. (1994). Reward and punishment. *Phi Delta Kappan, 75*, 494–497.

Bracken, B. A., & Walker, K. C. (1997). The utility of intelligence tests for preschool children. In D. P. Flanagan, J. L. Genshaft, & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 484–502). New York: Guilford.

Braine M. D. S., & O'Brien, P. P. (1998). *Mental logic.* Mahwah, NJ: Erlbaum.

Brannon, L. (2002). *Gender: Psychological perspectives* (3rd ed.). Boston: Allyn & Bacon.

Bransford, J. D. (1979). *Human cognition: Learning, understanding, and remembering.* Belmont, CA: Wadsworth.

Bransford, J. D., & Johnson, M. K. (1972). Contextual prerequisites for understanding: Some investigations of comprehension and recall. *Journal of Verbal Learning and Verbal Behavior, 11*, 717–726.

Bransford, J. D., & Stein, B. S. (1984). *The IDEAL problem solver.* New York: Freeman.

Bransford, J. D., & Stein, B. S. (1993). *The IDEAL problem solver: A guide for improving thinking, learning and creativity* (2nd ed.). New York: Freeman.

Bransford, J. D., Brown, A. L., & Cocking, R. (2000). *How people learn.* Washington, DC: National Academy Press.

Bransford, J., Darling-Hammond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 1–39). San Francisco: Jossey-Bass/Wiley.

Braun, H., & Mislevy, R. (2005). Intuitive test theory. *Phi Delta Kappan, 86*(7), 489–497.

Brennan, R., Kim, J., Wenz-Gross, M., & Siperstein, G. (2001). The relative equitability of high-stakes testing versus teacher-assigned grades: An analysis of the Massachusettes Comprehensive Assessment System. *Harvard Educational Review, 71*(2), 173–212.

Brennan, S. W., Thames, W., & Roberts, R. (1999). Mentoring with a mission. *Educational Leadership, 57*(3), 49–52.

Bridgeman, B. (1974). Effects of test store feedback on immediate subsequent test performance. *Journal of Educational Psychology, 66,* 62–66.

Brigham, F. J., & Brigham, M. M. (1998). Using mnemonic keywords in general music classes: Music history meets cognitive psychology. *Journal of Research and Development in Education, 31*, 205–213.

Brill, J. M., Galloway, C., & Kim, B. (2001). *Cognitive apprenticeship as an instructional model.* Retrieved September 2, 2008, from http://projects.coe.uga.edu/epltt/index.php?title=Cognitive_Apprenticeship

British Columbia Trustee Schools Association. (2008). *Cautions and limitations of international assessments.* Retrieved March 11, 2009, from http://www.bcsta.org/keyworkHome/referenceMaterials/achievement_assessment/international/limitations_international

Brock, B., & Grady, M. (1998). Beginning teacher induction programs: The role of the principal. *The Clearing House, 71*(3), 179–183.

Broden, M., Hall, R. V., & Mitts, B. (1971). The effect of self-recording on the classroom behavior of two eighth-grade students. *Journal of Applied Behavior Analysis, 4*, 191–199.

Broderick, P. C., & Blewitt, P. (2006). *The life span: Human development for helping professionals* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Brodkin, A., & Coleman, M. (1995, January/February). Children of divorce. *Instructor, 32,* 30.

Brody, N. (2007). Does education influence intelligence? In P. C. Kyllonen, R. D. Roberts, & L. Stankov (Eds.), *Extending intelligence: Enhancement and new constructs.* Mahwah, NJ: Erlbaum, pp. 71–78.

Bronfenbrenner, U. (1986). Alienation and the four worlds of childhood. *Phi Delta Kappan, 67*, 430–436.

Bronfenbrenner, U., McClelland, P., Wethington, E., & Moen, P. (1996). *The state of Americans: This generation and the next.* New York: Free Press.

Bronson, M. B. (2000). *Self-regulation in early childhood: Nature and nurture.* New York: Guilford.

Bronstein, W. P. (2006). The family environment: Where gender socialization begins. In J. Worell & C. D. Goodheart (Eds.), *Handbook of girls' and women's psychological health.* New York: Oxford University Press, pp. 262–271.

Brookhart, S. M. (2001). Successful students' formative and summative use of assessment information. *Assessment in Education, 8*, 5–14.

Brookhart, S. M. (2004). Classroom assessment: Tensions and intersections in theory and practice. *Teachers College Record, 106*(3), 429–458.

Brookover, W., & Erickson, E. (1969). *Society and schools and learning.* Boston: Allyn & Bacon.

Brophy, J. (1981). On praising effectively. *Elementary School Journal, 81*, 269–278.

Brophy, J. (1996). *Teaching problem students.* New York: Guilford.

Brophy, J. (2004). *Motivating students to learn* (2nd ed.). Mahwah, NJ: Erlbaum.

Brophy, J. E., & Alleman, J. (1992). Planning and managing learning activities: Basic principles. In J. Brophy (Ed.), *Advances in research on teaching: Vol. 3. Planning and managing learning tasks and activities* (pp. 1–45). Greenwich, CT: JAI Press.

Brophy, J. E., & Evertson, C. (1978). Context variables in teaching. *Educational Psychologist, 12*, 310–316.

Brophy, J. E., & Evertson, C. M. (1976). *Learning from teaching: A developmental perspective.* Boston: Allyn & Bacon.

Brophy, J. E., & McCaslin, N. (1992). Teachers' reports of how they perceive and cope with problem students. *Elementary School Journal, 93*, 3–68.

Brown, A. (1994). The advancement of learning. *Educational Researcher, 23*, 4–12.

Brown, A. C. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences, 2,* 141–178.

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 65–116). Mahwah, NJ: Erlbaum.

Brown, A. L. (1990). Domain-specific principles affect learning and transfer in children. *Cognitive Science, 14,* 107–133.

Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilley (Ed.), *Classrooms lessons: Integrating cognitive theory and classroom practice* (pp. 229–272). Cambridge, MA: MIT Press.

Brown, A. S. (1991). A review of the tip-of-the-tongue experience. *Psychological Bulletin, 109*, 204–223.

Brown, A. S., Schilling, H. E. H., & Hockensmith, M. L. (1999). The negative suggestion effect: Pondering incorrect alternatives may be hazardous to your knowledge. *Journal of Educational Psychology, 91,* 756–764.

Brown, B. B. (1990). Peer groups. In S. Feldman & G. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 171–196). Cambridge, MA: Harvard University Press.

Brown, I., & Inouye, D. K. (1978). Learned helplessness through modeling: The role of perceived similarity in competence. *Journal of Personality and Social Psychology, 36,* 900–908.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18,* 32–42.

Brown, K., Anfara, V., & Roney, K. (2004). Student achievement in high performing, suburban middle schools and low performing, urban middle schools: Plausible explanations for the differences. *Education and Urban Society, 36*(4), 428–456.

Brown, M. R. (2007). Educating all students: Creating culturally responsive teachers, classrooms, and schools. *Intervention in School and Clinic, 43,* 57–62.

Brown, M. R., Higgins, K., & Paulsen, K. (2003). Adolescent alienation: What is it and what can educators do about it? *Intervention in School & Clinic, 39*, 3–9.

Brown, R. D., & Bjorklund, D. F. (1998). The biologizing of cognition, development, and education: Approach with cautious enthusiasm. *Educational Psychology Review, 10*, 355–373.

Brown, R., Reynolds, C. R., & Whitaker, J. S. (1999). Bias in mental health testing. *School Psychology Quarterly, 14,* 208–238.

Brown, S. L., Shriberg , D., & Wang, A. (2007). Diversity research literature on the rise? A review of school psychology journals from 2000 to 2003. *Psychology in the Schools, 44*(6), 639–650.

Brown, W. H., Fox, J. J., & Brady, M. P. (1987). Effects of spatial density on 3- and 4-year-old children's socially directed behavior during freeplay: An investigation of a setting factor. *Education and Treatment of Children, 10*, 547–258.

Bruer, F. J. Symons, & J. W. Lichtman (Eds.), *Critical thinking about critical periods* (pp. 233–266). Baltimore: Brookes.

Bruer, J. T. (1997). Education and the brain: A bridge too far. *Educational Researcher, 26*(8), 4–16.

Bruer, J. T. (1999a). In search of . . . brain-based education. *Phi Delta Kappan, 80*, 648–655.

Bruer, J. T. (1999b). *The myth of the first three years: A new understanding of early brain development and life-long learning.* New York: Free Press.

Bruer, J., & Greenough, W. T. (2001). The subtle science of how experience affects the brain. In D. B. Bailey, Jr., J. T. Bruer, F. J. Symons, & J. W. Lichtman (Eds.), *Critical thinking about critical periods* (pp. 209–232). Baltimore: Brookes.

Bruner, J. S. (1961). The art of discovery. *Harvard Educational Review, 31*(1), 21–32.

Bruner, J. S., Goodnow, J. J., & Austin, G. A. (1956). *A study of thinking.* New York: Wiley.

Brunetti, G. J. (2001). Why do they teach? A study of job satisfaction among long-term high school teachers. *Teacher Education Quarterly, 28*(2), 49–74.

Brunetti, G. J. (2006). Resilience under fire: Perspectives on the work of experienced, inner city high school teachers in the United States. *Teaching and Teacher Education, 22*, 812–825.

Bruning, R. H., Schraw, G. J., Norby, M. M., & Ronning, R. R. (2004). *Cognitive psychology and instruction.* Upper Saddle River, NJ: Prentice Hall.

Brush, C., & Jones, B. (2002). *Student voices: Why school works for alternative high school students.* Salem, OR: Oregon Department of Education.

Bryk, A. S., & Schneider, B. (2002). *Trust in schools: A core resource for improvement.* New York, NY: Russell Sage Foundation.

Bryk, A. S., Lee, V. E., & Smith, J. B. (1989). *High school organization and its effects on teachers and students.* Paper presented at the Choice and Control in American Education conference, University of Wisconsin, Madison.

Buchel, C., Coull, J. T., & Friston, K. J. (1999). The predictive value of changes in effective connectivity for human learning. *Science, 293*, 1538–1541.

Buckner, J. P., & Fivush, R. (1998). Gender and self in children's autobiographical narratives. *Applied Cognitive Psychology, 12*, 407–429.

Budrova, E., & Leong, D. J. (2007). *Tools of the mind: The Vygotskian approach to early childhood education* (2nd ed.). Upper Saddle River, NJ: Pearson Merrill/Prentice Hall.

Bugelski, B. R. & Alampay, D. A. (1961). The role of frequency in developing perceptual sets. *Canadian Journal of Psychology, 15*, 205–211.

Bugelski, B. R., Kidd, E., & Segmen, J. (1968). Image as a mediator in one-trial paired-associate learning. *Journal of Experimental Psychology, 76*, 69–73.

Bulgren, J., Deshler, D., Schumaker, J., & Lenz, B. K. (2000). The use and effectiveness of analogical instruction in diverse secondary content classrooms. *Journal of Educational Psychology, 92*, 426–441.

Bullough, R. (2001). *Uncertain lives: Children of promise, teachers of hope.* New York: Teachers College Press.

Burbules, N. C., & Callister, T. A., Jr. (2000). Universities in transition: The promise and the challenge of new technologies. *Teachers College Record, 102*, 273–295.

Burden, P. (2006). *Classroom management* (3rd ed.). Hoboken, NJ: Wiley.

Burke, S., McIntosh, J., & Gridley, H. (2007). *Parenting after separation.* Melbourne, Australia: Australian Psychological Society.

Burkham, D. T., Lee, V. E., & Smerdon, B. A. (1997). Gender and science learning early in high school: Subject matter and laboratory experiences. *American Educational Research Journal, 34*, 297–331.

Burnett, P. (1999). Children's self-talk and academic self-concepts: The impact of teachers' statements. *Educational Psychology in Practice, 15*, 195–200.

Burnett, P. (2003). The impact of teacher feedback on self-talk and self-concept in reading and mathematics. *Journal of Classroom Interaction, 38*, 11–16.

Burns, R. B. (1984). How time is used in elementary schools: The activity structure of classrooms. In L. W. Anderson (Ed.), *Time and school learning: Theory, research, and practice.* London: Croom Helm.

Burris, C. C., & Welner, K. G. (2005). Closing the achievement gap by detracking. *Phi Delta Kappan, 86*(8), 594–598.

Burstyn, J., & Stevens, R. (2001). Involving the whole school in violence prevention. In J. Burstyn, G. Bender, R. Casella, H. Gordon, D. Guerra, K. Luschen, R. Stevens, & K. Williams (Eds.), *Preventing violence in schools: A challenge to American democracy* (pp. 139–158). Mahwah, NJ: Erlbaum.

Butler, S. M., & McMunn, N. D. (2006). *A teacher's guide to classroom assessment.* San Francisco: Wiley.

Buxton, C. (1998). Improving the science education of English language learners: Capitalizing on educational reform. *Journal of Women and Minorities in Science and Engineering, 4*(4), 341–369.

Byrne, B. M. (1984). The general/academic self-concept nomological network: A review of construct validation research. *Review of Educational Research, 54*, 427–456.

Byrne, B. M. (1996). *Measuring self-concept across the life span: Issues and instrumentation.* Washington, DC: American Psychological Association.

Byrnes, J. P. (1988). Formal operations: A systematic reformulation. *Developmental Review, 8*, 66–87.

Byrnes, J. P. (2001). *Cognitive development and learning in instructional contexts* (2nd ed.). Boston: Allyn & Bacon.

Byrnes, J. P. (2005). The development of regulated decision making. In J. E. Jacobs & P. A. Klaczynski (Eds.), *The development of judgment and decision making in children and adolescents.* Mahwah, NJ: Erlbaum.

Byrnes, J. P., & Fox, N. A. (1998). The educational relevance of research in cognitive neuroscience. *Educational Psychology Review, 10*, 297–342.

Cadinu, M., Maass, A., Rosabianca, A., & Kiesner, J. (2005). Why do women underperform under stereotype threat? *Psychological Science, 16*, 572–578.

Calandra, B., & Barron A. E. (2005). A preliminary investigation of advance organizers for a complex educational website. *Journal of Educational Multimedia and Hypermedia, 14*(1), 5–23.

Calderón, M., & Minaya-Rowe, L. (2003). *Designing and implementing two-way bilingual programs.* Thousand Oaks, CA: Corwin.

Calfee, R., Dunlap, K., & Wat, A. (1994). Authentic discussion of texts in middle grade schooling: An analytic-narrative approach. *Journal of Reading, 37*, 546–556.

Cameron, J. (2001). Negative effects of reward on intrinsic motivation—A limited phenomenon: Comment on Deci, Koestner, & Ryan (2001). *Review of Educational Research, 71*(1), 29–42.

Cameron, J., & Pierce, W.D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research, 64*, 363–423.

Campbell, D. E. (1996). *Choosing democracy: A practical guide to multicultural education.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Campbell, J. (1999). *Student discipline and classroom management: Preventing and managing discipline problems in the classroom.* Springfield, IL: Thomas.

Campione, J. C. (1996). Assisted assessment: A taxonomy of approaches and an outline of strengths and weaknesses. In H. Daniels (Ed.), *An introduction to Vygotsky* (pp. 219–250). London: Routledge.

Campione, J. C., Brown, A. L., & Bryant, N. R. (1985). Individual differences in learning and memory. In R. J. Sternberg (Ed.), *Human abilities: An information-processing approach* (pp. 103–126). New York: Freeman.

Cangelosi, J. S. (2003). *Teaching mathematics in secondary and middle school: An interactive approach* (3rd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Cangelosi, J. S. (2004). *Classroom management strategies* (5th ed.). New York: Wiley.

Canter, L., & Canter, M. (1992). *Lee Canter's assertive discipline: Positive behavior management for today's classroom.* Santa Monica, CA: Lee Carter and Associates.

Cardelle-Eawar, M. (1990). Effects of feedback tailored to bilingual students' mathematics needs on verbal problem solving. *Elementary School Journal, 91*, 165–175.

Carey, S. (1985). *Conceptual change in childhood.* Cambridge, MA: MIT Press.

Carey, S. (1986). Cognitive science and science education. *American Psychologist, 41*, 1123–1130.

Carlson Jones, D. (2001). Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys. *Sex Roles, 45*, 645–664.

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development, 72*, 1032–1053.

Carmichael, H., & Caldwell, M. (1988). Evaluation. In R. McNergney (Ed.), *Guide to classroom teaching* (pp. 263–283). Needham Heights, MA: Allyn & Bacon.

Carnegie Council on Adolescent Development. (1995). *Great transitions.* New York: Carnegie Foundation.

Carney, R. H., & Levin, J. R. (2000). Mnemonic instruction, with a focus on transfer. *Journal of Educational Psychology, 92*, 783–790.

Carr, M., & Borkowski, J. G. (1989). Attributional training and the generalization of reading strategies with underachieving children. *Learning and Individual Differences, 1,* 327–341.

Carr, M., Borkowski, J., & Maxwell, S. (1991). Motivational components of underachievers. *Developmental Psychology, 27*, 108–118.

Carraher, T. N., Carraher, D. W., & Schlieman, A. D. (1985). Mathematics in the streets and in the schools. *British Journal of Developmental Psychology, 3*, 21–29.

Carrier, K. A., & Cohen, J. A. (2005). Hispanic individuals in their communities: An untapped resource for increasing the bilingual teacher population. *Journal of Hispanic Higher Education, 4*(1), 51–63.

Carroll, J. (1993). *Human cognitive abilities.* Cambridge, UK: Cambridge University Press.

Carter, S. (1994). *Interventions. Organizing systems to support competent social behavior in children and youth.* ERIC Document Services No.: ED380971.

Carter. K., Cushing, K., Sabers, D., Stein, P., & Berliner, D. (1988). Expert-novice differences in perceiving and processing visual classroom information. *Journal of Teacher Education, 39*(3), 25–31.

Casanova, U. (1987). Ethnic and cultural differences. In V. Richardson-Koehler (Ed.), *Educator's handbook: A research perspective* (pp. 379–393). White Plains, NY: Longman.

Case, J. M. (2008). Alienation and engagement: Development of an alternative theoretical framework for understanding student learning. *Higher Education: The International Journal of Higher Education and Educational Planning, 55*(3), 321–332.

Case, R. (1985). *Intellectual development: Birth to adulthood.* New York: Academic Press.

Case, R. (1992). *The mind's staircase: Exploring the conceptual underpinnings of children's thought and knowledge.* Mahwah, NJ: Erlbaum.

Case, R. (1998). The development of conceptual structures. In D. Kuhn & R. S. Siegler (Eds.), *Handbook of child psychology: Vol. 2: Cognition, perception, and language* (pp. 745–800). New York: Wiley.

Case, R. (1999). Cognitive development. In M. Bennett (Ed.), *Developmental psychology: Achievements and prospects* (pp. 36–54). Philadelphia: Psychology Press.

Case, R., & Griffin, S. (1990). Child cognitive development: The role of central conceptual structures in the development of scientific and social thought. In C. A. Hauert (Ed.), *Developmental psychology: Cognitive, perceptuo-motor and neuropsychological perspectives.* Amsterdam: North-Holland.

Cashin, W. E. (1979). *Motivating students: Idea paper No. 1.* Manhattan: Center for Faculty Evaluation and Development in Higher Education—Kansas State University.

Cassady, J. C., & Johnson, R. E. (2002). Cognitive anxiety and academic performance. *Contemporary Educational Psychology, 27*, 270–295.

Casteel, C. A. (1997). Attitudes of African American and Caucasian eighth grade students about praises, rewards, and punishments. *Elementary School Guidance and Counseling, 31*, 262–272.

Cattell, R. B. (1987). *Intelligence: Its structure, growth, and action.* Amsterdam: North-Holland.

Cauley, K., & Tyler, B. (1989). The relationship of self-concept to prosocial behavior in children. *Early Childhood Research Quarterly, 4*, 51–60.

Cazden, C. (1988). *Classroom discourse: The language of teaching and learning.* Portsmouth, NH: Heinemann.

Certo, J., Cauley, K. M., & Chafin, C. (2003). Students' perspectives on their high school experience. *Adolescence, 38*(152), 705–724.

Chamot, A. U., & O'Malley, J. M. (1996). The cognitive academic language learning approach: A model for linguistically diverse classrooms. *Elementary School Journal, 96*, 259–274.

Chance, P. (1992). The rewards of learning. *Phi Delta Kappan, 74*, 200–207.

Chance, P. (1993). Sticking up for rewards. *Phi Delta Kappan, 74,* 787–790.

Chang, L. (2003). Variable effects of children's aggression, social withdrawal, and prosocial leadership as functions of teacher beliefs and behaviors. *Child Development, 74*, 535–548.

Chang, S., & Chiu, M. (2005). The development of authentic assessments to investigate ninth graders' scientific literacy: In the case of scientific cognition concerning the concepts of chemistry and physics. *International Journal of Science and Mathematics Education, 3*(1), 117–140.

Chapman, J. W., & Boersma, F. J. (1991). Assessment of learning disabled students' academic self-concepts with the PASS: Findings from 15 years of research. *Developmental Disabilities Bulletin, 19*, 81–104.

Charity, A. H., Scarborough, H. S., & Griffin, D. M. (2004). Familiarity with school English in African American children and its relation to early reading achievement. *Child Development, 75*, 1340–1356.

Charles, C. M. (2002). *Essential elements of effective discipline.* Boston: Allyn & Bacon.

Charles, C. M., & Senter, G. W. (2005). *Elementary classroom management* (4th ed.), Boston: Allyn & Bacon.

Chen, C. W. J. (2005). Pedagogical framework and students' perceptions in the creative process of multi-media composition: Visual stimulus and musical accent [online]. In D. Forrest (Ed.),*Celebration of voices: XV National Conference Proceedings* (pp. 55–62). Parkville, Victoria, Australia: Australian Society for Music Education.

Chen, X., & Li, B. (2000). Depressed mood in Chinese children: Development significance for social school adjustment. *International Journal of Behavioral Development, 24,* 472–479.

Cheng, L. R. (1987). *Assessing Asian language performance.* Rockville, MD: Aspen.

Chester, M. D., & Beaudin, B. Q. (1996). Efficacy beliefs of newly hired teachers in urban schools. *American Educational Research Journal, 33,* 233–257.

Cheung, K. C. (1995). On meaningful measurement: Issues of reliability and validity from a humanistic constructivist information-processing perspective. *Educational Research and Evaluation, 1*(1), 90–107.

Chi, M. T. H. (2000). Self-explaining: The dual process of generating inference and repairing mental models. In R. Glaser (Ed.), *Advances in instructional psychology: Educational design and cognitive science* (Vol. 5, pp. 161–238). Mahwah, NJ: Erlbaum.

Chi, M. T. H. (2005). Commonsense conceptions of emergent processes: Why some misconceptions are robust. *Journal of the Learning Sciences, 14*(2), 161–199.

Chi, M. T. H., de Leeuw, N., Chiu, M., & LaVancher, C. (1994). Eliciting self-explanations improves understanding. *Cognitive Science, 18,* 439–477.

Chia, J., & Duthie, B. (1993). Primary children and computer-based artwork: Their learning strategies and context. *Art Education, 46*(6), 23–41.

Chinn, C. A., & Brewer, W. F. (1993). The role of anomalous data in knowledge acquisition: A theoretical framework and implications for science instruction. *Review of Educational Research, 63,* 1–49.

Chinn, C. A., & Brewer, W. F. (1998). An empirical test of a taxonomy of responses to anomalous data in science. *Journal of Research in Science Teaching, 35,* 623–654.

Chinn, C. A., & Malhotra, B. A. (2002). Children's responses to anomalous scientific data: How is conceptual change impeded? *Journal of Educational Psychology, 94,* 327–343.

Chinn, C. A., Anderson, R. C., & Waggoner, M. A. (2001). Patterns of discourse in two kinds of literature discussion. *Reading Research Quarterly, 36,* 378–411.

Chira, S. (1993, June 23). What do teachers want most? Help from parents. *New York Times,* p. 7.

Chittooran, M. M. (2000). Conflict resolution and peer mediation: A guide for educators. In *Behavioral interventions: Creating a safe environment in our schools* (pp. 23–24). Bethesda, MD: National Association of School Psychologists.

Chiu, L. H., & Tulley, M. (1997). Student preferences of teacher discipline styles. *Journal of Instructional Psychology, 24,* 168–175.

Chomsky, N. (1957). *Syntactic structures.* The Hague, The Netherlands: Mouton.

Chomsky, N. (1959). A review of Skinner's verbal behavior. *Language, 35,* 25–58.

Chomsky, N. (1972). *Language and mind* (enlarged ed.). San Diego, CA: Harcourt Brace Jovanovich.

Christian, D. (1996). Language development in two-way immersion: Trends and prospects. In J. E. Alatis (Ed.), *Georgetown University roundtable on languages and linguistics* (pp. 30–42). Washington, DC: Georgetown University Press.

Church, M., Elliot, A., & Gable, S. (2001). Perceptions of classroom environment, achievement goals, and achievement outcomes. *Journal of Educational Psychology, 93,* 43–54.

Cizek, G. J. (2003). *Detecting and preventing classroom cheating: Promoting integrity in assessment.* Thousand Oaks, CA: Corwin.

Clark, B. (2002). *Growing up gifted: Developing the potential of children at home and at school* (6th ed). Upper Saddle River, NJ: Prentice Hall.

Clark, J.M., & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review, 3,* 149–210.

Clark, R. E. (2001). *Learning from media: Arguments, analysis and evidence.* Greenwich, CT: Information Age Publishers.

Clark, R. E., & Feldon, D. F. (2005). Five common but questionable principles of multimedia learning. In R. E. Mayer (Ed.). *Cambridge handbook of multimedia learning* (pp. 97–115). New York: Cambridge University Press.

Clees, T. J. (1995). Reflections on self-recording of students' daily schedules of teachers' expectancies: Perspectives on reactivity, stimulus control, and generalization. *Exceptionality, 5*(3), 183–187.

Clifford, M. (1990). Students need challenge, not easy success. *Educational Leadership, 48,* 22–26.

Clifford, M. M. (1991). Risk taking: Theoretical, empirical, and educational implications. *Educational Psychologist, 26,* 263–297.

Cochran, K. F., & Jones, L. L. (1998). The subject matter knowledge of preservice science teachers. In B. J. Fraser & K. G. Tobin (Eds.), *International handbook of science education* (Pt. II). Dordrecht, Netherlands: Kluwer, pp. 707–717.

Coffield, F. J., Moseley, D. V., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review.* London: Learning and Skills Research Centre/University of Newcastle upon Tyne.

Cognition and Technology Group at Vanderbilt (CTGV). (1996). Looking at technology in context: A framework for understanding technology and education research. In D. Berliner & R. Calfree (Eds.), *Handbook of educational psychology* (pp. 807–840). New York: Macmillan.

Cognition and Technology Group at Vanderbilt (CTGV). (2000). Adventures in anchored instruction: Lessons from beyond the ivory tower. In R. Glaser (Ed.), *Advances in instructional psychology: Vol. 5. Educational design and cognitive science* (pp. 35–99). Mahwah, NJ: Erlbaum.

Cognition and Technology Group at Vanderbilt. (1997). *The Jasper Project: Lessons in curriculum, instruction, assessment, and professional development.* Mahwah, NJ: Erlbaum.

Cohen, E. G. (1994). Restructuring the classroom: Conditions for productive small groups. *Review of Educational Research, 64,* 1–35.

Coie, J. D., & Dodge, K. A. (1998). Aggression and antisocial behavior. In W. Damon (Ed.), *Handbook of child psychology* (Vol. 3). New York: Wiley.

Colby, A., & Kohlberg, L. (1984). Invariant sequence and internal consistency in moral judgment stages. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Morality, moral behavior, and moral development* (pp. 41–51). New York: Wiley.

Cole, C. F., et al. (2003). The educational impact of Rechov Sumsum/Shara'a Simsim. A *Sesame Street* television series to promote respect and understanding among children living in Israel, the West Bank and Gaza. *International Journal of Behavioral Development, 27*(5), 409–422.

Cole, D. A., Martin, J. M., Peeke, L. A., Seroczynski, A. D., & Fier, J. (1999). Children's over- and underestimation of academic competence: A longitudinal study of gender differences, depression, and anxiety. *Child Development, 70,* 459–473.

Cole, D. A., Maxwell, S. E., Martin, J. M., Peeke, L. G., Seroczynski, A. D., Tram, J. M., Hoffman, K. B., Ruiz, M. D., Jacquez, F., & Maschman, T. (2001). The development of multiple domains of child and adolescent self-concept: A cohort sequential longitudinal design. *Child Development, 72,* 1723–1746.

Cole, M., & Cole, S. R. (2001). *The development of children* (4th ed.). New York: Worth.

Cole, M., Cole, S. R., & Lightfoot, C. (2005). *The development of children* (5th ed.). New York: Freeman.

Cole, N. S. (1990). Conceptions of educational achievement. *Educational Researcher, 19,* 2–7.

Coleman, L. J., & Cross, T. L. (2001). *Being gifted in school: An introduction to development, guidance, and teaching.* Waco, TX: Prufrock.

Coley, R. (2001). *Differences in the gender gap: Comparisons across racial/ethnic groups in the United States.* Princeton, NJ: Educational Testing Service.

Coll, C., Bearer, E., & Lerner, R. (2004). *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development.* Mahwah, NJ: Erlbaum.

Collie, R., & Hayne, H. (1999). Deferred imitation by 6- and 9-month-old infants: More evidence for declarative memory. *Developmental Psychobiology, 35,* 83–90.

Collier, V. P. (1992). The Canadian bilingual immersion debate: A synthesis of research findings. *Studies in Second Language Acquisition, 14,* 87–97.

Collins, A. (2006). Cognitive apprenticeship. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 47–60). Cambridge, UK: Cambridge University Press.

Collins, W. A., & Steinberg, L. (2006). Adolescent development in interpersonal context. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (pp. 1003–1067) (6th ed.). New York: Wiley.

Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist, 55,* 218–232.

Collinson, V. Killeavy, M. Stephenson, H. J. (1999). Exemplary teachers: Practicing an ethic of care in England, Ireland, and the United States. *Journal for a Just and Caring Education, 5*(4), 340–366.

Colwell, M. J., & Lindsey, E. W. (2005). Preschool children's pretend and physical play and sex of peer play partner. *Sex Roles, 52,* 497–509.

Combs, A. W. (1965). *The professional education of teachers.* Boston: Allyn & Bacon.

Comstock, G., & Scharrer, E. (2006). Media and popular culture. In I. E. Siegel and K. A. Renninger (Eds.), *Handbook of child psychology, Vol. 4: Child psychology in practice.* (pp. 817–863) (6th ed.). New York: Wiley.

Comstock, G., & Scharrer, E. (2006). Media and popular culture. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology: Volume 4. Child psychology in practice* (6th ed., pp. 817–863). New York: Wiley.

Comstock, G., & Scharrer, E. (2006). Media and popular culture. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed.). New York: Wiley.

Comstock, G., & Scharrer, E. (2007). *Media and the American child.* San Diego: Elsevier/Academic Press.

Condon, J., & Yousef, F. (1975). *An introduction to intercultural communication.* Indianapolis, IN: Bobbs-Merrill.

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy, and relatedness: A motivational analysis of self-system process. *The Minnesota Symposia on Child Development: Self Processes and Development, 23,* 43–77.

Connellan, J., Baron-Cohen, S., Wheelwright, S., Batki, A., & Ahluwalia, J. (2000). Sex differences in human neonatal social perception. *Infant Behavior & Development, 23,* 113–118.

Connolly, J. A., & Doyle, A. (1984). Relation of social fantasy play to social competence in preschoolers. *Developmental Psychology, 20,* 797–806.

Connor, D. E. (2002). *Aggression and antisocial behavior in children and adolescents: Research and treatment.* New York: Guilford.

Conrad, N. K., Gong, Y., Sipp, L., & Wright, L. (2004). Using text talk as a gateway to culturally responsive teaching. *Early Childhood Education Journal, 31*(3), 187–192.

Cook, B. (2001). A comparison of teachers' attitudes toward their included students with mild and severe disabilities. *Journal of Special Education, 34,* 203–213.

Cook, G. (1994). Repetition and learning by heart: An aspect of intimate discourse, and its implications. *ELT Journal, 48,* 133–141.

Coolahan, K., Fantuzzo, J., Mendez, J., & McDermott, P. (2000). Preschool peer interactions and readiness to learn: Relationship between classroom peer play and learning behaviors and conduct. *Journal of Educational Psychology, 92,* 458–465.

Cooper, H., Lindsay, J., Nye, B., & Greathouse, S. (1998). Relationships among attitudes about homework, amount of homework assigned and completed, and student achievement. *Journal of Educational Psychology, 90*(1), 70–83.

Cooper, J. E., Horn, S., & Strahan, D. B. (2005). "If only they would do their homework": Promoting self-regulation in high school English classes. *High School Journal, 88,* 10–25.

Cooper, P. M. (2002). Does race matter? A comparison of effective black and white teachers of African American students. In J. J. Irvine (Ed.), *In search of wholeness: African American teachers and their culturally specific classroom practice* (pp. 47–66). New York: Palgrave.

Copeland, W. D., Birmingham, C., de la Cruz, E., & Lewin, B. (1993). The reflective practitioner in teaching: Toward a research agenda. *Teaching and Teacher Education, 9*(4), 347–359.

Corbett, A. T., Koedinger, K. R., & Hadley, W. H. (2001). Cognitive tutors: From the research classroom to all classrooms. In P. S. Goodman (Ed.), *Technology enhanced learning: Opportunities for change* (pp. 235–263). Mahwah, NJ: Erlbaum.

Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology, 88,* 715–730.

Cosden, M., Morrison, G., Albanese, A. L., & Macias, S. (2001). When homework is not home work: After-school programs for homework assistance. *Educational Psychologist, 36,* 211–221.

Cotton, K. (2000). *Research you can use to improve results.* Portland, OR: Northwest Regional Educational Laboratory, and Alexandria, VA: Association for Supervision and Curriculum Development.

Coughlin, E. C., & Lemke, C. (1999). *Milken professional competency continuum: Professional skills for the digital age classroom.* Santa Monica, CA: Milken Exchange on Education Technology.

Covington, M. (2000). Intrinsic versus extrinsic motivation in schools: Reconciliation. *Current Directions in Psychological Science, 9,* 22–25.

Covington, M. (2002). Rewards and intrinsic motivation: A needs-based developmental perspective. In F. Pajares & T. Urdan (Eds.), *Academic motivation of adolescents* (pp. 169–192). Greenwich, CT: Information Age Publishing.

Covington, M. C., Crutchfield, R. S., Davies, L. B., & Olton, R. M. (1974). *The Productive Thinking program: A course in learning to think.* New York: Merrill/Macmillan.

Covington, M. V. (1987). Achievement motivation, self-attributions, and exceptionality. In J. D. Day & J. G. Borkowski (Eds.), *Intelligence and exceptionality* (pp. 173–213). Norwood, NJ: Ablex.

Covington, M. V. (1992). *Making the grade: A self-worth perspective on motivation and school reform.* Cambridge, UK: Cambridge University Press.

Covington, M. V., & Mueller, K. J. (2001). Intrinsic versus extrinsic motivation: An approach/avoidance formulation. *Educational Psychology Review, 13*, 157–176.

Covington, M. V., & Omelich, C. L. (1987). "I knew it cold before the exam": A test of the anxiety-blockage hypothesis. *Journal of Educational Psychology, 79*, 393–400.

Covington, M. V., Omelich, C. L., & Schwarzer, R. (1986). Anxiety, aspirations, and self-concept in the achievement process. A longitudinal model with latent variables. *Motivation and Emotion, 10*, 71–88.

Covino, E. A., & Iwanicki, E. F. (1996). Experienced teachers: Their constructs of effective teaching. *Journal of Personnel Evaluation in Education, 10*, 325–363.

Cowan, N. (1995). *Attention and memory: An integrated framework.* New York: Oxford University Press.

Cox, B. D. (1997). The rediscovery of the active learner in adaptive contexts: A developmental-historical analysis of transfer of training. *Educational Psychologist, 32*, 41–45.

Crago, M. B. (1988). *Cultural context in the communicative interaction of young Inuit children.* Unpublished doctoral dissertation, McGill University, Montreal.

Craig, D. (2003). Brain-compatible learning: Principles and applications in athletic training. *Journal of Athletic Training, 38*(4), 342–350.

Crawford, J. (1991). *Bilingual education: History, politics, theory and practice.* Los Angeles: Bilingual Educational Services.

Crawford, S. A. S., & Baine, D. (1992). Making learning memorable: Distributed practice and long-term retention by special needs students. *Canadian Journal of Special Education, 8*, 118–128.

Creswell, J. (2005). *Educational research* (2nd ed.). Boston: Pearson Education.

Cromer, R. F. (1993). Language growth with experience without feedback. In P. Bloom (Ed.), *Language acquisition: Core readings* (pp. 411–420). Cambridge, MA: MIT Press.

Crooks, T. J. (1988). The impact of classroom evaluation practices on students. *Review of Educational Research, 58*, 438–481.

Cross, S. E., & Markus, H. R. (1994). Self-schemas, possible selves, and competent performance. *Journal of Educational Psychology, 86*, 423–438.

Crowne, D. P., & Marlowe, D. (1964). *The approval motive: Studies in evaluative dependence.* New York: Wiley.

Cruz, B. C., & Duplass, J. A. (2007). *The elementary teacher's guide to the best Internet resources.* Upper Saddle River, NJ: Prentice Hall.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* New York: HarperCollins.

Csikszentmihalyi, M. (2003). *Good business: Flow, leadership and the making of meaning.* New York: Viking.

Cuban, L. (2001). *Oversold and underused: Reforming schools through technology, 1980–2000.* Cambridge, MA: Harvard University Press.

Cuevas, J. A. (1997). *Educating limited-English-proficient students: A review of the research on school programs and classroom practices.* San Francisco: WestEd.

Culbertson, J. L. (1998). Learning disabilities. In T. H. Ollendick & M. Hersen (Eds.), *Handbook of child psychopathology* (pp. 117–156). New York: Plenum.

Culpepper, S. (2007). The temperament trap: Recognizing and accommodating children's personalities. Retrieved November 6, 2007, from http://www.earlychildhoodnews.com/earlychildhood/article_view.aspx?ArticleID=241

Cummins, J. (1976). The influence of bilingualism on cognitive growth: A synthesis of research findings and explanatory hypothesis. *Working Papers on Bilingualism, 9*, 1–43.

Cummins, J. (1994). The acquisition of English as a second language. In K. Spangenberg-Urbschat & R. Prichard (Eds.), *Kids come in all languages: Reading instruction for ESL students* (pp. 36–62). Newark, DE: International Reading Association.

Cummins, J. (1996). *Negotiating identities: Education for empowerment in a diverse society.* Ontario, CA: California Association for Bilingual Education.

Cummins, J. (2000). *Language, power, and pedagogy: Bilingual children in the crossfire.* Clevedon, UK: Multilingual Matters.

Cummins, J. (2000). Putting language proficiency in its place: Responding to critiques of conversational/academic language distinction. In J. Cenoz & U. Jessner (Eds.), *English in Europe: The acquisition of a third language* (pp. 54–83). Clevedon, UK: Multilingual Matters.

Cunningham, C. E., & Cunningham, L. J. (1998). Student-mediated conflict resolution programs. In R. A. Barkley (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (2nd ed., pp. 491–509). New York: Guilford.

Cunningham, T. H., & Graham, C. R. (2000). Increasing native English vocabulary recognition through Spanish immersion: Cognate transfer from foreign to first language. *Journal of Educational Psychology, 92*, 37–49.

Curran, M. E. (2003). Linguistic diversity and classroom management. *Theory into Practice, 43*, 334–340.

Curry, C., Trew, K., Turner, T., & Hunter, J. (1994). The effect of life domains on girls' possible selves. *Adolescence, 29*, 133–150.

Curtiss, S. (1977). *Genie: A psycholinguistic study of a modern-day wild child.* New York: Academic Press.

Curwin, R. L., & Mendler, A. N. (1999). *Discipline with dignity.* Washington, DC: Association for Supervision and Curriculum Development.

Cushner, K. H. (2006). *Human diversity in action* (3rd ed.). New York: McGraw-Hill.

d'Ailly, H. (2003). Children's autonomy and perceived control in learning: A model of motivation and achievement in Taiwan. *Journal of Educational Psychology, 95*, 84–96.

d'Ailly, H. (2004). The role of choice in children's learning: A distinctive cultural and gender difference in efficacy, interest, and effort. *Canadian Journal of Behavioural Science, 36*, 17–29.

D'Amico, M., Baron, L. J., & Sissons, M. E. (1995). Gender differences in attributions about microcomputer learning in elementary school. *Sex Roles: A Journal of Research, 33*(5/6), 353–367.

D'Arcangelo, M. (2000). How does the brain develop? *Educational Leadership, 58*(3), 68–71.

Dahl, R. E. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. *Annals of the New York Academy of Sciences, 1021*, 1–22.

Damasio, A. (2000). *The feeling of what happens: Body and emotion in the making of consciousness.* New York: Harvest.

Damasio, A. (2003). *Looking for Spinoza: Joy, sorrow and the feeling brain.* New York: Harvest.

Damon, W. (1995). *Greater expectations.* New York: Free Press.

Daniels, H. (1996). Introduction: Psychology in a social world. In H. Daniels (Ed.), *An introduction to Vygotsky* (pp.1–27). London: Routledge.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*(1). Retrieved January 5, 2009, from http://epaa.asu.edu/epaa/v8n1/

Darling-Hammond, L. (2004). What happens to a dream deferred? In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (2nd ed., pp. 607–630). San Francisco: Jossey-Bass.

Darling-Hammond, L. (Ed.). (2000). *Studies of excellence in teacher education* (3 vol.). Washington, DC: American Association of Colleges for Teacher Education.

Darling-Hammond, L., & Baratz-Snowden, J. (Eds.). (2005). *A good teacher in every classroom: Preparing the highly qualified teachers our children deserve.* San Francisco: Jossey-Bass.

Darling-Hammond, L., & Bransford, J. (Eds.). (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do.* San Francisco: Jossey-Bass.

Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan, 76,* 597–604.

Davenport, S. V., Arnold, M., & Lassmann, M. (2004). The impact of cross-age tutoring on reading attitudes and reading achievement. *Reading Improvement, 41,* 3–12.

Davidson, G. C., & Neale, J. M. (2007). *Abnormal psychology* (10th ed.). New York: Wiley.

Davies, S., & Witte, R. (2000). Self-management and peer monitoring within a group contingency to decrease uncontrolled verbalization of children with attention deficit/hyperactivity disorder. *Psychology in the Schools, 37*(2), 135–147.

Davis, E. A., & Linn, M. C. (2000). Scaffolding students' knowledge integration: Prompts for reflection in KIE. *International Journal of Science Education*, 22(8), 819–837.

Davis, G. A., & Rimm, S. B. (2004). *Education of the gifted and talented* (6th ed.). Boston: Allyn & Bacon.

Davis, G. A., & Thomas, M. A. (1989). *Effective schools and effective teachers.* Needham Heights, MA: Allyn & Bacon.

Davis, H. A. (2003). Conceptualizing the role and influence of student-teacher relationships on children's social and cognitive development. *Educational Psychologist, 38*, 207–234.

Davis, P. J. (1999). Gender differences in autobiographical memory for childhood emotional experiences. *Journal of Personality and Social Psychology, 76*(3), 498–510.

Dawe, H. A. (1984). Teaching: A performing art. *Phi Delta Kappan, 65*(8), 548–552.

de Bono, E. (1973). *CoRT thinking materials.* London: Direct Education Services.

de Bruin, A. B. H., Rikers, R. M. J. P., & Schmidt, H. G. (2006). The effect of self-explanation and prediction on the development of principled understanding of chess in novices. *Contemporary Educational Psychology, 32,* 188–205.

De Corte, E., Greer, B., & Verschaffel, L. (1996). Mathematics teaching and learning. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 491–549). New York: Macmillan.

de Jong, T., & van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research, 68*(2), 179–201.

De Koning, B. B., Tabbers, H. K., Rikers, R. M. J. P., & Paas, F. (2007). Attention cueing as a means to enhance learning from an animation. *Applied Cognitive Psychology, 21*, 731–746.

De Lisi, R. & Golbeck, S. L. (1999). The implications of Piagetian theory for peer learning. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 3–37). Mahwah, NJ: Erlbaum.

deCharms, R. (1972). Personal causation training in the schools. *Journal of Applied Psychology, 2,* 95–113.

deCharms, R. (1984). Motivation enhancement in educational settings. In R. Ames & C. Ames (Eds.), *Research on motivation in education* (pp. 275–308) (Vol. 1). Orlando, FL: Academic Press.

Deci, E. L. (1992). The relation of interest to the motivation of behavior: A self-determination theory perspective. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 43–70). Mahwah, NJ: Erlbaum.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and control of behavior. *Journal of Personality and Social Psychology, 53,* 1024–1037.

Deci, E. L., & Ryan, R. M. (1992). The initiation and regulation of intrinsically motivated learning and achievement. In A. K. Boggiano & T. S. Pittman (Eds.), *Achievement and motivation: A social-developmental perspective* (pp. 9–36). Cambridge, England: Cambridge University Press.

Deci, E. L., & Ryan, R. M. (Eds.). (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

Deci, E. L., & Ryan, R. M. (Eds.). (2006). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*, 627–668.

Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic rewards and intrinsic motivation in education: Reconsidered once again. *Review of Educational Research, 71*(1), 1–27.

Deci, E. L., Schwartz, A. J., Sheinman, L., & Ryan, R. M. (1981). An instrument to assess adults' orientations toward control versus autonomy with children: Reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology, 73,* 642–650.

Deci, E. L., Spiegel, N. H., Ryan, R. M., Koestner, R., & Kauffman, M. (1982). Effects of performance standards on teaching styles: Behavior of controlling teachers. *Journal of Educational Psychology, 74,* 852–859.

Delclos, V. R., & Harrington, C. (1991). Effects of strategy monitoring and proactive instruction on children's problem-solving performance. *Journal of Educational Psychology, 83,* 35–42.

Delgado-Gaitan, C. (1994). Socializing young children in Mexican-American families: An intergenerational perspective. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural roots of minority child development.* Mahwah, NJ: Erlbaum, pp. 55–86.

Demmert, W. G., Jr. (2001). *Improving academic performance among Native American students: A review of the research literature.* Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools, Appalachian Educational Laboratory.

Demmert, W. G., Jr., & Towner, J. C. (2003). *A review of the research literature on the influences of culturally based education on the academic performance of Native American studies.* Portland, OR: Northwest Regional Educational Laboratory.

Dempster, F. N. (1989). Spacing effects and their implications for theory and practice. *Educational Psychology Review, 1*, 309–330.

Dempster, F. N. (1991). Synthesis of research on reviews and tests. *Educational Leadership, 48*(7), 71–76.

Dempster, F. N. (1993). Exposing our students to less should help them learn more. *Phi Delta Kappan, 74*, 432–437.

DeNavas-Walt, C., Proctor, B. D., & Smith, J. (2007). *Income, poverty, and health insurance coverage in the United States: 2006.* Washington, DC: U.S. Census Bureau. Retrieved on December 29, 2007, from http://www.census.gov/prod/2007pubs/p60-233.pdf

Dennis, T. A., Cole, P. M., Zahn-Waxler, C., & Mizuta, I. (2002). Self in context: Autonomy and relatedness in Japanese and U. S. mother-preschooler dyads. *Child Development, 73*, 1803–1817.

DePanfilis, D. (2006). *Child neglect: A guide for prevention, assessment, and intervention.* Washington, DC: U.S. Department of Health and Human Services, Administration on Children and Families, Administration for Children, Youth, and Families, Children's Bureau, Office on Child Abuse and Neglect.

DeRaad, B. (2005). The trait-coverage of emotional intelligence. *Personality & Individual Differences, 38*, 673–687.

DeRosier, M. E., & Marcus, S. R. (2005). Building friendships and combating bullying: Effectiveness of S. S. GRIN at one-year follow-up. *Journal of Clinical Child and Adolescent Psychology, 34,* 140–150.

Derry, S. J. (1996). Cognitive schema theory in the constructivist debate. *Educational Psychologist, 31*, 151–162.

Derry, S. J. (1996) Cognitive schema theory in the constructivist debate, *Educational Psychologist, 31*, 163–174.

Derry, S. J., Hmelo-Silver, C. E., Nagarajan, A., Chernobilsky, E., & Beitzel, B. (2006). Cognitive transfer revisited: Can we exploit new media to solve old problems on a large scale? *Journal of Educational Computing Research, 35*, 145–162.

Destrebecqz, A., & Peigneux, P. (2005). Methods for studying unconscious learning. *Progress in Brain Research, 150,* 69–80.

Detterman, D. K. (1993). The case for the prosecution: Transfer as an epiphenomenon. In D. K. Detterman & R. J. Sternberg (Eds.), *Transfer on trial: Intelligence, cognition, and instruction* (pp. 1–24). Norwood, NJ: Ablex.

Deutsch, D. (1987). Auditory pattern recognition. In K.R. Boff, L. Kaufman, & J.P. Thomas (Eds.), *Handbook of perception and human performance: Vol. 2. Information processing* (pp. 32–1 to 32–55). New York: Wiley.

DeVries, R. (1997). Piaget's social theory. *Educational Researcher, 26*(2), 4–18.

DeVries, R., & Zan, B. (1996). A constructivist perspective on the role of the sociomoral atmosphere in promoting children's development. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice* (pp. 92–102). New York: Teachers College Press.

Dewey, J. (1913). *Interest and effort in education.* Cambridge, MA: Riverside.

Dewey, J. D. (1910). *How we think.* Boston, MA: DC Heath.

Deyhle, D., & LeCompte, M. (1999). Cultural differences in child development: Navajo adolescents in middle schools. In R. H. Sheets & E. R. Hollins (Eds.), *Racial and ethnic identity in school practices: Aspects of human development* (pp. 123–139). Mahwah, NJ: Erlbaum.

Deyhle, D., & Margonis, F. (1995). Navajo mothers and daughters: Schools, jobs, and the family. *Anthropology and Education Quarterly, 26*, 135–167.

Diamond, J., & Gomez, K. (2004). African American parents' orientation toward schools: The implications of social class and school characteristics. *Education and Urban Society, 36*(4), 383–427.

Diaz, C. F., Pelletier, C. M., & Provenzo, E. F. (2006). *Touch the future . . . teach!* Boston: Allyn & Bacon.

Diaz, R. M., & Kingler, C. (1991). Toward an explanatory model of the interaction between bilingualism and cognitive development. In E. Bialystok (Ed.), *Language processing in bilingual children* (pp. 167–192). Cambridge, UK: Cambridge University Press.

Dickhäuser, O., & Stiensmeier-Pelster, J. (2002). Gender differences in computer work: Evidence for the model of achievement-related choices. *Contemporary Educational Psychology, 27*, 486–496.

Dien, T. (1998). Language and literacy in Vietnamese American communities. In B. Pérez (Ed.), *Sociocultural contexts of language and literacy* (pp. 123–162). Mahwah, NJ: Erlbaum.

Dien, T. (1998). Language and literacy in Vietnamese American communities. In B. Perez (Ed.), *Socio-cultural contexts of language and literacy.* Mahwah, NJ: Erlbaum.

Diller, J. V., & Moule, J. (2005). *Cultural competence: A primer for educators.* Belmont, CA: Thomas/Wadsworth.

DiMartino, J., Clarke, J., & Wolk, D. (Eds.). (2003). *Personalized learning: Preparing high school students to create their futures.* Lanham, MD: Scarecrow.

diSessa, A. (2000). *Changing minds: Computers, learning, and literacy.* Cambridge, MA: MIT Press.

Ditman, O. (2000, July/August). Online term-paper mills produce a new crop of cheaters. *Harvard Education Letter, 16,* 6–7.

Dobkin, B. A., & Pace, R. (2006). *Communication in a changing world.* New York: McGraw-Hill.

Dochy, F., & McDowell, L. (1997). Introduction: Assessment as a tool for learning. *Studies in Educational Evaluation, 23,* 279–298.

Dodds, R., & Mason, C. Y. (2005). Cell phones and PDAs hit K–6. *Education Digest: Essential Readings Condensed for Quick Review, 70*(8), 52–53.

Dodge, K. A., Coie, J. D., & Lynam, D. R. (2006). Aggression and antisocial behavior in youth. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed., pp. 45–84). New York: Wiley.

Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent–child interactions and early literacy development. *Topics in Early Childhood Special Education, 23*(3), 124–136.

Doherty, R. W., Hilberg, R. S., Pinal, A., & Tharp, R. G. (2003). Five standards and student achievement. *NABE Journal of Research and Practice, 1*(1), 1–24.

Doidge, N. (2007). *The brain that changes itself.* New York: Viking.

Dole, J., & Sinatra, G. (1998). Reconceptualizing change in the cognitive construction of knowledge. *Educational Psychologist, 33,* 109–128.

Dole, S. (2000). The implications of at risk and resilience literature for gifted students with learning disabilities. *Roeper Review, 23*, 91–96.

Doll, B., Zucker, S., & Brehm, K. (2004). *Resilient classrooms: Creating healthy environments for learning.* New York: Guilford.

Donaldson, M. (1978). *Children's minds.* New York: Norton.

Donovan, M. S., & Bransford, J. D. (Eds.). (2005). *How students learn: History, mathematics, and science in the classroom.* Washington, DC: National Academy Press.

Donovan, M. S., & Cross, C. T. (Eds.). (2002). *Minority students in special and gifted education.* Washington, DC: National Academy Press.

Douan, E., & Adelson, J. (1966). *The adolescent experience.* New York: Wiley.

Dovidio, J. F., & Gaertner, S. L. (1999). Reducing prejudice: Combating intergroup biases. *Current Directions in Psychological Science, 8*, 101–105.

Dowson, M., & McInerney, D. M. (2001). Psychological parameters of students' social and work avoidance goals: A qualitative investigation. *Journal of Educational Psychology, 93*, 35–42.

Doyle, A. (1982). Friends, acquaintances, and strangers: The influence of familiarity and ethnolinguistic backgrounds on social interaction. In K. Rubin & H. Ross (Eds.), *Peer relationships and social skills in childhood* (pp. 229–252). New York: Springer-Verlag.

Doyle, A., & Connolly, J. (1989). Negotiation and enactment in social pretend play: Relations to social acceptance and social cognition. *Early Childhood Research Quarterly, 4*, 289–302.

Doyle, M. (1997). Beyond life history as a student: Pre-service teachers' beliefs about teaching and learning. *College Student Journal, 31*, 519–532.

Doyle, W. (1986). Classroom organization and management. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 392–431) (3rd ed.). New York: Macmillan.

Doyle, W. (1990). Classroom management techniques. In O. C. Moles (Ed.), *Student discipline strategies: Research and practice.* (pp. 113–128) Albany: State University of New York Press.

Doyle, W. (2006). Ecological approaches to classroom management. In C. Evertson & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 97–126). Mahwah, NJ: Erlbaum.

Dreikurs, R. (1998). *Maintaining sanity in the classroom: Classroom management techniques* (2nd ed.). Bristol, PA: Hemisphere.

Dreikurs, R., Grunwald, B. B., & Pepper, F. C. (1982). *Maintaining sanity in the classroom: Classroom management techniques* (2nd ed.). New York: Harper & Row.

Drenth, P. J., Thierry, H., Willems, P. J., & de Wolff, C. J. (1984). *Handbook of work and organizational psychology.* Chichester, UK: Wiley.

Driessen, E., van der Vleuten, C., Schuwirth, L., van Tartwijk, J., & Vermunt, J. (2005). The use of qualitative research criteria for portfolio assessment as an alternative to reliability evaluation: A case study. *Medical Education, 39,* 214–220.

Driscoll, M. P. (1994). *Psychology of learning for instruction.* New York: Dutton.

du Boulay, B., & Luckin, R. (2001). Modelling human teaching tactics and strategies for tutoring systems. *International Journal of Artificial Intelligence in Education, 12*(3), 235–256.

Duchardt, B. A., Deshler, D. D., & Shumaker, J. B. (1995). A strategy intervention for enabling students with learning disabilities to identify and change their ineffective beliefs. *Learning Disability Quarterly, 18,* 186–201.

Duffy, G. (2002). The case for direct explanation of reading strategies. In M. Pressley & C. Block (Eds.), *Comprehension instruction: Research-based best practices* (pp. 28–41). New York: Guilford.

Dufrene, B. A., Noell, G. H., Gilbertson, D. N., & Duhon, G. J. (2005). Monitoring implementation of reciprocal peer tutoring: Identifying and intervening with students who do not maintain accurate implementation. *School Psychology Review, 34*, 74–86.

Duit, R. (1991). Students' conceptual frameworks: Consequences for learning science. In S. M. Glynn, R. H. Yeany, & B. K. Britton (Eds.), *The psychology of learning science* (pp. 65–85). Mahwah, NJ: Erlbaum.

Duncan, G., & Brooks-Gunn, J. (2000). Family poverty, welfare reform and child development. *Child Development, 71*(1), 188–196.

Duncan, T. K., Kemple, K. M., & Smith, T. M. (2000). Reinforcement in developmentally appropriate early childhood classrooms, *Childhood Education*, *76*, 194–203.

Duncker, K. (1945). On problem solving. *Psychological Monographs, 58* (5), Whole No. 270.

Dunlap, G., dePerczel, M., Clarke, S., Wilson, D., Wright, S., White, R., & Gomez, A. (1994). Choice making to promote adaptive behavior for students with emotional and behavioral challenges. *Journal of Applied Behavior Analysis, 27,* 505–518.

Dunlap, J. C. (2006). Using guided reflective journaling activities to capture students' changing perceptions. *TechTrends: Linking Research and Practice to Improve Learning, 50*(6), 20–26.

Dunn, K., & Dunn, R. (1987). Dispelling outmoded beliefs about student learning. *Educational Leadership, 44*(6), 55–62.

Dunn, L. M. (1968). Special education for the mentally retarded—Is it justified? *Exceptional Children, 35*, 5–22.

Dunn, N. A., & Baker, S. B. (2002). Readiness to serve students with disabilities: A survey of elementary school counselors. *Professional School Counselors, 5*, 277–284.

Dunning, D., Heath, C., & Suls, J. (2004). Flawed self-assessment: Implications for health, education, and the workplace. *Psychological Science in the Public Interest, 5*, 69–106.

DuPaul, G. J., Ervin, R. A., Hook, C. L., & McGoey, K. E. (1998). Peer tutoring for children with attention deficit hyperactivity disorder: Effects on classroom behavior and academic performance. *Journal of Applied Behavior Analysis, 31,* 579–592.

Dupper, D. R. (2003). *School social work: Skills & interventions for effective practice.* Hoboken, NJ: Wiley.

Durán, R. P. (1985). Influences on language skills on bilinguals' problem solving. In S. Chipman, J. Segal, & R. Glaser. (Eds.), *Thinking and learning skills: Research and open questions* (pp. 187–207). Hillsdale, NJ: Erlbaum.

Duran, B. J., & Weffer, R. E. (1992). Immigrants' aspirations, high school process, and academic outcomes. *American Educational Research Journal, 29*, 163–181.

Durrell, D., & Catterson, J. (1980). *Durrell analysis of reading difficulty* (3rd ed.). San Antonio, TX: Harcourt Brace Educational Measurement.

Duschl, R. A., Schweingruber, H. A., & Shouse, A. W. (Eds.). (2007). *Taking science to school: Learning and teaching science in grades K–8.* Committee on Science Learning, Kindergarten through Eighth Grade, Board on Science Education, National Research Council of the National Academies. Washington, DC: National Academies Press.

Dweck, C. (1975). The role of expectations and attributions in the alleviation of learned helplessness. *Journal of Personality and Social Psychology, 31*, 674–685.

Dweck, C. (2000). *Self theories: Their role in motivation, personality, and development.* Philadelphia: Routledge.

Dweck, C. S. (2007). The perils and promises of praise. *Educational Leadership, 65*(2), 34–39.

Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol 4. Socialization, personality, and social development* (4th ed., pp. 643–691). New York: Wiley.

Dwyer, K., Osher, D., & Warger, C. (1998). *Early warning, timely response: A guide to safe schools.* Washington, DC: U.S. Department of Education.

Dyson, A. H. (1997). *Writing superheroes: Contemporary childhood, popular culture, and classroom literacy*. New York: Teachers College Press.

Eamon, M. K. (2002). Effects of poverty on mathematics and reading achievements of young adolescents. *Journal of Early Adolescence, 22*, 49–74.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology* (Vol. 53). Palo Alto, CA: Annual Reviews.

Eccles, J. S., Jacobs, J., Harold, R., Yoon, K. S., Arbreton, A., & Freedman-Doan, C. (1993). Parents and gender-related socialization during the middle childhood and adolescent years. In S. Oskamp & M. Costanzo (Eds.), *Gender issues in contemporary society* (pp. 59–83). Newbury, Park, CA: Sage.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 1017–1095). New York: Wiley.

Eccles, J. S., Wigfield, A., Harold, R., & Blumenfeld, P. B. (1993). Age and gender differences in children' self- and task-perceptions during elementary school. *Child Development, 64*, 830–847.

Echevarria, J., Vogt, M., & Short, D. (2000). *Making content comprehensible for English language learners*. Boston: Allyn & Bacon.

Eckstrom, J., Goertz, M., Pollock, J., & Rock, D. (1986). Who drops out of high school and why? Findings from a national study. In G. Natriello (Ed.), *School dropouts: Patterns and policies* (pp. 52–69). New York: Teachers College Press.

Edelson, D. C. (2001). Learning-for-use: A framework for integrating content and process learning in the design of inquiry activities. *Journal of Research in Science Teaching, 38*, 355–385.

Edelson, D., Gordin, D., & Pea, R. (1999). Addressing the challenges of inquiry-based learning, technology and curriculum design. *Journal of the Learning Sciences, 8*, 391–450.

Education Commission of the States. (2000). *Technology: Equitable access in schools*. Denver, CO: Author.

Educational Testing Service. (1994). *Taking the SAT I reasoning test*. Princeton, NJ: College Board SAT Program.

Educational Testing Service. (1995). *Performance assessment: Different needs, difficult answers*. Princeton, NJ: Author.

Educational Testing Service. (2008). *The Praxis Series 2008-2009. Information Bulletin*. Retrieved January 23, 2009 from http://www.ets.org/Media/Tests/PRAXIS/pdf/01361.pdf

Edwards, V. (2003). Techs answer to testing. *Education Week, 22*(35), 8, 10.

Eggleton, T. (2001). Discipline in the schools. *ERIC Digest*, ED451554.

Eilam, B. (2001). Primary strategies for promoting homework performance. *American Educational Research Journal, 38*, 691–725.

Eisenberg, N., & Fabes, R. A. (1998). Prosocial development. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 701–778). New York: Wiley.

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). Prosocial development. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology Vol. 3, Social, emotional, and personality development (*pp. 646–718) (6th ed.). New York: Wiley.

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Murphy, B. C., Holgren, R., Maszk, P., & Losoya, S. (1997). The relations of regulation and emotionality to resiliency and competent social functioning in elementary school children. *Child Development, 68*, 295–311.

Eisenberg, N., Martin, C. L., & Fabes, R. A. (1996). Gender development and gender effects. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 358–396). New York: Macmillan.

Eisenberg, N., Spinrad, T. L., & Smith, C. L. (2004). Emotion-related regulation: Its conceptualization, relations to social functioning, and socialization. In P. Philippot & R. S. Feldman (Eds.), *The regulation of emotion* (pp. 277–306). Mahwah, NJ: Erlbaum.

Eisenberger, R., Pierce, W. D., & Cameron, J. (1999). Effects of reward on intrinsic motivation: Negative, neutral, and positive. *Psychological Bulletin, 125*, 677–691.

El Paso Independent School District. (1992). *Bilingual education evaluation*. El Paso, TX: Office for Research and Evaluation.

Elam, S. M., & Rose, L. C. (1995). The 27th annual Phi Delta Kappa/Gallup poll of the public's attitude toward the public schools. *Phi Delta Kappan, 77*, 41–59.

Elawar, M. C., & Corno, L. (1985). A factorial experiment in teachers' written feedback on student homework: Changing teacher behavior a little rather than a lot. *Journal of Educational Psychology, 77*, 162–173.

Elias, M. J., & Schwab, Y. (2006). From compliance to responsibility: Social and emotional learning and classroom management. In C. Evertson & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues*. (pp. 304–342). Mahwah, NJ: Erlbaum.

Elias, M. J., Gara, M. A., Schuyler, T. F., Branden-Muller, L. R., & Sayette, M. A. (1991). The promotion of social competence: Longitudinal study of a preventive school-based program. *American Journal of Orthopsychiatry, 61*, 409–417.

Elliot, A., & Thrash, T. (2001). Achievement goals and the hierarchical model of achievement motivation. *Educational Psychology Review, 13*, 139–156.

Elliott, J., & Thurlow, M. (2000). *Improving test performance of students with disabilities*. Thousand Oaks, CA: Corwin.

Elliott, S.N., & Busse, R.T. (1991). Social skills assessment and intervention with children and adolescents. *School Psychology International, 12*, 63–83.

Ellis, A. K. (2005). *Research on educational innovations* (4th ed.). Larchmont, NY: Eye on Education.

Ellis, E. S., & Friend, P. (1991). Adolescents with learning disabilities. In B. Y. L. Wong (Ed.), *Learning about learning disabilities* (pp. 505–561). San Diego, CA: Academic Press.

Ellis, E. S., & Friend, P. (1991). Adolescents with learning disabilities. In B. Y. L. Wong (Ed.). *Learning about learning disabilities* (pp. 505–561). San Diego: Academic Press.

eMINTS National Center. (2004). *Analysis of 2003 MAP results for eMINTS students*. Retrieved March 26, 2009, from http://www.emints.org/evaluation/reports/map2003.pdf

Emmer, E. (1988). Praise and the instructional process. *Journal of Classroom Interaction, 23*, 32–39.

Emmer, E. T. (1987). Classroom management and discipline. In V. Richardson-Koehler (Ed.), *Educators' handbook: A research perspective*. White Plains, NY: Longman.

Emmer, E. T., & Stough, L. M. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. *Educational Psychologist, 36*, 103–112.

Emmer, E. T., Evertson, C. M., & Worsham, M. E. (2006). *Classroom management for middle and high school teachers* (7th ed.). Boston: Allyn & Bacon.

Emmer, E. T., Evertson, C., & Anderson, L. (1980). Effective classroom management at the beginning of the school year. *Elementary School Journal, 80*(5), 219–231.

Emmer, E., Evertson, C., & Worsham, M. (2003). *Classroom management for secondary teachers* (6th ed.). Boston: Allyn & Bacon.

Ennis, R. H. (1987). A taxonomy of critical thinking dispositions and abilities. In J. Baron & R. Sternberg (Eds.), *Teaching thinking skills: Theory and practice* (pp. 9–26). New York: Freeman.

Ennis, R. H. (2000). Critical thinking. *Argumentation, 14*, 48–51.

Entwisle, D. R, Alexander, K., & Olson, L. (1997). *Children, schools, and inequality*. Boulder, CO: Westview.

Entwistle, N. J., & Tait, H. (1990) Approaches to learning, evaluations of teaching, and preferences for contrasting environments. *Higher Education, 19,* 169–194.

Epstein, J. L. (2001). *School, family, and community partnerships: Preparing educators and improving schools*. Boulder, CO: Westview.

Epstein, J. L. (2005). Results of the Partnership Schools-CSR model for student achievement over three years. *Elementary School Journal, 106*, 151–170.

Epstein, J. L., & Sanders, M. G. (2002). Family, schools, and community partnerships. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 5. practical issues in parenting* (2nd ed., pp. 407–483). Mahwah, NJ: Erlbaum.

Epstein, J. L., & Sheldon, S. B. (2006). Moving forward: Ideas for research on school, family, and community partnerships. In C. F. Conrad & R. Serlin (Eds.), *Sage handbook for research in education* (pp. 117–137). Thousand Oaks, CA: Sage.

Epstein, L., Plog, A., & Porter, W. (2002). Bully proofing your school: Results of a four-year intervention. *Report on Emotional and Behavioral Disorders in Youth*, 2(3), 55–56, 73–77.

Ercikan, K., & Koh, K. (2005). Examining the construct comparability of the English and French versions of TIMSS. *International Journal of Testing, 5*(1), 23–35.

Erez, M., & Zidon, I. (1984). Effects of goal acceptance on the relationship of goal difficulty to performance. *Journal of Applied Psychology, 69,* 69–78.

Ericsson, K. A., Charness, N., Feltovich, P. J., & Hoffman, R. R. (Eds.). (2006). *The Cambridge handbook of expertise and expert performance*. New York: Cambridge University Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363–406.

Erikson, E. H. (1963). *Childhood and society* (2nd ed.). New York: Norton.

Erikson, E. H. (1968). *Identity, youth, and crisis*. New York: Norton.

Erwin, P. (1993). *Friendship and peer relations in children*. Chichester, UK: Wiley.

Espelage, D. L., & Swearer, S. M. (2004). *Bullying in American schools: A social-ecological perspective on prevention and intervention*. Mahwah, NJ: Erlbaum.

Espelage, D. L., Holt, M. K., & Henkel, R. R. (2003). Examination of peer-group contextual effects on aggression during early adolescence. *Child Development, 74*, 205–220.

Estep, S. G., McInerney, W. D., Vockell, E., & Kosmoski, G. (1999–2000). An investigation of the relationship between integrated learning systems and academic achievement. *Journal of Educational Technology Systems, 28*(1), 5–19.

Everson, H., Smodlaka, I., & Tobias, S. (1994). Exploring the relationship of test anxiety and metacognition on reading test performance: A cognitive analysis. *Anxiety, Stress, and Coping, 7,* 85–96.

Everson, H., Tobias, S., Hartman, H., & Gourgey, A. (1993). Test anxiety and the curriculum: The subject matters. *Anxiety, Stress, and Coping, 6,* 1–8.

Evertson, C. M. (1982). Differences in instructional activities in higher- and lower-achieving junior high English and math classes. *Elementary School Journal, 82*, 329–350.

Evertson, C. M., & Harris, A. H. (1999). Support for managing learning-centered classrooms: The classroom organization and management program. In H. J. Freiberg (Ed.), *Beyond behaviorism: Changing the classroom management paradigm* (pp. 61–73). Boston: Allyn & Bacon.

Evertson, C. M., & Smithey, M. W. (2000). Mentoring effects on protégés' classroom practice: An experimental field study. *Journal of Educational Research*, 93(5), 294–304.

Evertson, C. M., & Weinstein, C. S. (2006). Classroom management as a field of inquiry. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 3–16). Mahwah, NJ: Erlbaum.

Evertson, C. M., Emmer, E. T., & Worsham, M. E. (2006). *Classroom management for elementary teachers* (7th ed.). Boston: Allyn & Bacon.

Evertson, C., Emmer, E., & Worsham, M. (2003). *Classroom management for elementary teachers* (6th ed.). Boston: Allyn & Bacon.

Exline, R. V. (1962). Need affiliation and initial communication behavior in problem solving groups characterized by low interpersonal visibility. *Psychological Reports, 10*, 405–411.

Eysenck, H. J. (1998). *Intelligence: A new look*. New Brunswick, NJ: Transaction.

Ezell, D., & Klein, C. (2003). Impact of portfolio assessment on locus of control of students with and without disabilities. *Education and Training in Developmental Disabilities, 38*(2), 220–228.

Facione, P. A., Facione, N. C., & Giancarlo, C. (2000). The disposition toward critical thinking: Its character, measurement, and relationship to critical thinking skills, *Journal of Informal Logic, 20*, 61–84.

Falk, J. H., & Dierking, L. D. (2000). *Learning from museums*. Walnut Creek, CA: AltaMira.

Fall, J. R., Webb, N. M., & Chudowsky, N. (2000). Group discussion and large-scale language arts assessment: Effects on students' comprehension. *American Educational Research Journal, 37,* 911–942.

Fantuzzo, J. W., King, J., & Heller, L. R. (1992). Effects of reciprocal peer tutoring on mathematics and school adjustment: A component analysis. *Journal of Educational Psychology, 84*, 331–339.

Farkas, G., & Beron, K. (2004). The detailed age trajectory of oral vocabulary knowledge: Differences by class and race. *Social Science Research, 33*, 464–497.

Farran, D. C. (2001). Critical periods and early intervention. In D. B. Bailey, Jr., J. T.

Feingold, A. (1992). Sex differences in variability in intellectual abilities: A new look at an old controversy. *Review of Educational Research, 62*(1), 61–84.

Fekkes, M., Pijpers, F. I. M., & Verloove-Vanhorick, S. P. (2005). Bullying: Who does what, when and where? Involvement of children, teachers and parents in bullying behavior. *Health Educational Research, 20*, 81–91.

Feldman, A., Alibrandi, M., & Kropkf, A. (1998). Grading with points: The determination of report card grades by high school science teachers. *School, Science, and Mathematics*. Retrieved September 30, 2008, from http://findarticles.com/p/articles/mi_qa3667/is_/ai_n8797491?tag=artBody;col1

Feldman, K. (1997). Identifying exemplary teachers and teaching: Evidence from student ratings. In R. Perry & J. Smart (Eds.), *Effective teaching in higher education: Research and practice* (pp. 368–395). Edison, NJ: Agathon.

Feldman, R. S. (2000). *Development across the life span* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Ferguson, R. (2003). Teachers' perceptions and expectations and the black-white test score gap. *Urban Education, 38*(4), 460–507.

Ferrari, M., & Elik, N. (2003). Influences on intentional conceptual change. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 21–54). Mahwah, NJ: Erlbaum.

Feuerstein, R. (1979). *The dynamic assessment of retarded performers: The Learning Potential Assessment Device, theory, instruments, and techniques.* Baltimore: University Park Press.

Feuerstein, R., Hoffman, M. B., Jensen, M. R., & Rand, Y. (1985). Instrumental enrichment, an intervention program for structural cognitive modifiability: Theory and practice. In J. W. Segal, S. F. Chipman, & R. Glaser (Eds.), *Thinking and learning skills* (Vol. 1, pp. 43–81). Hillsdale, NJ: Erlbaum.

Field, T. F., Woodson, R., Greenberg, R., & Cohen, D. (1982). Discrimination and imitation of facial expressions by neonates. *Science, 218,* 179–181.

Finders, M., & Lewis, C. (1994). Why some parents don't come to school. *Educational Leadership, 51*(8), 50–54.

Finn, J. D., Pannozzo, G. M., & Achilles, C. M. (2003). The "why's" of class size: Student behavior in small classes. *Review of Educational Research, 73*(3), 321–368.

Firmin, M., Hwang, C., Copella, M., & Clark, S. (2004). Learned helplessness: The effect of failure on test-taking. *Education, 124,* 688–693.

Fitzgerald, T. N., Duffy, A. J., Bell, R. L., Berman, L., Longo, W. E., & Roberts, K. E. (2008). Computer-based endoscopy simulation: Emerging roles in teaching and professional skills assessment. *Journal of Surgical Education, 65*(3), 229–235.

Fjellstrom, G. G., Born, D., & Baer, D. M. (1988). Some effects of telling preschool children to self-question in a matching task. *Journal of Experimental Child Psychology, 46*(3), 419–437.

Flavell, J. H., Friedrichs, A. G., & Hoyt, J. D. (1970). Developmental changes in memorization processes. *Cognitive Psychology, 1,* 324–340.

Flavell, J. H., Miller, P. H., & Miller, S. A. (2002). *Cognitive development* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Flavell, J., Miller, P., & Miller, S. (2002). *Cognitive development* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Fleming, V., & Alexander, J. (2001). The benefits of peer collaboration: A replication with a delayed posttest. *Contemporary Educational Psychology, 26,* 588–601.

Flinders, D. J. (1989). Does the "art of teaching" have a future? *Educational Leadership, 46*(8), 16–20.

Flores, B. B., Keehn, S., & Perez, B. (2002). Critical need for bilingual education teachers: The potentiality of normalistas and paraprofessionals. *Bilingual Research Journal, 26*(3), 501–504.

Flores, E., Cicchetti, D., & Rogosch, F. A. (2005). Predictors of resilience in maltreated and nonmaltreated Latino children. *Developmental Psychology, 41*(2), 338, 351.

Flynn, J. R. (1998). Israeli military IQ tests: Gender differences small; IQ gains large. *Journal of Biosocial Science, 30*(4), 541–553.

Foos, P. W., & Fisher, R. P. (1988). Using tests as learning opportunities. *Journal of Educational Psychology, 80,* 179–183.

Forcier R., & Descy, D. (2005). *The computer as an educational tool: Productivity and problem solving* (4th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Ford, M. E. (1996). Motivational opportunities and obstacles associated with social responsibility and caring behavior in school contexts. In J. Juvonen & K. R. Wentzel (Eds.), *Social motivation: Understanding children's school adjustment* (pp. 126–153). Cambridge, UK: Cambridge University Press.

Forness, S. R., & Kavale, K.A. (2000). What definitions of disabilities say and don't say: A critical analysis. *Journal of Learning Disabilities, 33,* 239–256.

Forsyth, D. R., & McMillan, J. H. (1991). Practical proposals for motivating students. In R. J. Menges & M. D. Svinicki (Eds.), *College teaching: From theory to practice* (pp. 53–65). San Francisco: Jossey-Bass.

Fosterling, E. (1985). Attributional retraining: A review. *Psychological Bulletin, 98,* 495–512.

Fox, N. A., Henderson, H. A., Rubin, K. H., Calkins, S. D., & Schmidt, L. A. (2001). Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysical and behavioral influences across the first four years of life. *Child Development, 72,* 1–21.

Frame, D. (2005). Maslow's hierarchy of needs revisited. *Interchange, 27,* 13–22.

Franzke, M., Kintsch, E., Caccamise, D., Johnson, N., & Dooley (2005). Summary street: Computer support for comprehension and writing. *Journal of Educational Computing Research, 33,* 53–80.

Frasier, M., & Passow, A. H. (1994). *Toward a new paradigm for identifying talent potential* (Research Monograph 94112). Storrs: National Research Center on the Gifted and Talented, University of Connecticut.

Frederikse, M., Lu, A., Aylward, E., Barta, P., Sharma, T., & Pearlson, G. (2000). Sex differences in inferior lobule volume in schizophrenia. *American Journal of Psychiatry, 157,* 422–427.

Frederiksen, N. (1984). The real test bias: Influences of testing on teaching and learning. *American Psychologist, 39,* 193–202.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56,* 218–226.

Freedman, J. S. (2002). *Easing the teasing.* Blacklick, OH: McGraw-Hill.

Freeman, E., & Hatch, J. (1989). What schools expect young children to know: An analysis of kindergarten report cards. *Elementary School Journal, 89,* 595–605.

Freeman, K. E., Gutman, L. M., & Midgley, C. (2002). Can achievement goal theory enhance our understanding of the motivation and performance of African American young adolescents? In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 175–204). Mahwah, NJ: Erlbaum.

Freiberg, H., Connell, M., & Lorentz, J. (2001). The effects of consistency management on student mathematics achievement in seven Chapter I elementary schools. *Journal of Education for Students Placed At Risk,* 6(3), 249–270.

Freiberg, J. (Ed.). (1999). *Beyond behaviorism: Changing the classroom management paradigm.* Boston: Allyn & Bacon.

Frey, K. S., Hirschstein, M. K., Snell, J. L., Van Schoiack Edstrom, L., MacKenzie, E. P., & Broderick, C. J. (2005). Reducing playground bullying and supporting beliefs: An experimental trial of the Steps to Respect program. *Developmental Psychology, 41,* 479–490.

Friedman, A., & Pines, A. (1991). Sex differences in gender-related childhood memories. *Sex Roles, 25,* 25–32.

Friedrich-Cofer, L., & Huston, A. C. (1986). Television violence and aggression: The debate continues. *Psychological Bulletin, 100*(3), 364–371.

Fromberg, D., & Driscoll, M. (1985). *The successful classroom.* New York: Teachers College Press.

Frost, J. L., Shin, D., & Jacobs, P. J. (1998). Physical environments and children's play. In O. N. Saracho & B. Spodek (Eds.), *Multiple perspectives on play in early childhood education*. Albany: State University of New York Press.

Fry, R. A. (2007). The changing racial and ethnic composition of U.S. public schools Washington, D.C.: Pew Hispanic Center. Retrieved January 23, 2009 from http://pewhispanic.org/reports/report.php?ReportID=79

Fu, J. (2007). Developing learner autonomy for oral language on the base of emergent metacognition. *US-China Education Review, 4*, 38–45.

Fuchs, D., Fuchs, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to diversity. *American Educational Research Journal, 34,* 174–206.

Fuchs, L. S., Fuchs, D., Prentice, K., Burch, M., Hamlett, C. L., Owen, R., et al. (2003). Explicitly teaching for transfer: Effects on third-grade students' mathematical problem solving. *Journal of Educational Psychology, 95*, 293–304.

Fuchs, T., & Woessmann, L. (2004). *Computers and student learning: Bivariate and multivariate evidence on the availability and use of computers at home and at school* (CESifo Working Paper 1321). Munich: CESifo. Retrieved November 14, 2008, from http://ideas.repec.org/p/ces/ceswps/_1321.html

Fujimura, N. (2001). Facilitating children's proportional reasoning: A model of reasoning processes and effects of intervention on strategy change. *Journal of Educational Psychology, 93*, 589–603.

Fuligni, A. J. (1998). The adjustment of children from immigrant families. *Current Directions in Psychological Science, 7*, 99–103.

Fuller, F. F. (1969). Concerns of teachers: A developmental conceptualization. *American Educational Research Journal, 6*(2), 207–226.

Fuller, M. L. (2001). Multicultural concerns and classroom management. In C. A. Grant & M. L. Gomez, *Campus and classroom: Making schooling multicultural (*2nd ed., pp. 109–134). Upper Saddle River, NJ: Merrill/Prentice Hall.

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*, 148–162.

Gabriele, A. J., & Montecinos, C. (2001). Collaborating with a skilled peer: The influence of achievement goals and perceptions of partners' competence on the participation and learning of low-achieving students. *Journal of Experimental Education, 69*, 152–178.

Gafni, N., & Melamed, E. (1994). *Differential tendencies to guess as a function of gender and lingual-cultural reference group* (Report No. 148). Jerusalem: National Institute for Testing and Evaluation.

Gagné, E., Yekovich, C., & Yekovish, F. (1993). *The cognitive psychology of school learning* (2nd ed.). New York: HarperCollins.

Gagné, R. M. (1965). *The conditions of learning*. New York: Holt.

Galambos, N. L., Barker, E. T., & Almeida, D. M. (2003). Parents *do* matter: Trajectories of change in externalizing and internalizing problems in early adolescence. *Child Development, 74*, 578–594.

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research* (8th ed.). Boston: Allyn & Bacon.

Gallagher, J. J. (2003). Issues and challenges in the education of gifted students. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 11–23). Boston: Allyn & Bacon.

Gallagher, K. C. (2002). Temperament and parenting style adjustment. *Developmental Review, 22*, 623–643.

Gallagher, L. A., Alvarez-Salvat, R., Silsbee, J., & Kenny, M. E. (2002). Sources of support and psychological distress among academically successful inner-city youth. *Adolescence, 37*, 161–182.

Gandal, M., & Vranek, J. (2001). Standards: Here today, here tomorrow. *Educational Leadership, 59*, 7–13.

Garcia, D. (2004). Exploring connections between the construct of teacher efficacy and family involvement practices: Implications for urban teacher preparation. *Urban Education, 39*, 290–315.

Garcia, E. E. (1992) "Hispanic" children: Theoretical, empirical, and related policy issues. *Educational Psychology Review, 4*, 69–94.

Garcia, E. E. (1994). *Understanding and meeting the challenge of student cultural diversity*. Boston: Houghton Mifflin.

Garcia, E. E. (1995). Educating Mexican American students: Past treatment and recent developments in theory, research, policy, and practice. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (pp. 372–387). New York: Macmillan.

Garcia, E. E. (1999). *Student cultural diversity: Understanding and meeting the challenges* (2nd ed.). Boston: Houghton Mifflin.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gardner, H. (1999). *Intelligence reframed*. New York: Basic Books.

Gardner, H. (2000). *The disciplined mind: Beyond facts and standardized tests, the K–12 education that every child deserves*. New York: Penguin.

Garland, V. (2006). Digital literacy and the use of wireless portable computers, planners, and cell phones for K–12 education. In L. Tan Wee Hin & R. Subramaniam (Eds.), *Handbook of research on literacy in technology at the K–12 level* (pp. 308–321). Hershey, PA: Idea Group Reference.

Garmezy, N. (1985). Stress resilient children: The search for protective factors. In J. E. Stevenson (Ed.), *Recent research in developmental psychopathology* (pp. 213–233), Oxford: Pergamon.

Garmston, R. J. (1998). Becoming expert teachers (part 1). *Journal of Staff Development, 19*(1), 1–16.

Garner, R., Gillingham, M., & White, C. (1989). Effects of "seductive details" on macroprocessing and microprocessing in adults and children. *Cognition and Instruction, 6*, 41–57.

Garnett, P. J., Garnett, P. J., & Hackling, M. W. (1995). Students' alternative conceptions in chemistry: A review of research and implications for teaching and learning. *Studies in Science Teaching, 25,* 69–95.

Garrahy, D. (2001). Three third-grade teachers' gender-related beliefs and behavior. *Elementary School Journal, 102,* 81–94.

Gathercole, S. E., Pickering, S. J., Ambridge, B., & Wearing, H. (2004). A structural analysis of working memory from 4 to 15 years of age. *Developmental Psychology, 40*, 177–190.

Gauvain, M. (2001). *The social context of cognitive development*. New York: Guilford.

Gavetti, G., & Rivkin, J. W. (2005). How strategists really think: Tapping the power of analogy. *Harvard Business Review, 83,* 54–63.

Gay, G. (1997). Educational equality for students of color. In J. A. Banks & C. A. McGee-Banks (Eds.), *Multicultural education*: *Issues and perspectives* (3rd ed.). Boston: Allyn & Bacon.

Gay, G. (2000). *Culturally responsive teaching: Theory, research, and practice*. New York: Teachers College Press.

Gay, G. (2002). Preparing for culturally responsive teaching. *Journal of Teacher Education, 53*(2), 106–116.

Gay, J., & Cole, M. (1967). *The new mathematics and an old culture*. New York: Holt, Rinehart & Winston.

Gay, L. R., & Airasian, P. (2000). *Educational research* (6th ed.). Upper Saddle River, NJ: Merrill.

Gazelle, H., & Ladd, G. W. (2003). Anxious solitude and peer exclusion: A diathesis-stress model of internalizing trajectories in childhood. *Child Development, 74,* 257–278.

Geiger, B. (1997). *A time to learn, a time to play: Premack's Principle applied in the classroom.* ERIC Document Service No. ED4055373.

Gelman, R. (1972). Logical capacity of very young children: Number invariance rules. *Child Development, 43*, 75–90.

Gelman, R., & Baillargeon, R. (1983). A review of some Piagetian concepts. In P. Mussen (Ed.), *Carmichael's manual of child psychology: Vol.3. Cognitive development* (E. Markman & J. Flavell, Vol. Eds., pp. 167–221). New York: Wiley.

Gelman, R., & Williams, E. M. (1998). Enabling constraints for cognitive development and learning. In W. Damon (Ed.), *Handbook of child psychology* (5th ed., Vol. 4). New York: Wiley.

Genesee, F., Holobow, N. E., Lambert, W. E., & Chartrand, L. (1989). Three elementary school alternatives for learning through a second language. *Modern Language Journal, 73,* 250–263.

Genesee, F., Lindholm-Leary, K., Saunders, W., & Christian, D. (2006). *Educating English language learners: A synthesis of research evidence.* New York: Cambridge University Press.

Georgiou, S. N. (1999). Achievement attributions of sixth grade children and their parents. *Educational Psychology, 19,* 399–412.

Germinario, V., Cervalli, J., & Ogden, E. H. (1992). *All children successful: Real answers for helping at-risk elementary students.* Lancaster, PA: Technomic.

Gershoff E. (2002) Corporal punishment by parents and associated child behaviors and experiences: A meta-analytic and theoretical review. *Psychological Bulletin, 128,* 539–579.

Gersten, R., & Woodward, J. (1995). A longitudinal study of transitional and immersion bilingual education programs in one district. *Elementary School Journal, 95*(3), 223–239.

Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology, 15*, 1–38.

Gick, M. L. (1986). Problem-solving strategies. *Educational Psychologist, 21*, 99–120.

Gigerenzer, G., & Selton, R. (Eds.). (2001). *Bounded rationality.* Cambridge, MA: MIT Press.

Gijbels, D., & Dochy, F. (2006). Students' assessment preferences and approaches to learning: Can formative assessment make a difference? *Educational Studies, 32,* 399–409.

Gijbels, D., van de Watering, G., Dochy, F. & van den Bossche, P. (2005). The relationship between students' approaches to learning and learning outcomes. *European Journal of Psychology of Education, 20*(4), 327–341.

Gilligan, C. F. (1987). Moral orientation and moral development. In E. F. Kittay & D. T. Meyers (Eds.), *Women and moral theory* (pp. 19–33). Totowa, NJ: Rowman & Littlefield.

Gilligan, C. F. (1993). *In a different voice.* Cambridge, MA: Cambridge University Press.

Gilliland, H. (1999). *Teaching the Native American.* Dubuque, IA: Kendall/Hunt.

Gilroy, M. (2004). Invasion of the classroom cell phones. *Education Digest: Essential Readings Condensed for Quick Review, 69*(6), 56–60.

Ginott, H. (1972). *Teacher and child.* New York: Macmillan.

Ginsberg, M. B., & Wlodkowski, R. J. (2000). *Creating highly motivating classrooms for all students: A schoolwide approach to powerful teaching with diverse learners.* San Francisco: Jossey-Bass.

Ginsburg, H. P., & Opper, S. (1988). *Piaget's theory of intellectual development* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Gipson, J. (1997, March/April). Girls and computer technology: Barrier or key? *Educational Technology*, pp. 41–43.

Girard, K., & Koch, S. J. (1996). *Conflict resolution in the schools: A manual for educators.* San Francisco: Jossey-Bass.

Glantz, M. D., Johnson, J., & Huffman, L. (Eds.). (2002). *Resilience and development: Positive life adaptations.* New York: Kluwer.

Glasser, W. (1990). *The quality school: Managing students without coercion.* New York: Perennial Library.

Glasser, W. (1998). *Building a quality school: A matter of responsibility.* Port Chester, NY: National Professional Resources.

Glassner, A., Weinstock, M., & Newman, Y. (2005). Pupils' evaluation and generation of evidence and explanation in argumentation. *British Journal of Educational Psychology, 75,* 105–118.

Glenn, A. (2002). *A perspective on the renewal of teacher education.* Naperville, IL: North Central Regional Educational Laboratory.

Glick, J. (1975). Cognitive development in cross-cultural perspective. In F. Horowitz (Ed.), *Review of child development research* (Vol. 4, pp. 595–694). Chicago: University of Chicago Press.

Glickman, C. D., Gordon, S. P., & Ross-Gordon, J. M. (1998). *Supervision of instruction: A developmental approach* (4th ed.). Boston: Allyn & Bacon.

Glover, J. A. (1989). The "testing" phenomenon: Not gone but nearly forgotten. *Journal of Educational Psychology, 81*, 392–399.

Glover, J. A., Harvey, A. L., & Corkill, A. J. (1988). Remembering written instructions: Tab A goes into slot C, or does it? *British Journal of Educational Psychology, 58*, 191–200.

Glover, J. A., Timme, V., Deyloff, D., Rogers, M., & Dinnel, D. (1987). Oral directions: Remembering what to do when. *Journal of Educational Research, 81*, 33–53.

Glucksberg, S., & Krauss, R. M. (1967). What do people say after they have learned to talk? Studies of the development of referential communication. *Merrill-Palmer Quarterly, 13*, 309–316.

Goddard, R. D., Hoy, W. K., & Woolfolk Hoy, A. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American Educational Research Journal, 37*, 479–507.

Goldberg, A., Russell, M., & Cook, A. (2003). The effect of computers on student writing: A meta-analysis of studies from 1992 to 2002. *Journal of Technology, Learning, and Assessment 2*(1), 1–51.

Goldenberg, C. (1996). The education of language-minority students: Where are we, and where do we need to go? *Elementary School Journal, 96*, 353–361.

Goldenberg, C., Gallimore, R., Reese, L, & Garnier, H. (2001). Cause or effect? A longitudinal study of immigrant Latino parents' aspirations and expectations, and their children's school performance. *American Educational Research Journal, 38*, 547–582.

Goldhaber, D. D., & Brewer, D. J. (1998). When should we reward degrees for teachers? *Phi Delta Kappan, 80*(2), 134, 136–138.

Goldhaber, D. D., & Brewer, D. J. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis, 22*(2), 129–145.

Goldman, S. R., Duschl, R. A., Ellenbogen, K., William, S. M., & Tzou, C. (2002). Science inquiry in a digital age: Possibilities for making thinking visible. In H. van Oostendorp (Ed.), *Cognition in a digital age.* (pp. 253–283) Mahwah, NJ: Erlbaum.

Goldman, S. R., Petrosino, A., Sherwood, R. D., Garrison, S., Hickey, D., Bransford, J. D., & Pellegrino, J. (1996). Anchoring science instruction in multimedia learning environments. In S. Vosniadou, E. De Corte, R. Glaser, & H. Mandl (Eds.), *International perspectives on the design of technology-supported learning environments.* Hillsdale, NJ: Erlbaum.

Goleman, D. (1995). *Emotional intelligence.* New York: Bantam.

Gollnick, D. M., & Chinn, P. C. (2002). *Multicultural education in a pluralistic society* (6th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Gonzáles, P., Guzman, J. C., Partelow, L., Pahlke, E., Jocelyn, L., Kastberg, D., & Williams, T. (2004). *Highlights from the Trends in International Mathematics and Science Study (TIMSS) 2003.* Washington, DC: U.S. Government Printing Office.

Good, T. (1987). Two decades of research on teacher expectations: Findings and future directions. *Journal of Teacher Education, 37,* 32–47.

Good, T., & Brophy, J. (2000) *Looking in classrooms* (8th ed.). New York: Longman.

Good, T., & Brophy, J. (2003). *Looking in classrooms* (pp. 257–284) (9th ed.). Boston: Allyn & Bacon.

Good, T., & Nichols, S. (2001). Expectancy effects in the classroom: A special focus on improving the reading performance of minority students in first grade classrooms. *Educational Psychologist, 36*, 113–126.

Good, T., Grouws, D., & Ebmeier, G, (1983). *Active mathematics teaching.* New York: Longman.

Goodenow, C. (1993). Classroom belonging among early adolescent students: Relationships to motivation and achievement. *Journal of Early Adolescence, 13*, 21–43.

Goodman, C. S., & Tessier-Lavigne, M. (1997). Molecular mechanisms of axon guidance and target recognition. In W. M. Cowan, T. M. Jessell, & S. L. Zipursky (Eds.), *Molecular and cellular approaches to neural development* (pp. 108–137). New York: Oxford University Press.

Goos, M. (2004). Learning mathematics in a classroom community of inquiry. *Journal for Research in Mathematics Education, 35*(4), 258–291.

Gootman, M. E. (1998). Effective in-house suspension. *Educational Leadership, 56*, 39–41.

Gopnik, M. (Ed.). (1997). *The inheritance and innateness of grammars.* New York: Oxford University Press.

Gordon, T. (1974). *Teacher effectiveness training.* New York: Wyden.

Gordon, T. (1981). Crippling our children with discipline. *Journal of Education, 163*, 228–243.

Goswami, U. (2001). Cognitive development: No stages please—we're British. *British Journal of Psychology, 92,* 257–277.

Gottfredson, D. C. (2001). *Schools and delinquency.* Cambridge, UK: Cambridge University Press.

Gottfredson, D. C., Gottfredson, G. D., & Hybl, L. G. (1993). Managing adolescent behavior: A multiyear, multi-school study. *American Educational Research Journal, 30*(1), 179–215.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology, 93*, 3–13.

Grabe, M., & Grabe, C. (2001). *Integrating technology for meaningful learning* (3rd ed.). Boston: Houghton Mifflin.

Graf, S. C., Mullis, R. L., & Mullis, A. K. (2008). Identity formation of United States American and Asian Indian adolescents. *Adolescence, 43*, 57–69.

Graham, L., & Wong, B. Y. L. (1993). Comparing two modes of teaching a question-answering strategy for enhancing reading comprehension: Didactic and self-instructional training. *Journal of Learning Disabilities, 26*(4), 270–279.

Graham, S. (1991). A review of attribution theory in achievement contexts. *Educational Psychology Review, 3*, 5–39.

Graham, S. (1994). Classroom motivation from an attributional perspective. In H. O'Neil & M. Drillings (Eds.), *Motivation: Theory and research* (pp. 31–48). Hillsdale, NJ: Erlbaum.

Graham, S. (1996). How causal beliefs influence the academic and social motivation of African-American children. In G. G. Brannigan (Ed.), *The enlightened educator: Research adventures in the schools* (pp. 111–126). New York: McGraw-Hill.

Graham, S. (1997). Using attribution theory to understand social and academic motivation in African American youth. *Educational Psychologist, 32*(1), 21–34.

Graham, S., & Barker, G. (1990). The downside of help: An attributional-developmental analysis of helping behavior as a low ability cue. *Journal of Educational Psychology, 82*, 7–14.

Graham, S., & Harris, K. R. (1996). Addressing problems in attention, memory, and executive functioning. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 349–365). Baltimore: Brookes.

Graham, S., & Long, A. (1986). Race, class, and the attributional process. *Journal of Educational Psychology, 78,* 4–13.

Graham, S., & Weiner, B. (1996). Theories and principles of motivation. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 63–84). New York: Macmillan.

Grant, C. A., & Gomez, M. L. (2001). Journeying toward multicultural and social reconstructionist teaching and teacher education. In C. A. Grant & M. L. Gomez (Eds.), *Making school multicultural: Campus and classroom* (pp. 3–16). Columbus, OH: Merrill.

Green, L., Fry, A. F., & Myerson, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science,* 5, 33–36.

Greenberg, P. (2000). The value of classroom rituals and routines. *Scholastic Early Childhood Today, 15*(1), 52–59.

Greene, R. L. (1992). *Human memory: Paradigms and paradoxes.* Mahwah, NJ: Erlbaum.

Greenfield, P. M. (1997). You can't take it with you: Why assessments of abilities don't cross cultures. *American Psychologist, 52*, 1115–1124.

Greenfield, P. M. (1999). Cultural change and human development. *New Directions for Child and Adolescent Development, 83*, 37–59.

Greenfield, P. M., & Suzuki, L. K. (1998). Culture and human development: Implications for parenting, education, pediatrics, and mental health. In I. E. Siegel & K. A. Renninger (Eds.), *Handbook of child psychology* (Vol. 4, pp. 1059–1109). New York: Wiley.

Greening, T. (1998). Building the constructivist toolbox: An exploration of cognitive technologies. *Educational Technology, 38*, 23–35.

Greeno, J., Collins, A., & Resnick, L. (1996). Cognition and learning. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 15–46). New York: Macmillan.

Greenwood, C. R., Carta, J. J., & Hall, R. V. (1988). The use of peer tutoring strategies in classroom management and educational instruction. *School Psychology Review, 17,* 258–275.

Gregory, G. H. (2003). *Differentiated instructional strategies in practice.* Thousand Oaks, CA: Corwin.

Griffin, J. (2004). Research on students and museums: Looking more closely at the students in school groups. *Science Education, 88,* S59–S70.

Griffin, P., & Cole, M. (1984). Current activity for the future: The Zo-ped. In B. Rogoff & J. V. Wertsch (Eds.), *Children's learning in the zone of proximal development* (pp. 45–63). San Francisco: Jossey-Bass.

Grissom, J. B., & Smith, L. A. (1989). Repeating and dropping out of school. In L. Shepard & M. Smith (Eds.), *Flunking grades: Research and policies on retention* (pp. 34–63). Philadelphia: Falmer.

Grolnick, W. S., Gurland, S. T., Jacob, K. F., & Decourcey, W. (2002). The development of self-determination in middle childhood and adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 147–171). San Diego: Academic Press.

Gronlund, N. E. (2000). *How to write and use instructional objectives* (6th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Gronlund, N. E. (2003). *Assessment of student achievement* (7th ed.). Boston: Allyn & Bacon.

Grosjean, F. (1992). Another view of bilingualism. In R. Harris (Ed.), *Cognitive processing in bilinguals* (pp. 51–62). Amsterdam: Elsevier.

Grossman, H. (1990). *Trouble-free teaching: Solutions to behavior problems in the classroom.* Mountain View, CA: Mayfield.

Grossman, H., & Grossman, S. H. (1994). *Gender issues in education.* Boston: Allyn & Bacon.

Grotzer, T. A., & Perkins, D. N. (2000). Teaching intelligence: A performance conception. In R. J. Sternberg (Ed.), *Handbook of intelligence* (pp. 492–515). New York: Cambridge University Press.

Guglielmo, H. M. & Tryon, G. S. (2001). Social skill training in an integrated preschool program. *School Psychology Quarterly, 16*(2), 158–175.

Gupta, A. (1999). *What's up wif Ebonics, y'all?* Newark, DE: International Reading Association.

Gurian, M., & Stevens, K. (2005). *The minds of boys.* San Francisco: Jossey-Bass.

Guskey, T. R. (2001). Helping students make the grade. *Educational Leadership, 59,* 20–27.

Guskey, T. R., & Bailey, J. M. (2001). *Developing grading and reporting systems for student learning.* Thousand Oaks, CA: Corwin.

Gustafsson, C. (2004). Reflection, the way to professional development? *Journal of Clinical Nursing, 13*(3), 271–280.

Guthrie, E. R. (1959). Association by contiguity. In S. Koch (Ed.), *Psychology: A study of science* (Vol. 2, pp. 158–195). New York: McGraw-Hill.

Gutierrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher, 32*(5), 19–25.

Gutierrez, K., Baquedano-Lopez, P., & Tejada, C. (1999). Rethinking diversity: Hybridity and hybrid language practices in the third space. *Mind, Culture, and Activity, 6*(4), 286–303.

Gutierrez, R., & Slavin, R. E. (1992). Achievement effects of the nongraded elementary school: A best evidence synthesis. *Review of Educational Research, 62,* 333–376.

Haertel, E. (1999). Performance assessment and education reform. *Phi Delta Kappan, 80*(9), 662–666.

Hakuta, K. (1986). *Mirror of language: The debate on bilingualism.* New York: Basic Books.

Hakuta, K. (2001). A critical period for second language acquisition? In D. B. Bailey, Jr., J. T. Bruer, E. J. Symons, & J. W. Lichtman (Eds.), *Critical thinking about critical periods* (pp. 193–205). Baltimore: Brookes.

Hakuta, K., Bialystok, E., & Wiley, E. (2003). Critical evidence: A test of the critical-period hypothesis for second-language acquisition. *Psychological Science, 14,* 31–38.

Haladyna, T. H. (2002). *Essentials of standardized achievement testing: Validity and accountability.* Boston: Allyn & Bacon.

Hale-Benson, J. (1986). *Black children: Their roots, culture, and learning styles* (2nd ed.). Baltimore, MD: Johns Hopkins University Press.

Hall, R., Hall, M., & Saling, C. (1999). The effects of graphical postorganization strategies on learning from knowledge maps. *Journal of Experimental Education, 67,* 101–112.

Hallahan, D., & Kauffman, J. (2006). *Exceptional children* (10th ed.). Needham Heights, MA: Allyn & Bacon.

Halpern, D. F. (1998). Teaching critical thinking for transfer across domains. *American Psychologist, 53,* 449–455.

Halpern, D. F. (2000). *Sex differences in cognitive abilities* (3rd ed.). Hillsdale, NJ: Erlbaum.

Halpern, D. F. (2002). *Sex differences in cognitive abilities.* Hillsdale, NJ: Erlbaum.

Halpern, D. F. (2003). *Thought and knowledge: An introduction to critical thinking* (4th ed.). Mahwah, NJ: Erlbaum.

Halpern, D. F. (2004). A cognitive-process taxonomy for sex differences in cognitive abilities. *Current Directions in Psychological Science, 13*(4), 135–139.

Halpern, D. F. (2006). Assessing gender gaps in learning and academic achievement. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 635–653). Mahwah, NJ: Erlbaum.

Halpern, D. F., & LaMay, M. (2000). The smarter sex: A critical review of sex differences in intelligence. *Educational Psychology Review, 12*(2), 229–245.

Halpern, D. F., Hansen, C., & Riefer, D. (1990). Analogies as an aid to understanding and memory. *Journal of Educational Psychology, 82,* 298–305.

Halpin, G., & Halpin, G. (1982). Experimental investigations of the effects of study and testing on student learning, retention, and ratings of instruction. *Journal of Educational Psychology, 74,* 32–38.

Hamann, S. B. (2001). Cognitive and neural mechanisms of emotional memory. *Trends in Cognitive Sciences, 5,* 394–400.

Hambrick, D. Z., Kane, M. J., & Engle, R. W. (2005). The role of working memory in higher-level cognition: Domain-specific versus domain-general perspectives. In R. J. Sternberg & J. Pretz (Eds.), *Cognition and Intelligence.: Identifying the mechanisms of the mind* (pp. 104–121). New York: Cambridge University Press.

Hamburg, D. A. (1997). Meeting the essential requirements for healthy adolescent development in a transforming world. In R. Takanishi & D. Hamburg (Eds.), *Preparing adolescents for the 21st century: Challenges facing Europe and the United States* (pp. 1–13). New York: Cambridge University Press.

Hamilton, S. F., & Hamilton, M. A. (2004). Contexts for mentoring: Adolescent-adult relationships in workplaces and communities. In R. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp. 395–428) (2nd ed.). New York: Wiley.

Hamilton, S. L., Seibert, M. A., Gardner, R., III, & Talbert-Johnson, C. (2000). Using guided notes to improve the academic achievement of incarcerated adolescents with learning and behavior problems. *Remedial and Special Education, 21,* 133–140.

Hamman, D., & Hendricks, C. B. (2005). The role of the generations in identity formation. *Clearing House: A Journal of Educational Strategies, Issues and Ideas, 79*(2), 72–75.

Hammel, S. (1999, November 29). Generation of loners? Living their lives online. *U.S. News and World Report,* November 29, p. 79.

Hamp-Lyons, L. (1992). Holistic writing assessment for Limited English proficient students. In *Focus on evaluation and measurement* (Vol. 2). Washington, DC: U. S. Department of Education. Office of Bilingual

Education and Minority Languages Affairs. Retrieved on March 31, 2009 from www.ncela.govu.edu/pubs/symposia/secondindex.html#2

Hampson, E. (1990). Variations in sex-related cognitive abilities across the menstrual cycle. *Brain and Cognition, 14*(1), 26–43.

Hampton, J. (1995). Testing the prototype theory of concepts. *Journal of Memory and Language, 32,* 686–708.

Hansgen, R. D. (1991). Can education become a science? *Phi Delta Kappan, 72*(9), 689–694.

Harackiewics, J., Barron, K., Taurer, J., Carter, S., & Elliott, A. (2000). Short-term and long-term consequences of achievement goals: Predicting interest and performance over time. *Journal of Educational Psychology, 92,* 316–330.

Hardiman, M. M. (2001). Connecting brain research with dimensions of learning, *Educational Leadership, 59*(3), 52–55.

Hardman, M., Drew, C., & Egan, W. (2005). *Human exceptionality* (8th ed.). Needham Heights, MA: Allyn & Bacon.

Hardre, P. L., & Reeve, J. (2003). A motivational model of rural students' intentions to persist in, versus drop out of, high school. *Journal of Educational Psychology, 95*, 347–356.

Harp, S. F., & Mayer, R. E. (1998). How seductive details do their damage?: A theory of cognitive interest in science learning. *Journal of Educational Psychology, 90*, 414–434.

Harriott, W. A., & Martin, S. S. (2004). Using culturally responsive activities to promote social competence and classroom community. *Teaching Exceptional Children, 37*(1), 48–54.

Harris Bowman, D. (2002, April 24). School "connectedness" makes for healthier students, study suggests. *Education Week*, p. 16.

Harris, A. C. (1986). *Child development.* St. Paul, MN: West.

Harris, S. L. (2000). Behave yourself. *Principal Leadership, 1*(3), 36–39.

Harrison-Hale, A. O., McLoyd, V. C., & Smedley, B. (2004). Racial and ethnic status: Risk and protective processes among African-American families. In D. L. Maton, C. J. Schellenbach, B. J. Leadbetter, & A. L. Sorarz (Eds.), *Investing in children, youth, families, and communities* (pp. 269–283). Washington, DC: American Psychological Association.

Harry, B. (1992). An ethnographic study of cross-cultural communication with Puerto Rican American families in the special education system. *American Educational Research Journal, 29*(3), 471–488.

Harry, K., Magnus, J., Keegan, D. (Eds.) (1993). *Distance education: New perspectives.* London: Routledge.

Hart, D., Atkins, R., & Fegley, S. (2003). Personality and development in childhood: A person-centered approach. *Monographs of the Society for Research in Child Development, 68*(1, Serial No. 272).

Harter, S. (1990). Issues in the assessment of self-concept of children and adolescents. In A. M. LaGreca (Ed.), *Through the eyes of a child* (pp. 292–325). Boston: Allyn & Bacon.

Harter, S. (1996). Teacher and classmate influences on scholastics motivation, self-esteem, and the level of voice in adolescents. In J. Juvonen & K. Wentzel (Eds.), *Social motivation: Understanding school adjustment* (pp. 11–42). New York: Cambridge University Press.

Harter, S. (1998). The development of self-representations. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology* (5th ed., Vol. 3, pp. 553–618). New York: Wiley.

Harter, S. (1999). *The construction of the self: A developmental perspective.* New York: Guilford.

Harter, S., Waters, P. L., Whitesell, N. R., & Kastelic, D. (1998). Level of voice among female and male high school students: Relational contest, support, and gender orientation. *Developmental Psychology, 34,* 892–901.

Harter, S., Whitesell, N. R, & Kowalski, P. (1992). Individual differences in the effects of educational transitions on young adolescents' perceptions of competence and motivational orientation. *American Educational Research Journal, 29*, 777–808.

Hartnell-Young, E., & Morriss, M. (2007). *Digital portfolios: Powerful tools for promoting professional growth and reflection* (2nd ed.). Thousand Oaks, CA: Corwin.

Hartup, W. W. (1983). Peer relations. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol 4. Socialization, personality, and social development* (4th ed., pp. 103–196). New York: Wiley.

Hasirci, D., & Demirkan, H. (2003). Creativity in learning environments: The case of two sixth grade art rooms. *Journal of Creative Behavior, 37,* 17–41.

Hassel, H., & Lourey, J. (2005). The dea(r)th of student responsibility. *College Teaching, 53*(1), 2–13.

Hatano, G., & Inagaki, K. (1991). Sharing cognition through collective comprehension activity. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 331–348). Washington, DC: American Psychological Association.

Hatano, G., & Inagaki, K. (1996). Cognitive and cultural factors in the acquisition of intuitive biology. In D. R. Olson & N. Torrance (Eds.), *The handbook of education and human development: New models of learning, teaching, and schooling* (pp. 683–708). Cambridge, MA: Blackwell.

Hatano, G., & Inagaki, K. (2000). Domain-specific constraints of conceptual development. *International Journal of Behavioral Development, 24,* 267–275.

Hatano, G., & Inagaki, K. (2003). When is conceptual change intended? A cognitive-sociocultural view. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 407–427). Mahwah: Erlbaum.

Hatano, G., & Oura, Y. (2003). Commentary: Reconceptualizing school learning using insight from expertise research. *Educational Researcher, 32*(8), 26–29.

Hatcher, D. L. (2006). Stand-alone versus integrated critical thinking courses. *Journal of General Education, 55*, 247–272.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1993). Emotional contagion. *Current Directions in Psychological Science*, *2*(3), 96–99.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*, 81–112.

Hattie, J., Bibbs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research, 66*, 99–136.

Hauser-Cram, P., Sirin, S. R., & Stipek, D. (2003). When teachers' and parents' values differ: Teachers' ratings of academic competence in children from low-income families. *Journal of Educational Psychology, 95*(4), 813–820.

Havu-Nuutinen, S. (2005). Examining young children's conceptual change process in floating and sinking from a social constructivist perspective. *International Journal of Science Education, 27,* 259–279.

Hayes, J. R. (1988). *The complete problem solver* (2nd ed.). Mahwah, NJ: Erlbaum.

Hayes, K., & Salazar, J. J. (2001). *Evaluation of the structured English immersion program. Final Report: Year 1.* Program Evaluation Branch, Los Angeles City Schools.

Haygood, R. C., & Bourne, L. E., Jr. (1965). Attribute- and rule-learning aspects of conceptual behavior. *Psychological Review, 72,* 175–196.

Healy, J. (1998). *Failure to connect.* New York: Simon & Schuster.

Heikkila, A., & Lonka, K. (2006) Studying in higher education: Students' approaches to learning, self-regulation and cognitive strategies. *Studies in Higher Education, 31*(1), 99–119.

Heller, W., Nitschke, J. B., Etienne, M. A., & Miller, G. A. (1997). Patterns of regional activity differentiates types of anxiety. *Journal of Abnormal Psychology, 106,* 376–385.

Henderson, A. T., & Mapp, K. L. (2002). *A new wave of evidence: The impact of school, family, and community connections on student achievement* [Annual synthesis]. Austin, TX: Southwest Educational Development Laboratory, National Center for Family & Community Connections with Schools.

Henk, W. A., & Melnick, S. A. (1995). The reader self-perception scale (RSPS): A new tool for measuring how children feel about themselves as readers. *Reading Teacher, 48*, 470–482.

Hennesey, B. A., & Amabile, T. M. (1988). The role of the environment in creativity. In R. Sternberg (Ed.), *The nature of creativity: Contemporary psychological perspectives* (pp. 11–38). New York: Cambridge University Press.

Hennessey, B. A., & Amabile, T. M. (1987). *Creativity and learning.* Washington, DC: National Education Association.

Henricsson, L., & Rydell, A. M. (2004). Elementary school children with behavior problems: Teacher-child relations and self-perception. A prospective study. *Merrill-Palmer Quarterly, 50*, 111–138.

Henry, D. L. (1999). Resilience in maltreated children: Implications for special needs adoption. *Child Welfare, 78*, 519–540.

Henshon, S. E. (2007). Creative, passionate teaching, researching, and leadership: An interview with Del Siegle. *Roeper Review, 29*(5), 5–9.

Henson, K. (2004). *Constructivist teaching strategies for diverse middle school classrooms.* Boston: Allyn & Bacon.

Henson, K. T. (1996). *Methods and strategies for teaching in secondary and middle schools.* White Plains, NY: Longman.

Herbert, J., & Stipek, D. (2005). The emergence of gender differences in children's perceptions of their academic competence. *Journal of Applied Developmental Psychology, 26*, 276–295.

Herlitz, A., & Yonker, J. E. (2002). Sex differences in episodic memory: The influence of intelligence. *Journal of Clinical and Experimental Neuropsychology, 24,* 107–114.

Herman, J. L., & Winters, L. (1994). Portfolio research: A slim collection. *Educational Leadership, 52*(2), 48–55.

Hetherington, E. M. (2005). Divorce and the adjustment of children. *Pediatrics in Review, 26*, 163–169.

Hetherington, E. M., & Kelley, J. (2002). *For better or for worse: Divorce reconsidered.* New York: Norton.

Hettinger, H. R., & Knapp, N. F. (2001). Potential, performance, and paradox: A case study of J. P., a verbally gifted, struggling reader. *Journal for the Education of the Gifted, 24*, 248–289.

Heward, W. L. (2006). *Exceptional children: An introduction to special education* (8th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Hewitt, J., & Scardamalia, M. (1998). Design principles for distributed knowledge building processes. *Educational Psychology Review, 10,* 75–96.

Hicks, L. (1997). Academic motivation and peer relationships—How they mix in an adolescent world? *Middle School Journal, 28*, 18–22.

Hidalgo, N. M., Siu, S., Bright, J. A., Swap, S. M., & Epstein, J. L. (1995). Research on families, schools, and communities: A multicultural perspective. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (pp. 498–524). New York: Macmillan.

Hidi, S. (1995). A re-examination of the role of attention in learning from text. *Review of Educational Psychology Review, 7,* 323–350.

Hidi, S., & Baird, W. (1986). Interestingness—A neglected variable in discourse processing. *Cognitive Science, 10,* 179–194.

Hidi, S., & Harackiewicz, J. M. (2000). Motivating academically unmotivated: A critical issue for 21st century. *Review of Educational Research, 70*, 151–179.

Hidi, S., & Renninger, K. A., (2006). The four-phase model of interest development. *Educational Psychologist, 41*, 111–127.

Hiebert, E. H., & Raphael, T. E. (1996). Psychological perspectives on literacy and extensions to educational practice. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 550–602). New York: Macmillan.

Higgins, J. W., Williams, R. L., & McLaughlin, T. F. (2001). The effects of a token economy employing instructional consequences for a third-grade student with learning disabilities: A case study. *Education and Treatment of Children, 24*, 99–106.

Hill, F., Kawagley, O., & Barnhardt, R. (2006). *Alaska Rural Systemic Initiative Final Report: Phase II, 1995-2005.* Retrieved January 5, 2009, from *w*ww.ankn.uaf.edu/download/AKRSI2005FinalReport.doc

Hill, K. T. (1984). Debilitating motivation and testing: A major educational problem, possible solutions, and policy applications. In R. Ames & C. Ames (Eds.), *Research on motivation in education: Vol. 1. Student motivation.* (pp. 245–274) New York: Academic Press.

Hill, K., & Wigfield, A. (1984). Test anxiety: A major educational problem and what can be done about it. *Elementary School Journal, 85*, 105–126.

Hill, W. F. (2002). *Learning: A survey of psychological interpretations* (7th ed.). Boston: Allyn & Bacon.

Hinson, S. (1988). Meaningfulness. In R. McNergney (Ed.). *Guide to classroom teaching* (pp. 193–210). Boston: Allyn & Bacon.

Hirsch, E. D., Jr. (1996). *The schools we need and why we don't have them.* New York: Doubleday.

Hirschstein, M., Van Schoiack Edstrom, L., Frey, K., Snell, J., & MacKenzie, E. (2007). Walking the talk in bullying prevention: Teacher implementation variables related to initial impact of the Steps to Respect program. *School Psychology Review, 36*(1), 3–21.

Hmelo-Silver, C. E. (2002). Collaborative ways of knowing: Issues in facilitation. In G. Stahl (Ed.), *Proceedings of CSCL 200* (pp. 199–208). Mahwah, NJ: Erlbaum.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*, 235–266.

Hmelo-Silver, C. E. (2006). Design principles for scaffolding technology-based inquiry. In A. M. O'Donnell, C. E. Hmelo-Silver, & G. Erkens (Eds.), *Collaborative reasoning, learning and technology* (pp. 147–170). Mahwah, NJ: Erlbaum.

Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem based Learning, 1*, 21–39.

Hmelo-Silver, C. E., Duncan, R. G., Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist, 42,* 99–107.

Ho, D. Y. F. (1994). Cognitive socialization in Confucian heritage cultures. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural roots of minority child development* (pp. 285–313). Mahwah, NJ: Erlbaum.

Hoekstra, R. A., Bartels, M., & Boomsma, D. I. (2007). Longitudinal genetic study of verbal and nonverbal IQ from early childhood to young adulthood. *Learning & Individual Differences, 17*, 97–114.

Hoffman, L. (2003). *Overview of public elementary and secondary schools and districts: School year 2001–02* (NCES 2003-411). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Hogan, D. M., & Tudge, J. R. H. (1999). Implications of Vygotsky's theory for peer learning. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 39–65). Mahwah, NJ: Erlbaum.

Hogan, K., & Pressley, M. (1997). *Scaffolding student learning: Instructional approaches & issues*. Cambridge, MA: Brookline Books.

Hogan, T. P. (2007). *Educational assessment: A practical introduction*. Hoboken, NJ: Wiley.

Hogan, T., Rabinowitz, M, & Craven, J. A., III. (2003). Representation in teaching: Inferences from research of expert and novice teachers. *Educational Psychologist, 38*, 235–247.

Hollingworth, R. W., & McLoughlin, C. (2001). Developing science students' metacognitive problem solving skills online. *Australian Journal of Educational Technology, 17*(1), 50–63.

Hollins, E. R. (1996). *Culture in school learning: Revealing the deep meaning*. Mahwah, NJ: Erlbaum.

Holloway, J. H. (2000). The digital divide. *Educational Leadership, 58*(2), 90–91.

Holloway, J. H. (2001). The dilemma of zero tolerance. *Educational Leadership, 59*(4), 84–85.

Holzberg, C. S. (1995). Classroom management at your fingertips. *Learning, 23*(4), 57–59.

Honawar, V. (2007). Cell phones in classrooms land teachers on online video sites. *Education Week, 27*(11), 1.

Hong, L. K. (2001). Too many intrusions on instructional time. *Phi Delta Kappan, 82*(9), 712–714.

Hong, S., & Ho, H. (2005). Direct and indirect longitudinal effects of parental involvement on student achievement: Second-order latent growth modeling across ethnic groups. *Journal of Educational Psychology, 97*, 32–42.

Hoover, J. H., & Hazlet, R. J. (1991). Bullies and victims. *Elementary School Guidance and Counseling, 25*, 212–218.

Hoover-Dempsey, K., & Sandler, H. (1997). Why do parents become involved in their children's education? *Review of Educational Research, 67*, 3–42.

Hopkins, K. D. (1998). *Educational and psychological measurement and evaluation* (8th ed.). Boston: Allyn & Bacon.

Hopstock, P. J., & Stephenson, T. G. (2003). *Descriptive study of services to LEP students and LEP students with disabilities. Special topic report #1: Native languages of LEP students*. Submitted to U.S. Department of Education, OELA. Arlington VA: Development Associates.

Horowitz, F. D., Darling-Hammond, L., Bransford, J., Comer, J., Rosebrock, K., Austin, K., & Rust, F. (2005). Educating teachers for developmentally appropriate practice. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do*. San Francisco: Jossey-Bass, pp. 88–125.

Howe, C. K. (1994). Improving the achievement of Hispanic students. *Educational Leadership, 51,* 42–44.

Howe, M. L. (2000). *The fate of early memories*. Washington, DC: American Psychological Association.

Howes, C., & Hamilton, C. E. (1993). The changing experience of child care: Changes in teachers and in teacher-child relationships and children's social competence with peers. *Early Childhood Research Quarterly, 8,* 15–32.

Howes, C., & Matheson, C. C. (1992). Sequences in the development of competent play with peers: Social and social pretend play. *Developmental Psychology, 28*, 961–974.

Howes, C., & Tonyan, H. (2000). Peer relations. In L. Balter & C. S. Tamis-LeMonda (Eds.), *Child psychology: A handbook of contemporary issues* (pp. 143–157). Philadelphia: Psychology Press.

Howes, C., Hamilton, C. E., & Matheson, C. C. (1994). Children's relationships with peers: Differential associations with aspects of the teacher-child relationship. *Child Development, 65,* 253–263.

Howes, C., Matheson, C. C., & Hamilton, C. E. (1994). Maternal, teacher, and child care history correlates of children's relationships with peers. *Child Development, 65*, 264–273.

Huba, M., & Freed, J. (2000). *Learner-centered assessment on college campuses*. Boston: Allyn & Bacon.

Huber, J. A. (2004). A closer look at SQ3R. *Reading Improvement, 41,* 108–112.

Hudelson, S. (1987). The role of native language literacy in the education of language minority children. *Language Arts, 64*(8), 827–841.

Huerta-Macias, A. (1995). Alternative assessment: Responses to commonly asked questions. *TESOL Journal, 5*, 8–10.

Huesmann, L. R., Lagerspetz, K., & Eron, L. D. (1984). Intervening variable in the TV violence-aggression relation: Evidence from two countries. *Developmental Psychology, 20,* 746–775.

Huesmann, L. R., Moise-Titus, J., Podolski, C. L., & Eron, L. D. (2003). Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977–1992. *Developmental Psychology, 39,* 201–221.

Huff, J. A. (1988). Personalized behavior modification: An in-school suspension program that teaches students how to change. *School Counselor, 35*, 210–214.

Hug, B., Krajcik, J. S., & Marx, R. W. (2005). Using innovative learning technologies to promote learning and engagement in an urban science classroom. *Urban Education, 40,* 446–472.

Hugdahl, K., & Davison, R. J. (Eds.). (2007). *The asymmetrical brain* (2nd ed.). Cambridge, MA: MIT Press.

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education, 13*(2), 277–302.

Hurlemann, R., Hawellek, B., Matusch, A., Kolsch H., Wollersen, H., Madea B., Vogeley, K., Maler, W., & Dolan, R. (2005). Noradrenergic modulation of emotion-induced forgetting and remembering. *Journal of Neuroscience, 25*, 6343–6349.

Huston, A. C., Watkins, B. A., & Kunkel, D. (1989). Public policy and children's television. *American Psychologist, 44*, 424–433.

Huttenlocher, P. R., & Dabholkar, A. S. (1997). Regional differences in synaptogenesis in human cerebral cortex. *Journal of Comparative Neurology, 37,* 167–178.

Huttenlocher, P. R., Haight, W., Bruk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to language input and gender. *Developmental Psychology, 27,* 236–248.

Hyde, J. S. (1997). Gender differences in cognition: Results from meta-analyses. In P. J. Caplan, M. Crawford, et al. (Eds.), *Gender differences in human cognition. Counterpoints: Cognition, memory, and language*. New York: Oxford University Press.

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist, 60*, 581–592.

Hyde, J. S., & McKinley, N. M. (1997). Gender differences in cognition: Results from meta-analyses. In P. J. Caplan, & M. Crawford, J. S. Hyde, & J. T. E. Richardson (Eds.), *Gender differences in human cognition* (pp. 30–51). New York: Oxford University Press.

Hyman, I. A. (1997). *School discipline and school violence.* Boston: Allyn & Bacon.

Hyson, M. C., Copple, C., & Jones, J. (2006). Early childhood development and education. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology: Vol. 4. Child Psychology in Practice* (pp. 3–47) (6th ed.). New York: Wiley.

Ialongo, N., Poduska, J., Werthamer, L., & Kellam, S. (2001). The distal impact of two first-grade preventive interventions on conduct problems and disorder in early adolescence. *Journal of Emotional and Behavioral Disorders, 9*(3), 146–160.

Igo, L. B., Bruning, R., & McCrudden, M. (2005). Exploring differences in students' copy-and-paste decision making and processing: A mixed-methods study. *Journal of Educational Psychology, 97*(1), 103–116.

Igoa, C. (1995). *The inner world of the immigrant child.* Mahwah, NJ: Erlbaum.

Ilg, T., & Massucci, J. (2003). Comprehensive urban high schools: Are there better options for poor and minority children? *Education and Urban Society, 36*(1), 63–78.

Inagaki, K., & Hatano, G. (2006). Young children's conceptions of the biological world. *Current Directions in Psychological Science, 15,* 177–181.

Inagaki, K., Hatano, G., & Morita, E. (1998). Construction of mathematical knowledge through whole-class discussion. *Learning and Instruction, 8,* 503–526.

International Society for Technology in Education (ISTE). (2007). *National educational technology standards for students: The next generation.* Retrieved November 11, 2008, from http://www.iste.org/AM/Template.cfm?Section=NETS

International Society for Technology in Education (ISTE). (2008). *National educational technology standards for teachers.* Retrieved November 11, 2008, from http://www.iste.org/AM/Template.cfm?Section=NETS

Irujo, S. (1988). An introduction to intercultural differences and similarities in nonverbal communication. In J. S. Wurzel (Ed.), *Toward multiculturalism: A reader in multicultural education* (pp. 142–150). Yarmouth, ME: Intercultural Press.

Irvine, J. J. (1990). *Black students and school failure: Policies, problems, and prescriptions.* New York: Greenwood Press.

Isen, A. M. (1990). The influence of positive and negative affect on cognitive organization: Some implications for development. In N. Stein, B. Leventhal, & J. Trabasso (Eds.), *Psychological and biological approaches to emotion* (pp. 75–94). Hillsdale NJ: Erlbaum.

Isen, A. M. (1999). Positive affect. In T. Dalgliesh & M. J. Power (Eds.) *Handbook of cognition and emotion* (pp. 521–539). Chichester, UK: Wiley.

Itakura, K. (1986, August 24–29). *The hypothesis-experiment-instruction method of learning.* Paper presented at the International Conference on Trends in Physics Education, Tokyo.

Itard, J. M. (1962). *The wild boy of Aveyron.* New York: Appleton-Century-Crofts.

Iwamasa, G. Y., & Smith, S. K. (1996). Ethnic diversity in behavioral psychology: A review of the literature. *Behavior Modification, 20,* 45–59.

Iwata, B. A. & Bailey, J. S. (1974). Reward versus cost token systems: An analysis of the effects on students and teacher. *Journal of Applied Behavior Analysis, 7,* 567–576.

Jackson, P. (1968). *Life in classrooms.* New York: Holt, Rinehart & Winston.

Jacobs, J. E., & Paris, S. G. (1987). Children's metacognition about reading: Issues in definition, measurement, and instruction. *Educational Psychologist, 22,* 255–278.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development, 73,* 509–527.

Jacobs, J., & Klaczynski, P. (Eds.). (2005). *The development of judgment and decision making in children and adolescents.* Mahwah, NJ: Erlbaum.

Jasper, M. A., & Fulton, J. (2005). Marking criteria for assessing practice-based portfolios at masters' level. *Nurse Education Today, 25,* 377–389.

Jensen, E. (1998). How Julie's brain learns. *Educational Leadership, 56*(3), 41–45.

Jensen, L. A., Arnett, J. J., Feldman, S. S., & Cauffman, E. (2002), "It's wrong, but everybody does it": Academic dishonesty among high school students. *Contemporary Educational Psychology, 27,* 209–228.

Jensen-Campbell, L. A., & Graziano, W. G. (2005). The two faces of temptation: Differing motives for self-control in children. *Merrill Palmer Quarterly, 51*(3), 287–314.

Jimenez, R. (2000). Literacy and identity development of Latina/o students. *American Educational Research Journal, 37*(4), 971–1000.

Jimerson, S. R. (1999). On the failure of failure: Examining the association between early grade retention and education and employment outcomes during late adolescence. *Journal of School Psychology, 37,* 243–272.

Jimerson, S., Egeland, B., & Teo, A. (1999). A longitudinal study of achievement trajectories: Factors associated with change. *Journal of Educational Psychology, 91,* 116–126.

Johnsen, F. K. (Ed.). (2004). *Identifying gifted students: A practical guide.* Waco, TX: Prufrock.

Johnson, C., & Kritsonis, W. A. (2007). National school debate: Banning cell phones in public school: Analyzing a national school and community relations problem. *Online Submission, National Forum of Educational Administration and Supervision Journals, 25*(4), 1–6.

Johnson, D. W., & Johnson, R. T. (1995a). Cooperative learning and nonacademic outcomes of schooling: The other side of the report card. In J. E. Pedersen & A. D. Digby (Eds.), *Secondary schools and cooperative learning* (pp. 81–150). New York: Garland.

Johnson, D. W., & Johnson, R. T. (1995b). *Creative controversy: Intellectual challenge in the classroom.* Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory into practice, 38,* 67–73.

Johnson, D. W., & Johnson, R. T. (2001). Peer mediation in an inner-city elementary school. *Urban Education, 36,* 165–178.

Johnson, D. W., & Johnson, R. T. (2004). The three Cs of promoting social and emotional learning. In J. Zins, R. Weissberg, M. Wang, & H. Walberg (Eds.), *Building academic success on social and emotional learning* (pp. 40–58). New York: Teachers College Press.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1995). Cooperative learning and individual student achievement in secondary schools. In J. E. Pedersen & A. D. Digby (Eds.), *Secondary schools and cooperative learning* (pp. 3–54). New York: Garland.

Johnson, D. W., Johnson, R., & Dudley, B. (1992). Effects of peer mediation training on elementary school students. *Mediation Quarterly, 10,* 89–99.

Johnson, H. (2001). Administrators and mentors: Keys in the success of beginning teachers. *Journal of Instructional Psychology, 28*(1), 44–49.

Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology, 21,* 60–99.

Johnson, L. (2004). Down with detention. *Education Week, 24*, 39–40.

Johnson, M. K., Beebe, T., Mortimer, J. T., & Snyder, M. (1998). Volunteerism in adolescence: A process perspective. *Journal of Research on Adolescence, 8,* 309–332.

Johnson, W. B. (2006). *On being a mentor.* Mahwah, NJ: Erlbaum.

Johnson-Laird, P. N. (2000). Reasoning. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 8, pp. 75–79). New York: Oxford University Press.

John-Steiner, V. (1997). *Notebooks of the mind: Explorations of thinking* (rev. ed.). New York: Oxford University Press.

John-Steiner, V., & Mahn, H. (1996). Sociocultural approaches to learning and development: A Vygotskian framework. *Educational Psychologist, 31*, 191–206.

Jonassen, D. (2000). *Computers as mindtools for schools* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Jones, S., & Dindia, K. (2004). A meta-analytic perspective on sex equity in the classroom. *Review of Educational Research, 74*(4), 443–471.

Jones, V. (2007). *Comprehensive classroom management: Creating positive learning environments and solving problems* (8th ed.). Boston: Allyn & Bacon.

Jones, V., & Jones, L. (2004). *Comprehensive classroom management* (7th ed.). Boston: Allyn & Bacon.

Joshi, M. S., & MacLean, M. (1994). Indian and English children's understanding of the distinction between real and apparent emotion. *Child Development, 65,* 1372–1384.

Josse, G., & Tzourio-Mazoyer, N. (2004). Hemispheric specialization for language. *Brain Research Reviews, 44*(1), 1–12.

Jovanovic, J., & King, S. S. (1998). Boys and girls in the performance-based science classroom: Who's doing the performing? *American Educational Research Journal, 35*(3), 477–496.

Joyce, B. R., Weil, M., & Calhoun, E. (2004). *Models of teaching. MyLabSchool edition.* New York: Allyn & Bacon.

Juniewicz, K. (2003). Student portfolios with a purpose. *The Clearing House, 77*(2), 73–77.

Jurdak, M., & Shahin, I. (1999). An ethnographic study of the computational strategies of a group of young street vendors in Beirut. *Educational Studies in Mathematics, 40,* 155–172.

Kagan, J. (1965). Reflection-impulsivity and reading ability in primary grade children. *Child Development, 36*, 609–628

Kagan, S. (1994). *Cooperative learning.* San Juan Capistrano, CA: Kagan Cooperative Learning.

Kahneman, D., & Tversky, A. (1995). Conflict resolution: A cognitive perspective. In K. Arrow, R. H. Mnookin, L. Ross, A. Tversky, & R. Wilson (Eds.), *Barriers to conflict resolution* (pp. 44–61). New York: Norton.

Kamii, C. (Producer). (2000). *Double-column addition: A teacher uses Piaget's theory* [Film]. (Available from Teacher College Press, Columbia University, New York, NY 10027).

Kansaku, K., Yamaura, A., & Kitazawa, S. (2000). Sex differences in lateralization revealed in the posterior language areas. *Cerebral Cortex, 10*(9), 866–872.

Kaplan, A., & Maehr, M. L. (1999). Achievement goals and student well-being. *Contemporary Educational Psychology, 24,* 330–358.

Kaplan, A., & Maehr, M. L. (2002). Adolescents' achievement goals: Situating motivation in socio-cultural contexts. In F. Pajaers & T. Urdan (Eds.), *Adolescence and education: Vol. 2. Academic motivation of adolescents* (pp. 125–167). Greenwich, CT: Information Age Publishing.

Kaplan, A., Middleton, M., Urdan, T., & Midgley, C. (2002). Achievement goals and goal structures. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 1–20). Hillsdale, NJ: Erlbaum.

Kaplan, C. A., & Davidson, J. E. (1988). *Hatching a theory of incubation effects.* Carnegie Mellon University Psychology Technical Report C. I.P. 472.

Kaplan, R. M., & Saccuzzo, D. P. (2005). *Psychological testing* (6th ed.). Belmont, CA: Wadsworth.

Karabenick, S. A., & Knapp, J. R. (1991). Relationship of academic help seeking to the use of learning strategies and other instrumental achievement behavior in college students. *Journal of Educational Psychology, 83*, 221–230.

Karlsen, B., & Gardner, E. (1995). *Stanford diagnostic reading test* (4th ed.). San Antonio, TX: Psychological Corporation.

Karmiloff-Smith, A. (1993). Innate constraints and developmental change. In P. Bloom (Ed.), *Language acquisition: Core readings* (pp. 563–590). Cambridge, MA: MIT Press.

Karpov, Y. V., & Bransford, J. D. (1995). Vygotsky and the doctrine of empirical and theoretical learning. *Educational Psychologist, 30,* 61–66.

Karweit, N. L. (1981). Time in school. *Research in Sociology of Education and Socialization, 2*, 77–110.

Karweit, N. L., & Slavin, R. E. (1981). Measurement and modeling choices in studies of time and learning. *American Educational Research Journal, 18*, 157–171.

Kasper, L. F. (1993). The keyword method and foreign language vocabulary learning: A rationale for its use. *Foreign Language Annals, 26*, 244–251.

Kato, Y., Honda, M., & Kamii, C. (2006). Kindergartners play Lining up the 5s: A card game to encourage logico-mathematical thinking. *Young Children, 61*(4), 82–88.

Katz, J. J. (1972). *Semantic theory.* New York: Harper & Row.

Katz, J. J., & Fodor, J. A. (1963). The structure of a semantic theory. *Language, 39,* 170–210.

Kauffman, J. M. (2005). How we prevent the prevention of emotional and behavioural difficulties in education. In P. Cough, P. Garner, J. T., Pardeck, & F. Yuen (Eds.), *Handbook of emotional and behavioural difficulties in education* (pp. 429–440). London: Sage.

Kauffman, J. M., & Burbach, H. J. (1997). On creating a climate of classroom civility. *Phi Delta Kappan, 79*(4), 320–325.

Kaufman, A. S., & Kaufman, N. L. (1983). *Kaufman assessment battery for children: Interpretive manual.* Circle Pines, MN: American Guidance Services.

Kaufman, J. C., & Baer, J. (Eds). (2006). *Creativity and reason in cognitive development.* Cambridge, UK: Cambridge University Press.

Kazdin, A. E., (2001). *Behavior modification in applied settings* (6th ed.). Belmont, CA: Wadsworth.

Keating, D. P. (1990). Adolescent thinking. In S. S. Feldman & G. R. Elliot (Eds.), *At the threshold: The developing adolescent* (pp. 54–89). Cambridge, MA: Harvard University Press.

Keating, D. P. (2004). Cognitive and brain development. In R. Lerner & L. Steinberg (Ed.), *Handbook of adolescent psychology* (2nd ed.). New York: Wiley.

Keefe, J. W. (1982). Assessing student learning styles: An overview. In J. W. Keefe (Ed.) *Student learning styles and brain behavior* (pp. 43–53). Reston, VA: National Association of Secondary School Principals.

Keefe, J. W., & Walberg, H. J. (Eds.). (1992). *Teaching for thinking.* Reston, VA: National Association of Secondary School Principals.

Kelhe, T. J., Bray, M. A., Theodore, L. A., Jenson, W. R., & Clark, E. (2000). A multicomponent intervention designed to reduce disruptive classroom behavior. *Psychology in the Schools, 37*, 475–481.

Keller, B. (2005). Panel urges new testing for teachers. *Education Week, 24*(38), 1–2.

Kentucky Department of Education. (2000). *Commonwealth accountability testing system.* Retrieved November 5, 2008, from http://education.ky.gov/KDE/Administrative+Resources/Testing+and+Reporting+/CATS

Keogh, B. K. (2000). Poor children: Child development deviations. *Focus on Exceptional Children, 33*, 1–10.

Keogh, B. K. (2003). *Temperament in the classroom.* Baltimore: Brookes.

Kermani, H., & Moallem, M. (2001). Cross-age tutoring: Exploring features and processes of peer-mediated learning. *NHSA Dialog, 4*(3), 453–485.

Khalili, A., & Shashaani, L. (1994). The effectiveness of computer applications: A meta-analysis. *Journal of Research on Computing in Education, 27*(1), 48–61.

Khattri, N., & Sweet, D. (1996). Assessment reform: Promises and challenges. In M. B. Kane & R. Mitchell (Eds.), *Implementing performance assessment: Promises, problems and challenges* (pp. 1–21). Mahwah, NJ: Erlbaum.

Kids Count. (2007). State data level online. Retrieved November 27, 2007, from http://www.kidscount.org/sld/databook.jsp

Kiernan, P. J., & Aizawa, K. (2004). Cell phones in task-based learning: Are cell phones useful language learning tools? *ReCall, 16*(1), 71–84.

Kiewra, K. A. (1989). A review of note-taking: The encoding-storage paradigm and beyond. *Educational Psychology Review, 1*, 147–172.

Kim, K. H. (2006). Can we trust creativity tests? A review of the Torrance tests of creative thinking. *Creativity Research Journal, 18*, 3–14.

Kimberg, D. Y., D'Esposito, M., & Farah, M. J. (1997). Cognitive functions in the prefrontal cortex—working memory and executive control. *Current Directions in Psychological Science, 6*, 185–192.

Kinchin, I. M. (2000). Using concept maps to reveal understanding: A two tier analysis, *School Science Review, 8*, 41–46.

Kindsvatter, R., Wilen, W., & Ishler, M. (1996). *Dynamics of teaching.* White Plains, NY: Longman.

King, A. (1991). Effects of training in strategic questioning on children's problem-solving performance. *Journal of Educational Psychology, 83,* 307–317.

King, A. (1992). Facilitating elaborative learning through guided student-generated questions. *Educational Psychologist, 27*, 111–126.

King, A. (1999). Discourse patterns for mediating peer learning. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 87–115). Mahwah, NJ: Erlbaum.

Kintsch, W. (1986). Learning from text. *Cognition and Instruction, 3*, 87–108.

Kintsch, W. (1988). The role of knowledge in discourse comprehension: A construction-integration model. *Psychology Review, 95*, 163–182.

Kirkland, M. C. (1971). The effect of tests on students and schools. *Review of Educational Research, 41*, 303–350.

Kirschenbaum, R. J. (1989). Identification of the gifted and talented American Indian student. In C. J. Maker & S. W. Schiever (Eds.), *Critical issues in gifted education: Vol. 2. Defensible programs for cultural and ethnic minorities* (pp. 91–101). Austin, TX: Pro-Ed.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*, 75–86.

Kirsh, S. J. (2006). *Children, adolescents, and media violence.* Mahwah. NJ: Erlbaum.

Kish, L. (2000). Sampling. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 7, pp. 139–142). New York: Macmillan.

Kitchener, K. S. (1983). Cognition, metacognition and epistemic cognition. A three level model of cognitive processing. *Human Development, 26*, 222–232.

Kitsantas, A., Zimmerman, B. J., & Cleary, T. (2000). The role of observation and emulation in the development of athletic self-regulation. *Journal of Educational Psychology, 92,* 811–817.

Klaczynski, P. A. (2001). Analytic and heuristic processing influences on adolescent reasoning and decision-making. *Child Development, 72,* 844–861.

Klein, J. D., & Schnackenberg, H. L. (2000). Effects of informal cooperative learning and the affiliation motive on achievement, attitude, and student interactions. *Contemporary Educational Psychology, 25*, 332–341.

Klein, P. (2003). Rethinking the multiplicity of cognitive resources and curricular representations: Alternatives to "learning styles" and "multiple intelligences." *Journal of Curriculum Studies, 35*, 45–81.

Klein, S. P., Jovanovic, J., Stecher, B. M., McCaffrey, D., Shavelson, R. J., Haertel, E., Solano-Flores, G., & Comfort, K. (1997). Gender and racial/ethnic differences on performance assessments in science. *Educational Evaluation and Policy Analysis, 19*(2), 83–97.

Kleiner, A., & Lewis, L. (2003). *Internet access in U.S. public schools and classrooms: 1994–2002* (NCES 2004–011, Department of Education). Washington, DC: National Center for Education Statistics.

Kluwe, R. H. (1987). Executive decisions and regulation of problem solving. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 31–64). Mahwah, NJ: Erlbaum.

Knapp, J. V. (2002). Teaching poetry via HEI (hypothesis-experiment-instruction). *Journal of Adolescent & Adult Literacy, 45*, 718–730.

Knight, J. (2005). Crossing boundaries: What constructivists can teach intensive-explicit instructors and vice versa. In T. M Skrtic, K. R. Harris, & J. G. Shriner (Eds.), *Special education policy and practice: Accountability, instruction, and social challenges* (pp. 242–266). Denver, CO: Love Publishing.

Knotek, S. (2005). Portfolio assessment. In S. W. Lee (Ed.), *Encyclopedia of school psychology* (pp. 387–390). Thousand Oaks, CA: Sage.

Knowlton, Dave S., Eschmann, Amy, Fish, Natalie, Heffren, Beth, & Voss, Holle (2004). Processes and impact of journal writing in a graduate-level theory course: Students' experiences and reflections. Teaching & Learning: *The Journal of Natural Inquiry and Reflective Practice, 18*(2), 40–53.

Kochanska, G., Coy, K. C., & Murray, K. T. (2001). The development of self-regulation in the first four years of life. *Child Development, 72*, 1091–1111.

Kochanska, G., Gross, J. N., Lin, M.-H., & Nichols, K. E. (2002). Guilt in young children: Development, determinants, and relations with a broader system of standards. *Child Development, 73,* 461–482.

Kohei, O. (2006). A research trend on attention in mental retardation. *Osaka Daigaku Daigakuin Ningen Kagaku Kenkyuka Kiyo, 32*, 265, 267–283.

Kohlberg, L. (1976). Moral stages and moralization: The cognitive-developmental approach. In T. Lickona (Ed.), *Moral development and behavior. Theory, research, and social issues* (pp. 31–53). New York: Holt, Rinehart & Winston.

Kohlberg, L. (1984). *Essays on moral development: Vol 2. The psychology of moral development.* New York: Harper & Row.

Kohlberg, L. (1986). A current statement of some theoretical issues. In S. Modgil & C. Modgil (Eds.), *Lawrence Kohlberg: Consensus and controversy* (pp. 485–546). Philadelphia: Palmer.

Kohler, W. (1929). *Gestalt psychology.* New York: Liveright.

Kohn, A. (1993). *Punished by rewards: The trouble with gold stars, incentive plans, A's, praise, and other bribes.* Boston: Houghton Mifflin.

Kohn, A. (1993). Rewards versus learning: A response to Paul Chance. *Phi Delta Kappan, 74*, 783–787.

Kohn, A. (1996). By all available means: Cameron and Pierce's defense of extrinsic motivators. *Review of Educational Research, 66*, 1–4.

Kohn, A. (2000a). Burnt at the high stakes. *Journal of Teacher Education, 51*(4), 315–327.

Kohn, A. (2000b). Standardized testing and its victims. *Education Week.* Retrieved November 5, 2008, from http://www.alfiekohn.org/teaching/edweek/staiv.htm

Kohn, A. (2001). Five reasons to stop saying "Good job!" In B. A. Marlowe & A. S. Canestrari (Eds.), *Educational psychology in context* (pp. 200–205). Thousand Oaks, CA: Sage.

Kohn, A. (2004). Safety from inside out: Rethinking traditional approaches. *Educational Horizons*, 83. Retrieved January 19, 2009, from http://www.alfiekohn.org/teaching/safety.htm

Kohn, A. (2005). Unconditional teaching. *Educational Leadership, 63*, 20–24.

Kohut, S., Jr. (1988). *The middle school: A bridge between elementary and high schools* (2nd ed.). Washington, DC: National Education Association.

Kolb, L. (2006). From toy to tool: Audioblogging with cell phones. *Learning and Leading with Technology, 34*(3), 16–20.

Kolodner, J. L., Hmelo, C. E., & Narayanan, N. H. (1996). Problem-based learning meets case-based reasoning. In D. C. Edelson & E. A. Domeshek (Eds.), *Proceedings of ICLS 96* (pp. 188-195). Charlottesville, VA: Association for the Advancement of Computing in Education.

Komatsu, L. K. (Ed.). (1994). *Experimenting with the mind: Readings in cognitive psychology.* Belmont, CA: Brooks/Cole.

Koppelman, K., & Goodhart, L. (2005). *Understanding human differences: Multicultural education for a diverse America.* Boston: Pearson.

Korenman, S., Miller, J., & Sjaastad, J. (1995). Long-term poverty and child development in the United States: Results from the NLSY. *Children and Youth Services Review, 17*, 127–155.

Koretz, D., Stecher, B., & Deiber, E. (1993). *The reliability of scores from the 1992 Vermont Portfolio Assessment Program* (Technical Report No. 355). Los Angeles: UCLA, Center for the Study of Evaluation.

Korf, R. (1999). Heuristic search. In R. A. Wilson & F. C. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences* (pp. 372–373). Cambridge, MA: MIT Press.

Koriat, A., Goldsmith, M., & Pansky, A. (2000). Toward a psychology of memory accuracy. In S. Fiske (Ed.), *Annual review of psychology* (pp. 481–537). Palo Alto, CA: Annual Reviews.

Kosslyn, S. M. (1976). Can imagery be distinguished from other forms of internal representation? Evidence from studies of information retrieval times. *Memory and Cognition, 4*, 291–297.

Kosslyn, S. M. (1985). Mental imagery ability. In R. J. Sternberg (Ed.), *Human abilities: An information-processing approach.* New York: Freeman.

Kosslyn, S. M., Ball, T. M., & Reiser, B. J. (1978). Visual images preserve metric spatial information: Evidence from studies of image scanning. *Journal of Experimental Psychology: Human Perception and Performance, 4*(1), 47–60.

Kounin, J. (1977). *Discipline and group management in classrooms* (rev. ed.). New York: Holt, Rinehart & Winston.

Kozulin, A. (1990). *Vygotsky's psychology: A biography of ideas.* Cambridge, MA: Harvard University Press.

Kozulin, A. (1998). *Psychological tools: A sociocultural approach to education.* Cambridge, MA: Harvard University Press.

Kozulin, A., & Presseisen, B. Z. (1995). Mediated learning experience and psychological tools: Vygotsky's and Feurstein's perspectives in a study of student learning. *Educational Psychologist, 30*, 67–75.

Krajcik, J. S., Czerniak, C., & Berger, C. (1999). *Teaching children science: A project-based approach.* Boston: McGraw-Hill.

Krapp, A., Hidi, S., & Renninger, K. A. (1992). Interest, learning, and development. In A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 3–25). Hillsdale, NJ: Erlbaum.

Krashen, S. D. (1996). *Under attack: The case against bilingual education.* Culver City, CA: Language Education Associates.

Kreitler, S., Zigler, E., Kagan, S., Olsen, D., Weissler, K., & Kreitler, H. (1995). Cognitive and motivational determinants of academic achievement and behavior in third and fourth grade disadvantaged children. *British Journal of Educational Psychology, 65*, 297–316.

Kreutzer, L. C., & Flavell, J. H. (1975). An interview study of children's knowledge about memory. *Monographs of the Society for Research in Child Development, 40* (1, Serial No. 159).

Kricos, P. (2000). *Facilitation of group support programs for new hearing aid users.* Retrieved January 2, 2009, from http://www.healthyhearing.com/articles/7809-facilitation-group-support-programs

Kristal, J. (2005). *The temperament perspective.* Baltimore: Brookes.

Kroger, J. (2007). *Identity development.* Thousand Oaks, CA: Sage.

Krumboltz, J. D., & Krumboltz, H. B. (1972). *Changing children's behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Kuhara-Kojima, K., & Hatano, G. (1991). Contribution of content knowledge and learning ability to the learning of facts. *Journal of Educational Psychology, 83*, 253–263.

Kuhn, D. (1992). Cognitive development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (3rd ed., pp. 211–272). Hillsdale, NJ: Erlbaum.

Kuhn, D. (1999). A developmental model of critical thinking. *Educational Researcher, 28,* 16–26.

Kuhn, D. (2001). Why development does (and does not) occur: Evidence from the domain of inductive reasoning. In J. L. McClelland & R. S. Siegler (Eds.), *Mechanisms of cognitive development: Behavioral and neural perspectives* (pp. 221–249). Mahwah, NJ: Erlbaum.

Kuhn, D. (2006). *Education for thinking.* Cambridge, MA: Harvard University Press.

Kuhn, D. (2007). Is direct instruction an answer to the right question? *Educational Psychologist, 42*, 109–115.

Kuhn, D., & Dean, D., Jr. (2004). Metacognition: A bridge between cognitive psychology and educational practice. *Theory into Practice, 43*(4), 268–273.

Kuhn, D., & Franklin, S. (2006). The second decade: What develops (and how)? In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed. pp. 953–993). New York: Wiley.

Kuhn, D., Garcia-Mila, M., Zohar, A., & Andersen, C. (1995). Strategies of knowledge acquisition. *Monographs of the Society for Research in Child Development, 60* (Whole No. 245).

Kuhn, D., Katz, J., & Dean, D. (2004). Developing reason. *Thinking & Reasoning, 10*(2), 197–219.

Kulik J. A. (1992). *An analysis of the research on ability grouping: Historical and contemporary perspectives.* Storrs, CT: National Research Center on the Gifted and Talented.

Kulik, J. A. (2003). Grouping and tracking. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 268–281). Boston: Allyn & Bacon.

Kulik, J. A., & Kulik, C-L. C. (1992). Meta-analytic findings on grouping programs. *Gifted Child Quarterly, 36*(2), 73–77.

Kulik, J. A., Kulik, C-L., & Bangert-Drowns, R. L. (1985). Effectiveness of computer-based education in elementary schools. *Computers in Human Behavior, 1*(1), 59–74.

Kulik, J. A. (1994). Meta-analytic studies of findings on computer-based instruction. In E. Baker & H. O'Neil (Eds.), *Technology assessment in education and training.* (pp. 9–33) Hillsdale, NJ: Erlbaum.

Kumar, D. D., & Helgeson, S. L. (1995). Trends in computer applications in science assessment. *Journal of Science Education and Technology, 4*, 29–36.

Kumar, R., Gheen, M. H., & Kaplan, A. (2002). Goal structures in the learning environment and students' disaffection from learning and schooling. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 143–173). Mahwah, NJ: Erlbaum.

Kumrow, D., Vogt, C., & Kazlauskas, J. (2002). The role of learning strategies in web-based instruction. *Academic Exchange Quarterly, 6*(4), 20–28.

Kunsch, C. A., Jitendra, A. K., & Sood, S. (2007). The effects of peer-mediated instruction in mathematics for students with learning problems: A research synthesis. *Learning Disabilities Research & Practice, 22,* 1–12.

Kupersmidt, J. B., Buchele, K. S., Voegler, M. E., & Sedikides, C. (1996). Social self-discrepancy: A theory relating peer relations problems and school maladjustment. In J. Juvonen & K. R. Wentzel (Eds.), *Social motivation: Understanding children's school adjustment* (pp. 66–97). Cambridge, UK: Cambridge University Press.

Kusimo, P., Ritter, M. G., Busick, K., Ferguson, C., Trumbull, E., & Solano-Flores, G. (2000). *Making assessment work for everyone: How to build on student strengths.* San Francisco, CA: WestEd.

Kyle, P., & Rogien, L. (2004). *Opportunities and options in classroom management.* Boston: Pearson.

Kyllonen, P. (2001). "g": Knowledge, speed, strategies, or working memory capacity? A systems perspective. In R. J. Sternberg & E. L. Grigorenko (Eds.), *The general factor of intelligence: How general is it?* (pp. 415–445) Mahwah, NJ: Erlbaum.

La Paro, K. M., & Pianta, R. C. (2000). Predicting children's competence in early school years: A meta-analytic review. *Review of Educational Research, 70,* 443–484.

LaBar, K. S., & Phelps, E. A. (1998). Arousal-mediated memory consolidation: Role of the medial temporal lobe in humans. *Psychological Science, 9,* 490–493.

LaCourse, E., Villeneuve, M., & Claes, M. (2003). Theoretical structure of adolescent alienation: A multigroup confirmatory factor analysis. *Adolescence, 38,* 639–650.

Ladd, G., Buhs, E., & Troop, W. (2004). Children's interpersonal skills and relationships in school settings: Adaptive significance and implications for school-based prevention and intervention programs. In P. K. Smith & C. H. Hart (Eds.), *Blackwell handbook of childhood social development* (pp. 394–415). Malden, MA: Blackwell.

Ladson-Billings, G. (1990). Like lightning in a bottle: Attempting to capture the pedagogical excellence of successful teachers of black students. *Qualitative Studies in Education, 3,* 335–344.

Ladson-Billings, G. (1992). Culturally relevant teaching: The key to making multicultural education work. In C. A. Grant (Ed.), *Research and multicultural education* (pp. 106–121). London: Falmer.

Ladson-Billings, G. (1994). *The dreamkeepers: Successful teachers of African-American children.* San Francisco: Jossey-Bass.

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory into Practice, 34*(3), 159–165.

Lagerwey, M. D., Phillips, E., & Fuller, K. (2003). Voices from the pipeline: High school completion among rural Latinos. *Journal of Cultural Diversity,10*(2), 42–49.

Lajoie, S. P., & Azevedo, R. (2006). Teaching and learning in technology-rich environments. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed.). Mahwah, NJ: Erlbaum.

Lambert, N. M., & McCombs, B. L. (Eds.). (1998). *How students learn: Reforming schools through learner-centered instruction.* Washington, DC: American Psychological Association.

Lamborn, S. D., Mounts, N. S., Steinberg, L., & Dornbusch, S. M. (1999). Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent, and neglectful families. *Child Development, 62,* 1049–1065.

Lampert, M. (2001). *Teaching problems and the problems of teaching.* New Haven, CT: Yale University Press.

Lan, W., & Lanthier, R. (2003). Changes in students' academic performance and perceptions of school and self before dropping out of schools. *Journal of Education for Students Placed At Risk, 8*(3), 309–333.

Lan, W., Repman, J., & Chyung, S. (1998). Effects of practicing self-monitoring of mathematical problem-solving heuristics on impulsive and reflective college students' heuristics knowledge and problem-solving ability. *Journal of Experimental Education, 67*(1), 32–52.

Landsman, J. (2004). Confronting the racism of low expectations. *Educational Leadership, 62*(3), 28–32.

Landy, F. J. (2005). Some historical and scientific issues related to research on emotional intelligence. *Journal of Organizational Behavior, 26,* 411–424.

Langdon, C., & Vesper, N. (2000). The sixth Phi Delta Kappa poll of teachers' attitudes toward the public schools. *Phi Delta Kappan, 81,* 607–611.

Langer, E. J. (2000). Mindful learning. *Current Directions in Psychological Science, 9,* 220–223.

Langer, J. A. (2000). Excellence in English in middle and high school: How teachers' professional lives support student achievement. *American Educational Research Journal, 37,* 397–439.

Langhout, R. D. (2005). Acts of resistance: Student invisibility. *Culture & Psychology, 11*(2), 123–158.

Lansford, J. E., Malone, P. S., Castellino, D. R., Dodge, K. A., Pettit, G. S., & Bates, J. E. (2006). Trajectories of internalizing, externalizing, and grades for children who have and have not experienced their parents' divorce or separation. *Journal of Family Psychology, 20,* 292–301.

Lanza, E. (1992). Can bilingual 2-year-olds code-switch? *Journal of Child Language, 19*, 633–658.

Lapsley, D. K., & Narvaez, D. (2006). Character education. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (pp. 248–296) (6th ed.). New York: Wiley.

Larkin, J. H., McDermott, J., Simon, D. P., & Simon, H. A. (1980). Expert and novice performance in solving physics problems. *Science, 208*, 1335–1342.

Larson, R. (2002). *Riding the roller coaster of emotions: Are adolescents moody, why, and so what?* New York University Child Study Center Grand Rounds. Retrieved on April 29, 2008, from http://www.aboutourkids.org/articles/riding_roller_coaster_emotions_are_adolescents_moody_why_so_what

Larson, R. W. (2000). Toward a psychology of positive youth development. *American Psychologist, 55*, 170–183.

Lashley, T., Matczynski, T., & Rowley, J. (2002). *Instructional models: Strategies for teaching in a diverse society* (2nd ed.). Belmont, CA: Wadsworth.

Latham, A. S. (1997). Peer counseling: Proceed with caution. *Educational Leadership, 55*(2), 77–78.

Laumann-Billings, I., & Emery, R. E. (2000). Distress among young adults in divorced families. *Journal of Family Psychology, 14,* 671–687.

Laurent Clerc National Deaf Education Center, Gallaudet University (2003). *Overall portfolio product rubric.* Retrieved February 27, 2009, from http://ccdam.gallaudet.edu/doc/16-OverallProductRubric.doc

Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life.* Cambridge, UK: Cambridge University Press.

Lay, K. L., Waters, E., & Park, K. A. (1989). Maternal responsiveness and child compliance: The role of mood as mediator. *Child Development, 60*, 1405–1411.

Lazarowitz, R., & Karsenty, G. (1990). Cooperative learning and students' academic achievement, process skills, learning environment, and self-esteem in a 10th grade biology classroom. In S. Sharan (Ed.), *Cooperative learning: Theory and research* (pp. 123–149). New York: Praeger.

Leahey, T., & Harris, R. (1997). *Learning and cognition* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Leamnson, R. (2000). Learning as biological brain change. *Change, 32*(6), 41–45.

LeDoux, J. E. (1996). *The emotional brain.* New York: Simon & Schuster.

LeDoux, J. E. (2002). *The synaptic self.* New York: Viking.

Lee, C. D. (2001). Is October Brown Chinese? A cultural modeling activity system for under-achieving students. *American Educational Research Journal, 38*(1), 97–142.

Lee, J., Pulvino, C., & Perrone, P. (1998). *Restoring harmony: A guide for managing conflicts in schools.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Lee, K., Ashton, M. C., & Shin, K-H. (2005). Personality correlates of workplace anti-social behavior. *Applied Psychology: An International Review, 54,* 81–97.

Lee, O. (1999). Science knowledge, world views, and information sources in social and cultural contexts: Making sense after a natural disaster. *American Educational Research Journal, 36,* 187–219.

Lee, O. (2003). Equity for linguistically and culturally diverse students in science education: A research agenda. *Teachers College Record, 105*(3), 465–489.

Lee, P. J. (2005). Putting principles into practice: Understanding history. In M. S. Donovan and J. D. Bransford (Eds.) *How students learn: History, mathematics, and science in the classroom.* (pp. 31–77). Washington, DC: National Academies Press.

Lee, V. E. & Burkam, D. T. (2003). Dropping out of high school: The role of school organization and structure. *American Educational Research Journal, 40*(2), 353–393.

Leeper, R. (1935). A study of a neglected portion of the field of learning: The development of sensory organization. *Journal of Genetic Psychology, 46*, 41–75.

Leinhardt, G., & Steele, M. (2005). Seeing the complexity of standing to the side: Instructional dialogues. *Cognition and Instruction, 23*(1), 87–163.

Lenneberg, E. H. (1967). *Biological foundations of language.* New York: Wiley.

Lentz, F. E. (1988). Reductive procedures. In J. C. Witt, S. N. Elliott, & F. M. Gresham (Eds.), *Handbook of behavior therapy in education.* New York: Plenum Press.

LePage, P., Darling-Hammond, L., & Akar, H. (with Gutierrez, C., Jenkins-Gunn, E., &. Rosebrock, K.). (2005). Classroom management. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 327–357). San Francisco: Jossey-Bass.

Lepper, M. R., & Hodell, M. (1989). Intrinsic motivation in the classroom. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 73–105). San Diego: Academic Press.

Lesaux, N., & Siegel, L. (2003). The development of reading in children who speak English as a second language. *Developmental Psychology, 39*, 1005–1019.

Lessow-Hurley, J. (2005). *Foundations of dual language instruction* (4th ed.). Boston: Allyn & Bacon.

Lester, F. K., Jr., Lambdin, D. V., & Preston, R. V. (1997). A new vision of the nature and purpose of assessment in the mathematics classroom. In G. D. Phye (Ed.), *Handbook of classroom assessment: Learning, achievement, and adjustment.* (pp. 287–319) San Diego: Academic Press.

Lester, J. C., Stone, B., & Stelling, G. (1999). Lifelike pedagogical agents for mixed-initiative problem solving in constructivist learning environments. *User Modeling and User-Adapted Interaction, 9,* 1–44.

Le Tendre, G. K., Hofer, B. K., & Shimizu, H. (2003). What is tracking? Cultural expectations in the United States, Germany, and Japan. *American Educational Research Journal, 40,* 43–89.

Lever-Duffy, J., McDonald, J., & Mizell, A. (2003). *Teaching and learning with technology.* Boston: Allyn & Bacon.

Levesque, R. J. R. (2007). The ethnicity of adolescent research. *Journal of Youth and Adolescence, 36*(4), 357–363.

Levin, B. (2003). *Case studies of teacher development: An in-depth look at how thinking about pedagogy develops over time.* Mahwah, NJ: Erlbaum.

Levin, J. R. (1993). Mnemonic strategies and classroom learning: A 20-year report card. *Elementary School Journal, 94*, 235–244.

Levin, J., & Nolan, J. F. (2004). *Principles of classroom management* (4th ed.). Boston: Allyn & Bacon.

Lewin, K., Lippitt, R., & White, R. (1939). Patterns of aggressive behaviour in experimentally created social climates. *Journal of Social Psychology, 10*, 271–299.

Lewis, M. (1987). Social development in infancy and early childhood. In J. D. Osofsky (Ed.), *Handbook of infant development* (2nd ed.). New York: Wiley.

Lewis, R. (2001). Classroom discipline and student responsibility: The students' view. *Teaching and Teacher Education, 17*, 307–319.

Lewit, E. M. & Behrman, R. E., Terman, D. L., (1997). Children and poverty: Analysis and recommendations. *The Future of Children, 7*(2), 4–24.

Liao, Y-K. (1992). Effects of computer-assisted instruction on cognitive outcomes: A meta-analysis. *Journal of Research on Computing in Education, 24*(3), 367–380.

Libsch, M., & Breslow, M. (2000). Students' use of computers for school work and other activities. *NASSP Bulletin, 84*(613), 86–89.

Lichtman, J. W. (2001). Developmental neurobiology overview: Synapses, circuits, and plasticity. In D. B. Bailey, Jr., J. T. Bruer, E. J. Symons, & J. W. Lichtman (Eds.), *Critical thinking about critical periods* (pp. 27–42). Baltimore: Brookes.

Liconia, T. (1991). *Educating for character.* New York: Bantam.

Lidz, C. S. (1991). Issues in the assessment of preschool children. In B. A. Bracken (Ed.), *The psychoeducational assessment of preschool children* (2nd ed., pp. 18–31). Boston: Allyn & Bacon.

Light, P., & Littleton, K. (1999). *Social processes in children's learning.* Cambridge, UK: Cambridge University Press.

Limón, M. (2001). On the cognitive conflict as an instructional strategy for conceptual change: A critical appraisal. *Learning and Instruction, 11* (4–5), 357–380.

Lin, P. J., & Schwanenflugel, P. J. (1995). Cultural familiarity and language factors in the structure of category knowledge. *Journal of Cross-Cultural Psychology, 23*, 153–168.

Lin, Y. G., McKeachie, W. J., & Kim, Y. C. (2001). College student intrinsic and/or extrinsic motivation and learning. *Learning and Individual Differences, 13*, 251–258.

Lindeman, B. (2001). Reaching out to immigrant parents. *Educational Leadership, 58*(6), 62–66.

Linderholm, T., & van den Broek, P. (2002). The effects of reading purpose and working memory capacity on the processing of expository text. *Journal of Educational Psychology, 94*(4), 778–784.

Lindholm, K. J. (1990). Bilingual immersion education: Criteria for program development. In A. Padilla, H. Fairchild, & C. Valadez (Eds.), *Bilingual education: Issues and strategies* (pp. 91–105). Newbury Park, CA: Sage.

Lindholm, T., & Christianson, S. A. (1998). Gender effects in eyewitness accounts of a violent crime. *Psychology, Crime and Law, 4*, 323–339.

Linebarger, D. L., Kosanic, A. Z., Greenwood, C. R., & Doku, N. S. (2004). Effects of viewing the television program *Between the Lions* on the emergent literacy skills of young children. *Journal of Educational Psychology, 96*, 297–308.

Linn, M. C. (1997). The role of the laboratory in science learning. *Elementary School Journal, 97*(4), 401–417.

Linn, M. C., & Hsi, S. (2000). *Computers, teachers, peers: Science learning partners.* Mahwah, NJ: Erlbaum.

Linn, M. C., & Slotta, J. D. (2006). Enabling participants in online forums to learn from each other. In A. M. O'Donnell, C. E. Hmelo-Silver, & G. Erkens (Eds.), *Collaborative learning, reasoning, and technology* (pp. 61–98). Mahwah, NJ: Erlbaum.

Linn, M. C., Lewis, C., Tsuchida, I., & Songer, N. B. (2000). Beyond fourth-grade science: Why do U.S. and Japanese students diverge? *Educational Researcher, 29*, 4–14.

Linn, R. L. (1994). Performance assessment: Policy promises and technical measurement standards. *Educational Researcher, 23*(9), 4–14.

Linn, R. L. (2000). Assessments and accountability. *Educational Researcher, 29*(2), 4–15.

Linn, R. L., & Gronlund, N. (2000). *Measurement and assessment in teaching* (8th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Linn, R. L., & Miller, M. D. (2005). *Measurement and assessment in teaching* (9th ed.). Upper Saddle River, NJ: Pearson.

Linnenbrink, E. A., & Pintrich, P. R (2002). The role of motivational beliefs in conceptual change. In M. Limon (Ed.), *Reconsidering conceptual change: Issues in theory and practice* (pp. 115–135). The Netherlands: Kluwer Academic Publishers.

Linnenbrink, E. A., & Pintrich, P. R. (2003). Achievement goals and intentional conceptual change. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 347–374). Mahwah, NJ: Erlbaum.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading and Writing Quarterly: Overcoming Learning Difficulties, 19,* 119–137.

Lipka, J. (2002). Schooling for self-determination: Research on the effects of including native language and culture in the schools. Eric Digest. EDORC0112.

Lipka, J., & Adams, B. (2002). *Improving Alaska Native rural and urban students' mathematical understanding of perimeter and area.* Unpublished manuscript, Alaska School Research Fund.

Lipka, J., with Mohatt, G. V., & the Ciulistet Group. (1998). *Transforming the culture of schools: Yup'ik Eskimo examples.* Mahwah, NJ: Erlbaum.

Lippa, R. A. (2002). *Gender, nature, and nurture.* Mahwah, NJ: Erlbaum.

Lipson, M. Y. (1983). The influence of religious affiliation on children's memory for text information. *Reading Research Quarterly, 18,* 448–457.

Liu, X. (2004). Using concept mapping for assessing and promoting relational conceptual change in science. *Science Education, 88,* 373–396.

Livingston, C., & Borko, H. (1989). Expert-novice differences in teaching: A cognitive analysis and implications for teacher education. *Journal of Teacher Education, 40*(4), 36–42.

Lloyd, J. E. V., Walsh, J., & Yailagh, M. S. (2005). Sex differences in performance attributions, self efficacy, and achievement in mathematics: If I'm so smart, why don't I know it? *Canadian Journal of Education, 28*, 384–408.

Lobato, J. (2006). Alternative perspectives on the transfer of learning: History, issues, and challenges for future research. *Journal of the Learning Sciences, 15*, 431–449.

Locke, E. A. (2005). Why emotional intelligence is an invalid concept. *Journal of Organizational Behavior, 26,* 425–431.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*, 705–717.

Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin, 117*, 75–98.

Loftus, E., & Palmer, J. C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior, 13*, 585–589.

Lomawaima, K. T. (1995). Educating Native Americans. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (pp. 331–345). New York: Macmillan.

Lombardi, T. P. (1995). Teachers develop their own learning strategies. *Teaching Exceptional Children, 27*, 52–56.

Lopata, C., Miller, K. A., & Miller, R. H. (2003). Survey of actual and preferred use of cooperative learning among exemplar teachers. *Journal of Educational Research, 96*(4), 232–239.

Lopez, A. M. (2003a). Mixed race school-age children: A summary of census 2000 data. *Educational Researcher, 32*(6), 25–37.

Lopez, A. M. (2003b). Collecting and tabulating race/ethnicity data with diverse and mixed heritage populations: A case-study with US high school students. *Ethnic and Racial Studies, 26*(5), 931–961.

Lopez, E. C. (1997). The cognitive assessment of limited English proficient and bilingual children. In D. P. Flanagan, J. L. Genshaft, & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 503–516). New York: Guilford.

Lopez, N. (2003). *Hopeful girls, troubled boys: Race and gender disparity in urban education.* New York: Routledge.

Losey, K. M. (1995). Mexican American students and classroom interaction: An overview and critique. *Review of Educational Research, 65*, 283–318.

Lou, Y., Abrami, P. C., Spence, J. C., Pulsen, C., Chambers, B., & d'Apollonia, S. (1996). Within-class grouping: A meta-analysis. *Review of Educational Research, 66*, 423–458.

Lou, Y., Abrami, P., & Spence, J. (2000). Effects of within-class grouping on student achievement: An exploratory model. *Journal of Educational Research, 94*(2), 101–112.

Loughran, J., Mulhall, P., & Berry, A. (2004). In search of pedagogical content knowledge in science: Developing ways of articulating and documenting professional practice. *Journal of Research in Science Teaching, 41*, 370–391.

Louis, B., Subotnik, R. F., Breland, P. S., & Lewis, M. (2000). Establishing criteria for high ability versus selective admission to gifted programs: Implications for policy and practice. *Educational Psychology Review, 12*, 295–314.

Louisiana Language Arts Content Standards. (2004). Retrieved September 30, 2008, from www.louisianaschools.net

Lounsbury, J. H. (1984). *Perspectives: Middle school education 1964–1984.* Columbus, OH: National Middle School Association.

Lovett, M. C. (2002). Problem solving. In D. Medin (Ed.), *Stevens' handbook of experimental psychology: Vol. 2. Memory and cognitive processes (*3rd ed., pp. 317–362). New York: Wiley.

Lowenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin, 116*, 75–98.

Lowman, J. (1990). Promoting motivation and learning. *College Teaching, 38*(4), 136–139.

Lu, M., Webb, J. M., & Krus, D. J. (1999). Using order analytic instructional hierarchies of mnemonics to facilitate learning Chinese and Japanese kanji characters. *Journal of Experimental Education, 67*, 293–311.

Lubinski, D. (2000). Measures of intelligence and IQ tests. In A. Kazdin (Ed.), *Encyclopedia of psychology* (8C, 113–123). Washington, DC: American Psychological Association and Oxford University Press.

Luchins, A. S. (1942). Mechanization in problem solving. *Psychological Monographs, 54*(6), Whole No. 248.

Luchins, A. S., & Luchins, E. H. (1950). New experimental attempts at preventing mechanization in problem solving. *Journal of General Psychology, 42*, 279–297.

Ludlow, S. (1992). Is cultural discontinuity an adequate explanation for dropping out? *Journal of American Indian Education, 31*(3), 21–36.

Luiten, J., Ames, A., & Ackerson, G. (1980). A meta-analysis of the effects of advance organizers on learning and retention. *American Educational Research Journal, 17*, 211–218.

Lumsden, G., & Lumsden, D. (2006). *Communicating with credibility and confidence* (3rd ed.). Belmont, CA: Thompson.

Lundeberg, M. A., Levin, B. B. & Harrington, H. L. (Eds.) (1999) *Who learns what from cases and how? The research base for teaching and learning with cases.* Mahwah, NJ: Erlbaum Associates.

Lyman, F. T. (1981). The responsive classroom discussion: The inclusion of all students. In A. Anderson (Ed.), *Mainstreaming Digest* (pp. 109–113). College Park: University of Maryland Press.

Lyon, M. A. (1984). Positive reinforcement and logical consequences in the treatment of classroom encopresis. *School Psychology Review, 13*, 238–243.

Lyon, T. D., & Flavell, J. H. (1993). Young children's understanding of forgetting over time. *Child Development, 64*, 789–800.

Maag, J. W. (2001). Rewarded by punishment: Reflections on the disuse of positive reinforcement in schools. *Exceptional Children, 67*, 173–186.

Maag, J. W., & Reid, R. (2006). Depression among students with learning disabilities: Assessing the risk. *Journal of Learning Disabilities, 39,* 3–10.

MacArthur, C. A. (1996). Using technology to enhance the writing processes of students with learning disabilities. *Journal of Learning Disabilities, 29*(4), 344–354.

Maccoby, E. E. (2002). Gender and group process: A developmental perspective. *Current Directions in Psychological Science, 11,* 54–58.

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol 4. Socialization, personality, and social development* (pp. 1–101) (4th ed.). New York: Wiley.

Mace, F. C., Belfiore, P. J., & Shea, M. C. (1989). Operant theory and research on self-regulation. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theory, research, and practice.* (pp. 27–50) New York: Springer-Verlag.

Macedo, D. (1991). English only: The tongue-tying of America. *Journal of Education, 173*, 9–20.

Mace-Matluck, B. (1982). *Literacy instruction in bilingual settings: A synthesis of current research* (Professional Paper M-1). Los Alamitos, CA: National Center for Bilingual Research. (ERIC Document Reproduction Service No. ED 222 079).

Macionis, J. (2006). *Society: The basics* (8th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Mackay, S., McLaoughlin, T. F., Weber, K., & Derby, K. M. (2001). The use of precision requests to decrease noncompliance in the home and neighborhood: A case study. *Child and Family Behavior Therapy, 23*, 43–52.

Mackey, B., Johnson, R., & Wood, T. (1995). Cognitive and affective outcomes in a multiage language arts program. *Journal of Research in Childhood Education, 10,* 49–61.

Mackintosh, N. J. (1996). Sex differences and IQ. *Journal of Biosocial Science, 28*(4), 559–571.

Madaus, G., & O'Dwyer, L. (1999). A short history of performance assessment. *Phi Delta Kappan, 80*(9), 688–695.

Magnusson, S. J. (1996). Complexities of learning with computer-based tools: A case of inquiry about sound and music in elementary school. *Journal of Science Education and Technology, 5*(4), 297–309.

Magnusson, S. J., & Palincsar, A. S. (1995). The learning environment as a site of science reform. *Theory into Practice, 34*, 43–50.

Mandler, J. M. (1984). *Stories, scripts, and scenes: Aspects of schema theory.* Mahwah, NJ: Erlbaum.

Mandler, J. M. (2004). *The origins of the mind.* New York: Oxford University Press.

Mangels, J. A., Piction, T. W., & Craik, F. I. (2001). Attention and successful episodic encoding: An event-related potential study. *Brain Research, 11*, 77–95.

Mann, S. J. (2001). Alternative perspectives on the student experience: Alienation and engagement. *Studies in Higher Education, 26*(1), 7–19.

Manning, C. F., Mohole, K., & the Goodman Research Group. (2002). *The Lesson One program results of a controlled pre and post study.* Unpublished manuscript, Lesson One Foundation, Boston, MA.

Manning, S. (2006). Recognizing gifted students: A practical guide for teachers. *Kappa Delta Pi Record, 42*, 64–68.

Manouchehri, A. (2004). Implementing mathematics reform in urban schools: A study of the effect of teachers' motivation style. *Urban Education, 38*, 472–508.

Mantzicopoulos, P., & Morrison, D. (1992). Kindergarten retention: Academic and behavioral outcomes through the end of second grade. *American Educational Research Journal, 29*, 182–198.

Maratsos, M. (1998). The acquisition of grammar. In W. Damon (Series Ed.), D. Kuhn, & R. S. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (pp. 421–466) (5th ed.). New York: Wiley.

Marcia, J. E. (1988). Common processes underlying ego identity, cognitive/moral development and individuation. In D. Lapsley & F. Power (Eds.), *Self, ego, and identity: Integrative approaches* (pp. 211–225). New York: Springer-Verlag.

Marcia, J. E. (1994). The empirical study of ego identity. In A. H. Bosma, T. L. Graafsma, G. H. D. Grotebanc, & J. D. deLivita (Eds.), *Identity and development* (pp. 67–81). Newbury Park, CA: Sage.

Marcia, J. E. (1999). Representational thought in ego identity, psychotherapy, and psychosocial development. In I. E. Sigel (Ed.), *Development of mental representation: Theories and applications* (pp. 391–414). Mahwah, NJ: Erlbaum.

Margolis, H., & McCabe, P. P. (2006). Self-efficacy: A key to improving the motivation of struggling learners. *The Clearing House, 77*, 241–249.

Market Data Retrieval. (2004). *Technology in education, 2004: A comprehensive report on the state of technology in the K–12 market.* Shelton, CT: Author.

Markman, A., & Gentner, D. (2001). Learning and reasoning. *Annual Review of Psychology* (Vol. 51). Palo Alto, CA: Annual Reviews.

Markman, E. M. (1979). Realizing that you don't understand: Elementary school children's awareness of inconsistencies. *Child Development, 50*, 643–655.

Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American Educational Research Journal, 37*(1), 153–184.

Markus, H., & Narius, P. (1986). Possible selves. *American Psychologist, 42*, 954–969.

Marsh, H. W., Hau, K.-T., & Kong, C. K. (2002). Multilevel causal ordering of academic self-concept and achievement: Influence of language of instruction (English compared with Chinese) for Hong Kong students. *American Educational Research Journal, 39,* 727–763.

Marsh, H. W. (1987). The big-fish-little-pond effect on academic self-concept. *Journal of Educational Psychology, 79*, 280–295.

Marsh, H. W. (1990a). The structure of academic self-concept: The Marsh/Shavelson model. *Journal of Educational Psychology, 82*, 623–636.

Marsh, H. W. (1990b). Influences of internal and external frames of reference on the formation of math and English self-concepts. *Journal of Educational Psychology, 82*, 107–116.

Marsh, H. W., & Ayotte, V. (2003). Do multidimensional dimensions of self-concept become more differentiated with age? The differential distinctiveness hypothesis. *Journal of Educational Psychology, 95,* 687–706.

Marsh, H. W., Byrne, B. M., & Yeung, A. S. (1999). Causal ordering of academic self-concept and achievement: Reanalysis of a pioneering study and revised recommendations. *Educational Psychologist, 34*, 155–167.

Marsh, H. W., & O'Neill, R. (1984). Self description questionnaire III: The construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement, 21,* 153–174.

Marsh, H. W., & Richards, G. (1988). The Outward Bound Bridging Course for low achieving high-school males: Effects on academic achievement and multidimensional self-concepts. *Australian Journal of Psychology, 40*, 281–298.

Marsh, H. W., & Shavelson, R. J. (1985). Self-concept: Its multifaceted, hierarchical structure. *Educational Psychologist, 20,* 107–125.

Marsh, H. W., & Yeung, A. S. (1997a). The causal effects of academic self-concept on academic achievement: Structural equation models of longitudinal data. *Journal of Educational Psychology, 89*, 41–54.

Marsh, H. W., & Yeung, A. S. (1997b). Coursework selection: The effects of academic self-concept and achievement. *American Educational Research Journal, 34*, 691–720.

Marsh, H. W., Hau, K. T., & Kong, C. K. (2002). Multilevel causal ordering of academic self-concept and achievement: Influence of language of instruction (English vs. Chinese) for Hong Kong students. *American Educational Research Journal, 39*, 727–763.

Marsh, H. W., Smith, I., & Barnes, J. (1983). Multitrait-multimethod analyses of the self-description questionnaire: Student-teacher agreement on multidimensional ratings of student self-concept. *American Educational Research Journal, 26*, 333–357.

Marshall, K. (2003). A principal looks back: Standards matter. *Phi Delta Kappan, 85*(2), 104–113.

Marshall, S. P. (1995). *Schemas in problem solving.* Cambridge, UK: Cambridge University Press.

Marso, R. N., & Pigge, F. L. (1997). A longitudinal study of persisting and non-persisting teachers' academic and personal characteristics. *Journal of Experimental Education, 65*, 243–254.

Marston, S. H., Brunetti, G. J., & Courtney, V. B. (2005). Elementary and high school teachers: Birds of a feather? *Education, 125*(3), 469–495.

Martin, C. D., Heller, R. S., & Mahmoud, E. (1992). American and Soviet children's attitudes toward computers. *Journal of Educational Computing Research, 8*(2), 155–185.

Martin, G., & Pear, J. (2002). *Behavior modification* (7th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Martin, S. S., Brady, M. P., & Williams, R. E. (1991). Effects of toys on the social behavior of preschool children in integrated and nonintegrated groups: Investigation of a setting event. *Journal of Early Intervention, 15*, 153–161.

Martinez, M. E. (1999). Cognition and the question of test item format. *Educational Psychologist, 34*(1), 207–218.

Maryland State Department of Education. (2001). *Maryland school performance assessment program.* Retrieved July 2, 2007, from www.msde.state.md.us/mspap/default2.htm

Marzano, R. J. (2003a). *Classroom management that works.* Alexandria, VA: Assoc. for supervision and curriculum development.

Marzano, R. J. (2003b). *What works in schools.* Alexandria, VA: Assoc. for supervision and curriculum development.

Marzano, R. J., & Kendall, J. S. (1996). *Designing standards-based districts, schools, and classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.

Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: Association for Supervision and Curriculum Development.

Marzano, R., & Marzano, J. (2003). The key to classroom management. *Educational Leadership, 61*(1), 6–13.

Maslow, A. H. (1954). *Motivation and personality*. New York: Harper & Row.

Maslow, A. H. (1971). *The farther reaches of human nature*. New York: Viking.

Mason, L. (2003). Personal epistemologies and intentional conceptual change. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 199–236). Mahwah, NJ: Erlbaum.

Massachusetts English Language Arts Curriculum Framework. (2001). Retrieved September 30, 2008, from www.doe.mass.edu

Masten, A. (1994). Resilience in individual development: Successful adaptation despite risk and adversity. In M. Wang & E. Gordon (Eds.), *Educational resilience in inner-city America: Challenges and prospects*. Hillsdale, NJ: Erlbaum.

Masten, A. S., & Garmezy, N. (1985). Risk, vulnerability, and protective factors in developmental psychopathology. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in clinical child psychology* (Vol. 8, pp. 1–52). New York: Plenum.

Mastropieri, M. A., Scruggs, T. A., Spencer, V., & Fontana, J. (2003). Promoting success in high school world history: Peer tutoring versus guided notes. *Learning Disabilities Research & Practice, 18*, 52–65.

Mastropieri, M. A., Sweda, J., & Scruggs, T. E. (2000). Teacher use of mnemonic strategy instruction. *Learning Disabilities Research and Practice, 15*, 69–74.

Mathis, W. J. (2005). Bridging the achievement gap: A bridge too far? *Phi Delta Kappan, 86*(8), 590–593.

Matlin, M. (2005). *Cognition* (6th ed.). New York: Wiley.

Maughan, A., & Cichetti, D. (2002). Impact of child maltreatment and interadult violence on children's emotion regulation abilities and socioemotional adjustment. *Child Development, 73,* 1525–1542.

Mautone, P. D., & Mayer, R. E. (2001). Signaling as a cognitive guide in multimedia learning. *Journal of Educational Psychology, 93*, 377–389.

Maxwell, K. (2002). Friends: The role of peer influence across adolescent risk behaviors. *Journal of Youth and Adolescence, 31,* 267–277.

Mayer, J. D., & Cobb, C. D. (2000). Educational policy on emotional intelligence: Does it make sense? *Educational Psychology Review, 12,* 163–183.

Mayer, R. E. (1979). Can advance organizers influence meaningful learning? *Review of Educational Research, 49*, 371–383.

Mayer, R. E. (1992). *Thinking, problem solving, cognition* (2nd ed.). New York: Freeman.

Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

Mayer, R. E. (2004). Should there be a three strikes rule against pure discovery learning? The case for guided methods of instruction. *American Psychologist, 59*(1), 14–19.

Mayer, R. E., & Chandler, P. (2001). When learning is just a click away: Does simple user interaction foster deeper understanding of multimedia messages? *Journal of Educational Psychology, 93*, 390–397.

Mayer, R. E., & Jackson, J. (2005). The case for coherence in scientific explanations: Quantitative details can hurt qualitative understanding. *Journal of Experimental Psychology: Applied, 11*, 13–18.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist, 38*, 43–52.

Mayer, R. E., & Wittrock, M. C. (1996). Problem-solving transfer. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 47–62). New York: Macmillan.

Mayer, R. E., Dow, G. T., & Mayer, S. (2003). Multimedia learning in an interactive self-explaining environment: What works in the design of agent-based microworlds? *Journal of Educational Psychology, 95*, 806–812.

Mayer, R. E., Heiser, H., & Lonn, S. (2001). Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *Journal of Educational Psychology, 93*, 187–198.

Mayer, R. E., Mathias, A., & Wetzell, K. (2002). Fostering understanding of multimedia messages through pre-training: Evidence for a two-stage theory of mental model construction. *Journal of Experimental Psychology: Applied, 8*, 147–154.

Mayer, R. E., Moreno, R., Boire, M., & Vagge, S. (1999). Maximizing constructivist learning from multimedia communications by minimizing cognitive load. *Journal of Educational Psychology, 91*, 638–643.

McAlpine, L. (1992). Language, literacy and education: Case studies of Cree, Inuit, and Mohawk communities. *Canadian Children, 17*(1), 17–30.

McBer, H. (2000). *Research into teacher effectiveness: A model of teacher effectiveness* (Research Report #216). Nottingham, UK: Department for Education and Employment.

McCain T., & Jukes, I. (2000). *Windows on the future: Education in the age of technology*. Thousand Oaks, CA: Corwin.

McCarty, T. L., & Watahomigie, L. J. (1998). Indigenous community-based language education in the USA. *Language, Culture and Curriculum, 11*, 309–324.

McCaslin, M., & Hickey, D. T. (2001). Self-regulated learning and academic achievement: A Vygotskian view. In B. Zimmerman & D. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed., pp. 227–252). Mahwah, NJ: Erlbaum.

McClelland, D. C. (1985). How motives, skills, and values determine what people do. *American Psychologist, 40*, 812–825.

McClelland, D. C., & Teague, G. (1975). Predicting risk preferences among power related tasks. *Journal of Personality, 43*, 121–139.

McClintock R (1999). *The educator's manifesto: Renewing bond with posterity through the social construction of digital learning communities*. New York: Teachers College, Columbia University, Institute for Learning Technologies.

McClowry, S. G. (1998). The science and art of using temperament as the basis for intervention. *School Psychology Review, 27*, 551–563.

McComas, J. J., Thompson, A., & Johnson, L. (2003). The effects of precession attention on problem behavior maintained by different reinforcers. *Journal of Applied Behavior Analysis, 36*, 297–307.

McCombs, B. L., & Pope, J. E. (1994). *Motivating hard to reach students*. Washington, DC: American Psychological Association.

McCormick, C. B. (2003). Metacognition and learning. In W. M. Reynolds & G. E. Miller (Eds.), *Handbook of psychology: Vol. 7. Educational psychology* (pp. 583–607). Hoboken, NJ: Wiley.

McCoy, A. R., & Reynolds, A. J. (1999). Grade retention and school performance: An extended investigation. *Journal of School Psychology, 37*, 273–298.

McCrae, R. R. (2002). The maturation of personality psychology: Adult personality development and psychological well-being. *Journal of Research in Personality, 36*(4), 307–317.

McDaniel, M. A., & Dannelly, C. M. (1996). Learning with analogy and elaborative interrogation. *Journal of Educational Psychology, 88*, 508–519.

McDaniel, M. A., Waddill, P. J., Finstad, K., & Bourg, T. (2000). The effects of text-based interest on attention and recall. *Journal of Educational Psychology, 92*, 492–502.

McDermott, P., Mordell, M., & Stoltzfus, J. (2001). The organization of student performance in American schools: Discipline, motivation, verbal learning, and nonverbal learning. *Journal of Educational Psychology, 93*, 65–76.

McDevitt, T. M. (1990). Encouraging young children's listening skills. *Academic Therapy, 25,* 569–577.

McDevitt, T. M., & Ford, M. E. (1987). Processes in young children's communicative functioning and development. In M. E. Ford & D. H. Ford (Eds.), *Humans as self-construction living systems: Putting the framework to work* (pp. 145–175). Mahwah, NJ: Erlbaum.

McDevitt, T. M., Spivey, N., Sheehan, E. P., Lennon, R., & Story, R. (1990). Children's beliefs about listening: Is it enough to be still and quiet? *Child Development, 61,* 713–721.

McDevitt, T., & Ormrod, J. (2004). *Child development: Educating and working with children and adolescents* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

McDonald, J. P. (1993). Three pictures of an exhibition: Warm, cool, and hard. *Phi Delta Kappan, 6*, 480–485.

McDougall, D., & Granby, C. (1996). How expectation of questioning method affects undergraduates' preparation for class. *Journal of Experimental Education, 65*, 43–54.

McEwan, E. K. (2002). *10 traits of highly effective teachers: How to hire, coach, and mentor successful teachers.* Thousand Oaks, CA: Corwin.

McGlinchey, M., & Hixson, M. (2004). Using curriculum-based measurement to predict performance on state assessments in reading. *School Psychology Review, 33*(2), 193–203.

McGrath, D., Swisher, R., Elder, G., & Conger R. (2001). Breaking new ground: Diverse routes to college in rural America. *Rural Sociology, 66*(2), 244–267.

McIntyre, T. (1996). Guidelines for providing appropriate services to culturally diverse youngsters with emotional and/or behavioral disorders. *Behavioral Disorders, 21*(2), 137–144.

McKoon, G., & Ratcliff, R., (1986). Inferences about predictable events. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 12*, 82–91.

McKown, C., & Weinstein, R. S. (2003). The development and consequences of stereotype consciousness in middle school. *Child Development, 74*, 498–515.

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist, 53*, 185–204.

McLoyd, V. C., & Smith, J. (2002). Physical discipline and behavior problems in African American, European Americans, and Hispanic children: Emotional support as a moderator. *Journal of Marriage and the Family, 64*, 40–53.

McLoyd, V. C., Aikens, N., & Burton, L. (2006). Childhood poverty, policy, and practice. In W. Damon, R. Lerner, A. Renninger, & I. Sigel (Eds.), *Handbook of child psychology: Vol. 4. Child psychology in practice* (6th ed., pp. 700–775). New York: Wiley.

McMillan, J. H. (2004). *Educational research* (4th ed.). Boston: Allyn & Bacon.

McMillan, J. H. (2007). *Classroom assessment* (4th ed.). Boston: Allyn & Bacon.

McMillan, J. H., Myran, S., & Workman, D. (2002). Elementary teachers' classroom assessment and grading practices. *The Journal of Educational Research, 95*(4), 203–213.

McNamara, E. (1987). Behavioural approaches in the secondary school. In K. Wheldall (Ed.), *The behaviourist in the classroom* (pp. 50–68) London: Allen & Unwin.

McNamara, T. P. (1994). Theories of priming: II. Types of primes. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 507–520.

McNeil, D. (2000). Systematic desensitization. In A. Kazdin (Ed.), *Encyclopedia of psychology.* Washington, DC & New York: American Psychological Association and Oxford University Press.

Medin, D., Proffitt, J., & Schwartz, H. (2000). Concepts: An overview. In A. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 2, pp. 242–245). New York: Oxford University Press.

Meece, J. L. (2002). *Child and adolescent development for educators* (2nd ed.). New York: McGraw-Hill.

Meece, J. L., & Scantlebury, K. S. (2006). Gender and schooling: Progress and persistent barriers. In J. Worrell & C. Goodheart (Eds.), *Handbook of girls' and women's psychological health* (pp. 283–291). New York: Oxford University Press.

Meek, C. (2003). Classroom crisis: It's about time. *Phi Delta Kappan, 84*(8), 592–595.

Meese, R. L. (1992). Adapting textbooks for children with learning disabilities in mainstreamed classrooms. *Teaching Exceptional Children, 24*, 49–51.

Meichenbaum, D. (1977). *Cognitive-behavior modification: An integrative approach.* New York: Plenum.

Meichenbaum, D. H., & Goodman, J. B. (1971). Training impulsive children to talk to themselves: A means of developing self-control. *Journal of Abnormal Psychology, 77*(2), 115–126.

Meichenbaum, D., & Bielmiller, A. (1998). *Nurturing independent learners: Helping students take charge of their learning.* Newton, MA: Brookline Books.

Meinschaefer, J., Hausmann, M., & Guentuerkuen, O. (1999). Laterality effects in the processing of syllable structure. *Brain and Language, 70*(2), 287–293.

Meir, S. L., Rich, B. S., & Cady, J. A. (2006). Teachers' use of rubrics to score non-traditional tasks: Factors related to discrepancies in scoring. *Assessment in Education, 13*, 69–95.

Mercer, C. D., & Pullen, P. C. (2005). *Students with learning disabilities* (6th ed.). New Jersey: Pearson/Prentice Hall.

Mergendoller, J. R. (1996). Moving from technological possibility to richer student learning: Revitalized infrastructure and reconstructed pedagogy. *Educational Researcher, 25*(8), 43–46.

Merzenich, M. M. (2001). Cortical plasticity contributing to child development. In J. L. McClelland & R. S. Siegler (Eds.), *Mechanisms of cognitive development: Behavioral and neural perspectives* (pp. 67–95). Mahwah, NJ: Erlbaum.

Messick, S. (1994). The matter of style: Manifestations of personality in cognition, learning, and teaching. *Educational Psychologist, 29*, 121–136.

Metcalfe, B. (1981). Self-concept and attitude toward school. *British Journal of Educational Psychology, 51*, 66–76.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106*(1), 3–19.

Meter, P., & Stevens, R. (2000). The role of theory in the study of peer collaboration. *Journal of Experimental Education, 69*(1), 113–127.

Meyer, B. F. J., & Rice, G. E. (1984). The structure of text. In P. D. Pearson (Ed.), *Handbook of reading research* (pp. 316–342). New York: Longman.

Meyer, C. A. (1992). What's the difference between authentic and performance assessment? *Educational Leadership, 49*(8), 39–40.

Michael, W. (1999). Guilford's view. In M. A. Runco & S. Pritzker (Eds.), *Encyclopedia of creativity.* (Vol. 1, pp. 785–797). San Diego: Academic Press.

Midgley, C. (2001). A goal theory perspective on the current status of middle level schools. In T. Urdan & F. Pajares (Eds.), *Adolescence and education* (vol. 1, pp. 33–59). Greenwich, CT: Information Age Publishing.

Midgley, C., Kaplan, A., Middleteon, M., Maehr, M., Urdan, T., Anderman, L., Anderman, E., & Roeser, R. (1998). The development and validation of scales assessing students' achievement goal orientations. *Contemporary Educational Psychology, 23*, 113–131.

Midgley, C., Middleton, M. J., Gheen, M. H., & Kumar, R. (2002). Stage-environment fit revisited: A goal theory approach to examining school transitions. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 109–142). Mahwah, NJ: Erlbaum.

Miller, B. A. (1996). A basic understanding of multiage grouping: Teacher readiness, planning, and parent involvement required for successful practice. *The School Administrator, 1*(53), 12–17.

Miller, D. L., & Kelley, M. L. (1994). The use of goal setting and contingency contracting for improving children's homework performance. *Journal of Applied Behavior Analysis, 27*, 73–87.

Miller, G. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review, 63*, 81–97.

Miller, P. (2002). *Theories of developmental psychology* (4th ed.). New York: Worth.

Miller, S. (2001). Tips for transitions. *Scholastic Early Childhood Today, 15*(5), 3.

Miller, S. D., Duffy, G. G., Rohr, J., Gasparello, R. Y., & Mercier, S. (2005). Preparing teachers for high-poverty schools. *Educational Leadership, 62,* 62–65.

Miltenberger, R. G. (2004). *Behavior modification: Principles and procedures.* Belmont, CA: Wadsworth/Thomson Learning.

Minami, M., & McCabe, A. (1996). Compressed collections of experiences: Some Asian American traditions. In A. McCabe (Ed.), *Chameleon readers: Some problems cultural differences in narrative structure pose for multicultural literacy programs* (pp. 72–97). New York: McGraw-Hill.

Minami, M., & Ovando, C. J. (1995). Language issues in multicultural contexts. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of multicultural education* (pp. 427–444). New York: Macmillan.

Minstrell, J., & Stimpson, V. (1996). A classroom environment for learning: Guiding students' reconstruction of understanding and reasoning. In L. Schauble & R. Glaser (Eds.), *Innovations in learning: New environments for education* (pp. 175–203). Mahwah, NJ: Erlbaum.

Mintzes, J. J., Trowbridge, J. E., Arnaudin, M. W., & Wandersee, J. H. (1991). Children's biology: Studies on conceptual development in the life sciences. In S. M. Glynn, R. H. Yeany, & B. K. Britton (Eds.), *The psychology of learning science* (pp. 179–202). Mahwah, NJ: Erlbaum.

Miserandino, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88*, 203–214.

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Mitchell, J. J. (1990). *Human growth and development: The childhood years.* Calgary, Alberta: Detselig Enterprises.

Mitchell, M. (1993). Situational interests: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology, 85,* 424–436.

Mithaug, D. K., & Mithaug, D. E. (2003). Effects of teacher-directed versus student-directed instruction on self-management of young children with disabilities. *Journal of Applied Behavior Analysis, 36*, 133–136.

Mizelle, N. B. (1995, April). *Transition from middle school into high school: The student perspective.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Mizelle, N. B., & Irvin, J. L. (2000). Transition from middle school into high school. *Middle School Journal. 31*(5), 57–61.

Moallem, M. (1997). The nature and content of reflective practice: A case of an expert science teacher. *The Clearing House Journal, 70*(3), 143–150.

Moersch, C., & Fisher, L. M. (1995). Electronic portfolios—some pivotal questions. *Learning & Leading with Technology, 23*(2), 10–15.

Moje, E. B. (1996). "I teach students, not subjects": Teacher-student relationships as contexts for secondary literacy. *Reading Research Quarterly, 31*, 172–195.

Mokhtari, K., & Reichard, C. A. (2002). Assessing students' metacognitive awareness of reading strategies. *Journal of Educational Psychology, 94*, 249–259.

Moles, O. C. (Ed.). (1990). *Student discipline strategies: Research and practice.* Albany: State University of New York Press.

Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review, 13*(2), 125–145.

Monke, L. W. (2005). The overdominance of computers. *Educational Leadership, 63*(4), 20–23.

Montemayor, R., & Eisen, M. (1977). The development of self-conceptions from childhood to adolescence. *Developmental Psychology, 13*, 314–319.

Moore, J. W., & Edwards, R. P. (2003). An analysis of aversive stimuli in classroom demand contexts. *Journal of Applied Behavior Analysis, 36*, 339–348.

Moore, K. D. (1992). *Classroom teaching skills* (2nd ed.). New York: McGraw-Hill.

Moran, C. E., & Hakuta, K. (1995). Bilingual education: Broadening research perspectives. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (pp. 445–462). New York: Macmillan.

Moreno, R. (2004). Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback on discovery-based multimedia. *Instructional Science, 32*, 99–113.

Moreno, R. (2005). Instructional technology: Promise and pitfalls. In L. PytlikZillig, M. Bodvarsson, & R. Bruning (Eds.), *Technology-based education: Bringing researchers and practitioners together* (pp. 1–19). Greenwich, CT: Information Age Publishing.

Moreno, R. (2006). Learning with high tech and multimedia environments. *Current Directions in Psychological Science, 15,* 63–67.

Moreno, R. (2007). Optimizing learning from animations by minimizing cognitive load: Cognitive and affective consequences of signaling and segmentation methods. *Applied Cognitive Psychology, 21,* 765–781.

Moreno, R. (2007). Optimizing learning from animations by minimizing cognitive load: Cognitive and affective consequences of signaling and segmentation methods. *Applied Cognitive Psychology, 21*, 1–17.

Moreno, R. (2009). Constructing knowledge with an agent-based instructional program: A comparison of cooperative and individual meaning making. *Learning and Instruction, 19,* 433–444.

Moreno, R., & Abercrombie, S. (in press). Promoting awareness of learner diversity in prospective teachers: Signaling individual and group differences within virtual classroom cases. *Journal of Technology and Teacher Education.*

Moreno, R., Abercrombie, S., & Hushman, C. (2009). Using virtual classroom cases as thinking tools in teacher education. In *Proceedings of the 2009 Society for Information Technology and Teacher Education (SITE) International Conference*, (pp. 2615–2622). New York, NY: AACE Press.

Moreno, R., & Durán, R. (2004). Do multiple representations need explanations? The role of verbal guidance and individual differences in multimedia mathematics learning. *Journal of Educational Psychology, 96,* 492–503.

Moreno, R., & Mayer, R. E. (1999). Cognitive principles of multimedia learning: The role of modality and contiguity. *Journal of Educational Psychology, 91*, 358–368.

Moreno, R., & Mayer, R. E. (1999b). Multimedia-supported metaphors for meaning making in mathematics. *Cognition and Instruction, 17*, 215–248.

Moreno, R., & Mayer, R. E. (2000a). A coherence effect in multimedia learning: The case for minimizing irrelevant sounds in the design of multimedia messages. *Journal of Educational Psychology, 92*, 117–125.

Moreno, R., & Mayer, R. E. (2000b). Engaging students in active learning: The case for personalized multimedia messages. *Journal of Educational Psychology, 92*, 724–733.

Moreno, R., & Mayer, R. E. (2002). Learning science in virtual reality multimedia environments: Role of methods and media. *Journal of Educational Psychology, 94*, 598–610.

Moreno, R., & Mayer, R. E. (2002). Verbal redundancy in multimedia learning: When reading helps listening. *Journal of Educational Psychology, 94*, 156–163.

Moreno, R., & Mayer, R. E. (2004). Personalized messages that promote science learning in virtual environments. *Journal of Educational Psychology, 96*, 165–173.

Moreno, R., & Mayer, R. E. (2005). Role of guidance, reflection, and interactivity in an agent-based multimedia game. *Journal of Educational Psychology, 97*, 117–128.

Moreno, R., & Mayer, R. E. (2007). Interactive multimodal learning environments. *Educational Psychology Review, 19*, 309–326.

Moreno, R., & Ortegano-Layne, L. (2008). Using cases as thinking tools in teacher education: The role of presentation format. *Educational Technology Research and Development, 56,* 449–465.

Moreno, R., & Valdez, A. (2007). Immediate and delayed learning effects of presenting classroom cases in teacher education: Are video cases or case narratives more effective? *Journal of Educational Psychology, 99,* 194–206.

Moreno, R., & Valdez, F. (2005). Cognitive load and learning effects of having students organize pictures and words in multimedia environments: The role of student interactivity and feedback. *Educational Technology Research and Development, 53*, 35–45.

Moreno, R., Abercrombie, S., & Booker, D. (2008, April). *A longitudinal study examining the influence of worked example instruction on prospective teacher's problem solving and learning attitudes.* Paper presented at the 2008 annual meeting of the American Educational Research Association (AERA), New York.

Moreno, R., Mayer, R. E., Spires, H. A., & Lester, J. C. (2001). The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction, 19*, 177–213.

Morgan, M. (1985). Self-monitoring of attained sub-goals in private study. *Journal of Educational Psychology, 77*, 623–630.

Morgan, P., & Ritter, S. (2002). *An experimental study of the effects of Cognitive Tutor Alegbra I on student knowledge and attitude.* Pittsburgh, PA: Carnegie Learning.

Morrell, K., Marchionini, G., & Neuman, D. (1993). Sailing Perseus: Instructional strategies for hypermedia in the classics. *Journal of Educational Multimedia and Hypermedia, 2*(4), 337–353.

Morrison, G. (2006). *Teaching in America* (4th ed.). Boston: Allyn & Bacon.

Morrison, G. R., & Lowther, D. L. (2005). *Integrating computer technology into the classroom* (3rd ed.). Englewood Cliffs, NJ: Merrill/Prentice Hall.

Morrow, L. M. (2002). *The literacy center: Contexts for reading and writing.* (2nd ed.) Portland, ME: Stenhouse.

Morrow, L. M., & Weinstein, C. S. (1982). Increasing children's use of literature through program and physical design changes. *Elementary School Journal, 85*, 133–137.

Mory, E. H. (2004). Feedback research revisited. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (2nd ed., pp. 745–783). Mahwah, NJ: Erlbaum.

Muchmore, J. A. (2001). The story of "Anna": A life history study of the literacy beliefs and teaching practices of an urban high school English teacher. *Teacher Education Quarterly, 25*(3), 89–110.

Mueller, C. M., & Dweck, C. S. (1998). Intelligence praise can undermine motivation and performance. *Journal of Personality and Social Psychology, 75*, 33–52.

Muir, M., Knezek, G., & Christensen, R. (2004). *The Maine Learning Technology Initiative: An exploratory study of the impact of ubiquitous technology on student achievement.* Farmington, ME: Maine Center for Meaningful Engaged Learning.

Mullis, I. V. S., Martin, M. O., Gonzalez, E., & Kennedy, A. M. (2003). *PIRLS 2001 International report: IEA's study of reading literacy achievement in primary schools.* Chestnut Hill, MA: Boston College.

Mumford, M. D., Constanza, D. P., & Baughann, W. A. (1994). Influences of abilities on performance during practice: Effects of massed and distributed practice. *Journal of Educational Psychology, 86*, 134–144.

Munk, D., & Bursuck, W. (1998). Can grades be helpful and fair? *Educational Leadership, 55*(4), 44–47.

Murdock, T. B., & Anderman, E. M. (2006). Motivational perspectives on student cheating: Toward an integrated model of academic dishonesty. *Educational Psychologist, 41*, 129–145.

Murphy, D. R., & Davidshofer, C. O. (1994). *Psychological testing: Principles and applications* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Murphy, R. A., Baker, A. G., & Fouguet, N. (2001). Relative validity effects with either one or two more valid cues in Pavlovian and instrumental conditioning. *Journal of Experimental Psychology: Animal Processes, 27*, 59–67.

Murphy, S. (1995). Revisioning reading assessment: Remembering to learn from the legacy of reading tests. *The Clearing House, 68*, 235–239.

Murray, C., & Greenberg, M. T. (2001). Relationships with teachers and bonds with school: Social emotional adjustment correlates for children with and without disabilities. *Psychology in the Schools, 38*, 25–41.

Myers-Walls. J. A., & Frias, L. V. (2007). Family, school, and community: Finding green lights at the intersection. In B. S. Trask & R. R. Harmon (Eds.), *Cultural diversity and families*: *Expanding perspectives* (pp. 194–210). Thousand Oaks, CA: Sage.

Nagel, G., & Peterson, P. (2001). Why competency tests miss the mark. *Educational Leadership, 58*(8), 46–48.

Nairne, J. S. (2000). Forgetting. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 3, pp 386–389). Washington, DC: APA Publishing.

Nakagawa, K., Stafford, M., Fisher, T., & Matthews, L. (2002). The "city migrant" dilemma: Building community at high-mobility urban schools. *Urban Education, 37*(1), 96–125.

Nakamura, R. M. (2000). *Healthy classroom management*. Belmont, CA: Wadsworth.

Nakhleh, M. B. (1994). A review of micro-computer-based labs: How have they affected science learning? *Journal of Computers in Mathematics and Science Teaching, 13*(4), 368–381.

Nansel, T. R., Overbeck, M., Pilla, R. S., Ruan, W. J., Simons-Morton, B., & Schiedt, P. (2001). Bullying behavior among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association, 285*, 2094–2100.

National Assessment of Educational Progress (NAEP). (2007). *The nation's report card*. Washington, DC: National Center for Educational Statistics.

National Assessment of Educational Progress. (2002). *The nation's report card: 2002*. Washington, DC: National Center for Educational Statistics.

National Assessment of Educational Progress. (2005). *The nation's report card: 2005*. Washington, DC: National Center for Educational Statistics.

National Association of School Psychologists (2006). Position statement on corporal punishment in schools. Retrieved January 8, 2007 from: http://www.nasponline.org/about_nasp/pospaper_corppunish.aspx.

National Association of School Psychologists. (2007). *Position statement on ability grouping and tracking*. Retrieved December 28, 2007, from http://www.nasponline.org/about_nasp/pospaper_ag.aspx

National Board for Professional Teaching Standards. (1994). *What teachers should know and be able to do*. Southfield, MI: Author.

National Center for Education Statistics (NCES). (2001). *The nation's report card. National report: 2001*. Washington, DC: Author.

National Center for Education Statistics (NCES). (2002). *Outcomes of learning: Results from the 2000 Program for International Student Assessment of 15-year-olds in reading, mathematics, and science literacy* (NCES 2002-115). Washington, DC: U.S. Government Printing Office.

National Center for Education Statistics (NCES). (2006). *The condition of education, 2006*. Washington, DC: U.S. Department of Education.

National Center for Education Statistics (NCES). (2007). *Timing and duration of student participation in special education in the primary grades* (NCES 2007-043). Washington, D.C.: Author.

National Center for Education Statistics. (2003). *The condition of education 2003*. Washington, DC: U.S. Department of Education.

National Center for Education Statistics. (2007). *Indicators of school crime and safety: 2007*. Retrieved January 19, 2009, from http://nces.ed.gov/programs/crimeindicators/crimeindicators2007

National Center for Education Statistics. (2008). *Trends in the achievement gaps in reading and mathematics*. Retrieved October 27, 2008, from http://nces.ed.gov/programs/coe/2008/charts/chart16.asp?popup=true

National Center for Fair and Open Testing. (1991). *Standardized tests and our children: A guide to testing reform*. Cambridge, MA: Sapphire.

National Clearinghouse for English Language Acquisition and Language Instruction Educational Programs. (2007). *National and regional data and demographics*. Retrieved November 27, 2007, from http://www.ncela.gwu.edu/expert/faq/08leps.html

National Commission on Teaching and America's Future. (2003). *No dream denied: A pledge to America's children*. Washington, DC: Author.

National Commission on Testing and Public Policy. (1990). *From gate keeper to gateway*. Chestnut Hill, MA: Boston College Press.

National Council of Teachers of English (NCTE). (1996). *Standards for the English language arts*. Urbana, IL: Author.

National Council of Teachers of English (NCTE). (2007) Retrieved March 30, 2009 from www.ncte.org/ standards for the English Language arts.

National Council of Teachers of Mathematics (NCTM). (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

National Dissemination Center for Children with Disabilities. (2004). *Emotional disturbance*. Fact Sheet 5 (FS5). Retrieved July 14, 2008, from http://www.nichcy.org/pubs/factshe/fs5txt.htm

National Education Association. (2007). Don't turn 'em off, tune 'em in! *NEA Today, 26*(1), 17. Reteieved may 4, 2009 from http://findarticles.com/p/articles/mi_993617/is-200709/a1-n21099675/?tag=content;col1.

National Joint Committee on Learning Disabilities. (2001). Learning disabilities: Issues on definition. In National Joint Committee on Learning Disabilities (Ed.), *Collective perspectives on issues affecting learning disability: Position papers, statements, and reports* (2nd ed., pp. 27–32). Austin, TX: Pro-Ed.

National Research Council (NRC). (1996). *National science education standards*. Washington, DC: National Academy Press.

National Research Council. (2004). *Engaging schools: Fostering high school students' motivation to learn*. Committee on Increasing High School Students' Engagement and Motivation to Learn. Washington, DC: National Academic Press.

National Research Council. (2005). *How students learn: History, mathematics, and science in the classroom*. Washington, DC: National Academic Press.

Naughton, C. C., & McLaughlin, T. F. (1995). The use of a token economy system for students with behaviour disorders. *B. C. Journal of Special Education, 19*, 29–38.

NCSS Task Force on Ethnic Studies Curriculum Guidelines. (1992). Curriculum guidelines for multicultural education. *Social Education, 56*, 274–294.

Nehm, R., & Schonfeld, I. S. (2007). Does increasing biology teacher knowledge of evolution and the nature of science lead to greater advocacy for the teaching of evolution in schools? *Journal of Science Teacher Education, 18*, 699–723.

Neiss, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education, 21*(5), 509–523.

Neisser, U. (1967). *Cognitive psychology*. New York: Appleton-Century-Crofts.

Neisser, U., & Weene, P. (1962). Hierarchies in concept attainment. *Journal of Experimental Psychology, 64*, 640–645.

Nelsen, J., Lott, L., & Glenn, S. (2000). *Positive discipline in the classroom: Developing mutual respect, cooperation, and responsibility in your classroom.* Rocklin, CA: Prima.

Nelson, C. A. (1993). *Memory and affect in development.* Hillsdale, NJ: Erlbaum.

Neukrug, E. S., & Fawcett, C. (2006). *Essentials of testing and assessment.* Belmont, CA: Wadsworth.

Neville, H. J., & Bavelier, D. (2001). Variability of developmental plasticity. In J. L. McClelland & R. S. Siegler (Eds.), *Mechanisms of cognitive development: Behavioral and neural perspectives* (pp. 271–287). Mahwah, NJ: Erlbaum.

New Mexico Language Arts Standards. (2000). Retrieved September 30, 2008, from www.nmstandards.org

Newell, A., & Simon, H. A. (1972). *Human problem solving.* Upper Saddle River, NJ: Prentice Hall.

Newman, R. S. (1998). Students' help seeking during problem solving: Influences of personal and contextual achievement goals. *Journal of Educational Psychology, 90,* 644–658.

Newman, R. S., & Schwager, M. T. (1992). Student perceptions and academic help-seeking. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* (pp. 123–146). Hillsdale, NJ: Erlbaum.

Newman, S. B., & Celano, D. (2001). Access to print in low-income and middle-income communities: An ecological study of four neighborhoods. *Reading Research Quarterly, 36,* 6–26.

Newport, E. L. (1990). Maturational constraints on language learning. *Cognitive Science,* 14, 11–48.

Newstrom, J., McLaughlin, T. F., & Sweeney, W. J. (1999). The effects of contingency contracting to improve the mechanics of written language with a middle school student with behavior disorders. *Child & Family Behavior Therapy, 21*(1), 39–48.

Ng, C. H., & Renshaw, P. D. (2002). Self-schema, motivation and learning: A cross-cultural comparison. In D. McInerney & S. Van Etten (Eds.), *Sociocultural influences on motivation and learning* (Vol. 2, pp. 55–87). Greenwich, CT: IAP.

Nichols, J. D. (1996). The effects of cooperative learning on student achievement and motivation in a high school geometry class. *Contemporary Educational Psychology, 21,* 467–476.

Nichols, J. D., Ludwin, W. G., & Iadicola, P. (1999). A darker shade of gray: A year-end analysis of discipline and suspension data. *Equity and Excellence in Education, 32*(1), 43–55.

Nickerson, R. (1988). On improving thinking through instruction. In E. Rothkopf (Ed.), *Review of research in education* (pp. 3–57). Washington, DC: American Educational Research Association.

Nickerson, R. S. (1994). The teaching of thinking and problem solving. In R. J. Sternberg (Ed.), *Thinking and problem solving* (pp. 409–449). San Diego: Academic Press.

Nickerson, R. S. (1995). Can technology help teach for understanding? In D. N. Perkins, J. H. Schwartz, M. M. West, & M. S. Wiske (Eds.), *Software goes to school: Teaching for understanding with new technologies.* (pp. 7–22). New York: Oxford University Press.

Nieto, S. (1999). *Identity, personhood, and Puerto Rican students: Challenging paradigms of assimilation and authenticity.* Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada.

Nieto, S. (2000). *Affirming diversity: The sociopolitical context of multicultural learning.* New York: Longman.

Nieto, S. (2001). We speak in many tongues. In C. F. Diaz (Ed.), *Multicultural education in the 21st century* (pp. 152–170). New York: Longman.

Nieto, S. (2004). *Affirming diversity: The sociopolitical context of multicultural education* (4th ed.). Boston: Pearson Education.

Nilsson, L., & Archer, T. (1989). Aversively motivated behavior: Which are the perspectives? In T. Archer & L. Nilsson (Eds.), *Aversion, avoidance and anxiety.* Hillsdale, NJ: Erlbaum.

Nisan, M. (1992). Beyond intrinsic motivation: Cultivating a "sense of the desirable." In F. Oser, A. Dick, & J. Patry (Eds.), *Effective and responsible teaching: The new synthesis* (pp. 126–138). San Francisco: Jossey-Bass.

Nitko, A. (2004). *Educational assessment of students* (4th ed.). Upper Saddle River, NJ: Pearson.

Nix, R. L., Pinderhughes, E. E., Dodge, K. A., Bates, J. E., Pettit, G. S., & McFadyen-Ketchum, S. A. (1999). The relation between mothers' hostile attribution tendencies and children's externalizing behavior problems: The mediating role of mothers' harsh discipline practices. *Child Development, 70,* 896–909.

Noddings, N. (1992). *The challenge to care in schools.* New York: Teachers College Press.

Noddings, N. (2001). The caring teacher. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 99–105). Washington, DC: American Educational Research Association.

Noguchi, J. (1998). "Easifying" ESP texts for EFL science majors. *Proceedings of the Japan Conference on English for Specific Purposes.* Aizuwakamatsu City, Fukushima, Japan.

Noice, H. (1993). Effects of rote versus gist strategy on verbatim retention of theatrical scripts. *Applied Cognitive Psychology, 7,* 75–84.

Nordvik, H., & Amponsah, B. (1998). Gender differences in spatial abilities and special activity among university students in an egalitarian educational system. *Sex Roles, 38*(11–12), 1009–1023.

Norman, D. (2004). *Emotional design: Why we love (or hate) everyday things.* New York: Basic Books.

Norman, M. (2000). Don Tapscott: Man with a message. *Converge, 3*(3), 50–52.

Norris, C., & Soloway, E. (2003). The viable alternative: Handhelds. *School Administrator, 60*(4), 26–28.

Norris, J. A. (2003). Looking at classroom management through a social and emotional learning lens. *Theory into Practice, 42,* 313–318.

Northeast Foundation for Children. (2006). *Responsive classroom principles and practices.* Retrieved January 5, 2009, from: www.responsiveclassroom.org/about/principles.html

Northup, J., Broussard, C., Jones, K., George, T., Vollmer, T. R., & Herring, M. (1995). The differential effects of teachers and peer attention on the disruptive classroom behavior of three children with a diagnosis of attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis,* 28, 227–228.

Norton, P., & Sprague, D. (2001). *Technology for teaching.* Boston: Allyn & Bacon.

Nucci, L. (2007). Classroom management for social and moral development. In C. Evertson & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice, & contemporary issues* (pp. 711–731). Mahwah, NJ: Erlbaum.

Nurmi, J.-E., Onatsu, T., & Haavisto, T. (1995). Underachievers' cognitive and behavioral strategies—Self-handicapping at school. *Contemporary Educational Psychology, 20,* 188–200.

Nystrand, M., & Gamoran, A. (1991). Instructional discourse, student encouragement, and literature achievement. *Research in the Teaching of English, 25,* 261–290.

O'Boyle, M. W., & Gill, H. S. (1998). On the relevance of research findings in cognitive neuroscience to educational practice. *Educational Psychology Review, 10,* 397–410.

O'Donnell, A. M. (2000). The effects of explicit incentives on scripted and unscripted cooperation. *Journal of Educational Psychology, 88,* 74–86.

O'Donnell, A. M., & Dansereau, D. F. (1992). Scripted cooperation in student dyads: A method for analyzing and enhancing academic learning and performance. In R. Hertz-Lazarowitz & N. Miller (Eds.), *Interaction in cooperative groups: The theoretical anatomy of group learning* (pp. 120–144). New York: Cambridge University Press.

O'Donnell, J. O., Hawkins, D., Catalano, R. F., Abbott, R. D., & Day, E. (1995). Preventing school failure, drug use, and delinquency among low-income children: Long-term intervention in elementary schools. *American Journal of Orthopsychiatry, 65,* 87–100.

O'Flahavan, J. F., & Stein, C. (1992). In search of the teacher's role in peer discussions about literature. *Reading in Virginia, 17,* 34–42.

O'Leary, K. D., Kuafman, K. F., Kass, R. E., & Drabman, R. S. (1970). The effects of loud and soft reprimands on the behavior of disruptive students. *Exceptional Children, 37,* 145–155.

O'Lone, D. J. (1997). Student information system software: Are you getting what you expected? *NASSP Bulletin, 81*(585), 86–93.

Oakes J., & Lipton, M. (2007). *Teaching to change the world* (3rd ed.). New York: McGraw-Hill.

Oakes, J. (1992). Can tracking research inform practice? *Educational Researcher, 21*(4), 12–21.

Oakes, J., & Guiton, G. (1995). Matchmaking: The dynamics of high school tracking decisions. *American Educational Research Journal, 32*(1), 3–33.

Oakes, J., & Wells, A. S. (2002). Detracking for high student achievement. In L. Abbeduto (Ed.), *Taking sides: Clashing views and controversial issues in educational psychology* (2nd ed., pp. 26–30). Guilford, CT: McGraw-Hill Duskin.

Oates, J., Flores, R., & Weishew, N. (1998). Achieving student success in inner-city schools is possible, provided. . . . *Research in Middle Level Education Quarterly, 21*(3), 51–62.

Obringer, S. J., & Coffey, K. (2007). Cell phones in American high schools: A national survey. *Journal of Technology Studies, 33*(1/2), 41–47.

Office of Educational Research and Improvement, U.S. Department of Education. (1994). *Technology and education reform* [online]. Retrieved January 5, 2009, from http://www.ed.gov/pubs/EdReformStudies/EdTech

Office of Management and Budget. (1997). Revisions to the standards for the classification of federal data on race and ethnicity. Retrieved July 14, 2008, from http://www.whitehouse.gov/omb/fedreg/1997standards.html

Ogawa, R. T. (1998). Organizing parent-teacher relations around the work of teaching. *Peabody Journal of Education, 73*(1), 6–14.

Ogbu, J. (1987). Variability in minority school performance: A problem in search of an explanation. *Anthropology and Education Quarterly, 18,* 312–334.

Ogbu, J. U. (1992). Understanding cultural diversity and learning. *Educational Researcher, 21*(8), 5–14, 24.

Ogbu, J. U. (1994). From cultural differences to differences in cultural frame of reference. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural roots of minority child development.* (pp. 369–392) Mahwah, NJ: Erlbaum.

Ogbu, J. U. (1999). Beyond a language: Ebonics, proper English, and identity in a black-American speech community. *American Educational Research Journal, 36,* 147–184.

Okagaki, L. (2006). Ethnicity, learning. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed. pp. 615–634). Mahwah, NJ: Erlbaum.

Oldfather, P. (1993). What students say about motivating experiences in a whole language classroom. *The Reading Teacher, 46,* 672–681.

Oldfather, P., & Thomas, S. (1998). What does it mean when high school teachers participate in collaborative research with students on literacy motivations? *Teachers College Record, 99,* 617–691.

Olina, Z., & Sullivan, H. (2004). Student self-evaluation, teacher evaluation, and learner performance. *Educational Technology Research and Development, 52,* 5–22.

Olneck, M. R. (1995). Immigration and education. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research in multicultural education* (pp. 310–327). New York: Macmillan.

Olson, A. (2000). Computerized testing. *American School Board Journal, 187*(3) (Suppl.).

Olszewski-Kubilius, P. (2003). Gifted education programs and procedures. In W. M. Reynolds & G. E. Miller (Eds.), *Handbook of psychology* (Vol. 7, pp. 487–510). New Jersey: Wiley.

Opfer, J., & Siegler, R. S. (2004). Revisiting preschoolers' living things concept: A microgenetic analysis of conceptual change in basic biology. *Cognitive Psychology, 49,* 301–332.

Oppenheimer, R. J. (2001). Increasing student motivation and facilitating learning. *College Teaching, 49*(3), 96–98.

Orfield, G., & Kornhaver, M. L. (Eds.). (2001). *Raising standards or raising barriers? Inequality and high-stakes testing in public education.* New York: Century Foundation Press.

Orlich, C., Harder, R., Callahan, R., Trevisian, M., & Brown, A. (2004). *Teaching strategies: A guide to effective instruction* (7th ed.). Boston: Houghton Mifflin.

Ornstein, A. C., Lasley, T., & Mindes, G. (2005). *Secondary and middle school methods.* Boston: Allyn & Bacon.

Oskamp, S. (Ed.). (2000). *Reducing prejudice and discrimination.* Mahwah, NJ: Erlbaum.

Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research, 70,* 323–367.

Ostrov, J. M., Keating, C. F., & Ostrov, J. M. (2004). Gender differences in preschool aggression during free play and structured interactions: An observational study. *Social Development, 13,* 255–277.

Otero, V. K. (2006). Moving beyond the "get it or don't" conception of formative assessment. *Journal of Teacher Education, 57,* 247–255.

Overskeid, G., & Svartdal, F. (1996). Effects of reward on subjective autonomy and interest when initial interest is low. *The Psychological Record, 46,* 319–331.

Overton, D. A. (1985). Contextual stimulus effects of drugs and internal states. In P. D. Balsam & A. Tomie (Eds.), *Context and learning* (pp. 357–384). Mahwah, NJ: Erlbaum.

Owens, R. E., Jr. (1996). *Language development* (4th ed.). Boston: Allyn & Bacon.

Oyserman, D. (2008). Possible selves: Identity-based motivation and academic achievement. In H. Marsh, R. G. Craven, & D. M. McInerney (Eds.), *Self-processes, learning, and enabling human potential: Dynamic new approaches* (pp. 269–288). Charlotte, NC: Information Age Publishing.

Oyserman, D., & Fryberg, S. (2006). The possible selves of diverse adolescents: Content and function across gender, race and national origin. In C. Dunkel & J. Kerpelman (Eds.), *Possible selves: Theory, research and applications* (pp. 17–39). New York: Nova Science.

Oyserman, D., & Markus, H. (1990). Possible selves and delinquency. *Journal of Personality and Social Psychology, 59*, 112—115.

Oyserman, D., & Markus, H. R. (1993). The sociocultural self. In Jerry M. Suls (Ed.), *Psychological perspectives on the self: Vol. 4. The self in social perspective* (pp. 187–220). Hillsdale, NJ: Erlbaum.

Oyserman, D., Brickman, D., & Rhodes, M. (2007). Racial ethnic identity: Content and consequences for African American, Latino and Latina youth. In A. Fuligni (Ed.), *Contesting stereotypes and creating identities: Social categories, social identities and educational participation* (pp. 91–114). New York: Russell Sage.

Oyserman, D., Brickman, D., & Rhodes, M. (2007). School success, possible selves, and parent school involvement. *Family Relations, 56*, 479–489.

Oyserman, D., Bybee, D., & Terry, K. (2006). Possible selves and academic outcomes: How and when possible selves impel action. *Journal of Personality and Social Psychology, 91*, 188–204.

Oyserman, D., Bybee, D., Terry, K., & Hart-Johnson, T. (2004). Possible selves as roadmaps. *Journal of Research in Personality, 38,* 130–149.

Oyserman, D., Terry, K., & Bybee, D. (2002). A possible selves intervention to enhance school involvement. *Journal of Adolescence, 25*, 313–326.

Pacheco, S., & Hurtado, S. (2001). Media stereotypes. In J. Worell (Ed.), *Encyclopedia of women and gender. Sex similarities and differences and the impact of society on gender* (Vol. 2, pp. 703–709). San Diego: Academic Press.

Paciotto, C. (2000). Measuring language dominance and bilingual proficiency development of Tarahumara children. In J. Reyhner, J. Martin, L. Lockard, & W. S. Gilbert (Eds.), *Learn in beauty: Indigenous education for a new century* (pp. 45–64). Flagstaff: Northern Arizona University.

Padilla, A. M. (2006). Second language learning: Issues in research and teaching. In P. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 571–591). Mahwah, NJ: Erlbaum.

Page, E. (1992). Is the world an orderly place? A review of teacher comments and student achievement. *Journal of Experimental Education, 60*(2), 161–181.

Pagliocca, P. (1988). Clarity of structure. In R. McNergney (Ed.), *Guide to classroom teaching* (pp. 167–192). Boston: Allyn & Bacon.

Paige, J. M., & Simon, H. A. (1966). Cognitive processes in solving algebra word problems. In B. Kleinmuntz (Ed.), *Problem solving: Research, method, and theory* (pp. 51–118). New York: Wiley.

Pajares, F. (1996). Self-efficacy beliefs and mathematical problem solving of gifted students. *Contemporary Educational Psychology, 21*, 325–344.

Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self-efficacy, self-concept, and school achievement. In R. Riding & S. Rayner (Eds.), *Self-perception* (pp. 239–266). London: Ablex.

Paley, V. G. (2000). *White teacher.* Cambridge, MA: Harvard University Press.

Palincsar, A. S. (1998). Social constructivist perspectives on teaching and learning. In J. T. Spence, J. M. Darley, & D. J. Foss (Eds.), *Annual review of psychology* (pp. 345–375). Palo Alto, CA: Annual Reviews.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1,* 117–175.

Palincsar, A. S., & Herrenkohl, L. R. (1999). Designing collaborative contexts: Lessons from three research programs. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 151–177). Mahwah, NJ: Erlbaum.

Palincsar, A. S., & Klenk, L. J. (1991). Dialogues promoting reading comprehension. In B. Means, C. Chelemer, & M. S. Knapp (Eds.), *Teaching advanced skills to at-risk students* (pp. 112–140). San Francisco: HarperCollins.

Palincsar, A. S., & Klenk, L. J. (1992). Fostering literacy learning in supportive contexts. *Journal of Learning Disabilities, 25*(4), 211–229.

Palincsar, A. S., Magnusson, S. J., Marano, N., Ford, D., & Brown, N. (1998). Designing a community of practice: Principles and practices of the GIsML community. *Teaching and Teacher Education, 14*, 5–19.

Pals, J. L. (2006). Constructing the "springboard effect": Causal connections, self-making, and growth within the life story. In D. P. McAdams, R. Josselson, & A. Lieblich (Eds.), *Identity and story* (pp. 175–199). Washington, DC: American Psychological Association.

Pang, V. O. (1995). Asian Pacific American students: A diverse and complex population. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education.* (2nd ed., pp. 545–580) New York: Macmillan.

Pang, V. O. (2005). *Multicultural education* (3rd ed.). New York: McGraw-Hill.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist, 36,* 89–101.

Parke, R. D., & O'Neil, R. (1997). The influence of significant others on learning about relationships. In S. Duck (Ed.), *Handbook of personal relationships* (2nd ed., pp. 29–60). New York: Wiley.

Parke, R. D., & Walters, R. H. (1967). Some factors influencing the efficacy of punishment training for inducing response inhibition. *Monographs of the Society for Research in Child Development, 32* (1, Whole No. 109).

Parker, J. G., & Asher, S. R. (1987). Peer relations and later personal adjustment: Are low accepted children at risk? *Psychological Bulletin, 102*, 357–389.

Parker, L. E., & Lepper, M. R. (1992). Effects of fantasy contexts on children's learning and motivation: Making learning more fun. *Journal of Personality and Social Psychology, 62*, 625–633.

Parsons, J., Kaczala, C., & Meece, J. (1982). Socialization of achievement attitudes and beliefs: Classroom influences. *Child Development, 53*, 322–339.

Parsons, R. D., & Brown, K. S. (2002). *Teacher as reflective practitioner and action researcher.* Belmont, CA: Wadsworth/Thomson Learning.

Pascual-Leone, J., & Ijaz, H. (1989). Mental capacity testing as a form of intellectual-developmental assessment. In R. J. Samuda, S. L. Kong, J. Cummins, J. Pascual-Leone, & J. Lewis (Eds.), *Assessment and placement of minority students* (pp. 143–171). Toronto, Canada: Intercultural Social Sciences Publications.

Patrick, H., Anderman, L. H., & Ryan, A. M. (2002). Social motivation and the classroom social environment. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 85–108). Mahwah, NJ: Erlbaum.

Patterson, G. R., DeBarsyshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist, 44*, 329–335.

Pavlov, I. P. (1955). *Selected works.* Moscow: Foreign Languages Publishing House.

Payne, D. A. (1997). *Applied educational assessment.* Belmont, CA: Wadsworth.

Peña, D. (2000). Parent involvement: Influencing factors and implications. *Journal of Educational Research, 94*(1), 42–54.

Peart, N. A., & Campbell, F. A. (1999). At-risk students' perceptions of teacher effectiveness. *Journal for a Just and Caring Education, 5*(3), 269–284.

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement. A program of qualitative and quantitative research. *Educational Psychologist, 37*, 91–105.

Pelham, W., Burrows-MacLean, L., Gnagy, E. M., Fabiano, G. A., Coles, E. K., Tresco, K. E., Chacko, A., Wymbs, B. T., Wienke, A.L., Walker, K. S., & Hoffman, M.T. (2005). Transdermal methylphenidate, behavioral, and combined treatment for children with ADHD. *Experimental and Clinical Psychopharmacology, 13*(2), 111–126.

Pellegrini, A. D. (2002). Bullying, victimization, and sexual harassment during the transition to middle school. *Educational Psychologist, 37*, 151–163.

Pellegrini, A. D., Huberty, P. D., & Jones, I. (1995). The effects of recess timing on children's playground and classroom behaviors. *American Educational Research Journal, 32*, 845–864.

Pellegrini, A. D., Kato, K., Blatchford, P., & Baines, E. (2002). A short-term longitudinal study of children's playground games across the first year of school: Implications for social competence and adjustment to school. *American Educational Research Journal, 39,* 991–1015.

Penner, S. G. (1987). Parental responses to grammatical and ungrammatical utterances. *Child Development, 58*, 376–384.

Peregoy, S., & Boyle, O. (2005). *Reading, writing, and learning in ESL: A resource book for teachers* (4th ed.). Boston: Allyn & Bacon.

Perez, B. (1998). *Sociocultural contexts of language and literacy.* Mahwah, NJ: Erlbaum.

Perkins, D. (1999). The many faces of constructivism. *Educational Leadership, 57*(3), 6–11.

Perry, N. E. (1998). Young children's self-regulated learning and contexts that support it. *Journal of Educational Psychology, 90*, 715–729.

Perry, N. E., Turner, J. C., & Meyer, D. K. (2006). Classrooms as contexts for motivating learning. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed, pp. 327–348). Mahwah, NJ: Erlbaum.

Perry, N. E., VandeKamp, K. O., Mercer, L. K., & Norby, C. J. (2002). Investigating teacher-student interactions that foster self-regulated learning. *Educational Psychologist, 37*(1), 5–15.

Perry, R. P. (1985). Teacher expressiveness: Implications for improving teaching. In J. G. Donald & A. M. Sullivan (Eds.), *Using research to improve teaching* (pp. 35–49). San Francisco: Jossey-Bass.

Perry, R. P., Magnusson, J. L., Parsonson, K. L., & Dickens, W. J. (1986). Perceived control in the college classroom: Limitations in instructor expressiveness due to noncontingent feedback and lecture content. *Journal of Educational Psychology, 78*, 96–107.

Persell, C. H. (1997). Social class and educational equality. In J. A. Banks & C. A. M. Banks (Eds.), *Multicultural education: Issues and perspectives* (pp. 87–107). Boston: Allyn & Bacon.

Peterson, C. (1990). Explanatory style in the classroom and on the playing field. In S. Graham & V. Folkes (Eds.), *Attribution theory: Applications to achievement, mental health, and interpersonal conflict* (pp. 53–75). Mahwah, NJ: Erlbaum.

Peterson, P. L., & Comeaux, M. A. (1989). Assessing the teacher as a reflective professional: New perspectives on teacher evaluation. In A. Woolfolk (Ed.), *Research perspectives on the graduate preparation of teachers* (pp. 132–152). Englewood Cliffs, NJ: Prentice Hall.

Peterson, R. L., & Skiba, R. (2001). Creating school climates that prevent school violence. *The Clearing House, 74*(3), 155–163.

Pfeifer, M., Goldsmith, H. H., Davidson, R. J., & Rickman, M. (2002). Continuity and change in inhibited and uninhibited children. *Child Development, 73*, 1474–1485.

Pfiffner, L. J., & Barkley, R. A. (1998). Treatment of ADHD in school settings. In R. A. Barkley (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (2nd ed., pp. 458–490). New York: Guilford Press.

Pfiffner, L. J., & O'Leary, S. G. (1993). School-based psychological treatments. In J. L. Matson (Ed.), *Handbook of hyperactivity in children* (pp. 234–255). Boston: Allyn & Bacon.

Phelan, P., Davidson, A. L., & Cao, H. T. (1991). Students' multiple worlds: Negotiating the boundaries of family, peer, and school cultures. *Anthropology and Education Quarterly, 22*(3), 224–250.

Phillips, B. K. (1995). Improving school attendance through an incentive system. *NASSP Bulletin, 79*, 111–115.

Phillips, B. N., Pitcher, G. D., Worsham, M. E., & Miller, S. C. (1980). Test anxiety and the school environment. In I. G. Sarason (Ed.), *Test anxiety: Theory, research, and applications* (pp. 327–346). Mahwah, NJ: Erlbaum.

Phillips, D. (2000). An opinionated account of the constructivist landscape. In D. Phillips (Ed.), *Constructivism in education: Opinions and second opinions on controversial issues* (pp. 1–16). Chicago: National Society for the Study of Education.

Phillips, D., & Zimmerman, M. (1990). The developmental course of perceived competence and incompetence among competent children. In R. Sternberg & J. Killigian (Eds.), *Competence considered* (pp. 41–66). New Haven, CT: Yale University Press.

Phinney, J. S. (1996). When we talk about American ethnic groups, what do we mean? *American Psychologist, 51,* 918–927.

Phinney, J., Berry, J., Sam, D., & Vedder, S. (2006). Understanding immigrant youth: Conclusions and implications. In J. Berry, J. Phinney, D. Sam, & P Vedder (Eds.), *Immigrant youth in cultural transition.* Mahwah, NJ: Erlbaum.

Phinney, J., Berry, J., Vedder, P., & Liebkind, K. (2006). The acculturation experience: Attitudes, identities and behaviors of immigrant youth. In J. Berry, J. Phinney, D. Sam, & P. Vedder (Eds.), *Immigrant youth in cultural transition: Acculturation, identity, and adaptation across national contexts* (pp. 71–116). Mahwah, NJ US: Lawrence Erlbaum Associates Publishers.

Phye, G. D. (2001). Problem-solving instruction and problem-solving transfer: The correspondence issue. *Journal of Educational Psychology, 93*, 571–578.

Piaget, J. (1951). *Play, dreams, and imitation in childhood.* New York: Norton.

Piaget, J. (1952). *The origins of intelligence in children* (M.Cook, Trans.). New York: Norton.

Piaget, J. (1954). *The construction of reality in the child.* New York: Basic Books.

Piaget, J. (1963). *Origins of intelligence in children.* New York: Norton.

Piaget, J. (1964). Development and learning. In R. Ripple & V. Rockcastle (Eds.), *Piaget rediscovered* (pp. 78–119). Washington, DC: U. S. Office of Education National Science Foundation.

Piaget, J. (1969). *Science of education and the psychology of the child.* New York: Viking.

Piaget, J. (1970). *Genetic epistemology.* New York: W. W. Norton.

Piaget, J. (1977). Problems in equilibration. In M. Appel & L. Goldberg (Eds.), *Topics in cognitive development: Vol 1. Equilibration: Theory, research, and application* (pp. 3–13). New York: Plenum.

Piaget, J. (1995). *Sociological studies*. New York: Routledge. (Original work published 1965)

Piaget, J., & Inhelder, B. (1956). *The child's conception of space*. Boston: Routledge & Kegan-Paul.

Pianta, R. (2006). Classroom management and relationships between children and teachers: Implications for research and practice. In C. Evertson & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice, & contemporary issues* (pp. 685–710). Mahwah, NJ: Erlbaum.

Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. Washington, DC: American Psychological Association.

Picard, R. (2000). *Affective computing*. Cambridge, MA: MIT Press.

Pichert, J. W., & Anderson, R. C. (1977). Taking different perspectives on a story. *Journal of Educational Psychology, 69*, 309–315.

Piirto, J. (1999). *Talented children and adults: Their development and education* (2nd ed.). Upper Saddle River, NJ: Merrill.

Pillow, B. H. (2002). Children's and adults' evaluation of the certainty of deductive inferences, inductive inferences, and guesses. *Child Development, 73*, 779–792.

Pinker, S. (1987). The bootstrapping problem in language acquisition. In B. MacWhinney (Ed.), *Mechanisms of language acquisition*. Mahwah, NJ: Erlbaum.

Pinker, S. (2007). *The language instinct: How the mind creates language* (pp. 399–441). New York: Morrow.

Pintrich, P. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92*, 544–555.

Pintrich, P. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452–501). San Diego: Academic Press.

Pintrich, P. R., & Schrauben, B. (1992). Students' motivational beliefs and their cognitive engagement in academic tasks. In D. Schunk & J. Meece (Eds.), *Student perceptions in the classroom: Causes and consequences* (pp. 149–183). Hillsdale, NJ: Erlbaum.

Pintrich, P. R., & Zusho, A. (2002). The development of achievement self-regulation: The role of cognitive and motivational factors. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 250–284). San Diego: Academic Press.

Pintrich, P. R., Marx, R. W., & Boyle, R. A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63*(2), 167–199.

Pintrich, P., & Schunk, D. (2002). *Motivation in education: Theory, research, and applications* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Pithers, R. T., & Soden, R. (2000). Critical thinking in education: A review. *Educational Research, 42*, 237–249.

Pitner, R. O., Astor, R. A., Benbenishty, R., Haj-Yahia, M. M., & Zeira, A. (2003). The effects of group stereotypes on adolescents' reasoning about peer retribution. *Child Development, 74*, 413–425.

Pitoniak, M., & Royer, J. (2001). Testing accommodations for examinees with disabilities: A review of psychometric, legal, and social policy issues. *Review of Educational Research, 71*, 53–104.

Platt, R. (2004). Standardized tests: Whose standards are we talking about? *Phi Delta Kappan, 85*(5), 381–382.

Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potential pitfalls and future directions in creativity research. *Educational Psychology, 39*(2), 83–96.

Polk, T. A., & Newell, A. (1995). Deduction as verbal reasoning. *Psychological Review, 102*, 533–566.

Pollard, A. (Ed.). (1996). *Readings for reflective teaching in primary school*. London: Cassell.

Pollard, D. S. (1993). Gender, achievement, and African-American students' perception of their school experience. *Educational Psychologist, 28*(4), 341–356.

Pomerantz, E. M., Altermatt, E., & Saxon, J. L. (2002). Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of Educational Psychology, 94*, 396–404.

Popat, H., & Dinnage, J. (2006). Improving cross-cultural awareness: A review of Australian indigenous health for UK dentists. *British Dental Journal, 201*(1), 37–44.

Popham, W. J. (2005). *Classroom assessment: What teachers need to know* (4th ed.). Boston: Pearson.

Popham, W. J. (2006). *Assessment for educational leaders*. Boston: Allyn & Bacon.

Popham, W. J. (2009). All about assessment: Unraveling reliability. *Educational Leadership, 66*(5), 77–78.

Portes, A, & Zhou, M. (1994). Should immigrants assimilate? *The Public Interest, 116*, 13–33.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzon, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*, 211–217.

Powell, R. A., Symbaluk, D. G., & MacDonald, S. E. (2005). *Introduction to learning and behavior* (2nd ed.). Belmont, CA: Wadsworth.

Powell, R. G., & Caseau, D. (2004). *Classroom communication and diversity*. Mahwah, NJ: Erlbaum.

Powell, S., & Nelson, B. (1997). Effects of choosing academic assignments on a student with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis, 30*, 181–183.

Power, F. C., & Power, M. R. (1992). A raft of hope: Democratic education and the challenge of pluralism. *Journal of Moral Education, 21*, 193–205.

Power, F. C., Higgins, A., & Kohlberg, L. (1989). *Lawrence Kohlberg's approach to moral education*. New York: Columbia University Press.

Powers, K., Potthoff, S. J., Bearinger, L. H., & Resnick, M. D. (2003). Does cultural programming improve educational outcomes for American Indian youth? *Journal of American Indian Education, 42*(2), 17–49.

Premack, D. (1959). Toward empirical behavior laws: I. Positive reinforcement. *Psychological Review, 66*, 219–233.

Pressley, M. (2002). *Reading instruction that works* (2nd ed.). New York: Guilford.

Pressley, M., Dolezal, S. E., Raphael, L. M., Welsh, L. M., Bogner, K., & Roehrig, A. D. (2003). *Motivating primary-grade students*. New York: Guilford.

Pressley, M., Levin, J. R., & McCormick, C. B. (1980). Young children's learning of a foreign language vocabulary: A sentence variation of the keyword. *Contemporary Educational Psychology, 5*, 22–29.

Pressley, M., Raphael, L., & Gallagher, J. D, & DiBella, J. (2004). Prodience-St. Mel School: How a school that works for African American students works. *Journal of Educational Psychology, 96*(2), 216–235.

Proost, K., Elen, J., & Lowyck, J. (1997). Effects of gender on perception of the preferences of telematic learning environments. *Journal of Research on Computing in Education, 29*(4), 371–385.

Psychometric Success. (2009). *Spatial ability for all levels.* Retrieved February 26, 2009, from http://www.psychometric-success.com/faq/faq-spatial-ability-tests.htm

Pugach, M. C. (2006). *Because teaching matters.* Hoboken, NJ: Wiley.

Purdie, N., & Hattie, J. (1996). Cultural differences in the use of strategies for self-regulated learning. *American Educational Research Journal, 33*, 845–871.

Purkey, S., & Smith, M. (1983). Effective schools: A review. *Elementary School Journal, 83*, 427–452.

Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4–15.

Qian, G., & Pan, J. (2002). A comparison of epistemological beliefs and learning from science texts between American and Chinese high school students. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 365–385). Mahwah, NJ: Erlbaum.

Qin, Z., Johnson, D. W., & Johnson, R. T. (1995). Cooperative versus competitive efforts and problem solving. *Review of Educational Research, 65*(2), 129–143.

Quinlan, T. (2004). Speech recognition technology and students with writing difficulties: Improving fluency. *Journal of Education Psychology, 96*(2), 337–346.

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Duncan, R. G. et al. (2004). A scaffolding design framework for software to support science inquiry. *Journal of the Learning Sciences, 13*, 337–386.

Raffaelli, M., & Ontai, L. L. (2004). Gender socialization in Latino/a families: Results from two retrospective studies. *Sex Roles, 50*, 287–299.

Rainbows. (2007). Retrieved October 29, 2007, from http://www.rainbows.org/statistics.html

Rainey, R. (1965). The effects of directed vs. nondirected laboratory work on high school chemistry achievement. *Journal of Research in Science Teaching, 3,* 286–292.

Ramey, C. T., & Ramey, S. L. (1998). Early intervention and early experience. *American Psychologist, 53,* 109–120.

Ramey, S. L., & Ramey, C. T. (2000). Early childhood experiences and developmental competence. In S. Danzinger & J. Waldfogel (Eds.), *Securing the future: Investing in children from birth to college* (pp. 121–150). New York: Sage.

Ramsey, P. G. (1987). *Teaching and learning in a diverse world: Multicultural education for young children.* New York: Teachers College Press.

Randall, V. (1999). Cooperative learning: Abused and overused? *Education Digest, 65*(2), 29–32.

Rapport, M. D., Murphy, H. A., & Bailey, J. S. (1982). Ritalin vs. response cost in the control of hyperactive children: A within-subject comparison. *Journal of Applied Behavior Analysis, 15*, 205–216.

Raschke, D. B., Alper, S. K., & Eggers, E. (1999). Recalling alphabet letter names: A mnemonic system to facilitate learning. *Preventing School Failure, 43*, 80–83.

Raskauskas, J., & Stoltz, A. D. (2007). Involvement in traditional and electronic bullying among adolescents. *Developmental Psychology, 43*(3), 564–575.

Rathvon, N. (1999). *Effective school interventions: Strategies for enhancing academic achievement and social competence.* New York: Guilford.

Ravitch, D. (1995). *National standards in American education: A citizens guide.* Washington, DC: Brookings Institution.

Rebich, S., & Gautier, C. (2005). Concept mapping to reveal prior knowledge and conceptual change in a mock summit course on global climate change. *Journal of Geoscience Education, 53*(4), 355–365.

Redman, G. L. (2007). *Casebook for exploring diversity* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-supportive teachers: How they teach and motivate students. *Journal of Educational Psychology, 91*, 537–548.

Reeve, J., Jang, H., Carrell, D., Barch, J., & Jeon, S. (2004). Enhancing high school students' engagement by increasing teachers' autonomy-supportive instructional strategies. *Motivation and Emotion, 28*, 147–169.

Regional Educational Laboratories. (1998). *Improving classroom assessment: A toolkit for professional developers.* Portland, OR: Author.

Reglin, G. L., & Adams, D. R., (1990). Why Asian American high school students have higher grade point averages and SAT scores than other high school students. *High School Journal, 73*, 143–149.

Reich, P. A. (1986). *Language development.* Upper Saddle River, NJ: Prentice Hall.

Reid, C., Romanoff, B., & Algozzine, R. (2000). An evaluation of alternative screening procedures. *Journal for the Education of the Gifted, 23*, 378–396.

Reid, N. (1989). Contemporary Polynesian conceptions of giftedness. *Gifted Education International, 6*(1), 30–38.

Reiner, M., Slotta, J. D., Chi, M. T. H., & Resnick, L. B. (2000). Naive physics reasoning: A commitment to substance-based conceptions. *Cognition and Instruction, 18,* 1–34.

Reis, S. M., & McCoach, D. B. (2000). The underachievement of gifted students: What do we know and where do we go? *Gifted Child Quarterly, 44*(3), 152–170.

Reis, S. M., Colbert, R. D., & Hebert, T. P. (2004). Understanding resilience in diverse, talented students in an urban high school. *Roeper Review, 29*, 110–120.

Reisberg, D. (2001). *Cognition: Exploring the science of the mind* (2nd ed.). New York: Norton.

Reiser, B. J. (2002). Why scaffolding should sometimes make tasks more difficult for learners. In G. Stahl (Ed.), *Computer support for collaborative learning foundations for a CSCL community* (pp. 255–264). Hillsdale, NJ: Erlbaum.

Reiser, B. J., Tabak, I., Sandoval, W. A., Smith, B., Steinmuller, F., & Leone, T. J. (2001). BGuILE: Strategic and conceptual scaffolds for scientific inquiry in biology classrooms. In S. M. Carver & D. Klahr (Eds.), *Cognition and instruction: Twenty five years of progress* (pp. 262–305). Mahwah, NJ: Erlbaum.

Reiter, A., Tucha, O., & Lange, K. W. (2004). Executive functions in children with dyslexia. *Dyslexia, 11*, 116–131.

Remington, B. (1996). Assessing the occurrence of learning in children with profound intellectual disability: A conditioning approach. *International Journal of Disability, Development, and Education, 43*, 101–118,

Renninger, K. A., Hidi, S., & Krapp, A. (Eds.). (1992). *The role of interest in learning and development.* Hillsdale, NJ: Erlbaum.

Renzulli, J. S. (1994). *Schools for talent development: A comprehensive plan for total school improvement.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S. (2002). Expanding the conception of giftedness to include co-cognitive traits and promote social capital. *Phi Delta Kappan, 84*, 33–40, 57–58.

Renzulli, J. S., Gentry, M., & Reis, S. M. (2003). *Enrichment clusters: A practical plan for real-world, student-driven learning.* Mansfield Center, CT: Creative Learning Press.

Renzulli, J., & Reis, S. (2003). The school-wide enrichment model: Developing creative and productive giftedness. In N. Colangelo & G. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 184–203). Boston: Allyn & Bacon.

Resnick, D. P., & Resnick, L. B. (1996). Performance assessment and the multiple functions of educational measurement. In M. B. Kane & R. Mitchell (Eds.), *Implementing performance assessment: Promises, problems, and challenges* (pp. 23–38). Mahwah, NJ: Erlbaum.

Rest, J. R. (1979). *Development in judging moral issues.* Minneapolis: University of Minnesota Press.

Rest, J., Narvaez, D., Bebeau, M., & Thoma, S. (1999). A neo-Kohlbergian approach: The DIT and schema theory. *Educational Psychology Review, 11,* 291–324.

Reutzel, D. R., & Fawson, P. C. (2002). *Your classroom library: New ways to give it more teaching power.* New York: Scholastic Professional Books.

Reynolds, A. (1992). Grade retention and school adjustment: An explanatory analysis. *Educational Evaluation and Policy Analysis, 14*(2), 101–121.

Reynolds, C. R., Livingston, R., & Willson, V. (2006). *Measurement and assessment in education.* Boston: Allyn & Bacon.

Reynolds, L. K., & Kelly, M. L. (1997). The efficacy of a response cost-based treatment package for managing aggressive behavior in preschoolers. *Behavior Modification, 21,* 216–230.

Reynolds, R. E., Taylor, M. A., Steffensen, M. S., Shirey, L. L., & Anderson, R. C. (1982). Cultural schemata and reading comprehension. *Reading Research Quarterly, 17,* 353–366.

Reynolds, W. M. (1980). Self-esteem and classroom behavior in elementary school children. *Psychology in the Schools, 17,* 273–277.

Ricciardelli, L. A. (1992). Bilingualism and cognitive development: Relation to threshold theory. *Journal of Psycholinguistic Research, 21,* 301–316.

Rice, M. L. (1986). Children's language acquisition. *American Psychologist, 44,* 149–156.

Richardson V., & Placier, P. (2001). Teach change. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 905–947). Washington, DC: American Educational Research Association.

Richardson, J., & Morgan, R. (1997). *Reading to learn in the content areas.* Belmont, CA: Wadsworth.

Rickards, T., & deCock, C. (2009). Understanding organizational creativity: Toward a paradigmatic approach. In M. A. Runco (Ed.), *The creativity research handbook* (Vol. 2, pp 1–33). Cresskill, NJ: Hampton.

Rickards, T. (1999). Brainstorming. In M. A. Runco & S. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 219–229). San Diego: Academic Press.

Rickards, T., & deCock, C. (2003). Understanding organizational creativity: Toward a paradigmatic approach. In M. A. Runco (Ed.), *Creativity research handbook.* Cresskill, NJ: Hampton.

Rideout, V., Roberts, D. F., & Foehr, U. G. (2005). *Generation M.* Menlo Park, CA: Kaiser Family Foundation.

Riggs, J. M. (1992). Self-handicapping and achievement. In A. K. Boggiano & T. S. Pittman (Eds.), *Achievement and motivation: A social-developmental perspective* (pp. 244–267). Cambridge, UK: Cambridge University Press.

Rimm-Kaufman, S. E., & Chiu, Y. I. (2007). Promoting social and academic competence in the classroom: An intervention study examining the contribution of the responsive classroom approach. *Psychology in the Schools, 44*(4), 397–413.

Rimm-Kaufman, S. E., & Sawyer, B. E. (2004). Primary-grade teachers' self-efficacy beliefs, attitudes toward teaching, and discipline and teaching practice priorities in relation to the responsive classroom approach. *Elementary School Journal, 104*(4), 321–341.

Rimm-Kaufman, S., La Paro, K., Downer, J., & Pianta, R. (2005). The contribution of classroom setting and quality of instruction to children's behavior in kindergarten classrooms. *Elementary School Journal, 105*(4), 377–394.

Riordan, C. (1996). *Equality and achievement: An introduction to the sociology of education.* New York: Longman.

Rips, L. J. (1994). *The psychology of proof.* Cambridge, MA: MIT Press.

Rist, M. C. (1992). Learning by heart. *Executive Educator, 14,* 12–19.

Ritcher-Levin, G., & Akirav, I (2003). Emotional tagging of memory formation: In the search for neural mechanisms. *Brain Research Reviews, 43*(3) 247–256.

Ritchie, D., & Karge, B. D. (1996). Making information memorable: Enhanced knowledge retention and recall through the elaboration process. *Preventing School Failure, 41,* 28–33.

Rittle-Johnson, B., & Siegler, R. S. (1998). The relation between conceptual and procedural knowledge in learning mathematics: A review. In C. Donlan (Ed.), *The development of mathematical skills. Studies in developmental psychology* (pp. 75–110). Hove, UK: Psychology Press/Taylor & Francis.

Roberts, C. (1994). Transferring literacy skills from L1 to L2: From theory to practice. *Journal of Educational Issues of Language Minority Students, 13,* 209–221.

Roberts, S. M., & Pruitt, E. Z. (2003). *Schools as professional learning communities: Collaborative activities and strategies for professional development.* Thousand Oaks, CA: Corwin.

Robertson, J. (2000). Is attribution training a worthwhile classroom intervention for K–12 students with learning difficulties? *Educational Psychology Review, 12,* 111–134.

Robinson, D. H., Funk, D. C., Beth, A., & Bush, A. M. (2005). Changing beliefs about corporal punishment: Increasing knowledge about ineffectiveness to build more consistent moral and informational beliefs. *Journal of Behavioral Education, 14,* 117–139.

Robinson, S. L., & Griesemer, S. M. R. (2006). Helping individual students with problem behavior. In C. M. Evertson, & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 787–802). Mahwah, NJ: Erlbaum.

Robinson, T. R., Smith, S. W., Miller, M. D., & Brownell, M. T. (1999). Cognitive behavior modification of hyperactivity/impulsivity and aggression: A meta-analysis of school-based studies. *Journal of Educational Psychology, 91,* 195–203.

Roblyer, M. D. (2006). *Integrating educational technology into teaching* (4th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Roche, K. M., Ensminger, M. E., & Cherlin, A. J. (2007). Variations in parenting and adolescent outcomes among African American and Latino families living in low-income, urban areas. *Journal of Family Issues, 28*(7), 882–909.

Roderick, M. (1994). Grade retention and school dropout: Investigating an association, *American Educational Research Journal, 31,* 729–760.

Roderick, M., & Camburn, E. (1999). Risk and recovery from course failure in the early years of high school. *American Educational Research Journal, 36,* 303–343.

Roeser, R. W., Midgley, C., & Urdan, T. C. (1996). Perceptions of school psychological environment and early adolescents' psychological and behavioral functioning in school: The mediating role of goals and belonging. *Journal of Educational Psychology, 88*, 408–422.

Rogers, C. (1959). A theory of therapy, personality, and interpersonal relationships, as developed in the client-centered framework. In S. Koch (Ed.), *Psychology: A study of a science* (Vol. 3, pp. 184–256). New York: McGraw-Hill.

Rogers, C. (1963). Actualizing tendency in relation to "motives" and to consciousness. In M. Jones (Ed.), *Nebraska Symposium on Motivation* (Vol. 11, pp. 1–24). Lincoln: University of Nebraska Press.

Rogers, C. R., & Roethlisberger, F. J. (1952). Barriers and gateways to communication. *Harvard Business Review, 30*(4), 46–52.

Rogers, C. R., & Stevens, B. (Eds.). (1967). *Person to person: The problem of being human; a new trend in psychology.* Walnut Creek, CA: Real People Press.

Rogers, K. B. (2001). *Re-forming gifted education: Matching the program to the child.* Scottsdale, AZ: Great Potential Press.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context.* New York: Oxford University Press.

Rogoff, B. (1991). Social interaction as apprenticeship in thinking: Guidance and participation in spatial planning. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 349–364). Washington, DC: American Psychological Association.

Rogoff, B. (2003). *The cultural context of human development.* Oxford, UK: Oxford University Press.

Rohner, R. P. (1998). Father love and child development: History and current evidence. *Current Directions in Psychological Science, 7,* 157–161.

Rohrbeck, C. A., Ginsburg-Block, M. D., Fantuzzo, J. W., & Miller, T. R. (2003). Peer-assisted learning interventions with elementary school students: A meta-analytic review. *Journal of Educational Psychology, 94*, 240–257.

Rolstad, K., Mahoney, K., & Glass, G. V. (2005). The big picture: A meta-analysis of program effectiveness research on English language learners. *Educational Policy, 19*(4), 572–594.

Roman, R. J., Moskowitz, G. B., Stein, M. I., & Eisenberg, R. F. (1995). Individual differences in experiment participation: Structure, autonomy, and the time of the semester. *Journal of Personality, 63*(1), 113–138.

Romeo, F. F. (1998). The negative effects of using a group contingency system of classroom management. *Journal of Instructional Psychology, 25*(2), 130–133.

Root, M. P. P. (1999). The biracial baby boom: Understanding ecological constructions of racial identity in the 21st century. In R. H. Sheets & E. R. Hollins (Eds.), *Racial and ethnic identity in school practices: Aspects of human development* (pp. 67–89). Mahwah, NJ: Erlbaum.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 28–48). Mahwah, NJ: Erlbaum.

Rosch, E. H. (1973). On the internal structure of perceptual and semantic categories. In T. E. Moore (Ed.), *Cognition and the acquisition of language* (pp. 111–144). New York: Academic Press.

Rosch, E., & Mervis, C. B. (1975). Family resemblance: Studies in the internal structure of categories. *Cognitive Psychology, 7*, 573–605.

Rose, A. J. (2002). Co-rumination in the friendship of girls and boys. *Child Development, 73*, 1830–1843.

Rosenberg, M. (1979). *The convincing self.* New York: Basic Books.

Rosenshine, B. (1987). Explicit teaching. In D. Berliner & B. Rosenshine (Eds.), *Talks to teachers* (pp. 75–92). New York: Random House.

Rosenshine, B., & Meister, C. (1994). Reciprocal teaching: A review of the research. *Review of Educational Research, 64,* 479–530.

Rosenshine, B., & Stevens, R. (1986). Teaching functions. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 376–391). New York: Macmillan.

Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom.* New York: Holt, Rinehart, & Winston.

Ross, B. H., & Spalding, T. L. (1994). Concepts and categories. In R. J. Sternberg (Ed.), *Handbook of perception and cognition: Thinking and problem solving* (pp. 119–148). San Francisco: Academic Press.

Rotenberg, K. J., & Mayer, E. V. (1990). Delay of gratification in Native and White children: A cross-cultural comparison. *International Journal of Behavioral Development, 13*, 23–30.

Rotheram-Borus, M. J. (1993). Biculturalism among adolescents. In M. E. Bernal & G. P. Knight (Eds.), *Ethnic Identity: Formation and transmission among Hispanics and other minorities* (pp. 81–102). Albany, NY: State University of New York Press.

Rotheram-Borus, M. J. (1994). Bicultural reference group orientations and adjustment. In M. Bernal & G. Knight (Eds.), *Ethnic identity.* Albany: State University of New York Press.

Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80* (1, Whole No. 609).

Rowan, B., Correnti, R., & Miller, R. (2002). *What large-scale, survey research tells us about teacher effects on student achievement: Insights from the Prospects study of elementary schools.* Philadelphia: Consortium for Policy Research in Education, University of Pennsylvania.

Rowe, M. B. (1974). Relation of wait-time and rewards to the development of language, logic and fate control: Part II—Rewards. *Journal of Research in Science Teaching, 11*, 291–308.

Rowe, M. B. (1987). Wait-time: Slowing down may be a way of speeding up. *American Educator, 11*, 38–43, 47.

Rowe, S. M., & Wertsch, J. V. (2002). Vygotsky's model of cognitive development. In U. Goswami (Ed.), *The Blackwell handbook of childhood cognitive development.* Malden, MA: Blackwell.

Rowls, M., & Swick, K. J. (2000). The "voices" of pre-service teachers on the meaning and value of their service-learning. *Education, 120*(3), 463.

Royal, K. (2007). Cell phones in North Carolina classrooms. *District Administration, 43*(7), 18.

Rubin, K. H., Bukowski, W., & Parker, J. G. (2006). Peer interactions, relationships, and groups. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 571–645). New York: Wiley.

Rubin, R. J. (1985). *Artistry in teaching.* New York: Random House.

Rubison, F. (2004). Urban dropouts: Why so many and what can be done? In S. R. Steinberg & J. L. Kincheloe (Eds.), *19 Urban questions: Teaching in the city* (pp. 53–67). New York: Peter Lang.

Ruble, D. (1983). The development of social comparison processes and their role in achievement-related self-socialization. In E. T. Higgins, D. N. Ruble, & W. W. Hartup (Eds.), *Social cognition and social development: A sociocultural perspective* (pp. 134–157). New York: Cambridge University Press.

Ruble, D. N., Martin, C. L., & Berenbaum, S. A. (2006). Gender development. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 858–932). New York: Wiley.

Rueda, R., & Yaden, D. B. (2006). The literacy education of linguistically and culturally diverse young children: An overview of outcomes, assessment, and large-scale interventions. In B. Spodek & O. N. Saracho (Eds.), *Handbook of research on the education of young children* (2nd ed., pp. 167–186). Mahwah, NJ: Erlbaum.

Rumelhart, D. E. (1984). Schemata and the cognitive system. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 1, pp. 161–188). Mahwah, NJ: Erlbaum.

Runco, M. A. (2004). Creativity. *Annual Review of Psychology, 55.* Palo Alto, CA: Annual Reviews.

Runco, M. A. (2006). The development of children's creativity. In B. Spodek & O. N. Saracho (Eds.), *Handbook of research on the education of young children* (2nd ed. pp. 121–131). Mahwah, NJ: Erlbaum.

Runco, M. A. (2007). *Creativity theories and themes: Research, development and practice.* Burlington, MA: Elsevier Academic.

Russell, T. L. (1999). *No significant difference phenomenon.* Raleigh: North Carolina State University, Office of Instructional Telecommunication.

Rutter, M. (1984, March). Resilient children. *Psychology Today*, pp. 57–65.

Ryan, A. M. (2000). Peer groups as a context for the socialization of adolescents' motivation, engagement, and achievement in school. *Educational Psychologist, 35*, 101–111.

Ryan, A. M. (2001). The peer group as a context for the development of young adolescent motivation and achievement. *Child Development, 72*, 1135–1150.

Ryan, A. M., Hicks, L., & Midgley, C. (1997). Social goals, academic goals, and avoiding help seeking in the classroom. *Journal of Early Adolescence, 17*, 152–171.

Ryan, R. L., & Deci, E. M. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well being. *American Psychologist, 55*, 68–78.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist, 55*, 68–78.

Ryan, R. M., & Deci, E. L. (2006). Self-regulation and the problem of human autonomy: Does psychology need choice, self-determination, and will? *Journal of Personality, 74,* 1557–1585.

Sabers, D. S., Cushing, K. S., & Berliner, D. C. (1991). Differences among teachers in a task characterized by simultaneity, multidimensionality, and immediacy. *American Educational Research Journal, 28*(1), 63–88.

Sabers, D. S., Cushing, K. S., & Berliner, D. C. (1991). Differences among teachers in a task characterized by simultaneity, multidimensionality, and immediacy. *American Educational Research Journal, 28*, 63–88.

Saddler, B., & Andrade, H. (2004). The writing rubric. *Educational Leadership, 62*(2), 48–52.

Sadker, M. P., & Sadker, D. (1994). *Failing at fairness: How our schools cheat girls.* New York: Touchstone.

Sadker, M. P., & Sadker, D. M. (2005). *Teachers, schools, and society* (7th ed.). New York: McGraw-Hill.

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science, 18,* 119–144.

Sailor, W., & Roger, B. (2005). Rethinking inclusion: Schoolwide applications. *Phi Delta Kappan, 86*(7), 503–509.

Salend, S., & Taylor, L. (1993). Working with families: A cross-cultural perspective. *Remedial and Special Education, 14*(5), 25–39.

Salganik, M. W. (1980, January 27). Teachers busy teaching make city's 16 "best" schools stand out. *Baltimore Sun*, p. A4.

Salili, F., Chiu, C., & Lai, S. (2001). The influence of culture and context on students' motivational orientation and performance. In F. Salili, C. Chiu, & Y. Hong (Eds.), *Student motivation: The culture and context of learning* (pp. 221–247). New York: Kluwer Academic/Plenum Publishers.

Salomon, G. (1994). *Interaction of media, cognition, and learning.* Mahwah, NJ: Erlbaum. (Original work published 1979)

Saltz, E. (1971). *The cognitive bases of human learning.* Homewood, IL: Dorsey.

Samuels, S. J. (1988). Decoding and automaticity: Helping poor readers become automatic at word recognition. *Reading Teacher, 41*, 756–760.

Sanchez, C. A. & Wiley, J. (2006). An examination of the seductive details effect in terms of working memory capacity. *Memory & Cognition, 34*, 344–355.

Sanders-Phillips, K. (1989). Prenatal and postnatal influences on cognitive development. In G. L. Berry & J. K. Asamen (Eds.), *Black students: Psychosocial issues and academic achievement* (pp. 18–39). Newbury Park, CA: Sage.

Sandoval, J., Scheuneman, J. D., Ramos-Grenier, J., Geisinger, K. F., & Frisby, C. (Eds.). (1999). *Test interpretation and diversity: Achieving equity in assessment.* Washington, DC: American Psychological Association.

Sandoval, W. A. (2003). Conceptual and epistemic aspects of students' scientific explanations. *Journal of the Learning Sciences, 12*(1), 5–51.

Sandoval, W. A., & Reiser, B. J. (2004). *Explanation-driven inquiry: Integrating conceptual and epistemic scaffolds for scientific inquiry. Science Education, 88*(3), 345–372.

Sands, D. K., & Wehmeyer, M. L. (Eds.). (1996). *Self-determination across the life span: Independence and choice for people with disabilities.* Baltimore: Brookes.

Sapp, M. (1996). Three treatments for reducing the worry and emotionality components of test anxiety with undergraduate and graduate college students: Cognitive-behavioral hypnosis, relaxation therapy, and supportive counseling. *Journal of college Student Behavior, 37*, 79–87.

Sardo-Brown, D. (1994). Descriptions of six classroom teachers' action research. *People and Education, 1*, 458–467.

Sasso, G. M., & Rude, H. A. (1987). Unprogrammed effects of training high-status peers to interact with severely handicapped children. *Journal of Applied Behavior Analysis, 20,* 35–44.

Sattler, J. M. (2001). *Assessment of children: Cognitive applications* (4th ed.). San Diego, CA: Author.

Sattler, J. M. (2001). *Assessment of children: Cognitive applications* (4th ed.). San Diego: Jerome M. Sattler.

Savage, T. (1999). *Teaching self-control through management and discipline* (2nd ed.) Boston: Allyn & Bacon.

Sawyer, R. J., Graham, S., & Harris, K. R. (1992). Direct teaching, strategy instruction, and strategy instruction with explicit self-regulation: Effects on the composition skills and self-efficacy of students with learning disabilities. *Journal of Educational Psychology, 84,* 340–352.

Sawyer, R. K. (2006). Introduction: The new science of learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences.* (pp. 1–16) New York: Cambridge University Press.

Sax, G. (1989). *Principles of educational and psychological measurement and evaluation* (3rd ed.). Belmont, CA: Wadsworth.

Sax, G. (1997). *Principles of educational and psychological measurement and evaluation* (4th ed.). Belmont, CA: Wadsworth.

Scarcella, R. (1990). *Teaching language-minority students in the multicultural classroom.* Upper Saddle River, NJ: Prentice Hall.

Scardamalia, M. (2004). CSILE/Knowledge Forum. In A. Kovalchick and K. Dawsan (Eds.) *Education and technology: An encyclopedia* (pp. 183–192). Santa Barbara, CA: ABC-CLIO.

Scardamalia, M., Bereiter, C., & Lamon, M. (1994). The CSILE project: Trying to bring the classroom into world 3. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory & classroom practice* (pp. 201–228). Cambridge, MA: MIT Press.

Schön, D. (1983). *The reflective practitioner: How professionals think in action.* San Francisco: Jossey-Bass.

Schacter, D. L. (2000). Memory: Memory systems. In A. Kazdin (Ed.), *Encyclopedia of psychology* (vol. 5, pp. 169–172). Washington, DC, and New York: American Psychological Association

Schafer, W. D., Swanson, G., Bené, N., & Newberry, G. (2001). Effects of teacher knowledge of rubrics on student achievement in four content areas. *Applied Measurement in Education, 14,* 151–170.

Schallert, D. L. (1991). The contribution of psychology to teaching the language arts. In J. Flood, J. M. Jensen, D. Lapp, & J. R. Squire (Eds.), *Handbook of research on teaching the English language arts* (pp. 30–39). New York: Macmillan.

Schamel, D., & Ayres, M. P. (1992). The minds-on approach: Student creativity and personal involvement in the undergraduate science laboratory. *Journal of College Science Teaching, 21,* 226–229.

Schank, R. C., & Abelson, R. (1977). *Scripts, plans, goals, and understanding.* Mahwah, NJ: Erlbaum.

Schaps, E., & Solomon, D. (1990). Schools and classrooms as caring communities. *Educational Leadership, 48,* 38–42.

Scharlach, T. D. (2008). START comprehending: Students and teachers actively reading text. *Reading Teacher, 62*(1), 20–31.

Scheinman, A. J. (2000). 6 behavior tips that really work. *Instructor, 110*(1), 24.

Scherer, M. (2001). How and why standards can improve student achievement: A conversation with Robert J. Marzano. *Educational Leadership, 59,* 14–19.

Scheuermann, F., & Guimarães Pereira, A. (Eds.). (2008). *Towards a research agenda on computer-based assessment.* Lu: Office for Official Publications of the European Communities printed in Ispra, Italy.

Scheuneman, J. D. (1982). A new look at bias in aptitude tests. In P. Merrifield (Ed.), *New directions for testing and measurement: Measuring human abilities,* (pp. 3–35) *No. 12.* San Francisco: Jossey-Bass.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist, 26,* 299–323.

Schiefele, U. (1999). Interest and learning from text. *Scientific Studies of Reading, 3,* 257–280.

Schlaefli, A., Rest, J. R., & Toma, S. J. (1985). Does moral education improve moral judgment? A meta-analysis of intervention studies using the defining issues test. *Review of Educational Research, 55,* 319–352.

Schloss, P. J., & Smith, M. A. (1994). *Applied behavior analysis in the classroom.* Boston: Allyn & Bacon.

Schloss, P. J., & Smith, M. A. (1998). *Applied behavior analysis in the classroom* (2nd ed.). Needham Heights, MA: Allyn & Bacon.

Schmoker, M. (1999). *Results: The key to continuous school improvement* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Schneider, B., & Lee, Y. (1990). A model for academic success. The school and home environment of East Asian Students. *Anthropology and Education Quarterly, 21,* 358–377.

Schneider, W. (1993). Domain-specific knowledge and memory performance in children. *Educational Psychology Review, 5,* 257–273.

Schneider, W. (1999). Working memory in a multilevel hybrid connectionist control architecture (CAP2). In A. Miyake & P. Shah (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control.* (pp. 340–374). New York: Cambridge University Press.

Schneider, W., & Pressley, M. (1997). *Memory development between 2 and 20* (2nd ed.). Mahwah, NJ: Erlbaum.

Schneider, W., & Schiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. *Psychological Review, 84,* 1–66.

Schofield, J. W. (1995). Improving intergroup relations among students. In J. A. Banks & C. A. M. Banks (Eds.), *Handbook of research on multicultural education* (pp. 635–645). New York: Macmillan.

Schön, D. (1983). *The reflective practitioner: How professionals think in action.* San Francisco: Jossey-Bass.

Schramke, C. J., & Bower, R. M. (1997). State-dependent learning in older and younger adults. *Psychology and Aging, 12,* 255–263.

Schraw, G., Flowerday, T., & Lehman, S. (2001). Promoting situtional interest in the classroom. *Education Psychology Review, 13,* 211–224.

Schraw, G., Flowerday, T., & Reisetter, M. (1998). The role of choice in reader engagement. *Journal of Educational Psychology, 90,* 705–714.

Schrumpf, F., Crawford, D., & Bodine, R. (1997). *Peer mediation: Conflict resolution in schools.* Champaign, IL: Research Press.

Schunk, D. (2004). *Learning theories: An educational perspective* (4th ed.). New York: Prentice Hall.

Schunk, D. H. (1987). Peer models and children's behavioral change. *Review of Educational Research, 57*(2), 149–174.

Schunk, D. H. (2000). *Learning theories: An educational perspective* (3rd ed.). Columbus, OH: Merrill/Prentice Hall.

Schunk, D. H. (2000). Coming to terms with motivation constructs. *Contemporary Educational Psychology, 25,* 116–119.

Schunk, D. H. (2008). *Learning theories: An educational perspective* (5th ed.). Upper Saddle River, NJ: Prentice-Hall/Merrill.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77,* 313–322.

Schunk, D. H., & Swartz, C. W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology, 18,* 337–354.

Schunk, D. H., & Zimmerman, B. H. (1997). Social origins of self-regulatory competence. *Educational Psychologist, 32,* 195–208.

Schunk, D. H., & Zimmerman, B. J. (1997). Developing self-efficacious readers and writers: The role of social and self-regulatory processes. In J. T. Gutrie & A. Wigfield (Eds.), *Reading engagement: Motivating readers through integrated instruction* (pp. 34–50). Newark, DE: International Reading Association.

Schunk, D. H., & Zimmerman, B. J. (2006). Competence and control beliefs: Distinguishing the means and ends. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed.). Mahwah, NJ: Erlbaum.

Schunk, D. H., Hanson, A. R., & Cox, P. D. (1987). Peer-model attributes and children's achievement behaviors. *Journal of Educational Psychology, 79*(1), 54–61.

Schwanenflugel, P. J., & Rey, M. (1986). Interlingual semantic facilitation: Evidence for a common representational system in the bilingual lexicon. *Journal of Memory and Language, 26,* 505–518.

Schwartz, D. L., & Bransford, J. D. (1998). A time for telling. *Cognition and Instruction, 16*, 475–522.

Schwartz, J. M., & Begley, S. (2002). *The mind and the brain: Neuroplasticity and the power of mental force.* New York: HarperCollins.

Scruggs, T. E., & Lifson, S. A. (1985). Current conceptions of test-wiseness: Myths and realities. *School Psychology Review, 14*, 339–350.

Search Institute. (1995). *Barriers to participation in youth programs.* Unpublished manuscript, the Search Institute, Minneapolis.

Segall, A. (2004). Revising pedagogical content knowledge: The pedagogy of content/the content of pedagogy. *Teaching and Teacher Education, 20*, 489–504.

Seidlitz, L., & Diener, E. (1998). Sex differences in the recall of affective experiences. *Journal of Personality and Social Psychology, 74*(1), 262–271.

Seifert, T. (1993). Effects of elaborative interrogation with prose passages. *Journal of Educational Psychology, 85*, 642–651.

Seligman, M. E. (1992). *Helplessness: On depression, development, and death.* San Francisco: Freeman.

Shabani, D. B., Katz, R. C., Wilder, D. A., Beauchamp, K., Taylor, C. R., & Fischer, K. J. (2002). Increasing social initiations in children with autism: Effects of a tactile prompt. *Journal of Applied Behavior Analysis, 35*, 79–83.

Shanker, A. (1995, May 15). Restoring the connection between behavior and consequences. *Vital Speeches of the Day Vol. 15,* (pp. 463–469).

Shany, M. T. (1995). Assisted reading practice: Effects on performance for poor readers in grades 3–4. *Reading Research Quarterly, 30*, 382–395.

Shapiro, E. S., DuPaul, G. J., & Bradley-Klug, K. L. (1998). Self-management as a strategy to improve the classroom behavior of adolescents with ADHD. *Journal of Learning Disabilities, 31*(6), 545–555.

Sharan, S., & Shaulov, A. (1990). Cooperative learning, motivation to learn, and academic achievement. In S. Sharan (Ed.), *Cooperative learning: Theory and research* (pp. 173–202). New York: Praeger.

Sharan, Y., & Sharan, S. (1992). *Expanding cooperative learning through group investigation.* New York: Teachers College Press.

Shavelson, R. J., Baxter, G. P., & Gao, X. (1993). Sampling variability of performance assessments. *Journal of Educational Measurement, 30*, 215–232.

Shavelson, R. J., Baxter, G. P., & Pine, J. (1992). Performance assessments: Political rhetoric and measurement reality. *Educational Researcher, 21*(4), 22–27.

Shaw, J. (2002). Linguistically responsive science teaching. *Electronic Magazine of Multicultural Education [online], 4*(1), 24 paragraphs. Retrieved February 19, 2009, from http://www.eastern.edu/publications/emme/2002spring/shaw.html

Shea, M. A. (1993). *Handbook for beginning teachers.* Springfield, IL: Charles C. Thomas.

Sheets, R. H. (1995). From remedial to gifted: Effects of culturally centered pedagogy. *Theory into Practice, 34*(3), 186–193.

Sheffield, C. J. (1997, March/April). Instructional technology for teachers: Preparation for classroom diversity. *Educational Technology*, pp. 16–18.

Shepard, L. (2001). The role of classroom assessment in teaching and learning. In V. Richardson (Ed.), *Handbook of research on learning* (4th ed., pp. 1066–1101). Washington, DC: American Educational Research Association.

Shepard, L. A. (1995). Using assessment to improve learning. *Phi Delta Kappan, 52*(5), 38–43.

Shepard, L. A. (2000). The role of assessment in a learning culture. *Educational Researcher, 29*(7), 4–14.

Shepard, L. A., & Smith, M. L. (1989). Academic and emotional effects of kindergarten retention. In L. Shepard & M. Smith (Eds.), *Flunking grades: Research and policies on retention* (pp. 79–107). Philadelphia: Falmer.

Shepard, R. N. (1978). Externalization of mental images and the act of creation. In B. S. Randhawa & W. E. Coffman (Eds.), *Visual learning, thinking, and communication* (pp. 139–189). New York: Academic Press.

Shepardson, D. P., & Britsch, S. J. (1996). When dinosaurs roamed: Hypermedia and the learning of mathematics and science. *Journal of Computers in Mathematics and Science Teaching, 15*(1/2), 7–18.

Sheridan, S., Kratochwill, T. & Elliott. S. (1990). Behavioral consultation with parents and teachers: Delivering treatment for socially withdrawn children at home and school. *School Psychology Review, 19*(1), 33–52.

Sherman, D. K., & Cohen, G. L. (2002). Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science, 11,* 119–123.

Shermer, M. (2002). *Why people believe weird things: Pseudoscience, superstition, and other confusions of our time.* New York: Freeman.

Shernoff, D. J., Knauth, S., & Makris, E. (2000). The quality of classroom experiences. In M. Csikszentmihalyi & B. Schneider (Eds.), *Becoming adult: How teenagers prepare for the world of work* (pp. 141–166). New York: Basic Books.

Shin, M. (2005). Interference and cognitive inhibition in children with ADHD using Stroop task. *Psychologia, 48*, 171–181.

Shuell, T. (1996). Teaching and learning in a classroom context. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 726–764). New York: Macmillan.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–22.

Sideridis, G. D. (2006). Understanding low achievement and depression in children with learning disabilities: A goal orientation approach. *International Review of Research in Mental Retardation, 31,* 163–203.

Siegel, D. J. (1999). *The developing mind: How relationships and the brain interact to shape who we are.* New York: Guilford.

Siegler, R. S. (1983). Information processing approaches to development. In W. Kessen (Ed.), *Handbook of child psychology: History, theory, and methods* (Vol. 1, pp. 129–212). New York: Wiley.

Siegler, R. S. (1985). Encoding and the development of problem solving. In S. F. Chipman, J. W. Segal, & R. Glaser (Eds.), *Thinking and learning skills* (pp. 161–185) (Vol. 2). Hillsdale, NJ: Erlbaum.

Siegler, R. S. (1998). *Children's thinking* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Silberman, M. L., & Wheelan, S. A. (1980). *How to discipline without feeling guilty: Assertive relationships with children.* Champaign, IL: Research Press.

Silvernail, D. L., & Lane, D. M. M. (2004). *The impact of Maine's one-to-one laptop program on middle school teachers and students* (Report # 1). Gorham, ME: Maine Education Policy Research Institute, University of Southern Maine Office.

Silvia P. J., & Phillips, A. G. (2004). Self-awareness, self-evaluation, and creativity. *Personality and Social Psychology Bulletin, 30*(8), 1009–1017.

Sim, T. N., & Ong, L. P. (2005). Parent punishment and child aggression in a Singapore Chinese preschool sample. *Journal of Marriage and the Family, 67*, 85–99.

Simon, A., & Boyer, E. G. (Eds.). (1974). *Mirrors for behavior III: An anthology of observation instruments.* Wyncote, PA: Communication Materials Center.

Simon, H. A. (1999). Problem solving. In R. A. Wilson & F. C. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences* (pp. 674–676). Cambridge, MA: MIT Press.

Simons, P. R. (1993). Constructive learning: The role of the learner. In T. M. Duffy, J. Lowyck, D. H. Jonassen, & T. M. Welch (Eds.), *Designing environments for constructivist learning* (pp. 291–314). Berlin: Springer-Verlag.

Simonton, D. K. (2000). Creative development as acquired expertise: Theoretical issues and an empirical test. *Developmental Review, 20,* 283–318.

Simpson, G. (2001). Learner characteristics, learning environments, and constructivist epistemologies. *Australian Science Teachers Journal, 47*(2), 17–20, 22–24.

Simpson, J., Olejnik, S., Tam, A., & Suprattathum, S. (1994). Elaborative verbal rehearsals and college students' cognitive performance. *Journal of Educational Psychology, 86,* 267–278.

Sinatra, G. M., & Pintrich, P. R. (2003). The role of intentions in conceptual change learning. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 1–18). Mahwah, NJ: Erlbaum.

Singer, J., Marx, R. W., Krajcik, J., & Chambers, C. J. (2000). Constructing extended inquiry projects: Curriculum materials for science education reform. *Educational Psychologist, 35*(3), 165–178.

Skiba, R. & Raison, J. (1990). Relationship between the use of time-out and academic achievement. *Exceptional Children,* 57, 36–46.

Skiba, R., & Peterson, R. (1999). The dark side of zero tolerance: Can punishment lead to safe schools? *Phi Delta Kappan,* 80(5), 372–382.

Skinner, B. F. (1953). *Science and human behavior.* New York: Free Press.

Skinner, B. F. (1968). *The technology of teaching.* New York: Appleton-Century-Crofts.

Skinner, B. F. (1978). *About behaviorism.* New York: Alfred A. Knopf.

Skinner, C. H., Williams, R. L., & Neddenriep, C. E. (2004). Using interdependent group-oriented reinforcement to enhance academic performance in general education classrooms. *School Psychology Review, 33,* 384–397.

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85,* 571–581.

Skoe, E. E. A. (1998). The ethic of care: Issues in moral development. In E. E. A. Skoe & A. L. von der Lippe (Eds.), *Personality development in adolescence* (pp. 143–171). London: Routledge.

Slavin, R. E. (1987). Ability grouping and student achievement in elementary schools: A best-evidence synthesis. *Review of Educational Research, 57,* 293–336.

Slavin, R. E. (1995). *Cooperative learning: Theory, research, and practice* (2nd ed.). Boston: Allyn & Bacon.

Slavin, R. E., & Karweit, N. L. (1984). Mastery learning and student teams: A factorial experiment in urban general mathematics classes. *American Educational Research Journal, 21,* 725–736.

Slavin, R. E., Hurley, E. A., & Chamberlain, A. (2003). Cooperative learning and achievement: Research and theory. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioral sciences.* Oxford: Pergamon.

Slavin, R. E., & Madden, N. A. (2006). *Success for All: 2006 summary of research on achievement outcomes.* Baltimore: Johns Hopkins University, Center for Research and Reform in Education.

Slobin, D. I. (1985). Crosslinguistic evidence for the language-making capacity. In D. I. Slobin (Ed.), *The crosslinguistic study of language acquisition: Theoretical issues* (pp. 1157–1249) (Vol. 2). Hillsdale, NJ: Erlbaum.

Slonim, M. B. (1991). *Children, culture, ethnicity: Evaluating and understanding the impact.* New York: Garland.

Smally, S., & Reyes-Blanes, M. (2001). Reaching out to African American parents in an urban community: A community-university partnership. *Urban Education, 36*(4), 518–533.

Smedler, A. C., & Torestad, B. (1996). Verbal intelligence: A key to basic skills. *Educational Studies, 22*(3), 343–356.

Smerdon, B., Cronen, S., Lanahan, L., Anderson, J., Iannotti, N., & Angeles, J. (2000). *Teachers' tools for the 21st century: A report on teachers' use of technology* (NCES Publication No. 2000–102). Washington: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics. Retrieved November 18, 2008, from http://nces.ed.gov/pubs2000/2000102A.pdf

Smetana, J. G. (1997). Parenting and the development of social knowledge reconceptualized: A social-domain analysis. In J. E. Grusec & L. Kuczynski (Eds.), *Parenting and children's internalization of values* (pp. 162–192). New York: Wiley.

Smith, J. D., & Caplan, J. (1988). Cultural differences in cognitive style development. *Developmental Psychology, 24,* 46–52.

Smith, J. D., Schneider, B. H., Smith, P. K., & Ananiadou, D. (2004). The effectiveness of whole-school antibullying programs: A synthesis of evaluation research. *School Psychology Review, 33,* 547–560.

Smith, J. K., & Carr, D. W. (2001). In Byzantium. *Curator, 44,* 335–354.

Smith, J. K., Smith, L. F., & De Lisi, R. (2001). *Natural classroom assessment: Designing seamless instruction and assessment.* Thousand Oaks, CA: Corwin.

Smith, M., & Wilhelm, J. (2002). *Reading don't fix no Chevys: Literacy in the lives of young men.* Portsmouth, NH: Heinemann.

Smith, P., & Fouad, N. (1999). Subject-matter specificity of self-efficacy, outcome expectancies, interest, and goals: Implications for the social-cognitive model. *Journal of Counseling Psychology, 46,* 461–471.

Smith, R. A. (2005). The classroom as a social psychology laboratory. *Journal of Social & Clinical Psychology, 24,* 62–71.

Smith, S. M. (1995). Getting into and out of mental ruts: A theory of fixation, incubation and insight. In R. J. Sternberg & J. E. Davidson (Eds.), *The nature of insight* (pp. 229–252). Cambridge, MA: MIT Press.

Smith, S. W. (2002). *Applying cognitive-behavioral techniques to social skills instruction.* ERIC Clearinghouse on Disabilities and Gifted Edcucation, Arlington, VA. ERIC/OSEP Digest E630.

Smith, S. W., & Kortering, L. J. (1996). Using computers to generate IEPs: Rethinking the process. *Journal of Special Education Technology, 13,* 81–90.

Smoll, F. L., & Schutz, R. W. (1990). Quantifying gender differences in physical performance: A developmental perspective. *Developmental Psychology, 26,* 360–369.

Snarey, J. (1995). In a communitarian voice: The sociological expansion of Kohlbergian theory, research, and practice. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Moral development: An introduction* (pp. 109–134). Boston: Allyn & Bacon.

Snarey, J. R. (1985). Cross-cultural universality of social-moral development: A critical review of Kohlbergian research. *Psychological Bulletin, 97,* 202–232.

Snow, C. (2002). *Reading for understanding: Toward an R and D program in reading comprehension.* Arlington, VA: RAND.

Snow, C. E. (1990). Rationales for native language instruction: Evidence from research. In A. M. Padilla, H. H. Fairchild, & C. M. Valadez (Eds.), *Bilingual education: Issues and strategies* (pp. 60–74). Newbury Park, CA: Sage.

Snow, M. A. (1986). *Innovative second language education: Bilingual immersion programs* (Education Report 1). Los Angeles: Center of Language Education and Research, University of California.

Snow, R. E., Corno, L., & Jackson, D., III (1996). Individual differences in affective and conative functions. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 243–310). New York: Macmillan.

Snyder, J. (2000). Knowing children—understanding teaching: The developmental teacher education program at the University of California, Berkeley. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation at the graduate level* (pp. 97–172). Washington, DC: American Association of Colleges for Teacher Education.

Sobell, L. C., & Sobell, M. B. (2003). Using motivational interviewing techniques to talk with clients about their alcohol use. *Cognitive and Behavioral Practice, 10*(3), 214–221.

Solomon, D., Watson, M. S., & Battistich, V. A. (2001). Teaching and schooling effects on moral/prosocial development. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 566–603). Washington, DC: American Educational Research Association.

Solon, T. (2003). Teaching critical thinking: The more, the better! *Community College Enterprise, 9*(2), 25–38.

Solvberg, A., & Valas, H. (1995). Effects of mnemonic imagery strategy on students' prose recall. *Scandinavian Journal of Educational Research, 39*, 107–119.

Sommerer, C. (2001). Special Section Introduction: A Life in Art, Design, Edutainment, Games and Research. *Leonardo, 34* (4), 297–298.

Sorrell, G. T., & Montgomery, M. J. (2001). Feminist perspectives on Erikson's theory: Their relevance for contemporary identity development research. *Identity, 1*(2), 97–128.

Sosa, A. S. (1997). Involving Hispanic parents in educational activities through collaborative relationships. *Bilingual Research Journal, 21*(2/3), 103–111.

Sousa, D. A. (1995). *How the brain learns: A classroom teacher's guide.* Reston, VA: National Association of Secondary School Principals.

Southerland, S. A., & Sinatra, G. M. (2003). Learning about biological evolution: A special case of intentional conceptual change. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 317–345). Mahwah, NJ: Erlbaum.

Sowers, J. (2004). *Creating a community of learners: Solving the puzzle of classroom management.* Portland, OR: Northwest Regional Educational Laboratory.

Spandel, V. (1997). Reflections on portfolios. In G. D. Phye (Ed.), *Handbook of academic learning: Construction of knowledge.* (pp. 573–590). San Diego, CA: Academic Press, 573–590.

Spandel, V. (2005). Creating writers through 6-trait writing assessment and instruction (4th Ed.). New York: Pearson, 573–590.

Sparks, W. G. (1994). Culturally responsive pedagogy: A framework for addressing multicultural issues. *Journal of Physical Education, Recreation & Dance, 65*(9), 33–37.

Spaulding, C. L. (1992). *Motivation in the classroom.* New York: McGraw-Hill.

Spearman, C. E. (1927). *The abilities of man.* New York: Macmillan.

Spelke, E. S. (2005). Sex differences in intrinsic aptitude for mathematics and science? A critical review. *American Psychologist, 60*, 950–958.

Spencer, M. B. (2006). Phenomenology and ecological systems theory: Development of diverse groups. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology*: *Vol. 1. Theoretical models of human development* (6th ed.). New York: Wiley.

Spencer, M. B., & Markstrom-Adams, C. (1990). Identity processes among racial and ethnic-minority children in America. *Child Development, 61,* 290–310.

Spencer, M. B., Noll, E., & Cassidy, E. (2005). Monetary incentives in support of academic achievement: Results of a randomized field trial involving high-achieving, low-resource, ethnically diverse urban adolescents. *Evaluation Review, 29,* 199–222.

Spielberger, C. D., & Starr, L. M. (1994). Curiosity and exploratory behavior. In H. F. O'Neil, Jr. & M. Drillings (Eds.), *Motivation: Theory and research* (pp. 221–244). Hillsdale, NJ: Erlbaum.

Spielberger, C., & Vagg, P. (1995). *Test anxiety: Theory, assessment, and treatment.* Washington, DC: Taylor & Francis.

Spinelli, C. G. (2002). *Classroom assessment for students with special needs in inclusive classrooms.* Upper Saddle River, NH: Merrill/Prentice Hall.

Spor, M., & Schneider, B. (1999). Content reading strategies: What teachers know, use, and want to learn. *Reading Research and Instruction, 38,* 221–231.

Spring, J. (2006). *American education* (12th ed.). New York: McGraw-Hill.

Spring, J. (2007). *Deculturalization and the struggle for equality* (5th ed.). New York: McGraw-Hill.

Sprinthall, N. A., Reiman, A. J., & Theis-Spinthall, L. (1996). Teacher professional development. In J. P. Sikula, T. J. Buttery, E. Guyton, & Association of Teacher Educators (Eds.), *Handbook of research on teacher education: A project of the Association of Teacher Educators* (2nd ed., pp. 666–703). New York: Macmillan Library Reference, USA.

Spruijt, E., & de Goede, M. (1997) Transitions in family structure and adolescent well-being. *Adolescence, 32,* 897–911.

Squire, L. (1987). *Memory and brain.* New York: Oxford University Press.

St. Gerard, V. (2006). Updating policy on latest risks for students with cell phones in the school. *Education Digest: Essential Readings Condensed for Quick Review, 72*(4), 43–45.

Stack, C. B., & Burton, L. M. (1993). Kinscripts. *Journal of Comparative Family Studies, 24*, 157–170.

Stage, S. A., & Quiroz, D. R. (1997). A meta-analysis of interventions to decrease disruptive classroom behavior in public education settings. *School Psychology Review, 26*, 333–368.

Stahl, S. A. (2002). Different strokes for different folks? In L. Abbeduto (Ed.), *Taking sides: Clashing on controversial issues in educational psychology* (pp. 98–107). Guilford, CT: McGraw-Hill/Duskin.

Stanford, B. H. (2001). Reflections of resilient, persevering urban teachers. *Teacher Education Quarterly, 28*(3), 75–87.

Stanovich, K. E. (1998). Cognitive neuroscience and educational psychology: What season is it? *Educational Psychology Review, 10*, 419–426.

Stanovich, K. E. (2000). *Progress in understanding reading: Scientific foundations and new frontiers.* New York: Guilford.

Stanovich, K. E. (2004). *How to think straight about psychology* (7th ed.). Boston: Allyn & Bacon.

Stanton Fraser, D., Smith, H., Tallyn, E., Kirk, D., Benford, S., Rowland, D., Paxton, M., Price, S., & Fitzpatrick, G. (2005). The SENSE project: A context-inclusive approach to studying environmental science within and across schools. In *Proceedings of the International Conference on Computer Supported Collaborative Learning 2005* (pp. 155–159). Taipei, Taiwan: Erlbaum.

Starratt, R. (2003). Opportunity to learn and the accountability agenda. *Phi Delta Kappan, 85*, 298–303.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual ability and performance. *American Psychologist, 52*, 613–629.

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology 69*(5), 797-811.

Steffensen, M. S., Joag-Dev, C., & Anderson, R. C. (1979). A cross-cultural perspective on reading comprehension. *Reading Research Quarterly, 15,* 10–29.

Stein, M., & Carnine, D. (1999). Designing and delivering effective mathematics instruction. In R. Stevens (Ed.), *Teaching in American schools* (pp. 245–270). Upper Saddle River, NJ: Merrill/Prentice Hall.

Steinberg, L. (1996). *Beyond the classroom: Why school reform has failed and what parents need to do.* New York: Touchstone.

Steinberg, L., Blatt-Eisengart, I., & Cauffman, E. (2006). Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent, and neglectful homes: A replication in a sample of juvenile defenders. *Journal of Research on Adolescent Development, 16,* 47–58.

Stepans, J. (2003). *Targeting students' science misconceptions: Physical science concepts using the conceptual change model.* Tampa, FL: Showboard.

Sternberg, R. J. (1997). The concept of intelligence and its role in lifelong learning and success. *American Psychologist, 52,* 1030–1037.

Sternberg, R. J. (1998). *Cupid's arrow.* New York: Cambridge University Press.

Sternberg, R. J. (2000). *Handbook of intelligence.* New York: Oxford University Press.

Sternberg, R. J. (2003). *Wisdom, intelligence, and creativity synthesized.* Cambridge, UK: Cambridge University Press.

Sternberg, R. J. (2006). *Cognitive psychology* (4th ed.). Belmont, CA: Wadsworth.

Sternberg, R. J., & Ben Zeev, T. (2001). *Complex cognition: The psychology of human thought.* New York: Oxford University Press.

Sternberg, R. J., & Grigorenko, E. L. (2000). *Teaching for successful intelligence.* Arlington Heights, IL: Skylight.

Sternberg, R. J., & Grigorenko, E. L. (2000). A capsule history of theory and research on styles. In R. J. Sternberg & L. F. Zhang (Eds.), *Perspectives on cognitive, learning and thinking styles* (pp. 1–21). Mahwah, NJ: Erlbaum.

Sternberg, R. J., & Horvath, J. A. (1995). A prototype view of expert teaching. *Educational Researcher, 24*(6), 9–17.

Sternberg, R. J., & Lubart, T. I. (1995). *Defying the crowd: Cultivating creativity in a culture of conformity.* New York: Free Press.

Sternberg, R. J., & Spear-Swerling, P. (1996). *Teaching for thinking.* Washington, DC: American Psychological Association.

Sternberg, R. J., Grigorenko, E. L., & Nokes, C. (1997). Effects of children's ill health on cognitive development. In M. E. Young (Ed.), *Early child development programs: Investing in our children's future* (pp. 85–125). Amsterdam: Elsevier.

Stetsenko, A., Little, T. D., Gordeeva, T., Grasshof, M, & Oettingen, G. (2000) Gender effects in children's beliefs about school performance: A cross-cultural study. *Child Development, 71*(2), 517–527.

Stevens, R. J., & Slavin, R. E. (1995). The effects of Cooperative Integrated Reading and Composition (CIRC) on academically handicapped and non-handicapped students' achievement, attitudes, and metacognition in reading and writing. *Elementary School Journal, 95*, 241–262.

Stevens, R. J., Madden, N. A., Slavin, R. E., & Farnish, A. M. (1987). Cooperative Integrated Reading and Composition: Two field experiments. *Reading Research Quarterly, 22*, 433–454.

Stevenson, H. C., & Fantuzzo, J. W. (1986). The generality and social validity of a competency-based self-control training intervention for underachieving students. *Journal of Applied Behavior Analysis, 19,* 269–272.

Stewart, L., & Pascual-Leone, J. (1992). Mental capacity constraints and the development of moral reasoning. *Journal of Experimental Child Psychology, 54,* 251–287.

Stiggins, R. (2004). New assessment beliefs for a new school mission. *Phi Delta Kappan, 86*(1), 22–27.

Stiggins, R. (2005). *Student-centered classroom assessment* (4th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Stinson, D. W. (2004). Mathematics as "gate-keeper": Three theoretical perspectives that aim toward empowering all children with a key to the gate. *The Mathematics Educator, 14*, 8–18.

Stipek, D. (2002). *Motivation to learn: Integrating theory and practice* (4th ed.). Boston: Allyn & Bacon.

Stipek, D. (2002). At what age should children enter kindergarten? A question for policy makers and parents. *Social Policy Report of the Society for Research in Child Development, 16*(2), 3–16.

Stipek, D. J. (2002). *Motivation to learn: Integrating theory and practice* (4th ed.). Boston: Allyn & Bacon.

Stipek, D., & MacIver, D. (1989). Developmental change in children's assessment of intellectual competence. *Child Development, 60,* 521–538.

Stoll, C. (1995). The Internet? Bah! *Newsweek, 27*, 39.

Stone, C. A., & May, A. L. (2002). The accuracy of academic self-evaluations in adolescents with learning disabilities. *Journal of Learning Disabilities, 35*(4), 370–383.

Story, C. M. (1998). What instructional designers need to know about advance organizers. *International Journal of Instructional Media, 25*, 253–261.

Stotsky, S. (1999). *Losing our language: How multicultural classroom instruction is undermining our children's ability to read, write, and reason.* New York: Free Press.

Strand, J. A., & Peacock, T. D. (2002). *Nurturing resilience and school success in American Indian and Alaska Native students.* ERIC Digests: Clearinghouse on Rural Education and Small Schools.

Streib, L. Y. (1993). Visiting and revisiting the trees. In M. Cochran-Smith & S. L. Lytle (Eds.), *Inside/outside: Teacher research and knowledge* (pp. 121–130). New York: Teachers College Press.

Stronge, J. H. (2007). *Qualities of effective teachers* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Suarez-Orozco, C. (2002). Afterword: Understanding and serving the children of immigrants. *Harvard Educational Review, 71*, 579–589.

Suina, J. H., & Smolkin, L. B. (1994). From natal culture to school culture to dominant society culture: Supporting transitions for Pueblo Indian students. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural roots of minority child development* (pp. 115–130). Mahwah, NJ: Erlbaum.

Sullivan, J. S. (1989). Planning, implementing, and maintaining an effective in-school suspension program. *Clearing House, 62*, 409–410.

Supovitz, J. A. (1998). Gender and racial/ethnic differences on alternative science assessments. *Journal of Women and Minorities in Science and Engineering, 4*(2 & 3), 129–140.

Supovitz, J. A., & Brennan, R. T. (1997). Mirror, mirror on the wall, which is the fairest test of all? An examination of the equitability of portfolio assessment relative to standardized tests. *Harvard Educational Review, 67*(3), 474–505.

Swaggart, B. L. (1998). Implementing a cognitive behavior management program. *Intervention in School and Clinic, 33*(4), 235–238.

Swan, K., Cook, D., Kratcoski, A., Lin, Y., Schenker, J., & van Hooft, M. (2006). Ubiquitous computing: Rethinking teaching, learning and technology integration. In S. Tettegah & R. Hunter (Eds.), *Education and technology: Issues and applications, policy, and administration* (pp. 231–252). New York: Elsevier.

Swan, K., van't Hooft, M., Kratcoski, A., & Unger, D. (2005). Uses and effects of mobile computing devices in K–8 classrooms: A preliminary study. *Journal of Research on Technology and Education, 38*(1), 99–112.

Swanborn, M. S. L., & de Glopper, K. (1999). Incidental word learning while reading: A meta-analysis. *Review of Educational Research, 69,* 261–285.

Swanson, H. L. (1990). The influence of metacognitive knowledge and aptitude on problem solving. *Journal of Educational Psychology, 82*, 306–314.

Swanson, H. L. (1993). An information processing analysis of learning disabled children's problem solving. *American Educational Research Journal, 30*, 861–893.

Swanson, H. L., & Sáez, L. (2003). Memory difficulties in children and adults with learning disabilities. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 182–198). New York: Guilford.

Swanson, H. L., & Siegel, L. (2001). Learning disabilities as working memory deficit. *Issues in Education, 7*, 1–48.

Swanson, H. L., O'Connor, J. E., & Cooney, J. B. (1990). An information processing analysis of expert and novice teachers' problem-solving. *American Educational Research Journal, 27*(3), 533–556.

Swanson, R. L. (1995). Toward the ethical motivation of learning. *Education, 116*, 43–51.

Swanson, R., & Holton, E., (2001). *Foundations of human resource development.* San Francisco: Berrett-Koehler.

Swartz, R. J., & Perkins, D. N. (1990). *Teaching thinking: Issues and approaches.* Pacific Grove, CA: Midwest.

Sweet, A. P., Guthrie, J. T., & Ng, M. M. (1998). Teacher perceptions and student reading motivation. *Journal of Educational Psychology, 90*, 210–223.

Sweller, J. (1999). *Instructional design in technical areas.* Camberwell, Australia: ACER Press.

Sweller, J. (2006). The worked example effect and human cognition. *Learning and Instruction, 16*(2) 165-169.

Sweller, J., van Merrienboer, J. J. G., & Paas, F. W. C. (1998). Cognitive architecture and instructional design. *Educational Psychology Review, 10*, 251–296.

Sylwester, R. (1997). The neurobiology of self-esteem and aggression. *Educational Leadership, 54*, 75–79.

Taconis, R., Ferguson-Hessler, M. G. M., & Broekkamp, H. (2001). Teaching problem solving strategies. *Journal of Research in Science Teaching, 38*(4), 442–468.

Taguchi, K. (2006). Should the keyword method be introduced in tertiary foreign language classrooms? *Electronic Journal of Foreign Language Teaching, 3*, 22–38.

Tanner, C. K. (2000). The influence of school architecture on academic achievement. *Journal of Educational Administration, 38*, 309–330.

Tanner, J. M. (1978). *Fetus into man.* Cambridge, MA: Harvard University Press.

Tao, V., & Hong, Y. (2000). A meaning system approach to Chinese students' achievement goals. *Journal of Psychology in Chinese Societies, 1*(2), 13–38.

Tapscott, D. (1999). *Growing up digital: The rise of the Net.* New York: McGraw-Hill.

Tate, W. (1994). Race, retrenchment, and the reform of school mathematics. *Phi Delta Kappan,* 75, 477–486.

Tauber, R. T. (1990). Classical conditioning: Eliciting the right response. *NASSP Bulletin, 74*, 90–92.

Taylor, B. A., & Levin, L. (1998). Teaching a student with autism to make verbal initiations: Effects of a tactile prompt. *Journal of Applied Behavior Analysis, 31*, 651–654.

Taylor, I. A. (1976). A retrospective view of creativity investigation. In I. A. Taylor & J. W. Getzels (Eds.), *Perspectives in creativity* (pp. 1–36). Chicago: Aldine de Gruyter.

Taylor, K. R. (2008). Still trying to make the call on student cell phones. *Principal Leadership, 8*(6), 62–64.

Teens targeted with cellphone marketing. (2007). USA Today. Retrieved November 14, 2008, from http://www.usatoday.com/tech/wireless/phones/2007–03-19-cellphone-marketing_N.htm

Terhune, K. W. (1968). Studies of motives, cooperation, and conflict within laboratory microcosms. In G. H. Snyder (Ed.), *Studies in international conflict* (Vol. 4, pp. 29–58). Buffalo, NY: SUNY Buffalo Council on International Studies.

Terry, W. S. (2003). *Learning and memory* (2nd ed.). Boston: Allyn & Bacon.

Terwilliger, J. (1997). Semantics, psychometrics, and assessment reform: A close look at "authentic assessments" *Educational Researcher, 26*, 24–27.

Théberge Rafal, C. (1996). From co-construction to takeovers: Science talk in a group of four girls. *Journal of the Learning Sciences, 5*(3), 279–293.

Tharp, R. (1982). The effective instruction of comprehension: Results and description of the Kamehameha Early Education Program. *Reading Research Quarterly, 71*(4), 503–527.

Tharp, R. G. (1989). Psychocultural variables and constants: Effects on teaching and learning in schools. *American Psychologist, 44,* 349–359.

The First Hour. (2002). *Instructor, 112*(1), 44–46.

Thiede, K. W., & Anderson, M. C. M. (2003). Summarizing can improve metacomprehension accuracy. *Contemporary Educational Psychology, 28,* 129–160.

Thomas, R. M. (2000). *Comparing theories of child development* (5th ed.). Belmont, CA: Wadsworth/Thomas Learning.

Thomas, W. P., Collier, V. P., & Abbott, M. (1993). Academic achievement through Japanese, Spanish, or French: The first two years of partial immersion. *Modern Language Journal, 77,* 170–179.

Thompson, D. N. (1998). Using advance organizers to facilitate reading comprehension among older adults. *Educational Gerontology, 24,* 625–638.

Thompson, P. M., Gield, J. N., Woods, R. P., MacDonald, D., Evans, A. C., & Toga, A. W. (2000). Growth patterns in the developing brain

detected by using continuum mechanical sensor maps. *Nature, 404*, 190–193.

Thompson, R. A. (1998). Early sociopersonality development. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol 3. Social, emotional, and personality development* (5th ed., pp. 25–104). New York: Wiley.

Thompson, R. A., & Wyatt, J. M. (1999). Current research on child maltreatment: Implications for educators. *Educational Psychology Review, 11*, 173–201.

Thompson, R. F. (1985). *The brain: An introduction to neuroscience*. New York: Freeman.

Thorley, R. N., & Stofflet, R. T. (1996). Representation of the conceptual change model in science teacher education. *Science Education, 80*, 317–339.

Thornburg, D. (2002). *The new basics: Education and the future of work in the telematic age*. Alexandria, VA: Association for Supervision and Curriculum Development.

Thorndike, E. L. (1913). *Educational psychology: Vol. 2. The psychology of learning*. New York: Teachers College, Columbia University.

Thorndike, E. L. (1924). *Educational psychology: Briefer course*. New York: Teachers College, Columbia University.

Thorndike, R. L., Hagen, E. P., & Sattler, J. M. (1986). *Stanford-Binet Intelligence Scale: Guide for administering and scoring the fourth edition*. Chicago: Riverside.

Thorndike, R. M. (2005). *Measurement and evaluation in psychology and education* (7th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Thrash, T., & Elliott, A. (2001). Delimiting and integrating achievement motive and goal constructs. In A. Efklides, J. Kuhl, & R. Sorrentino (Eds.), *Trends and prospects in motivation research* (pp. 3–21). Boston: Kluwer.

Tierno, M. J. (1991). Responding to the socially motivated behaviors of early adolescents: Recommendations for classroom management. *Adolesence*, 26, 569–577.

Tieso, C. L. (2003). Ability grouping is not just tracking any more. *Roeper Review, 26*(1), 29–37.

Timm, P., & Borman, K. (1997). The souppot don't stretch that far no more: Intergenerational patterns of school leaving in an urban Appalachian neighborhood. In M. Selter & L. Weis (Eds.), *Beyond black and white: New faces and voices in U.S. schools* (pp. 257–282). Albany: State University of New York Press.

Titsworth, S. (2004). Students' notetaking: The effects of teacher immediacy and clarity. *Communication Education, 53,* 305–320.

Tobias, R. (1994). *Education progress of students in bilingual and ESL programs: A longitudinal study, 1990–1994*. Brooklyn, NY: Office of Educational Research, Board of Education of the City of New York.

Tobias, S. (1992). The impact of test anxiety cognition in school learning. In K. A. Hagtvet & T. B. Johnsen (Eds.), *Advances in test anxiety research* (Vol. 7, pp. 18–31). Amsterdam: Swets & Zeitlinger.

Tobias, S. (1994). Interest, prior knowledge, and learning. *Review of Educational Research, 64*, 37–54.

Tomei, L. A. (2003). *Challenges of teaching with technology across the curriculum: Issues and solutions*. Hershey, PA: Information Science Publishers.

Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners*. Alexandria, VA: Association for Supervision and Curriculum Development.

Toomey, R., & Ketterer, K. (1995). Using multimedia as a cognitive tool. *Journal of Research on Computing in Education, 27*(4), 472–482.

Torgensen, J. K. (1996). Thoughts about intervention research in learning disabilities. *Learning Disabilities: A Multidisciplinary Journal, 7*, 55–58.

Torrance, E. P. (1976). Creativity research in education: Still alive. In I. A. Taylor & J. W. Getzels (Eds.), *Perspectives in creativity* (pp. 278–296). Chicago: Aldine de Gruyter.

Torres-Guzman, M. E. (1998). Language, culture, and literacy in Puerto Rican communities. In B. Perez (Ed.), *Sociocultural contexts of language and literacy* (pp. 99–121). Mahwah, NJ: Erlbaum.

Tower, C. (1996). *Child abuse and neglect*. Boston: Allyn & Bacon.

Tramontana, M. G., Hooper, E. P., & Selzer, S. C. (1988). Research on the preschool prediction of later academic achievement: A review. *Developmental Review, 8,* 89–146.

Traub, R., & MacRury, K. (1990). Multiple-choice vs. free-response in the testing of scholastic achievement. In K. Ingenkamp & R. Jager (Eds.), *Tests and trends 8: Jahrbuch der padagogischen diagnostik*. (pp. 128–159). Weinheim and Basel, Germany: Beltz Verlag.

Trawick-Smith, J. (2003). *Early childhood development: A multicultural perspective* (3rd ed.). Upper Saddle River, NJ: Pearson.

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 96*, 506–520.

Trickett P. K., & McBride-Chang, C. (1995). The developmental impact of different forms of child abuse and neglect. *Developmental Review, 15,* 311–337.

Tripp, D. H. (1990). Socially critical action research. *Theory into Practice, 29*, 158–166.

Troop, W. R., & Asher, S. R. (1999). Teaching peer relationship competence in schools. In R. J. Stevens (Ed.), *Teaching in American schools* (141–171). Upper Saddle River, NJ: Merrill/Prentice Hall.

Trumbull, E., Rothstein-Fisch, C., Greenfield, P. M., & Quiroz, B. (2001). *Bridging cultures between home and school: A guide for teachers, with a special focus on immigrant Latino families*. Mahwah, NJ: Erlbaum.

Trumper, R., & Gelbman, M. (2002). What are microcomputer-based laboratories (MBLs) for? An example from introductory kinematics. *Journal of Computers in Mathematics and Science Teaching, 21*(3), 207–227.

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*, 202–248.

Tsovaltzi, D., Rummel, N., Pinkwart, N., Schever, O., Harrer, A., Braun, I., & McLaren, B. M. (2008). CoChemEX: Supporting conceptual chemistry learning via computer-mediated collaboration scripts. In P. Dillenbourg and M. Specht (Eds.). *Proceedings of the Third European Conference on Technology Enhanced Learning (EC-TEL 2008), Lecture Notes in Computer Science 5192* (pp. 437–448). Berlin: Springer.

Tsui, A. B. M. (2003). *Understanding expertise in teaching: Case studies of second language teachers*. New York: Cambridge University Press.

Tulving, E. (2002). Episodic memory: From mind to brain. *Annual Review of Psychology, 53*, 1–25.

Tulving, E., & Osler, S. (1968). Effectiveness of retrieval cues in memory for words. *Journal of Experimental Psychology, 77,* 593–601.

Turiel, E. (1998). The development of morality. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol 3. Social, emotional, and personality development* (5th ed., pp. 863–932). New York: Wiley.

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological Science, 14*, 623–628.

Turnbull, A. P., Turnbull, R., & Wehmeyer, M. L. (2007). *Exceptional lives: Special education in today's schools* (5th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Turnbull, A., Turnbull, R., Shank, M., Smith, S., & Leal, D. (2004). *Exceptional lives: Special education in today's schools* (4th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Turner, J. C. (1995). The influence of classroom contexts on young children's motivation for literacy. *Reading Research Quarterly, 30*, 410–441.

Twenge, J. M., & Campbell, W. K. (2001). Age and birth cohort differences in self-esteem: A cross temporal meta-analysis. *Journal of Personality and Social Psychology Review, 5*, 321–344.

Uberti, H. Z., Scruggs, T. E., & Mastropieri, M. A. (2003). Keywords make the difference! Mnemonic instruction in inclusive classrooms. *Teaching Exceptional Children, 10*(3), 56–61.

Uline, C., Wilson, J. D., & Cordry, S. (2004). Reflective journals: A valuable tool for teacher preparation. *Education, 124*(3), 456.

Underwood, J., Cavendish, S., Dowling, S., Fogelman, K., & Lawson, T. (1996). Are integrated learning systems effective learning support tools? Computers and Education, 26, 33–40.

Unsworth, N., & Engle, R. W. (2005). Working memory capacity and fluid abilities: Examining the correlation between Operation Span and Raven. *Intelligence, 33*, 67–81.

Urdan, T. C., & Maehr, M. L. (1995). Beyond a two-goal theory of motivation and achievement: A case for social goals. *Review of Educational Research, 65*, 213–243.

Urdan, T., & Midgley, C. (2001). Academic self-handicapping: What we know, what more there is to learn. *Educational Psychology Review, 13*, 115–138.

Urdan, T., Ryan, A. M., Anderman, E. M., & Gheen, M. H. (2002). Goals, goal structures, and avoidance behaviors. In C. Midgley (Ed.), *Goals, goal structures, and patterns of adaptive learning* (pp. 55–83). Mahwah, NJ: Erlbaum.

U. S. Department of Education Office of Special Education Programs. (2002). *Twenty-fourth annual report to Congress on the implementation of the Individuals with Disabilities Education Act.* Washington, DC: Author.

U. S. Department of Education. (2004). Toward a new golden age in American education: How the Internet, the law and today's students are revolutionizing expectations. National Education Technology Plan. Retrieved November 18, 2008, from http://www.ed.gov/about/offices/list/os/technology/plan/2004/index.html

U. S. Department of Education. (2005). *Twenty-seventh annual report to Congress on the implementation of the Individuals with Disabilities Education Act.* Washington, DC: U.S. Government Printing Office. Retrieved July 14, 2008, from http://www.ed.gov/about/reports/annual/osep/2005/parts-b-c/index.html

U. S. Department of Education. (2008). *Mapping America's educational progress 2008.* Retrieved January 24, 2009, from http://www.ed.gov/nclb/accountability/results/progress/nation.html

U. S. Department of Education. (2008). *Mapping America's educational progress 2008.* Retrieved June 23, 2008, from http://www.ed.gov/nclb/accountability/results/progress/nation.html

U.S. Department of Education. (2002). *No Child Left Behind fact sheet.* Retrieved April 30, 2009, from http://www.ed.gov/policy/elsec/leg/esea02/107-110.pdf

U.S. Department of Education (2006). *Civil Rights Data Collection 2006.* Retrieved August 1, 2008 from: http://ocrdata.ed.gov/ocr2006rv30/wdsdata.html.

Utley, C. A., Rotatori, A. F., & Obiakor, F. E. (Eds.) (2003). *Advances in special education: Psychology of effective education for learners with exceptionalities.* Stamford, CT: JAI Press.

Vail, P. (2002). *Learning styles and emotions.* Retrieved April 26, 2008, from http://www.schwablearning.org/pdfs/expert_vail.pdf.

Valas, H. (2001). Learned helplessness and psychological adjustment II: Effects of learning disabilities and low achievement. *Scandinavian Journal of Educational Research, 42,* 101–114.

Valdes, G. (1997). The teaching of Spanish to bilingual Spanish-speaking students: Outstanding issues and unanswered questions. In M.C. Colombi & F.X. Alarcon (Eds.), *La enseñanza del español a hispanohablantes: Praxis y teoría* (pp. 93–101). Boston: Houghton Mifflin.

Van Camp, C.M., Lerman, D.C., Kelley, M.E., Roane, H.S., Contrucci, S.A., & Vorndran, C.M. (2000). Further analysis of idiosyncratic antecedent influences during the assessment and treatment of a problem behavior. *Journal of Applied Behavior Analysis,* 33, 207-221.

Van Dusen, L. M., & Worthen, B. R. (1995). Can integrated instructional technology transform the classroom? *Educational Leadership, 53*(2), 28–33.

van Gelder, T. (2005). Teaching critical thinking: Some lessons from cognitive science. *College Teaching, 53,* 41–46.

Van Houten, R., Nau, P., MacKenzie-Keating, S., Sameoto, D., & Colavecchia, B. (1982). An analysis of some variables influencing the effectiveness of reprimands. *Journal of Applied Behavior Analysis,* 15, 65-83.

Van Horn, K. L. (1982). *The Utah pupil/teacher self-concept program: Teacher strategies that invite improvement of pupil and teacher self-concept.* Paper presented at the annual meeting of the American Educational Research Association, New York.

van Kraayenoord, C. E., & Paris, S. G. (1997). Australian students' self-appraisal of their work samples and academic progress. *Elementary School Journal, 97*, 523–537.

Van Lier, P. A. C., Muthen, B. O., van der Sar, R. M., & Crijen, A. A. M. (2004). Preventing disruptive behavior in elementary school-children: Impact of a universal classroom-based intervention. *Journal of Consulting and Clinical Psychology, 72*, 467–478.

van Manen, M. (1990). Beyond assumptions: Shifting the limits of action research. *Theory into Practice, 29*, 152–157.

Van Wagenen, L., & Hibbard, K. M. (1998). Building teacher portfolios. *Educational Leadership, 55*(5), 26–29.

Vasquez, J. A. (1990). Teaching to the distinctive traits of minority students. *Clearing House, 63*(7), 299–304.

Vaughn, B. J., & Horner, R. H. (1997). Identifying instructional tasks that occasion problem behaviors and assessing the effects of student versus teacher choice among these tasks. *Journal of Applied Behavior Analysis, 30*, 299–312.

Vavilis, B., & Vavilis, S. (2004). Why are we learning this? What is this stuff good for, anyway? The importance of conversation in the classroom. *Phi Delta Kappan, 86*(4), 282–287.

Vermont Department of Education. (2000). *Vermont's framework of standards and learning opportunities.* Retrieved November 5, 2008, from http://education.vermont.gov/new/html/pubs/framework.html

Vernez, G. (1998). *Projected social context for education of children.* Washington, DC: RAND.

Vess, D. L. (2006). History to go: Why I teach with iPods. *History Teacher, 39*(4), 479–492.

Vidal, F. (2000). Piaget, Jean. In A. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 6, pp. 193–196). Washington, DC: American Psychological Association and Oxford University Press.

Vispoel, W. P. (1995). Self-concept in artistic domains: An extension of the Shavelson, Hubmner, and Stanton (1976) model. *Journal of Educational Psychology, 87*, 134–153.

Vogt, W. P. (2007). *Quantitative research methods for professionals in education and other fields*. Boston: Allyn & Bacon.

Vokoun, M. J., & Bigelow, T. P. (2008). Dude, what choice do I have? *Educational Leadership, 66*(3), 70–74.

Volman, M., & van Eck, E. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research, 71*, 613–634.

Von Eckardt, B. (1999). Mental representation. In R. A. Wilson & F. C. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences* (pp. 527–529). Cambridge, MA: MIT Press.

von Hippel, W., Lakin, J. L., & Shakarchi, R. J. (2005). Individual differences in motivated social cognition: The case of self-serving information processing. *Personality and Social Psychology Bulletin, 31*(10), 1347–1357.

Vosniadou, S. (2003). Exploring the relationships between conceptual change and intentional learning. In G. M. Sinatra & P. R. Pintrich (Eds.), *Intentional conceptual change* (pp. 377–406). Mahwah, NJ: Erlbaum.

Vosniadou, S. (2007). Conceptual change and education. *Human Development, 50*, 47–54.

Vosniadou, S., & Brewer, W. F. (1992). Mental models of the earth: A study of conceptual change in childhood. *Cognitive Psychology, 24*, 535–585.

Voss, J. F. (1974). Acquisition and nonspecific transfer effects in prose learning as a function of question form. *Journal of Educational Psychology, 66*, 736–740.

Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L. S. (1987). *Problems of general psychology*. New York: Plenum.

Vygotsky, L. S. (1993). *The collected works of L. S. Vygotsky* (Vol. 2, J. Knox & C. Stevens, Trans.). New York: Plenum.

Vygotsky, L. S. (1997). *Educational psychology* (R. Silverman, Trans.). Boca Raton, FL: St. Lucie.

Wade, S. E. (1992). How interest affects learning from text. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 255–278). Hillsdale, NJ: Erlbaum.

Wainer, H. (2000). *Computerized adaptive testing: A primer* (2nd ed.). Mahwah, NJ: Erlbaum.

Waits, B. K., & Demana, F. (2000). Calculators in mathematics teaching and learning: Past, present, future. In M. J. Burke & F. R. Curcio (Eds.), *Learning mathematics for a new century: NCTM 2000 Yearbook* (pp. 51–66). Reston, VA: National Council of Teachers of Mathematics.

Walberg, H. (1988). Synthesis of research on time and learning. *Educational Leadership, 45*(6), 76–80.

Walker, B. (2003). The cultivation of student self-efficiency in reading and writing. *Reading and Writing Quarterly: Overcoming Learning Difficulties, 19*, 173–187.

Walker, H. M., Ramsey, E., & Gresham, F. M. (2004). *Antisocial behavior in school: Strategies and best practices* (2nd ed.). Pacific Grove, CA: Brooks/Cole.

Walker, J. E., Shea, T. M., & Bauer, A. M. (2007). *Behavior management: A practical approach for educators* (9th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Walker, K. L. (1997). Do you ever listen? Discovering the theoretical underpinnings of empathic listening. *International Journal of Listening, 11*, 127–137.

Walker, L. J. (2002). Moral exemplarity. In W. Damon (Ed.), *Bringing in a new era of character* (pp. 65–83). Stanford, CA: Hoover Press.

Walker, S. E. (2006). Journal writing as a teaching technique to promote reflection. *Journal of Athletic Training, 41*, 216–221.

Wallas, G. (1926). *The art of thought*. New York: Harcourt, Brace.

Walters, G. C., & Grusec, J. F. (1977). *Punishment*. San Francisco: Freeman.

Walton, S., & Taylor, K. (1996/97). How did you know the answer was boxcar? *Educational Leadership, 54*(4), 38–40.

Wang, A. Y., Thomas, M. H., & Ouellette, J. A. (1992). Keyword mnemonic and retention of second-language vocabulary words. *Journal of Educational Psychology, 84*, 520–528.

Wang, C. M. (1997). Next steps in inner-city education: Focusing on resilience development and learning success. *Education and Urban Society, 29*(3), 255–276.

Wang, M. C., Haertel, G. D., & Walber, H. J. (1993). Toward a knowledge base for school learning. *Review of Educational Research, 63*, 249–294.

Wang, M., Haertel, G., & Walberg, H. (1993). Toward a knowledge base for school learning. *Review of Educational Research, 63*, 249–294.

Washburn, D. A., Smith, J. D., & Taglialatela, L. A. (2005). Individual differences in metacognitive responsiveness: Cognitive and personality correlates. *Journal of General Psychology, 132*, 446–461.

Wason, P. C., & Johnson-Laird, P. N. (1972). *Psychology of reasoning: Structure and content*. London: B. T. Batsford.

Watson, D., Charner-Laird, M., Kirkpatrick, C. L., Szczesiul, S. A., & Gordon, P. J. (2006). Effective teaching/effective urban teaching: Grappling with definitions, grappling with difference. *Journal of Teacher Education, 57*, 395–409.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20*, 158–177.

Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology, 3*, 1–14.

Watson, M. S., & Battistich, V. (2006). Building and sustaining caring communities. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management* (pp. 253–279). Mahwah, NJ: Erlbaum.

Wattenmaker, W. D., Dewey, G. I., Murphy, T. D., & Medin, D. L. (1986). Linear separability and concept learning: Context, relational properties, and concept naturalness. *Cognitive Psychology, 18*, 158–194.

Waxman, H. C., & Tellez, K. (2002). *Research synthesis on effective teaching practices for English language learners*. Philadelphia: Mid-Atlantic Laboratory for Student Success.

Waxman, H. C., Gray, J. P., & Padron, N. (2002). Resiliency among students at risk of academic failure. In S. Springfield & D. Land (Eds.), *Educating at-risk students* (pp. 29–48). Chicago: National Society for the Study of Education.

Waxman, S. R., Medin, D. L., & Ross, N. (2007). Folkbiological reasoning from a cross-cultural developmental perspective: Early essentialist notions are shaped by cultural beliefs. *Developmental Psychology, 43*, 294–308.

Weaver, T. (1992, April). *Year-round education.* Portland: University of Oregon, ERIC Clearinghouse on Educational Management. (ED 342 107)

Webb, N. M., & Palincsar, A. S. (1996). Group processes in the classroom. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 841–873). New York: Macmillan.

Webb, N., Nemer, K., & Zuniga, S. (2002). Short circuits or superconductors? *American Educational Research Journal, 39*, 943–989.

Weber, W. A., & Roff, L. A. (1983). A review of teacher education literature on classroom management. In W. A. Weber, L. A. Roff, J. Crawford, & C. Robinson (Eds.), *Classroom management: Reviews of the teacher education and research literature* (pp. 7–42). Princeton, NJ: Educational Testing Service.

Wechsler, D. (1974). *Wechsler Intelligences Scale for Children—Revised.* New York: Psychological Corporation.

Wechsler, D. (1991). *Manual for the Wechsler Intelligence Scales for Children* (3rd ed.) (WISC—III). San Antonio, TX: Psychological Corporation.

Weinberger, D. (2001, March 10). A brain too young for good judgment. *New York Times,* p. A13.

Weiner, B. (1979). A theory of motivation for some classroom experiences. *Journal of Educational Psychology, 71*, 3–25.

Weiner, B. (1986). *An attributional theory of motivation and emotion.* New York: Springer.

Weiner, B. (1992). *Human motivation: Metaphors, theories, and research.* Newbury Park, CA: Sage.

Weiner, B. (2000). Interpersonal and intrapersonal theories of motivation from an attributional perspective. *Educational Psychology Review, 12*, 1–14.

Weiner, B. (2002). Interpersonal and intrapersonal theories of motivation from an attributional perspective. *Educational Psychology Review, 12*, 1–14.

Weiner, L. (2000). Research in the 90's: Implications for urban teacher preparation. *Review of Educational Research, 70*, 369–406.

Weinert, F. E., & Helmke, A. (1995). Learning from wise Mother Nature or Big Brother Instructor: The wrong choice as seen from an educational perspective. *Educational Psychologist, 30*, 135–142.

Weinert, F. E., & Schneider, W. (1999). *Individual development from three to twelve: Findings from the Munich longitudinal study.* New York: Cambridge University Press.

Weinstein, C. (1979). The physical environment of the school: A review of the research. *Review of Educational Research, 49*, 577–610.

Weinstein, C. E., Husman, J., & Dierking, D. R.(2000). Self-regulation interventions with a focus on learning strategies. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 727–747). San Diego: Academic Press.

Weinstein, C. S. (2006). *Middle and secondary classroom management: Lessons from research and practice.* New York: McGraw-Hill.

Weinstein, C. S., & Mignano, A. J., Jr. (2007). *Elementary classroom management* (4th ed.). New York: McGraw-Hill.

Weinstein, M. (2000). A frame for critical thinking. *High School Magazine, 7*, 40–44.

Weinstein, R. (1998). Promoting positive expectations in schooling. In N. Lambert & B. McCombs (Eds.), *How students learn: Reforming schools through learner-centered education* (pp. 81–111). Washington, DC: American Psychological Association.

Weinstein, R. S. (2002). Overcoming inequality in schooling: A call to action for community psychology. *American Journal of Community Psychology, 30*, 21–42.

Weiss, H., Mayer, E., Kreider, H., Vaughan, M., Dearing, E., Hencke, R., & Pinto, K. (2003). Making it work: Low-income working mothers' involvement in their children's education. *American Educational Research Journal, 40*(4), 879–901.

Weissberg, R. P., & Kumpfer, K. (Eds.). (2003). Prevention that works for children and youth [Special Issue]. *American Psychologist, 58*, 425–490.

Weissberg, R. P., Barton, H. A., & Shriver, T. P. (1997). The Social-Competence Promotion program for young adolescents. In G. W. Albee & T. P. Gullotta (Eds.), *Primary prevention exemplars: The Lela Rowland Awards.* (pp. 268–290) Thousand Oaks, CA: Sage.

Welch, D. C., & West, R. L. (1995). Self-efficacy and mastery: Its application to issues of environmental control, cognition, and aging. *Developmental Review, 15,* 150–171.

Wellman, H. M., & Gelman, S. A. (1998). Acquisition of knowledge. In W. Damon (Series Ed.), D. Kuhn, & R. S. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language (*5th ed, pp. 523–574). New York: Wiley.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics.* Princeton, NJ: Educational Testing Service.

Wenglinsky, H. (2002). The link between teacher classroom practices and student academic performance. *Education Policy Analysis Archives, 10*(12). Retrieved January 24, 2009 from http//epaa.asu.edu/epaa/v10n12

Wentzel, K. R. (1991). Relations between social competence and academic achievement in early adolescence. *Child Development, 62*, 1066–1078.

Wentzel, K. R. (1999). Social-motivational processes and interpersonal relationships: Implications for understanding motivation at school. *Journal of Educational Psychology, 91*(1), 76–97.

Wentzel, K. R. (2002). Are effective teachers like good parents? Interpersonal predictors of school adjustment in early adolescence. *Child Development, 73*, 287–301.

Wentzel, K. R., & Battle, A. (2001). Social relationships and school adjustment. In T. Urdan & F. Pajares (Eds.), *Adolescence and education.* Greenwich, CT: IAP.

Wentzel, K. R., & Wigfield, A. (1998). Academic and social motivational influences on students' academic performance. *Educational Psychology Review, 10*, 155–175.

Wentzel, K. R., & Wigfield, A. (2007). Motivational interventions that work: Themes and remaining issues. *Educational Psychologist, 42*, 261–271.

Wentzel, K. R., Barry, C. M., & Caldwell, K. A. (2004). Friendships in middle school: Influences on motivation and school adjustment. *Journal of Educational Psychology, 96*, 195–203.

Werner, E. (1993). Risk, resilience, and recovery. Perspectives from the Kauai longitudinal study. *Development and Psychopathology, 5*, 503–515.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V., & Tulviste, P. (1996). L. S. Vygotsky and contemporary developmental psychology. In H. Daniels (Ed.), *An introduction to Vygotsky* (pp. 53–74). New York: Routledge.

Westen, D., Blagov, P. S., Harenski, K., Kilts, C., & Hamann, S. (2006). Neural bases of motivated reasoning: An fMRI study of emotional constraints on partisan political judgment in the 2004 U.S. presidential election. *Cognitive Neuroscience, 18*(11), 1947–1958.

Westerman, D. A. (1991). Expert and novice teacher decision making. *Journal of Teacher Education, 42*(4), 292–305.

White, K. R. (1982). The relation between socioeconomic status and academic achievement. *Psychological Bulletin, 91*(3), 461–481.

White, R., Algozzine, B., Audette, R., Marr, M. B., & Ellis, E. D., Jr. (2001). Unified Discipline: A school-wide approach for managing problem behavior. *Intervention in School and Clinic, 37*, 3–8.

Whitehead, A. N. (1929). *The aims of education*. New York, NY: Macmillan.

Wiencek, J. & O'Flahavan, J. F. (1994). From teacher-led to peer discussions about literature: Suggestions for making the shift. *Language Arts, 71,* 488–498.

Wigfield, A. Harold, R. D., Freedman-Doan, C., Eccles, J. S., Yoon, K. S., Arbreton, A. J. A., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology, 89,* 451–469.

Wigfield, A. L., & Eccles, J. S. (2002). *Development of achievement motivation*. San Diego: Academic Press.

Wigfield, A., & Eccles, J. (1989). Test anxiety in elementary and secondary students. *Educational Psychologist, 24*, 159–183.

Wigfield, A., & Eccles, J. (1990). Test anxiety in the school setting. In M. Lewis & S. M. Miller (Eds.), *Handbook of developmental psychopathology* (pp. 237–250). New York: Plenum.

Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265–310.

Wigfield, A., Byrnes, J. P. & Eccles, J. S. (2006). Developing during early and middle adolescence. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 87–113). Mahwah, NJ: Erlbaum.

Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R., & Davis-Kean, P. (2006). Development of achievement motivation. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology* (6th ed.). New York: Wiley.

Wigfield, A., Eccles, J., MacIver, D., Reuman, D., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27*, 552–565.

Wiggins, G. (1989). Teaching to the (authentic) test. *Educational Leadership, 46*, 41–47.

Wilder, M. (2000). Increasing African American teachers' presence in American schools: Voices of students who care. *Urban Education, 35*(2), 205–220.

Wilgenbusch, T., & Merrell, K. W. (1999). Gender differences in self-concept among children and adolescents: A meta-analysis of multidimensional studies. *School Psychology Quarterly, 14,* 101–120.

Williams, R., & Worth, S. (2001). The relationship of critical thinking to success in college. *Inquiry: Critical Thinking Across the Disciplines, 21*(1), 5–16.

Willingham, D. T. (2002). Allocating student study time. *American Educator, 26*, 37–39.

Willingham, D. T. (2005, Summer). Do visual, auditory, and kinesthetic learners need visual, auditory, and kinesthetic instruction? *American Educator,* pp. 31–35.

Willingham, W. W., & Cole, N. S. (1997). *Gender and fair assessment*. Mahwah, NJ: Erlbaum.

Wilson, B. L., & Corbett, H. D. (2001). *Listening to urban kids: School reform and the teachers they want*. Albany: State University of New York Press.

Wilson, K., & Fowler, J. (2005) Assessing the impact of learning environments on students' approaches to learning. *Assessment and Evaluation in Higher Education, 30*(1), 85–99.

Wilson, M. (1989). Child development in the context of the black extended family. *American Psychologist, 44*, 380–383.

Windschitl, M. (2002). Framing constructivism in practice as the negotiation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facing teachers. *Review of Educational Research, 72*, 131–175.

Wineburg, M. S. (2006). Evidence in teacher preparation. *Journal of Teacher Education, 57*, 51–64.

Winger, T. (2005). Grading to communicate. *Educational Leadership, 63*(3), 61–65.

Wink, J., & Putney, L. (2002). *A vision of Vygotsky*. Boston: Allyn and Bacon.

Winner, E. (1988). *The point of words*. Cambridge, MA: Harvard University Press.

Winsler, A., Diaz, R. M., & Montero, I. (1997). The role of private speech in the transition from collaborative to independent task performance in young children. *Early Childhood Research Quarterly, 12,* 59–79.

Winter, D. G. (1973). *The power motive*. New York: Free Press.

Wintergerst, A. C., DeCapua, A., & Itzen, R. C. (2001). The construct validity of one learning styles instrument. *System, 29*(3), 385–403.

Wittrock, M. C. (1966). The learning by discovery hypothesis. In L. S. Shulman & E. R. Keislar (Eds.), *Learning by discovery: A critical appraisal* (pp. 33–75). Chicago: Rand McNally.

Wittrock, M. C., & Farley, F. (1989). Toward a blueprint for educational psychology. In M. C. Wittrock & F. Farley (Eds.), *The future of educational psychology* (pp. 193–199). Hillsdale, NJ: Erlbaum.

Wlodkowski, R. (1999). *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults* (rev. ed.). San Francisco: Jossey-Bass.

Wlodkowski, R. J., & Ginsberg, M. B. (1995). *Diversity and motivation: Culturally responsive teaching*. San Francisco: Jossey-Bass.

Wolf, D., Bixby, J., Glenn, J., III, & Gardner, H. (1991). To use their minds well: Investigating new forms of student assessment. *Review of Research in Education, 17*, 31–74.

Wolfgang, C. H. (2000). Another view on "Reinforcement in developmentally appropriate early childhood classrooms," *Childhood Education, 77* (2), 64–67.

Wolfgang, C. H. (2005). *Solving discipline and classroom management problems: Methods and models for today's teachers* (6th ed.). Hoboken, NJ: Wiley.

Wolfgang, C. H., & Wolfgang, M. E. (1995). *The three faces of discipline for early childhood: Empowering teachers and students*. Boston: Allyn & Bacon.

Wong, B. Y. L. (1991). *Learning about learning disabilities*. San Diego: Academic Press.

Wood, J. V. (1989). Theory and research concerning social comparisons of personal attributes. *Psychological Bulletin, 106,* 231–248.

Wood, S. E., & Wood, E. G. (1999). *The world of psychology* (3rd ed.). Boston: Allyn & Bacon.

Woodward, J., & Cuban, L. (Eds.). (2001). *Technology, curriculum and professional development: Adapting schools to meet the needs of students with disabilities*. Thousand Oaks, CA: Corwin.

Woolfolk, A. E., & Brooks, D. M. (1983). Nonverbal communication in teaching, *Review of Research in Education*, 10, 103–149.

Woolfolk, A. E., & Brooks, D. M. (1985). The influence of teachers' nonverbal behaviors on students' perceptions and performances. *Elementary School Journal, 85*, 513–528.

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology, 82*, 81–91.

Wortham, S. (2004). The interdependence of social identification and learning. *American Educational Research Journal, 41*(3), 715–750.

Worthen, B. (1993). Critical issues that will determine the future of alternative assessment. *Phi Delta Kappan, 74*, 444–454.

Worthen, B., & Spandel, V. (1991). Putting the standardized test debate in perspective. *Educational Leadership, 48*, 65–69.

Worthy, J., Moorman, M., & Turner, M. (1999). What Johnny likes to read is hard to find in school. *Reading Research Quarterly, 34*(1), 12–14.

Wright, D. R. (1995). Mnemonics: An aid to geographical learning. Teacher's notebook. *Journal of Geography, 94*, 339–340.

Wright, L.S. (1982). The use of logical consequences in counseling children. *School Counselor, 30*, 37–49.

Wright, R. (1995, March 13). The biology of violence. *The New Yorker*, pp. 68–77.

Wright, S. C., & Taylor, D. M. (1995). Identity and the language of the classroom: Investigating the impact of heritage versus second language instruction on personal and collective self-esteem. *Journal of Educational Psychology, 87*, 241–252.

Wright, S. C., Taylor, D. M., & Macarthur, J. (2000). Subtractive bilingualism and the survival of the Inuit language: Heritage versus second-language education. *Journal of Educational Psychology, 92*, 63–84.

Xin, F., Glaser, C. W., & Rieth, H. (1996). Multimedia reading: Using anchored instruction and video technology in vocabulary lessons. *Teaching Exceptional Children, 29*(2), 45–49.

Yeakey, C. C., & Henderson, R. D. (Eds.). (2003). *Surmounting all odds: Education, opportunity, and society in the new millennium. Vol. 2. A volume in research on African American education.* Greenwich, CT: Information Age Publishing.

Yee, A. H. (1992). Asians as stereotypes and students: Misperceptions that persist. *Educational Psychology Review, 4*, 95–132.

Yee, P. L., Pierce, G. R., Ptacek, J. T., & Modzelesky, K. L. (2003). Learned helplessness attributional style and examination performance: Enhancement effects are not necessarily moderated by prior failure. *Anxiety, Stress, & Coping, 16*, 359–373.

Yell, M. L., Robinson, T. R., & Drasgow, E. (2001). Cognitive behavior modification. In T. J. Zirpoli & K. J. Melloy, *Behavior management: Applications for teachers* (3rd ed., pp. 200–246). Upper Saddle River, NJ: Merrill/Prentice Hall.

Yip, D. Y. (2004). Questioning skills for conceptual change in science instruction. *Journal of Biological Education, 38*, 76–83.

York-Barr, J., Sommers, W. A., Ghere, G. S., & Montie, J. (2001). *Reflective practice to improve schools: An action guide for educators.* Thousand Oaks, CA: Corwin.

Yost, R. (2002). "I think I can." Mentoring as means of enhancing teacher efficacy. *Clearing House, 75*, 195–197.

Young, J. W. (2003). *Validity in college admissions testing.* New York: College Board.

Youniss, J. (2006). Forming a political-moral identity through service. In A. Sliwka, M. Diedrich, & M. Hofer (Eds.), *Citizenship education* (pp. 183–194). Munster, Germany: Waxmann.

Yuen-Yee, G. C., & Watkins, D. (1994). Classroom environment and approaches to learning: An investigation of the actual and preferred perception of Hong Kong secondary school students. *Instructional Science, 22*, 233–246.

Yung, B. H. W. (2001). Three views of fairness in a school-based assessment scheme of practical work in biology. *International Journal of Science Education, 23*, 985–1005.

Zeichner, K. M. (2000). Ability-based teacher education: Elementary teacher education at Alverno College. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation in the undergraduate years* (pp. 1–66). Washington, DC: American Association of Colleges for Teacher Education.

Zellemayer, M., Salomon, G., Globerson, T., & Givon, H. (1991). Enhancing writing-related metacognitions through a computerized writing partner. *American Educational Research Journal, 28*, 373–391.

Zentall, S. S. (1989). Attentional cuing in spelling tasks for hyperactive and comparison regular classroom children. *Journal of Special Education, 23*(1), 83–93.

Zhang, Z., & Schumm, J. S. (2000). Exploring effects of the keyword method on limited English proficient students' vocabulary recall and comprehension. *Reading Research and Instruction, 39*, 202–221.

Zhao, Y. (Ed.). (2003). *What teachers should know about technology: Perspectives and practices.* Greenwich, CT: Information Age.

Zhou, L., Goff, G., & Iwata, B. (2000). Effects of increased response effort on self-injury and objective manipulation as competing responses. *Journal of Applied Behavioral Analysis, 33*, 29–40.

Zimmerman, B. J. (1990). Self-regulated academic learning and achievement: The emergence of a social cognitive perspective. *Educational Psychology Review, 2*, 173–201.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). San Diego: Academic Press.

Zimmerman, B. J. (2001). Theories of self-regulated learning and academic achievement: An overview and analysis. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (pp. 1–65). Mahwah, NJ: Erlbaum.

Zimmerman, B. J. (2002). Achieving self-regulation: The trial and triumph of adolescence. In F. Pajares & T. Urdan (Eds.), *Academic motivation of adolescents* (pp. 1–27). Greenwich, CT: Information Age Publishing.

Zimmerman, B. J., & Kitsantas, A. (1997). Developmental phases in self-regulation: Shifting from process to outcome goals. *Journal of Educational Psychology, 89*, 29–36.

Zimmerman, B. J., & Risemberg, R. (1997). Self-regulatory dimensions of academic learning and motivation. In G. H. Phye (Ed.), *Handbook of academic learning: Construction of knowledge* (pp. 105–125). San Diego: Academic Press.

Zimmerman, B. J., Bonner, S., & Kovach, R. (1996). *Developing self-regulated learners.* Washington, DC: American Psychological Association.

Zins, J., Bloodworth, M., Weissberg, R., & Walberg, H. (2004). The scientific base linking social and emotional learning to school success. In J. Zins, R. Weissberg, M. Wang, & H. Walberg (Eds.), *Building academic success on social and emotional learning* (pp. 3–22). New York: Teachers College Press.

Zirpoli, T. J. (2008). *Behavior management: Applications for teachers* (5th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Zucker, A. A., & McGhee, R. (2005). *A study of one-to-one computer use in mathematics and science instruction at the secondary level in Henrico County Public Schools.* Washington, DC: SRI International.

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