Preface

Welcome to the tenth edition of *Educational Psychology: Windows on Classrooms*. We have redoubled our efforts to make this edition the clearest, most comprehensive, and up-to-date presentation of theory and research, combined with the most specific and usable applications, of any text in the field. Our text is generally recognized as the most applied in educational psychology, and in this edition we've tried to achieve the optimal balance of theory, research, and application.

To meet this goal we have much that is new to this edition. We outline these changes in the sections that follow.

Content New to This Edition

To provide students with the most complete and up-to-date information on recent developments in educational psychology, we have included the following new content in our tenth edition.

- *Major reorganization of the learning section of the book—Chapters 6–9:* Learning is at the heart of educational psychology, and we've reorganized these chapters to reflect recent developments in our understanding of how students in classrooms, and people of all ages, learn.
- *Analyzing Theories:* Research in every field is grounded in theory, but all theories have both strengths and weaknesses. "Analyzing Theories," a new feature in this edition, analyzes all the major theories discussed in the text. For instance, Piaget's and Vygotsky's theories of cognitive development are analyzed in Chapter 2, behaviorism and social cognitive theory are analyzed in Chapter 6, and constructivism is analyzed in Chapter 9. This analysis includes a summary of the major concepts within each theory, together with the contributions the theories make to our understanding of teaching and learning and common criticisms directed at each. We believe the addition of this feature will provide students with a more complete and accurate view of the theoretical foundation of educational psychology.
- *New chapter—Knowledge Construction in Social Contexts:* Educational psychology generally accepts the idea that learners construct their own knowledge and that learning is substantively a social process. This new chapter reflects and integrates these ideas in a comprehensive presentation that explains how these powerful ideas influence teaching and learning.
- *Extensive coverage of the learning sciences:* The learning sciences focus on learning as it exists in real-world settings and how teachers can facilitate that learning. This is the essential message of our text, and this new content explains how to apply these ideas to increase learning for all students.
- *Expanded coverage of technology's impact on learning:* To say that technology is an integral part of our lives is a vast understatement. Expanded coverage of technology throughout the text examines how it influences learning, development, and motivation, in addition to the general impact it is having on the way we live.
- *Greatly expanded coverage of neuroscience:* Neuroscience is providing researchers, educational leaders, teachers, and students with new insights into the teaching–learning process. As one powerful example, the concept of *neuroplasticity* helps us understand that our learning potential is much greater than we once believed possible, and with the right kinds of experiences, we can literally get smarter. This

expanded coverage helps teachers capitalize on this information to increase learning for all students regardless of their backgrounds.

- *Extensive coverage of the role of personality and emotion on learning and development:* Learning and development consist of much more than cognitive processes alone; personality and emotion play an important role in our motivation and how effectively we learn and develop. Further, both home and school environments have an important impact on the healthy development of learners' personalities and emotions. This coverage helps teachers create the kinds of environments that capitalize on these insights.
- *Updated descriptions of standards, accountability, and value-added teacher assessment and how they impact teaching and learning:* Standards—including the Common Core State Standards—combined with accountability, are facts of teaching life, and our discussion of these topics in this edition, including the controversies involved with each, is designed to prepare teachers to adapt to this new reality.

This new content adds to our expanded and detailed descriptions of traditional theories combined with the latest research. Our goal is to make the content presented in this text the most comprehensive and up-to-date discussion of learning, development, motivation, instruction and classroom management, classroom and standardized assessment, and learner diversity of any text in the field.

Applications New to This Edition

The content of educational psychology isn't useful if teachers don't know how to apply it to increase their students' learning and shape their development. To prepare teachers for the real world, and to help all students understand how educational psychology applies to their lives today, we have again redoubled our efforts to improve what is already the most applied educational psychology text in the field.

The following applications are new to this edition:

- *Explicit suggestions for applying educational psychology in teaching:* Instructors often tell us that their students can describe the theories and research that make up educational psychology, but these same students "don't know what to do with the content" when they go out into the real world of teaching. We attempt to solve this problem in this edition. Each chapter now includes specific sections titled "Educational Psychology and Teaching," which provide teachers with specific and concrete suggestions for applying the content of each chapter in their teaching. For instance, in Chapter 2, "Educational Psychology and Teaching: Applying Piaget's Theory with Your Students" provides teachers with specific suggestions for using Piaget's theory to advance their students' development, and a similar section does the same with Vygotsky's theory. As another example, in Chapter 4, "Educational Psychology and Teaching: Teaching Students in Your Classes Who Are Culturally and Linguistically Diverse" provides specific suggestions for accommodating and capitalizing on the diversity that our students are increasingly bringing to our classes. These suggestions are combined with concrete illustrations of teachers in the real world demonstrating these applications. "Educational Psychology and Teaching" sections are included in every chapter in the text.
- *Case studies linked to standards*: Standards have become a part of teachers' lives in today's classrooms. Case studies that introduce each chapter in the book are now linked to standards so prospective teachers can now see how their colleagues in the real world have adjusted to this new reality and have incorporated standards into their instruction.

- *Case studies in both written and video formats:* In the etext version of this edition, students can read case studies embedded in the text and can now see in video form the very lesson on which the case study is based. So they can read the case studies, and then with a simple click of their mouse see the actual lesson and how the teacher in the lesson applies the content of educational psychology to the real world of classrooms. No other text in the field applies the content of educational psychology to classrooms in this way.
- *Ed Psych and You:* This feature, which first appeared in our ninth edition, has been expanded to help students see that educational psychology applies not only to teaching but also to our lives as we live them every day. This feature is also designed to make the content of educational psychology more meaningful to students who may not plan to be teachers.

These new applications, combined with other features such as "Classroom Connections" and "Developmentally Appropriate Practice," make this edition even more usable in the real world of teaching. Further, we would like to believe that the text can be a resource for both new and veteran teachers as they move through their careers.

The Most Applied Educational Psychology Book in the Field

This is the most applied text in the field. The following illustrate these applications.

Educational Psychology and Teaching: Applying Information Processing and the Model of Human Memory with Your Students

Applying your understanding of information processing and the model of human memory in your teaching can increase learning for all your students. Guidelines for applying this information in your teaching are outlined below and discussed in the sections that follow.

- Conduct reviews to activate schemas and check perceptions
- Begin learning activities with attention-getting experiences
- Develop learners' background knowledge with high-quality representations of content
- Interact with students to promote cognitive activity and reduce cognitive load
- Capitalize on meaningful encoding strategies
- Model and encourage metacognition

The guidelines overlap and interact with each other. We will see how as we discuss each.

CONDUCT REVIEWS TO ACTIVATE SCHEMAS AND CHECK PERCEPTIONS

To begin this section let's return to Mike's Thursday lesson before he had his students work in their groups.

He begins, "What were we talking about yesterday? . . . Alexandria?"
". . . Figurative language . . . and figures of speech," Alexandria responds hesitantly.

Explicit Suggestions for Applying Educational Psychology in Teaching. "Educational Psychology and Teaching," which appears in every chapter, provides teachers with specific suggestions for applying the content of educational psychology to increase learning for all their students. The excerpt you see here appears on page 300 of Chapter 7 in the text.

Ed Psych and You. This feature helps students see how educational psychology applies to our lives and the people around us. The example you see here appears on page 46 in Chapter 2 of the text.

Ed Psych and You

Are you bothered when something doesn't make sense? Do you want, and even expect, the world to be predictable? Are you more comfortable in classes where the instructor specifies the requirements, outlines the grading practices, and consistently follows through? For most people, the answer to these questions is "Yes." Why do you think this is the case?

The students in this case are third graders, and their teacher, Alicia Evans, is working with them on *Common Core State Standard* ***CCSS.ELA-Literacy.L.3.1f "Ensure subject-verb and pronoun-antecedent agreement"*** (Common Core State Standards Initiative, 2014f).

After completing her routines for the beginning of language arts, Alicia explains and demonstrates the rules with some examples on the board. She then displays the following short paragraph on her document camera.

Bill takes his lunch to the cafeteria when it's time to eat. His friend Leroy and his other friend Antonio (takes, take) (his, theirs) to the cafeteria, too. Each of the boys has (his, their) own lunch box with pictures of cars on (it, them). Bill doesn't like apples, so he will give his to anyone else if (he, they) (wants, want) it.

"Now," she directs, "Read the paragraph carefully, . . . think about it, and then decide which one of the words in the parentheses in each case is correct. Remember, our reasons and thinking are as important as the actual answers."

After giving the students a couple minutes to study the paragraph, she begins, "How about the first one?" pointing to the first set of parentheses (takes, take) in the paragraph.

The students conclude that "take" is correct in the sentence because "Leroy and Antonio" is a plural subject, so it requires the plural verb "take." They also conclude that "theirs" is correct in the sentence because "theirs" agrees with its antecedent (Leroy and Antonio).

"Now, how about this one?" she asks, pointing to the next set of parentheses (his, their) in the third sentence—Each of the boys has (his, their) own lunch box with pictures of cars on (it, them). "What do you think, and why do you think so . . . Brittany?"

Case Studies Linked to Standards. The case studies that appear in this edition are now linked to standards. The excerpt you see here appears on page 359-360 in Chapter 9 of the text.

Classroom Connections at Elementary, Middle School, and High School Levels. These features in each chapter offer suggestions and illustrations for applying topics discussed in the chapter at different grade levels. Each strategy is illustrated with a classroom example, derived from teachers' experiences in elementary, middle, and high schools. The example you see here appears on page 407 of Chapter 10 of the text.

Classroom Connections

Capitalizing on Students' Needs to Increase Motivation in Classrooms

Maslow's Hierarchy of Needs

1. Maslow described people's needs in a hierarchy with deficiency needs—survival, safety, belonging, and self-esteem—preceding the growth needs. Address students' deficiency and growth needs both in instruction and in the way you interact with students.
   - **Elementary:** A fourth-grade teacher calls on all students to involve everyone and promote a sense of belonging in his classroom. He makes them feel safe by helping them respond correctly when they are unable to answer.
   - **Middle School:** To help meet learners' belonging needs, a seventh-grade teacher asks two of the more popular girls in her class to introduce a new girl to other students and to take her under their wings until she gets acquainted.
   - **High School:** To address learners' growth needs, an American government teacher brings in a newspaper columnist's political opinion piece, comments that it was interesting to her, and asks students for their opinions on the issue.

Learners' Needs for Self-Determination

2. Self-determination theory suggests that people have innate needs for competence, autonomy, and relatedness. Design challenging learning tasks that, when completed, can provide evidence for increasing competence, and emphasize these accomplishments when students succeed.
   - **Elementary:** A fifth-grade teacher drops an ice cube into a cup of water and a second cube into a cup of alcohol and asks them why it floats in one and sinks in the other. He guides students' efforts until they solve the problem and then praises them for their thinking.
   - **Middle School:** A math teacher has students bring in a challenging "problem of the week." He helps them solve each problem and comments on how much their problem solving is improving.
   - **High School:** A biology teacher guides a discussion of our skeletal system until students understand the function of the skull, rib cage, and other bones, and then comments on how good the students are getting at analyzing our body systems.
3. Learners' perceptions of autonomy increase when teachers ask them for input into classroom procedures, involve them in learning activities, and give them feedback on assessments. Create a classroom environment that helps meet learners' needs for autonomy.
   - **Elementary:** A fourth-grade teacher holds periodic class meetings in which she encourages students to offer suggestions for improving the classroom environment.
   - **Middle School:** A prealgebra teacher returns all tests and quizzes the following day and discusses frequently missed problems in detail. He comments frequently on students' continually improving skills.
   - **High School:** In a simulation, a world history teacher asks students to identify specific archeological evidence for sites that represent different civilizations. She comments that the students' ability to link evidence to conclusions has improved significantly.
4. Learners' needs for relatedness are met when teachers communicate a commitment to students both as people and as learners.
   - **Elementary:** A first-grade teacher greets her students each morning at the door with a hug, "high five," or handshake. She tells them what a good day they're going to have.
   - **Middle School:** A seventh-grade teacher calls a parent to express concern about a student whose behavior and attitude seems to have changed.
   - **High School:** A geometry teacher in an urban school conducts help sessions after school on Mondays through Thursdays. When they come in for extra help, she also encourages students to talk about their personal lives and their hopes for the future.

Learners' Needs to Preserve Self-Worth

5. Self-worth theory suggests that people link self-worth to high ability. Emphasize that ability can be increased with effort.
   - **Elementary:** When her second graders succeed with word problems during their seatwork, a teacher comments, "You're really understanding what we're doing. The harder we work, the smarter we get."
   - **Middle School:** A life-science teacher comments, "You're really seeing the connections between animals' body structures and their ability to adapt. This is not an easy idea to grasp and you should feel good about figuring this out.
   - **High School:** As students' understanding of balancing equations increases, a chemistry teacher comments, "Balancing equations is important in chemistry and I know it isn't easy, but you people are really getting good at this stuff."

Developmentally Appropriate Practice. These features in each chapter describe developmental differences in our students and help teachers ensure that their instruction will best meet the needs of learners at all developmental levels. The example you see here appears on page 126 of Chapter 3 in the text.

Developmentally Appropriate Practice

Personal, Social, and Moral Development with Learners at Different Ages

Important differences exist in the personal, emotional social, and moral development of elementary, middle, and high school students. The following paragraphs outline suggestions that will help you respond to these differences.

Working with Students in Preschool Programs and Elementary Schools

As children enter preschool, they are developing autonomy and taking the initiative to seek out experiences and challenges. "Let me help!" and "I want to do it" are signs of this initiative. Criticism or overly restrictive directions detract from a sense of independence and, in extreme cases, lead to feelings of guilt and dependency. At the same time, children need the structure that helps them learn to take responsibility for their own behavior.

As children move through the elementary years, teachers attempt to help them succeed in learning activities challenging enough to promote feelings of competence and industry. This is demanding. Activities that are so challenging that students frequently fail can leave them with a sense of inferiority, but success on trivial tasks does little to make students feel competent (Brophy, 2010).

During the elementary years, students need opportunities to practice perspective taking and social problem solving. Discussions and small-group work where students can interact with others and practice these skills are effective learning experiences.

The elementary grades also lay the foundation for students' moral growth and the development of social responsibility and self-control. Teachers who encourage students to understand the impact of their actions on others help them make the transition from preconventional morality, with its egocentric orientation, to conventional morality, at which stage students understand why rules are important for both classrooms and the world outside of school.

Working with Students in Middle Schools

Adolescence is a time of considerable physical, emotional, and intellectual changes, and adolescents are often uncertain about how to respond to new sexual feelings. They are concerned with what others think of them and are preoccupied with their looks. They want to assert their independence, yet long for the stability of structure and discipline. They want to rebel to assert their independence but need something solid to rebel against.

Most adolescents successfully negotiate this period, however, exploring different roles and maintaining positive relationships with their parents, teachers, and other adults. Students in middle and junior high schools need firm, caring teachers who empathize with them and their sometimes capricious actions while simultaneously providing the security of clear limits for acceptable behavior (Emmer & Evertson, 2013). Classroom management provides opportunities to advance moral reasoning from preconventional to conventional thinking. Effective teachers create clear classroom rules, discuss the reasons for them, and enforce them consistently.

Instruction in middle school classrooms should promote deep understanding of the topics being studied, while simultaneously providing students with opportunities to practice prosocial behaviors, such as tolerance for others' opinions, listening politely, and avoiding hurtful comments. Effective instruction in middle schools is highly interactive, and lecture is held to a minimum.

Working with Students in High Schools

High school students are continuing to wrestle with who they are and what they want to become. Peers become increasingly important to students and have an important influence on social, emotional, and moral development.

Linking content to students' lives is particularly valuable at this age. For example, examining ideas about gender and occupational trends in social studies and showing how math and science can influence their futures are important for these students.

Like younger learners, high school students need opportunities to try out new ideas and link them to their developing sense of self. Discussions, small-group work, and focused writing assignments provide valuable opportunities for students to integrate new ideas into their developing self-identities.

Supplementary Materials

This edition of *Educational Psychology: Windows on Classrooms* provides a comprehensive and integrated collection of supplements to assist students and professors in maximizing learning and instruction. The following resources are available for instructors to download from **www.pearsonhighered.com/educator.** Enter the author, title of the text, or the ISBN number, then select this text, and click on the "Resources" tab. Download the supplement you need. If you require assistance in downloading any resources, contact your Pearson representative.

Instructor's Resource Manual

The Instructor's Resource Manual includes chapter overviews and outcomes, lists of available PowerPoint® slides, presentation outlines, teaching suggestions for each chapter, and questions for discussion and analysis along with feedback.

Powerpoint® Slides

The PowerPoint® slides highlight key concepts and summarize text content. The slides also include questions and problems designed to stimulate discussion, encourage students to elaborate and deepen their understanding of the topics in each chapter, and apply the content of the chapter to both the real world of teaching and their daily lives. The slides are further designed to help instructors structure the content of each chapter to make it as meaningful as possible for students.

Test Bank

The Test Bank provides a comprehensive and flexible assessment package. The Test Bank for this edition has been revised and expanded to make it more applicable to students. To provide complete coverage of the content in each chapter, all multiple-choice and essay items are grouped under the chapters' main headings and are balanced between knowledge/recall items and those that require analysis and application.

TestGen®

TestGen is a powerful test generator available exclusively from Pearson Education publishers. You install TestGen on your personal computer (Windows or Macintosh) and create your own tests for classroom testing and for other specialized delivery options, such as over a local area network or on the web. A test bank, which is also called a Test Item File (TIF), typically contains a large set of test items, organized by chapter and ready for your use in creating a test, based on the associated textbook material. Assessments may be created for both print and testing online. The tests can be downloaded in the following formats:

TestGen Testbank file—PC
TestGen Testbank file—MAC
TestGen Testbank—Blackboard 9 TIF
TestGen Testbank—Blackboard CE/Vista (WebCT) TIF
Angel Test Bank (zip)
D2L Test Bank (zip)
Moodle Test Bank
Sakai Test Bank (zip)

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Our appreciation goes to all of these fine people who have taken our words and given them shape. We hope that all of our efforts will result in increased learning for students and more rewarding teaching for instructors.

Finally, we would sincerely appreciate any comments or questions about anything that appears in the book or any of its supplements. Please feel free to contact either of us at any time. Our e-mail addresses are: peggen@unf.edu and don.kauchak@gmail.com.

Good luck and best wishes.

Paul Eggen

Don Kauchak

chapter 1

Educational Psychology: Understanding Learning and Teaching

Digital Vision/Getty Images

OUTLINE	LEARNING OUTCOMES
	After you've completed your study of this chapter, you should be able to:
The Preeminence of Teachers	**1.** Describe expert teaching and explain how expert teaching influences student learning.
Educational Psychology, Professional Knowledge, and Expert Teaching Professional Knowledge Professional Knowledge and Reflective Practice ▶ Developmentally Appropriate Practice: Using Knowledge of Learners and Learning to Promote Achievement in Students at Different Ages	**2.** Describe the different kinds of professional knowledge that expert teachers possess.
The Role of Research in Acquiring Professional Knowledge Quantitative Research Qualitative Research Action Research Design-Based Research Research and the Development of Theory	**3.** Describe different types of research, and explain how research and theory contribute to teachers' professional knowledge.
Teaching in Today's Classrooms Standards and Accountability Teacher Licensure and Evaluation Learner Diversity Technology The Influence of Neuroscience Educational Psychology and Teaching: Applying Your Professional Knowledge in Today's Classrooms	**4.** Identify factors that influence teaching in today's classrooms.

You've just opened your textbook, and you're probably wondering what this class will be like and how it will make you a better teacher. So, let's start right off with a couple questions. First, why do children go to school? To learn and develop is the obvious answer. Easy question, right?

Second, which of the following factors contributes the most to students learning and development?

- *Curriculum and materials available to them*—the content students study and the quality of their textbooks.
- *Facilities and extracurricular activities*—access to a good library, the Internet, and athletics, clubs, and after-school music and drama.
- *Class size*—the number of students in a class.
- *Leadership*—such as the school principal and district superintendent.
- *You*—their teacher.

The unequivocal answer is *you, their teacher*! Unlike our first question, however, this answer hasn't always been obvious to educational leaders. We'll explore the importance of excellent teachers in more detail as the chapter unfolds, but before we do, let's turn to a conversation between Keith Jackson, a struggling, first-year, middle school math

teacher, and Jan Davis, a four-year "veteran" who has become his confidant. As you read this case study, think about Jan's teaching and how it might influence her students' learning.

As Keith walks into the work room at Lakeside Middle School, Jan looks up and asks, "Hi, Keith. How's it going?"

"My last period class is getting to me," Keith replies."The students are okay when we just stick to mechanics, but they simply can't do word problems. . . . And they hate them. . . . They just try to memorize formulas and enough to get by.

"I have a good math background, and I was going to be so great when I got here. . . . I'm not so sure any more. . . . I explain the stuff so carefully, but some of the kids just sit with blank looks on their faces. Then, I explain it even more carefully, and . . . nothing.

"And, there's Kelly. She disrupts everything I do. I gave her a referral, and I even called her mother. . . . The only thing that seemed to work was taking her aside and asking her straight out why she was giving me such a hard time."

"Sounds like you're becoming a *teacher*," Jan smiles. "There are few easy answers for what we do. . . . But then, that's what makes it both the toughest and the most rewarding work in the world.

"Like working with Kelly. She might not have another adult she can talk to, and she may simply need someone to care about her.

"As for the blank looks, I'm taking a class at the university. The instructor emphasizes involving the kids, and he keeps talking about research that says how important it is to call on all the kids as equally as possible.

"So, here's an example of how I'm approaching word problems now. We're working on decimals and percents, ultimately to help the kids reach this standard," she says as she shows Keith a lesson plan:

> **CCSS.Math.Content.6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. (Common Core State Standards Initiative, 2014v).**

"So, here's what I'm doing. I brought in a 12-ounce soft drink can from a machine, a 20-ounce bottle, and a 6-pack with price tags on them.

"I put the kids into pairs and told them to figure out a way to determine which one was the best buy. To figure it out, they needed to apply their understanding of decimals and percents, which helps us reach the standard. I helped them along, and we created a table, so we could compare the groups' answers. They're beginning to see how math relates to their lives. . . . Some of them even said they think it's important. And, now that they're used to being called on, they really like it. It's one of the most important things I do.

"When I think about it, I realize that I sometimes jump in too soon when they can figure it out themselves, and at other times I let them stumble around too long, and they waste time. So, then I adapt for the next lesson."

"I hate to admit this," Keith says, "but some of my university courses suggested just what you did. It was fun, but I didn't think it was real teaching."

"You couldn't relate to it at the time. You didn't have a class with live students who 'didn't get it.'

"Hang in there," Jan smiles. "You're becoming what teaching needs—a real pro."

Now, as you study this chapter, keep the following questions in mind:

1. How was Jan's approach to teaching word problems different from Keith's?
2. Why were their approaches so different, and how will these differences affect their students' learning?

We answer these and other questions about teaching and learning as the chapter unfolds. We begin by revisiting the idea we introduced at the beginning of the chapter.

The Preeminence of Teachers

In our introduction we asked, "Which of the following factors contributes the most to student's learning and development?" and we said that the answer hasn't always been obvious to educational leaders. In an effort to improve schooling, a great deal has been written about this question, and reformers have offered a variety of answers, including different organizational structures, such as open classrooms, and a variety of curricular and instructional approaches, such as Whole Language, or what was commonly described as "New Math." However, none of them were as successful as hoped (Thomas & Wingert, 2010).

The solution, however, is simple (but admittedly not easy). No organization, system, institution, or enterprise is any better than the people in it, and the same applies to schools. The quality of a school is determined by the quality of its teachers. *You* are the most important factor influencing your students' learning! Surprisingly, in spite of many years of research documenting the importance of teachers, only within approximately the last two decades have educational leaders begun to understand and appreciate this fact (Thomas & Wingert, 2010).

Let's look at some of this research. One widely publicized study conducted 20 years ago found that students who had expert teachers in third, fourth, and fifth grades scored more than 50 percentile points higher on standardized math tests than those in the same three grades who were taught by teachers less skilled (Sanders & Rivers, 1996). Another study revealed that five years in a row of expert teaching was nearly enough to close the achievement gap between disadvantaged and advantaged students (Hanushek, Rivkin, & Kain, 2005). Additional research has found that expert teaching in later grades could substantially, though not completely, make up for poor teaching in earlier grades (Rivkin, Hanushek, & Kain, 2001). More recent research corroborates the assertion that the expertise of teachers is the key to increased student achievement (Konstantopoulos, 2011; Kraus et al., 2008; Kunter et al., 2013).

The importance of teachers even caught the attention of the popular press. "The Key to Saving American Education" appeared on the cover of the March 15, 2010, issue of *Newsweek*, identifying teachers as the "key," and the *New York Times* included a lengthy article, "Building a Better Teacher," in its March 7, 2010, issue (Green, 2010). "Teacher quality is now a national priority" (Margolis, 2010, Introduction, para. 1). The American people agree. According to an annual poll of the public's attitudes toward public education, "Americans singled out improving the quality of teachers as the most important action for improving education" (Bushaw & Lopez, 2010, p. 15). Also, the quality of teachers is linked to the widely publicized success of students in other countries (Friedman, 2013). And, some good news: public opinion polls indicate that "More than 70% of Americans have trust and confidence in the men and women who teach in public schools" (Bushaw & Lopez, 2013, p. 12).

Some, including many educational leaders, once believed that expert teaching is essentially instinctive, a kind of magic performed by born superstars. And, just as is the case with other domains, such as athletics, music, or art, some teachers do indeed have more natural ability than others. However, research dating back to the 1960s and 1970s indicates

Video 1.1 Expert teachers possess professional knowledge, skills, and attitudes that increase learning for all their students. A principal describes what he would look for if he could have an ideal teacher working in his school.

ENHANCED etext *video example*

that expert teachers possess knowledge and skills that are not purely instinctive. They are acquired through study and practice (Fisher et al., 1980), and more recent work corroborates these earlier findings (Kunter et al., 2013; Lemov, 2010). This is true in all domains. For example, many athletes, through awareness and hard work, perform better than their counterparts with more natural ability.

We referred to "expert" teachers in the preceding paragraphs. **Experts** are people who are highly knowledgeable and skilled in a particular domain, such as music, architecture, medicine, or teaching. Expert teachers' professional knowledge and skills are what set them apart from their less effective colleagues. This knowledge and these skills make them capable of producing learning in students that less able teachers cannot produce.

This leads us to the reason we wrote this book and the reason you're taking this course. Your goal is to begin acquiring the knowledge and skills that will ultimately lead to expertise, and our goal is to help you in this process. We turn to this topic next.

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Educational Psychology, Professional Knowledge, and Expert Teaching

If expertise is so important to effective teaching, how do teachers gain the knowledge and skills needed to become experts? This leads us to the study of **educational psychology (ed psych)**, the academic discipline that examines human teaching and learning (Berliner, 2006). The content of educational psychology contributes to the professional knowledge base you will need to become an expert teacher. We discuss this professional knowledge in the following sections.

Ed Psych and You

How much do you know about teaching and learning? To test your knowledge, complete the following Learning and Teaching Inventory. It will introduce you to the kinds of knowledge you'll need to become an expert teacher.

Professional Knowledge

Professional knowledge refers to the body of information and skills that are unique to an area of study, such as law, medicine, architecture, or engineering. The same applies to teaching. In this section we focus on how educational psychology can increase your professional knowledge, and with it, your expertise.

To introduce you to the idea of professional knowledge in teaching, respond to each of the items in the *Learning and Teaching Inventory* below.

Learning and Teaching Inventory

Look at each of the 12 items, and decide if the statement is true or false.

1. The thinking of children in elementary schools tends to be limited to the concrete and tangible, whereas the thinking of middle and high school students tends to be abstract.
2. Students generally understand how much they know about a topic.

3. Experts in the area of intelligence view knowledge of facts, such as "On what continent is Brazil?," as one indicator of intelligence.
4. Expert teaching is essentially a process of presenting information to students in succinct and organized ways.
5. Preservice teachers who major in a content area, such as math, are much more successful than nonmajors in providing clear examples of the ideas they teach.
6. To increase students' motivation to learn, teachers should praise as much as possible.
7. The key to successful classroom management is to stop disruptions quickly.
8. Preservice teachers generally believe they will be more effective than teachers who are already in the field.
9. Teachers learn by teaching; in general, experience is the primary factor involved in learning to teach.
10. Testing detracts from learning, because students who are tested frequently develop negative attitudes and consequently learn less than those who are tested less often.
11. Criticizing students damages their self-esteem and should be avoided.
12. Because some students are left-brained thinkers and others are right-brained thinkers, teachers should make an effort to accommodate these differences in their students.

Let's see how you did. The correct answers for each item are outlined in the following paragraphs. As you read the answers, remember that they describe students or other people in general, and exceptions will exist.

1. *The thinking of children in elementary schools tends to be limited to the concrete and tangible, whereas the thinking of middle and high school students tends to be abstract.*
   False: Research indicates that middle school, high school, and even university students can effectively think in the abstract only when they have considerable prior knowledge and experience related to the topic they're studying (Berk, 2013; Cole, Cole, & Lightfoot, 2009). When you study the development of students' thinking in Chapter 2, you'll see how understanding this research can improve your teaching.
2. *Students generally understand how much they know about a topic.*
   False: Learners, in general, and young children in particular, often cannot accurately assess their own understanding (Hacker, Bol, Horgan, & Rakow, 2000). Students' awareness of what they know and how they learn strongly influences understanding, and cognitive learning theory helps us understand why. (You will study cognitive learning theory in Chapters 7, 8, and 9.)
3. *Experts in the area of intelligence view knowledge of facts, such as "On what continent is Brazil?," as one indicator of intelligence.*
   True: The Wechsler Intelligence Scale for Children—Fourth Edition (Wechsler, 2003), the most popular intelligence test in use today, includes several items similar to this example. We examine theories of intelligence, including controversies involved in these theories, in Chapter 5.
4. *Expert teaching is essentially a process of presenting information to students in succinct and organized ways.*
   False: The better we understand learning, the more we realize that simply explaining information to students is often ineffective for promoting learning (Kunter et al., 2013; Mayer, 2008). Learners construct their own knowledge based on what they already know, and their emotions, beliefs, and expectations all influence the process (Bruning, Schraw, & Norby, 2011; Schunk, Meece, & Pintrich, 2014). You will study the process of knowledge construction in Chapter 9.
5. *Preservice teachers who major in a content area, such as math, are much more successful than nonmajors in providing clear examples of the ideas they teach.*
   False: One of the most pervasive misconceptions about teaching is the idea that knowledge of subject matter is all that is necessary to teach effectively. In a study of

teacher candidates, researchers found that math majors were no more capable than nonmajors of effectively illustrating math concepts in ways that learners could understand (U.S. Department of Education, 2008). Knowledge of content is essential for expert teaching, but understanding how to make that content meaningful to students requires additional knowledge (Darling-Hammond & Baratz-Snowden, 2005; Kunter et al., 2013). You will study ways of making knowledge accessible to learners in Chapters 2, 6–9, and 13.

6. *To increase students' motivation to learn, teachers should praise as much as possible.*
   False: Although appropriate use of praise is effective, overuse detracts from its credibility. This is particularly true for older students, who discount praise if they believe it is invalid or insincere. Older students may also interpret praise given for easy tasks as indicating that the teacher thinks they have low ability (Schunk et al., 2014). Your study of motivation in Chapters 10 and 11 will help you understand this and other factors influencing students' motivation to learn.
7. *The key to successful classroom management is to stop disruptions quickly.*
   False: Research indicates that classroom management, a primary concern of beginning teachers, is most effective when teachers prevent management problems from occurring in the first place, instead of responding to problems after they occur (Brophy, 2006; Emmer & Evertson, 2013; Evertson & Emmer, 2013). You will study classroom management in Chapter 12.
8. *Preservice teachers generally believe they will be more effective than teachers who are already in the field.*
   True: Preservice teachers (like you) are often optimistic and idealistic. They believe they'll be effective with young people, and they generally believe they'll be better than teachers now in the field (Feiman-Nemser, 2001; Ingersoll & Smith, 2004). They are also sometimes "shocked" when they begin work and face the challenge of teaching on their own for the first time (Grant, 2006; Johnson & Birkeland, 2003). Keith's comments in the opening case study are typical of many beginning teachers: "I was going to be so great when I got here. . . . I'm not so sure anymore." Teaching is complex and challenging, and the more knowledge you have about learners, learning, and the teaching process, the better prepared you'll be to cope with the realities of your first job.
9. *Teachers learn by teaching; in general, experience is the primary factor involved in learning to teach.*
   False: Experience is essential in learning to teach, but it isn't sufficient by itself (Darling-Hammond & Bransford, 2005; Song & Felch, 2009; Kunter et al., 2013). In some cases, experience results in repeating the same actions year after year, regardless of their effectiveness. Knowledge of learners and learning, combined with experience, however, can lead to high levels of teaching expertise.
10. *Testing detracts from learning, because students who are tested frequently develop negative attitudes and consequently learn less than those who are tested less often.*
    False: In comprehensive reviews of the literature on assessment, experts have found that frequent, thorough assessment is one of the most powerful and positive influences on learning that exist (Rohrer & Pashler, 2010; Stiggins & Chappuis, 2012). This emphasis focuses on assessment *for* learning, however, and not the emphasis—and many argue *overemphasis*—on high-stakes standardized testing (Stiggins & Chappuis, 2012).
11. *Criticizing students damages their self-esteem and should be avoided.*
    False. Under certain circumstances, criticism can increase motivation and learning. For instance, criticism, such as a teacher saying, "Come on, you can do better work than this," communicates high expectations to students and the belief that they are capable learners. We're not suggesting that you make criticizing students

a habit, but periodic and well-timed criticism can enhance motivation (Deci & Ryan, 2008).

12. *Because some students are left-brained thinkers and others are right-brained thinkers, teachers should make an effort to accommodate these differences in their students.* **False.** The idea that we tend to be right-brained or left-brained is a myth (Boehm, 2012; Jarrett, 2012; Nielsen, Zielinski, Ferguson, Lainhart, & Anderson, 2013). "This popular myth, which conjures up an image of one side of our brains crackling with activity while the other lies dormant, has its roots in outdated findings from the 1970s . . ." (Boehm, 2012, para. 1).

The items you've just examined briefly introduce you to the professional knowledge base that will help you acquire teaching expertise. In the next section we examine this knowledge in more detail. Research indicates that four related types of knowledge are essential for expert teaching (Darling-Hammond & Baratz-Snowden, 2005; Kunter et al., 2013; Shulman, 1987). They are outlined in Figure 1.1 and discussed in the sections that follow.

KNOWLEDGE OF CONTENT

We obviously can't teach what we don't understand. To effectively teach about the American Revolutionary War, for example, a social studies teacher needs to know not only basic facts about the war but also how the war relates to other aspects of history, such as the French and Indian War, the colonies' relationship with England before the Revolution, and the unique characteristics of the colonies. The same is true for any topic in any other content area, and research confirms the relationship between what teachers know and how they teach (Bransford, Brown, & Cocking, 2000).

PEDAGOGICAL CONTENT KNOWLEDGE

Knowledge of content is essential, but, alone, not sufficient for expert teaching. We must also possess **pedagogical content knowledge**, an understanding of how to represent topics in ways that make the content understandable to learners, as well as an understanding of what makes specific topics easy or difficult to learn (Darling-Hammond & Bransford, 2005; Kunter et al., 2013; Shulman, 1986). It also includes teachers' abilities to identify students' most common misconceptions and to help students resolve their misunderstandings (Sadler, Sonnert, Coyle, Smith, & Miller, 2013).

The following quote supports the idea that pedagogical content knowledge (PCK) is essential for teaching expertise. "Yet as a new insight, our study also showed that teachers' PCK affects not only students' achievement but also their motivation, specifically their enjoyment of the subject . . ." (Kunter et al., 2013, p. 815). Expert teachers understand the

Video 1.2 Teachers demonstrate pedagogical content knowledge when they represent topics in ways understandable to students. This teacher helps her students understand the concept *arthropod* by showing them a real lobster.

ENHANCEDetext *video example*

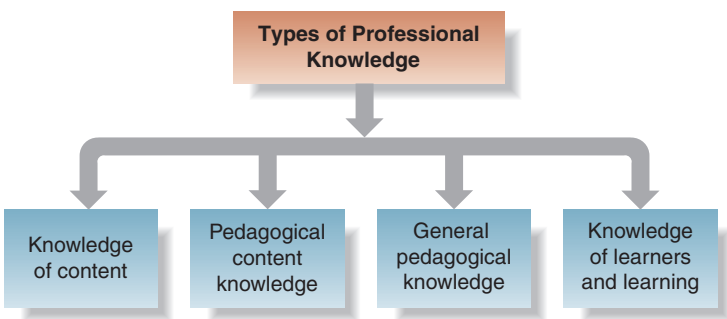


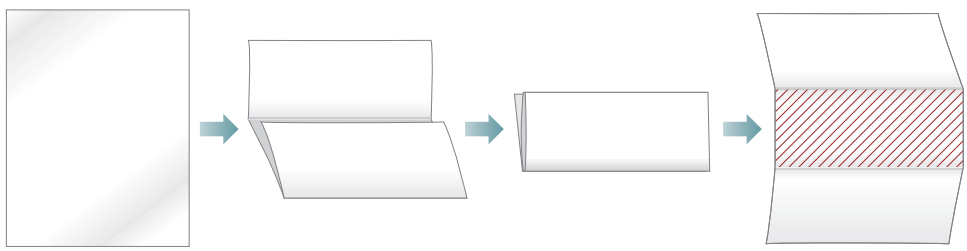
Figure 1.1
Types of professional knowledge

content they teach, and they also know how to make it understandable and interesting to students.

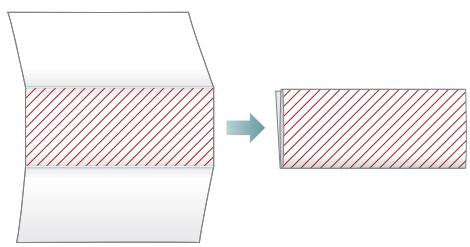
Knowledge of content and pedagogical content knowledge are related but not identical. For example, understanding the factors that led to the American Revolution reflects knowledge of content; knowing how to illustrate this content so students can understand it reflects pedagogical content knowledge. Expert teachers possess both (Kunter et al., 2013; Loughran, Mulhall, & Berry, 2004; Segall, 2004). So, as you study specific topics in your content area, such as math, social studies, science, or any other, ask yourself, "How can I illustrate this topic so students can understand it?" The ability to do so will reflect your pedagogical content knowledge, and it is one of the most important aspects of teaching expertise.

Demonstrating Pedagogical Content Knowledge. To further illustrate what we mean by pedagogical content knowledge in expert teaching, let's look at several examples. First, think about how you might help students understand the process of multiplying fractions, such as $1/4 \times 1/3 = 1/12$. This is neither easy to understand nor easy to teach. Our experience tells us that the product of two numbers is larger than either (e.g., $6 \times 5 = 30$), but with fractions the product is smaller, so the results are counterintuitive. As a result, students often simply memorize the process with little understanding.

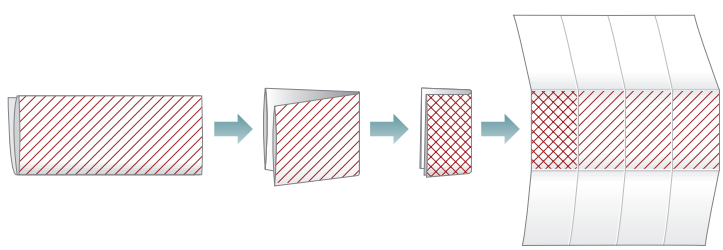
Now, try the following activity. Fold a sheet of plain paper into thirds, and shade the center one-third of the paper, as shown:



Now, refold your paper so that the shaded third is exposed:



Now fold the paper in half, and in half again, so that one-fourth of the shaded one-third is visible. Put additional shading on that portion, and then unfold the paper, as shown:



You've just prepared a concrete example demonstrating that $1/4 \times 1/3 = 1/12$ (the cross-hatched portion of the paper). This example helps students see that the product of multiplying two fractions results in a smaller number and also helps them apply their understanding in real-world settings (Mayer, 2008). This also demonstrates why pedagogical content knowledge is so important. Without examples, such as this one, students grasp what they can, memorize as much as possible, and little understanding develops (Donovan & Bransford, 2005; Kunter et al., 2013).

Now, let's look at an example in science. Consider the concept *density,* which represents the amount of mass (material) in a certain volume—and a concept with which many students, including those who are older, struggle. You can simply illustrate this concept for your students with cotton balls in a transparent drink cup as you see here.

Then, when you compress the cotton in the cup, your students can see that the same amount of cotton (mass) takes up less space (occupies less volume), so the cotton is more dense.

Illustrating the concept this way is much more meaningful for students than using the formula $D = m/v$, which is the way *density* is usually represented, and which students memorize with little understanding.

As a third example, suppose you are a language arts teacher and you want to teach your students about *gerunds*, verb forms that behave as nouns, and *participles*, verb forms that behave as adjectives. To illustrate these concepts you might display the following short paragraph for your students.

> Running is a very good form of exercise, and athletes, such as running backs in football, have to be in very good physical shape. I'm running a three miler this afternoon.

Here students can see that "running" is first used as a noun (*Running* is a very good form of exercise); then as an adjective (. . . such as *running* backs in football); and finally as a verb (I'm *running* a three miler this afternoon). An important point here is that students *can see* how the verb forms are used. They don't have to understand the concepts based on your explanation. The ability to represent topics in this way again illustrates pedagogical content knowledge.

Finally, suppose you're a geography teacher and you want to illustrate the concepts *longitude* and *latitude* for your students. You might draw lines on a beach ball as you see here.

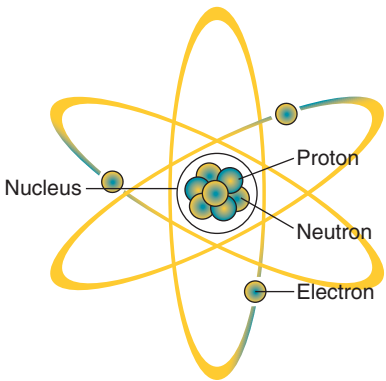
As with the language arts example, your students *can see* that the latitude lines are parallel to each other, and the longitude lines meet at the poles. Then, during your discussion, you can guide your students to recognize that lines of longitude are farthest apart at the equator, but lines of latitude are the same distance apart everywhere, and that longitude measures distance east and west, whereas latitude measures distance north and south.

These are merely examples, and you will find many others when you teach. Depending on the content area, you can represent the topics you teach in several ways:

- *Examples.* Examples are useful when you're teaching a well-defined topic (Renkl, 2011). The illustrations we outlined above to help students understand multiplication of fractions and the concepts *density, gerund, participle, longitude,* and *latitude* are all examples Demonstrations, such as using the cotton balls in the drink cup, are also forms of examples.
- *Case studies.* We use case studies throughout this text to illustrate the topics you're studying. Together with vignettes (short case studies), they effectively illustrate complex topics that are hard to represent with simple examples. For instance, an English teacher might illustrate the concept *internal conflict* with this brief vignette:

Andrea didn't know what to do. She was looking forward to the class trip, but if she went, she wouldn't be able to take the scholarship-qualifying test.

- *Metaphors.* A world history teacher uses her students' loyalty to their school, their ways of talking, and their weekend activities as a metaphor for the concept *nationalism*. Another history teacher uses her class's "crusade" for extracurricular activities as a metaphor for the actual Crusades.
- *Simulations.* Simulations can be effective because they provide concrete models that illustrate complex systems and processes (de Jong, 2011). For instance, an American government teacher creates a mock trial to simulate the workings of our country's judicial system, and a history teacher has students role-play delegates in a simulated Continental Congress to help students understand forces that shaped our country.
- *Models.* Models allow students to visualize what they can't observe directly. For instance, a science teacher uses a model of an atom to help students visualize the organization of the nucleus and electrons, as you see here.



This list further illustrates why knowledge of content and pedagogical content knowledge are related but not identical, and it also helps us understand why item 5 in our Learning and Teaching Inventory ("Preservice teachers who major in a content area, such as math, are much more successful than nonmajors in providing clear examples of the ideas they teach") is false. Earning a degree in a content area, such as math, doesn't ensure that someone will be able to create examples like the one involving the multiplication of fractions, nor does majoring in history ensure that we would be able to think of using a campaign to save a school's extracurricular activities as a metaphor for the Crusades. The ability to represent topics in ways that are understandable to learners requires a special form of knowledge—pedagogical content knowledge—in addition to understanding content (Kunter et al., 2013). If we lack either, we commonly paraphrase information in learners' textbooks or provide abstract explanations that aren't meaningful to our students. We need both to become expert teachers.

GENERAL PEDAGOGICAL KNOWLEDGE

Knowledge of content and pedagogical content knowledge are domain specific, that is, they're related to knowledge of a particular content area, such as the Crusades, multiplying fractions, or the concepts *density, gerund, participle, internal conflict*, and many others. In comparison, **general pedagogical knowledge** involves an understanding of instructional strategies and classroom management that apply to all subject matter areas and topics (Borko & Putnam, 1996; Darling-Hammond & Bransford, 2005).

Instructional Strategies. Instructional strategies, such as knowing how to structure effective lessons that involve students in learning and check for understanding, are important regardless of the grade level, content area, or topic. For example, involving all students in a lesson by calling on them as equally as possible is important whether you're teaching first graders, middle school learners, or advanced high school students (Good & Brophy, 2008; Lemov, 2010). These strategies are essential aspects of general pedagogical knowledge, and you will study them in detail in Chapter 13.

Classroom Management. Classroom management is a second major component of general pedagogical knowledge. To be effective we need to create classroom environments that are safe, orderly, and focused on learning (Emmer & Evertson, 2013; Evertson & Emmer, 2013). Meeting this goal requires that we know how to plan, implement, and monitor rules and procedures; organize groups; and intervene when misbehavior occurs. The complexities of these processes help us see why item 7 in the Learning and Teaching Inventory ("The key to successful classroom management is to stop disruptions quickly") is false. It's impossible to maintain an orderly classroom if we wait for misbehavior to occur. Ideally,

classroom environments are designed to prevent, rather than stop, disruptions. Chapter 12 describes how to do this in your classroom.

KNOWLEDGE OF LEARNERS AND LEARNING

Knowledge of learners and learning, the fourth type of professional knowledge, is also essential, "arguably the most important knowledge a teacher can have" (Borko & Putnam, 1996, p. 675). Let's see how this knowledge can influence the way we teach.

Knowledge of Learners. The following items from the Learning and Teaching Inventory all involve knowledge of learners.

Item 1: The thinking of children in elementary schools tends to be limited to the concrete and tangible, whereas the thinking of middle and high school students tends to be abstract.

Item 2: Students generally understand how much they know about a topic.

Item 6: To increase students' motivation to learn, teachers should praise as much as possible.

For instance, with respect to item 1, we know that students need to have abstract ideas illustrated with concrete examples, and this is true for older as well as younger students. Chapter 2 helps us understand how students' thinking develops, and helps us understand how to represent topics in developmentally appropriate ways.

Item 2 suggests that learners often aren't good judges of either how much they know or the way they learn. Chapters 7 and 8 help us understand how to make our students more aware of the way they think and how to become more strategic in their approaches to learning (Bruning et al., 2011; Veenman, 2011).

Item 6 has implications for the ways we interact with our students. Intuitively, it seems that providing as much praise as possible is desirable and effective. However, motivation research, which you will study in Chapters 10 and 11, helps us understand why this isn't always the case.

Knowledge of Learning. As we better understand the different ways people learn, we can understand why item 4 ("Expert teaching is essentially a process of presenting information to students in succinct and organized ways") on the Learning and Teaching Inventory is false. For example, evidence consistently indicates that we don't behave like video recorders; we don't simply remember what we hear or read. Rather, in our attempts to make sense of the information, we interpret it in personal and sometimes idiosyncratic ways (Dubinsky, Roehrig, & Varma, 2013; Edwards, Esmonde, & Wagner, 2011; Hattie & Gan, 2011). In the process, meaning can be distorted, sometimes profoundly. For instance, the following statements were actually made by students:

"The phases of the moon are caused by clouds blocking out the unseen parts."
"Coats keep us warm by generating heat, like a stove or radiator."
"A triangle which has an angle of 135 degrees is called an obscene triangle."

Obviously, students didn't acquire these ideas from their teachers' explanations. Rather, they interpreted what they heard, experienced, or read; related it to what they already knew; and attempted to make sense of it.

These examples help us understand Keith's comments in the case study at the beginning of the chapter: "I explain the stuff so carefully, but some of the kids just sit with blank looks on their faces. Then, I explain it even more carefully, and . . . nothing." Expert teaching is much more than simply explaining, and expert teachers have a thorough understanding of how learning occurs and what they can do to promote it. (We examine learning in detail in Chapters 6 through 9.)

Developmentally Appropriate **Practice**

Using Knowledge of Learners and Learning to Promote Achievement in Students at Different Ages

While much of what we know about learners and learning applies to students of all ages, **developmental differences**, age-related changes in students' thinking, personalities, and social skills, exist.

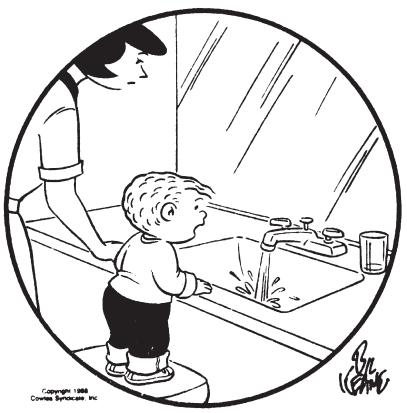
Because the developmental level of your students affects their learning and your teaching, a feature titled "Developmentally Appropriate Practice" appears in each chapter. **Developmentally appropriate practice** refers to instruction that matches teacher actions to the capabilities and needs of learners at different developmental levels. The feature describes ways to adapt each chapter's content to the different learning needs of early childhood and elementary, middle school, and high school students.

Here's how the feature will appear in subsequent chapters:

Working with Students in Early Childhood Programs and Elementary Schools

Young children's thinking differs from the thinking of older students. As an example, look at the accompanying cartoon. Wondering how all the water could fit in the spigot is characteristic of the thinking of young children. Older students would of course realize that a vast reservoir of water exists that we can't see. Young children's personal and social characteristics also differ from those of older students and influence how they interact and learn in classrooms. We examine these differences in each of the chapters in the book.

FAMILY CIRCUS



"How do they fit so much water in that little spigot?"

Working with Students in Middle Schools

As a result of maturation and experience, the thinking and social skills of middle school students differ from those of young children. For example, older students are more likely to realize that they don't understand an idea being discussed in class and raise their hands to ask for an explanation. In addition, middle schoolers are increasingly social and find the opposite sex more interesting. These developmental differences have important implications for how we teach and interact with these students.

Working with Students in High Schools

As with differences between elementary and middle school students, additional differences exist between high school learners and their younger counterparts. For example, many high school students are quite mature, and discussing personal and social issues with them on an adult-to-adult level can be effective. They are capable of more abstract thinking than their younger counterparts, although they still need concrete examples to understand new or difficult topics.

We now understand why item 9 ("Teachers learn by teaching; in general, experience is the primary factor involved in learning to teach") on the Learning and Teaching Inventory is false. Experience is important, but we can't acquire all the knowledge we need to be effective from experience alone. Acquiring this knowledge is the primary reason you're studying educational psychology.

Professional Knowledge and Reflective Practice

You will make a staggering number of decisions in your teaching; some historical research suggests as many as 800 per day (Jackson, 1968). For example, the following are only a few of the aspects of her teaching about which Jan made decisions in her lesson earlier in the chapter:

- The learning objectives for her lesson
- The examples she would use to help students reach the objectives
- Which students she would call on and the order in which she would call on them
- The specific questions she would ask and how she would respond to students if they answered incorrectly

No one is there to help you make these decisions; you're essentially on your own. Learning how to make them leads us to the idea of **reflective practice**, the process of conducting a critical self-examination of one's teaching (Clarke, 2006; McGregor, 2011). Every professional decision we make is designed to promote student learning, and research suggests that reflective practice can help us become more sensitive to student differences (Berrill & Whalen, 2007). And it can make us more aware of the impact of our instruction on learning (Gimbel, 2008). For example, Jan's comment, "When I think about it, I realize that I sometimes jump in too soon . . . and at other times I let them stumble around too long. . . . So, then I adapt for the next lesson," illustrates the process of reflective practice and its influence on her instruction.

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The Role of Research in Acquiring Professional Knowledge

To this point in the chapter, we've found that professional knowledge is essential for expert teaching, and we've examined the different types of professional knowledge we need to become experts. But, where does this knowledge originate, how does it accumulate, and how can we acquire it?

One answer is experience, sometimes called "the wisdom of practice" (Berliner, 2000). Well-designed teacher education programs help people like you acquire the beginnings of "the wisdom of practice" by integrating clinical experiences in schools with the topics you study in your classes.

Research, the process of systematically gathering information in an attempt to answer professional questions, is a second important source of the knowledge needed for expert teaching. All professions use research to guide their practice (Gall, Gall, & Borg, 2010; Van Horn, 2008). For example, in an effort to answer the question "How does teacher questioning influence student learning?" researchers have conducted large numbers of studies examining the numbers and types of questions teachers ask and the ways they are asked and distributed among students (Good & Brophy, 2008). The influence of teacher questioning on student learning is part of the professional literature of educational psychology. Jan drew from it when she talked about the changes she made in her teaching based on the class she is taking and her instructor who "keeps talking about research that says how important it is to call on all the kids as equally as possible." Jan is a veteran teacher but continues to grow professionally by staying up to date on current research.

Research in education exists in several forms, each of which answers different kinds of questions. The different types include:

- Quantitative research, which includes descriptive research, correlational research, and experimental research
- Qualitative research
- Action research
- Design-based research

Quantitative Research

Quantitative research refers to the systematic, empirical investigation of phenomena using numerical data and often involving statistical and mathematical techniques. Quantitative research can exist in descriptive, correlational, or experimental forms. We discuss them next.

DESCRIPTIVE RESEARCH

Descriptive research uses tools such as tests, surveys, and observations to describe the status or characteristics of a situation or phenomenon (Gall et al., 2010). For example, "How much are our students learning?" is an important question facing all educators. To answer this question, the National Assessment of Educational Progress (NAEP), often called "The Nation's Report Card," assesses our country's students in a variety of areas, including math, science, reading and writing, the arts, economics, geography and U.S. history, and beginning in 2014, in technology and engineering literacy (TEL) (National Center for Education Statistics, 2012). This is a form of descriptive research, and educators use it to measure the effectiveness of different programs and to make comparisons with other countries.

Surveys, such as the annual Phi Delta Kappan/Gallup Poll of the Public's Attitude Toward the Public Schools (Bushaw & Lopez, 2013), are also forms of descriptive research, as are firsthand observations. Jean Piaget (1959), a pioneer in the study of cognitive development, used systematic observations of children as his primary research technique. (You will study Piaget's work in Chapter 2.)

Descriptive research provides valuable information about a variety of topics related to education, but it doesn't allow us to predict future events, and it doesn't identify relationships. Finding relationships between variables leads us to correlational research.

CORRELATIONAL RESEARCH

Consider the following questions: Does a relationship exist between

- Students' grade-point averages (GPAs) and their scores on the SAT?
- Students' absences and their grades in school?
- Students' heights and high school GPAs?

Correlational research is the process of looking for relationships between variables that enables researchers to predict changes in one variable on the basis of changes in another. A **correlation** is a relationship, either positive or negative, between two or more variables. In our first example, the variables are *grade-point averages* and *SAT scores*; in the second, *absences* and *grades;* and in the third, *height* and *high school GPAs*. The variables are positively correlated in the first example; in general, the higher students' GPAs, the higher their SAT scores. In the second example, the variables are negatively correlated; the more school students miss, the lower their grades. No correlation exists in the third; height and high school GPAs are not related.

It's important to remember that a correlation doesn't imply that one variable *causes* the other. For example, a high GPA—by itself—obviously doesn't cause a high SAT score. Rather, time spent studying, effective study strategies, and general intelligence are likely to be causes of both. Similarly, being absent, per se, doesn't cause low grades. Instead, missing

opportunities to learn, not completing homework assignments, and losing chances to interact with peers are likely causes.

Much of what we know about the relationships between teaching and learning is based on correlational research (Springer, 2010).

EXPERIMENTAL RESEARCH

Whereas correlational research looks for relationships in existing situations, such as the relationship between teacher questioning and student achievement, **experimental research** systematically manipulates variables in attempts to determine cause and effect (Springer, 2010). To illustrate this process, imagine that researchers randomly assign teachers to two groups (random assignment is important to ensure, as much as possible, that the groups are comparable). The researchers then train teachers in one group to call on their students equally, as Jan did with hers, but the other group receives no training. If the students taught by the trained teachers exhibit higher levels of achievement than the students taught by teachers who receive no training, researchers can then conclude that training in equitable distribution of questions causes an increase in achievement (Springer, 2010).

Qualitative Research

Quantitative research, and particularly experimental studies, can be costly, and conducting this research can be a challenge. For example, training interventions are often time consuming, and access to classrooms and teachers may be difficult. **Qualitative research**, which attempts to describe a complex educational phenomenon in a holistic fashion using nonnumerical data, such as words and pictures, is an alternative (Johnson & Christensen, 2011). It relies on interviews, field notes, and other descriptive techniques, and then looks for patterns, as does quantitative research. The results of qualitative studies, however, are published in narrative reports with detailed descriptions of settings and participants, whereas quantitative studies typically result in reports with correlations and other statistical techniques (Gay, Mills, & Airasian, 2012).

A classic qualitative study of teaching, *First-Year Teacher* (Bullough, 1989), illustrates these characteristics. The researcher's goal was to describe, from the teacher's perspective, what it's like to be a first-year teacher. He spent a year observing a first-year, middle school language arts teacher, interviewing her, and collecting artifacts such as lesson plans and assignments. A realistic account of the triumphs and difficulties encountered by one teacher emerged from the study. As in other qualitative studies, the researcher did not claim that this teacher's experience generalized to the experiences of all first-year teachers. Instead, he simply attempted to describe one teacher's experience in as much detail as possible and then allow readers to draw their own conclusions about that teacher's experiences.

Each of these forms of research contributes to professional knowledge, the knowledge expert teachers understand and apply in their work with students.

Action Research

When you teach, and as you gain experience, you'll have questions about the effects your actions have on your students' learning. Some might include:

- How much homework should I give?
- Should I systematically grade homework, or merely check to see if students have completed it?
- How often should I give quizzes?
- Should I ever give my students free time to socialize with their classmates?

Many other examples exist, and to answer these questions, you might conduct your own studies, which are forms of **action research**, applied research designed to answer a specific

school- or classroom-related question. It can use either quantitative or qualitative methods (Gay et al., 2012). For example, you might want to compare your students' achievement when you give a quiz every week during one grading period to a previous grading period when you gave only three quizzes for the 9 weeks. In doing so, you are conducting action research.

If carefully organized and systematically conducted, action research can be published in professional journals or presented at conferences just as is done by professional researchers (Bransford et al., 2000). If you do so, you will also be contributing to the body of professional knowledge that expert teachers possess.

Design-Based Research

Research in education has received a considerable amount of criticism over the years, with its lack of impact on classroom practice being one of the most important. "It is both surprising and depressing that many educators cannot think of a single research output or can think of only trivial outputs that meet this most practical and important outcome of research" (Anderson & Shattuck, 2012, p. 18).

In response to these criticisms, **design-based research** has evolved. In addition to the goal of impacting classroom practice, it has the following characteristics (Anderson & Shattuck, 2012; McKenney & Reeves, 2013):

- It is conducted in a real-world context, such as a classroom.
- It focuses on the design and testing of educational interventions, which could be a specific learning activity, type of assessment, administrative innovation (such as starting school later in the morning), or application of some form of technology, among many others.
- It uses mixed methods, such as combining experimental and qualitative methods.
- It involves multiple iterations, that is, it repeats the process with the aim of approaching a desired goal. The result of one iteration is used as a starting point for the next one.
- It involves a partnership between researchers and practitioners.
- It is intended to contribute to theory.

Design-based research is not the same as action research. When action research is conducted, the educator, such as a teacher or administrator, is both researcher and teacher, whereas a design-based study involves a partnership between researchers and practitioners. "The partnership in a design-based study recognizes that teachers are usually too busy and often ill trained to conduct rigorous research" (Anderson & Shattuck, 2012, p. 17). It also recognizes that teachers working in the real world of classrooms are essential for a study's validity. Further, design-based research doesn't focus exclusively on a local need, as would be the case with action research; as we saw above, it also attempts to contribute to theories that are applicable to a variety of settings.

From your perspective as someone involved in a teacher preparation program, design-based research's attempt to have a practical impact on classroom practice is probably its most important characteristic. When successful, design-based research provides us with concrete and practical suggestions for improving our teaching.

Research and the Development of Theory

As we saw in the discussion of design-based research, contributing to theory is one of its goals. Arguably, this is the goal of all research. As research results accumulate, patterns emerge. For instance, after many studies researchers have concluded that the thinking of young children tends to be dominated by their perceptions (Piaget, 1970, 1977; Wadsworth, 2004). For example, when first graders see an inverted cup of water with a card beneath it, as we see in the accompanying picture, they commonly explain that the card doesn't fall because the water somehow holds it against the cup. They focus on the most perceptually

obvious aspect of the object—the water—and ignore atmospheric pressure, the actual reason the card stays on the cup.

The statement "The thinking of young children tends to be dominated by their perceptions" is a pattern found in large numbers of research studies. Some additional examples of research-based patterns include:

- Behaviors rewarded some of the time, but not all of the time, persist longer than behaviors rewarded every time they occur.
- People tend to imitate behaviors they observe in others.
- People strive for a state of order, balance, and predictability in the world.

As additional research is conducted, related patterns are found, which in turn generate further studies. As knowledge accumulates, **theories**, sets of related patterns that researchers use to explain and predict events in the world, are gradually constructed (Cooper, 2006). In our everyday world, the term is used more loosely. For instance, one person makes a point in a conversation, and a second responds, "I have a theory about that." In this case, the person is merely offering an explanation for the point. In educational psychology, theory is reserved for the more systematic collection of data and the forming of patterns over time.

Theories help organize research findings and can provide valuable guidance for our teaching. Let's look at a brief example. One research-based pattern states, "Reinforced behaviors increase in frequency," and a related pattern we mentioned earlier indicates that intermittently reinforced behaviors persist longer than those that are continuously reinforced (Baldwin & Baldwin, 2001; Schunk, 2012; Skinner, 1957). Further, too much reinforcement can actually decrease its effectiveness. So, for example, if you reinforce your students for their attempts to answer questions by praising them, they are likely to increase their efforts, but they will persist longer if they are praised for some, but not all, of their attempts (intermittently reinforced). If you praise them too much, they may actually reduce their efforts (Deci & Ryan, 2008).

These related patterns are part of behaviorism, a theory that studies the effects of external influences on behavior. Our illustration, of course, is only a minor portion of the complete theory. (We examine behaviorism in depth in Chapter 6.) The key feature of any theory is the large number of research-based patterns that are integrated into a coherent body of knowledge.

Theories are useful in two important ways. First, they allow us to *explain* events in our classrooms and the world at large. For instance, look again at the cartoon on page 15. Piaget's theory of cognitive development (1970, 1977), which includes the pattern we mentioned earlier ("The thinking of young children tends to be dominated by their perceptions"), helps us explain why the child in the cartoon thinks the way he does. We can explain this behavior by saying that the child can see only the water and the faucet, and because his thinking is dominated by his perception—what he can see—he concludes that all the water is in the faucet. Similarly, using behaviorist theory, we can explain why casino patrons persist in playing slot machines, though coins infrequently fall into the trays, by observing that they are being intermittently reinforced.

Theories also allow us to *predict* behavior and events. For instance, based on behaviorism, we would predict that students who periodically receive positive comments on essays will try harder than either students who receive no comments at all, or students who receive effusive positive comments.

In both instances, theories—cognitive development theory and behaviorist theory—help us understand learning and teaching by allowing us to explain and predict our students' behavior and how our actions will influence their learning. Throughout this book, you will study a number of theories, and we will discuss and illustrate ways that you can apply them in your teaching. These theories, together with a large body of research, make up the professional knowledge you need to become an expert teacher.

ENHANCED etext *self check*

Teaching in Today's Classrooms

The world of teaching is rapidly changing, and in many ways it's more challenging than it was only a few years ago. But at the same time more potential rewards also exist. To start you on the path toward meeting these challenges and reaping these rewards, we want to provide you with an overview of what you will encounter when you begin your teaching career. In it we'll discuss the following:

- Standards and accountability
- Teacher licensure and evaluation
- Learner diversity
- Technology
- The influence of neuroscience

Standards and Accountability

In 1983 a very influential report, called *A Nation at Risk: The Imperative for Educational Reform,* was published (National Commission on Excellence in Education, 1983). This widely read document, considered to be a landmark in American educational history, argued that our country's schools were failing to meet the national need for a competitive workforce, and since its publication, a great deal has been written about American students' lack of knowledge and skills. For instance, one survey found more than half of high school students identified Germany, Japan, or Italy, instead of the Soviet Union, as America's World War II ally (Bauerlein, 2008). And in 2010 the National Assessment of Educational Progress (NAEP) found that only 12% of American 12th graders scored well enough to be considered "proficient" in American history (National Center for Education Statistics, 2010). Further, NAEP results for 2013 showed that student performance in math and reading remains well below where government and education leaders want it to be (National Center for Education Statistics, 2013a).

American adults also fare poorly. For example, a report from the Organization for Economic Cooperation and Development (OECD), which focused on people aged 16–64 in 24 countries, found that, compared with their international counterparts, American adults are weak in both literacy and math (OECD, 2013).

In response to these concerns, educational leaders have established academic **standards**, statements that describe what students should know or be able to do at the end of a prescribed period of study. All states and the District of Columbia have established standards. The following are two examples, the first in world history from the state of California and the second in third-grade math from Texas.

> Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan and the United States.
>
> 1. Analyze why England was the first country to industrialize (California State Board of Education, 2008).
>
> (3) Number and operations. The student applies mathematical process standards to represent and explain fractional units. The student is expected to:
>
> (A) represent fractions greater than zero and less than or equal to one with denominators of 2, 3, 4, 6, and 8 using concrete objects and pictorial models, including strip diagrams and number lines (Texas Education Agency, 2012)

Video 1.3 Standards and accountability are part of reality in today's classrooms. This first-grade teacher describes her reactions to this reality.

ENHANCEDetext *video example*

Analysis of standards from different states has identified significant variations in expectations, rigor, and even content. Also, charges have been made suggesting that many states lowered their standards to meet federal mandates (Ginsburg, Leinwand, & Decker, 2009).

Further, American students still remain behind other nations in academic achievement, readiness for college, and the world of work. For instance, according to some measures,

American students rank 25th in math, 17th in science, and 14th in reading compared with students in 27 industrialized countries around the world (Broad Foundation, 2013).

Because of these issues, the Common Core State Standards Initiative (CCSSI) was developed. Let's look at it.

THE COMMON CORE STATE STANDARDS INITIATIVE

The **Common Core State Standards Initiative (CCSSI)** is a state-led effort to establish a single set of clear educational standards for all states (Common Core State Standards Initiative, 2014a). The standards exist in mathematics and English-language arts together with literacy in history/social studies, science, and technical subjects. States can voluntarily adopt and share the standards. The CCSSI is coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO). By 2012, 45 states, the District of Columbia, four territories, and the Department of Defense Education Activities had adopted the Common Core standards (Common Core State Standards Initiative, 2014a).

The CCSSI standards are designed to ensure that students graduating from high school are prepared to go to college or enter the workforce and that parents, teachers, and students have a clear understanding of what is expected of them. The standards are also linked to international benchmarks to hopefully ensure that American students are competitive in the emerging global marketplace (Ginsburg et al., 2009; Lee & Spratley, 2010).

The following is an example from first-grade math:

> **CCSS.Math.Content.1.OA.B.3 Apply properties of operations as strategies to add and subtract. Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition.) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10 = 12$. (Associative property of addition.) (Common Core State Standards Initiative, 2014p).**

As another example, a literacy standard in History/Social Studies for Grade 9–10 appears as follows.

> **CCSS.ELA-Literacy.RH.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claims. (Common Core State Standards Initiative, 2014d).**

The Common Core State Standards are similar to many of the standards that already exist in the states. The consistency that the standards provide—both among states in our country and internationally—is a primary advantage of the CCSSI.

Controversies with the Common Core. The Common Core enjoyed widespread acceptance until the fall of 2012, but then criticisms began to surface (Bushaw & Lopez, 2013). For example, some critics argued that the uniformity of standards across states represented federal overreach and an attempt to establish a national curriculum (Strauss, 2013).

Public understanding of the CCSSI was also a problem. For instance, one poll found that "almost two of three Americans have never heard of the Common Core State Standards, . . . and most of those who say they know about the Common Core neither understand it nor embrace it" (Bushaw & Lopez, 2013, p. 9).

On the other hand, supporters point out that the CCSSI is not a federal program; it originated in the states, where the standards were developed by governors and state school officials. Also, initial impetus for the standards began at the annual meeting of the Council of Chief State School Officers in 2007 during the George W. Bush presidential administration (Schoof, 2013). And the Common Core isn't a mandate, and it doesn't prescribe curriculum. Individual teachers interpret the standards, set their own objectives, design their own learning activities, and create their own assessments.

Further, the Common Core has variously been described as "The most important educational reform in the country's history" (New York Times Editorial Board, 2013, para. 2),

"[A]rguably one of the most important education initiatives in decades" (Bushaw & Lopez, 2013, p. 9), and "[A]rguably the most serious educational reform of our lifetime" (Keller, 2013, para. 3). The standards have been endorsed by most professional groups, and business leaders have come out in formal support of the Common Core (Molnar, 2014). Also, more than 8 of 10 Americans strongly agree that schools should teach critical thinking skills, which are integral to the Common Core (Bushaw & Lopez, 2013).

Despite controversies, the Common Core appears to be moving forward and will likely be a part of your professional life when you begin teaching. This is the reason we link most of our case studies in this book to Common Core standards—so you will be ready when you begin your career.

ACCOUNTABILITY

Accountability is the process of requiring students to demonstrate that they have met standards as measured by standardized tests. States that have adopted the Common Core standards have collaborated to develop common assessments that are aligned with the standards and replace existing end-of-year state assessments. These assessments linked to the Common Core were intended to be made available for the 2014–2015 school year (Common Core State Standards Initiative, 2014a). So, if your state is one that has adopted the Common Core standards, your students will be held accountable for meeting them.

Prior to the development of tests aligned with the Common Core State Standards, states developed their own end-of-year tests designed to assess the extent to which students have met state standards. If your state has not adopted the Common Core, your students will be held accountable for meeting the standards established by your state.

Either way, standards and accountability will be a part of your teaching life when you begin your career, and the sooner you become comfortable with them, the easier your job will be. Our goal in introducing them in this chapter is to help you hit the ground running.

Teacher Licensure and Evaluation

In addition to standards and accountability, teacher licensure and evaluation are part of the reality of teacher preparation programs and teaching in today's classroom. For you, this process will exist at two levels. The first will occur before you begin teaching and will require you to pass a licensure exam; the second is ongoing evaluation that will be conducted throughout your career. Let's first look at licensure exams.

LICENSURE EXAMS

As you saw earlier in the chapter, teacher quality is now a national priority, and, for many, "teacher quality" is synonymous with teacher knowledge. In an attempt to ensure that teachers possess adequate professional knowledge, all states now require prospective teachers to pass one or more tests before they receive a teaching license. These tests commonly measure general knowledge, as well as the types of professional knowledge that we described earlier in the chapter. It is a virtual certainty that you will be required to pass an exam that measures your professional knowledge before you receive your teaching license.

The Praxis Series™, published by the Educational Testing Service, is the test most widely used for teacher licensure (*praxis* means putting theory into practice). A majority of the states in our country use this series (Educational Testing Service, 2014a). States that don't use the Praxis Series™ have created their own licensure exams, and these exams are quite similar to the Praxis in design and content.

The Praxis Series™ tests include (Educational Testing Service, 2014a):

- Praxis™ Core Academic Skills for Educators (Core). These tests measure academic skills in reading, writing, and mathematics. They're designed to assess the knowledge and skills of candidates entering teacher preparation programs.

- Praxis I® Pre-Professional Skills Tests (PPST®). These tests measure basic skills in reading, writing, and mathematics. In addition to licensure, these tests are often used to qualify candidates for entry into a teacher education program.
- Praxis II® Subject Assessments. These tests measure subject-specific content knowledge, together with general and subject-specific teaching skills that are needed to succeed as a teacher.

The *Principles of Learning and Teaching (PLT)* tests are important parts of the Praxis II® series. The PLT tests are designed for teachers seeking licensure in early childhood or grades K–6, 5–9, and 7–12. Each of the four tests is 2 hours long and consists of 70 questions that are multiple-choice combined with four constructed-response questions that are based on two "case histories" similar to the case study that you read at the beginning of this chapter (Educational Testing Service, 2014b, 2014c, 2014d, 2014e). The content of educational psychology makes up much of what is measured on the tests, and in our "Preparing for Your Licensure Exam" feature, which appears at the end of each chapter, you can practice responding to multiple-choice and short-answer questions similar to those you'll encounter on the PLT tests. In addition, Appendix C provides a matrix that correlates the content covered in this text with the content measured on the Praxis PLT exams.

TEACHER EVALUATION

Teacher evaluation, the process of assessing teachers' classroom performance and providing feedback they can use to increase their expertise, is another aspect of reality that you will encounter when you begin your career. Teacher evaluation has become an increasingly important issue in education, because evidence suggests that, historically, evaluation procedures have done little to reward good teachers and eliminate those that are incompetent. Criticisms of these procedures vary from calling them inefficient and ineffective (Weisberg, Sexton, Mulhern, & Keeling, 2009) to calling them perfunctory and haphazard (Pallas, 2010/2011). Current reforms are attempting to remedy this problem by creating more valid and reliable teacher evaluation systems (Hull, 2013; MET, 2013).

The use of student achievement data is one aspect of these systems. This leads us to the concept of value-added modeling in teacher evaluation.

Value-Added Modeling in Teacher Evaluation. **Value-added modeling** is a method of teacher evaluation that measures a teacher's contribution to student learning in a given year by comparing the current test scores of their students to the scores of those same students in previous school years, and to the scores of other students in the same grade. For example, if a second grader scores at the 50th percentile on a reading test at the beginning of the year and on the 60th percentile at the end of the year, researchers conclude that the gain is a result of the teacher's expertise, and *value* had been added. This approach seeks to isolate the contribution that each teacher provides (the value added) during the year, which can then be compared with the performance of other teachers (Corcoran, 2010; Darling-Hammond, Amrein-Beardsley, Haertel, & Rothstein, 2011).

Value-added models are controversial (Fuhrman, 2013). Students are rarely randomly assigned to teachers, which can impact the validity of test results (Paufler & Amrein-Beardsley, 2014). Critics also question whether tests can accurately capture what teachers are actually accomplishing, such as learning gains that might not show up immediately, and other outcomes, such as social skills, motivation, and self-regulation, that can't be measured on tests (Baker et al., 2010; Corcoran, 2010; Darling-Hammond et al., 2011). "[T]here is broad agreement among statisticians, psychometricians, and economists that student test scores alone are not sufficiently reliable and valid indicators of teacher effectiveness . . . even when the most sophisticated statistical applications such as value-added modeling are employed" (Baker et al., 2010, p. 2). As a result of these criticisms, no state in our country evaluates teachers on the basis of student test scores alone (Hull, 2013).

Trends in Teacher Evaluation. So, how will you be evaluated when you begin your teaching career? A report issued in 2013 by National School Boards Association Center for Public Education outlines the patterns among the states in our country with respect to teacher evaluation (Hull, 2013). The following is a summary of them:

- Forty-seven states require or recommend that stakeholders, including teachers, provide input into the design of evaluation systems. This means that you and/or your colleagues will have input into the way your teaching will be evaluated.
- Forty-one states require or recommend that teachers be evaluated on multiple measures. In addition to student test scores and classroom observations, these evaluations may include measures such as student and parent surveys, examinations of lesson plans, teacher self-assessments, student artifacts, and teacher portfolios.
- Forty-six states require or recommend that evaluations include measures on how teachers impact their students' achievement, and 23 states have mandated that achievement measures comprise half of teachers' evaluations. And some research suggests that high-quality measures of student achievement correlate strongly with other measures of teacher effectiveness (MET, 2013). So, it's highly likely that your students' test scores will make up part of your evaluation.
- Classroom observations are a component of every state's evaluation system, and several evaluations during a school year are recommended. The goal is to use well-trained observers to ensure that teachers being evaluated receive similar scores regardless of who conducts the observations, and observation instruments are supposed to be based on practices most likely to increase student learning.
- Most states are focusing on using evaluation for the purpose of raising teacher performance, but some are also using the results to inform personnel decisions, such as teacher retention and salary increases.

To identify your state's specific practices, go to the website that includes the report conducted by the National School Boards Association Center for Public Education (Hull, 2013).

What are the implications of these changes for you when you begin teaching? First, evaluation will be an important part of your teaching life, so become thoroughly familiar with the criteria that will be used to evaluate you. Study the observation instruments that will be used, so that demonstrating the teaching skills identified in them become essentially automatic. For instance, if the instrument has a category saying, "Learning objectives are displayed for students," make writing your learning objectives on the board one of your routines. If the amount of student involvement is a category, make high levels of student involvement part of your teaching repertoire. (This is a win-win for you. Student involvement promotes learning, and you will earn positive evaluations.)

Since it's likely that your students' performance on standardized tests will make up part of your evaluation, become as familiar as possible with the content measured on the tests, as well as test formats, and do everything you can to ensure that your students have mastered the content and are familiar with test formats and procedures. (This suggestion is different from "teaching to the test," which focuses on specific test items and provides practice with those items.)

The same is true for other measures, such as lesson plans or student artifacts, if they're used as part of your evaluation. You will undoubtedly feel some pressure to perform well when you're evaluated, but teacher evaluation should not be onerous or punitive. Rather, it should be an opportunity for you to demonstrate your expertise and receive feedback that will help you improve in areas where needed. None of us teach perfect lessons, and we can all improve. If this is the spirit in which your district and school conducts evaluations, they can become a positive professional growth experience.

Learner Diversity

The demographic trends in our country are changing rapidly, and increasing diversity is one of the most significant. For example, you probably have friends whose ethnic backgrounds

are different from your own, and they may speak a native language other than English. In fact, English may not be your first language.

The following projections illustrate some of these demographic changes, comparing the status in 2010 to predictions for 2021 (National Center for Education Statistics, 2013b):

- The total population in our country is projected to increase slightly more than 7%.
- The Hispanic population is projected to increase from approximately 23% to 26% of the total.
- The Black population, approximately 16% of the total, is projected to remain stable.
- The percentage of other ethnic groups, such as Asian/Pacific Islander, Native Americans, and multi-ethnic groups, is projected to increase.
- In 2010 the non-Hispanic white population in our country made up 52% of the total, but by 2021 that figure is projected to drop to 47%. This means that by that year, no ethnic group will be a majority in our country.

Prior to 2010, more than 40% of Californians spoke a language at home other than English. In Texas it was more than 33%; in New York nearly 30%; and it was more than 25% in Florida (Center for Public Education, 2012). Those figures are almost certainly higher today. In an event that symbolizes some of the potential issues related to this diversity, 20,000 students sued California educators in the spring of 2013 for failing to teach English to non-native English speakers (Mohajer, 2013).

The diversity in our country is more complex than culture and language. For example, children coming from low-income families are now a major factor in today's schools. Consider the following statistics (Southern Education Foundation, 2013):

- All states in our country experienced rising rates of low-income students between the years 2000 and 2011.
- Forty-eight percent of all students in our country were eligible for free or reduced-price lunch in 2011.
- Urban areas in every part of our country now have majorities of students who come from low-income families, and nationwide, two out of five students in the suburbs also are poor.

In addition, over a million homeless students attended our schools in 2011–2012, with substantial subgroups of learners with disabilities and non-native English speakers among this number. Forty states reported an increase in the number of homeless students, with 10 reporting an increase of 20% or more (National Center for Homeless Education, 2013).

Finally, statistics indicate that approximately 12% of the students who attend our nation's schools have exceptionalities that may require extra services in order for them to reach their full potential (Center for Public Education, 2013; Heward, 2013).

This all means that your students will have very diverse backgrounds, and this diversity will be both enriching and challenging. Different cultural habits, attitudes, and values can make learning experiences more enriching for all your students, while at the same time, for example, working with children from low-income families will be a challenge. Because learner diversity is such an important influence on teaching and learning in today's world, we include one or more sections examining diversity topics in each of the chapters of this book.

Technology

Think about the following questions.

1. When was the last time you went to a print encyclopedia to find some information, or to a print dictionary to find the definition of a word?
2. When was the last time you took a picture with a camera that uses film?

3. How often do you "Google" something?
4. Are you a Facebook user?
5. Do you own a smartphone or tablet computer?
6. Do you prefer to "text" rather than talk on the phone?

The answer to the first two questions might be "Never" or "Can't remember when." "Daily" or even more often might be the answer to the third, and "Yes" is probably the most common answer to the last three. We could ask many more similar questions, but you get the idea. Technology is now so much a part of our world that, until we stop to think about it, we almost don't realize it.

Video 1.4 Technology has the potential the make an important contribution to teaching and learning in today's classrooms. A first grade teacher uses a tablet computer to help her students understand counting backwards.

ENHANCEDetext *video example*

As with the other topics we've discussed in this section, technology will be an integral part of your teaching life, and it will have benefits and present challenges. As a simple example, instead of sending a letter in print form home to parents you will likely email it. You may teach some classes online. You will store lesson plans and a myriad of examples and other resources in your computer, which you will access and display for your students at the touch of your keyboard. Your classroom will likely be equipped with an **interactive whiteboard**, a device that includes a display screen connected to a computer and projector that allows information displayed on the screen to be manipulated with hands or special pens, stored in the computer, and recovered later for further use (Roblyer & Doering, 2013). Technology such as this is being used in classrooms across the country ranging from early elementary (Linder, 2013) to university levels (Greene & Kirpalani, 2013). Also, an increasing number of teachers are using social media, such as blogs, wikis, Twitter, and others, to promote classroom learning (Seo, 2013). And students are becoming increasingly "tech savvy." For example, many kindergarten students are now experienced tablet users—for both entertainment and learning. This technology is merely the tip of an iceberg. The list of potential technological influences is virtually endless, and we can only imagine what the future world has in store (Kaku, 2011).

Challenges will also exist. For instance, one survey found that nearly half of university students text at least once per class session (Johnson, 2013), and another determined that more than 9 of 10 bring their cell phones to class every day and use their phones to send texts during class time (Tindell & Bohlander, 2013). These issues also exist at the P–12 level.

The point here is that technology has permeated students' very existence, and it will also be an integral part of your teaching life. So, the sooner you begin preparing to capitalize on its benefits and meet its challenges the better off you'll be. Because technology is such an integral part of teaching and learning in our nation's schools, we include discussions of it in special features throughout this book.

The Influence of Neuroscience

Ed Psych and You

Is it possible for us to literally "get smarter" if the conditions are right? To what extent do emotions, such as joy and anger, influence our learning? We've all heard the old adage, "Let's sleep on it?" Can this make a difference?

Neuroscience is the study of how the nervous system develops, how it's structured, and what it does. Traditionally seen as a branch of biology, neuroscience is now viewed as an interdisciplinary science that collaborates with other fields such as chemistry, computer science, and medicine, and it's also linked to such disciplines as law, psychology, and education. Neuroscience began its march to prominence in the 1980s, and in the 1990s it gathered momentum that continues today (van Ommen, 2013).

Neuroscience research contributes to our understanding of learning and teaching in two ways. First, it provides evidence that confirms teaching practices that we have long believed are important, such as the need for active learning. "Many research studies suggest that active engagement is a prerequisite for changes in the brain. Not surprisingly, just listening to a presentation or lecture will not lead to learning" (Van Dam, 2013, p. 32). This quote implies that we won't learn from lectures, and while this is probably overstated, we have long known that students learn much more when they are cognitively active—consciously *thinking about* the content they're studying—than they do when they sit passively listening (Edwards et al., 2011; Veenman, 2011).

As a second example, intuitively it makes sense that stress and fatigue will have a negative impact on cognitive functioning, and neuroscience research confirms this sensible idea (Palmer, 2013). This research was done on university students, and it has implications for you as you move through your university experience; simply, understand that stress and fatigue affect learning and make every effort to manage your stress levels and get enough rest.

Second, neuroscience provides us with insights into the brain and the way it works. **Neuroplasticity** (sometimes called *brain plasticity,* or simply *plasticity*), the brain's ability to physically remodel itself in response to experience, is one of the most important of these insights (Dubinsky et al., 2013; Pascual-Leone, Amedi, Fregni, & Merabet, 2005). In other words, as we acquire experiences, the brain can literally rewire itself (Schachter, 2012). "People have different genetic predispositions, but experience continuously shapes our brain structure and modifies behavior" (Van Dam, 2013, p. 32). This is a very different view of the brain; until recently scientists thought the structure of the brain developed during childhood and that once developed there was little room for change (Pascual-Leone et al., 2005).

The concept of neuroplasticity helps answer the first question we asked in *Ed Psych and You*. It suggests that yes, if we have the right kinds of experiences, we can indeed literally get smarter. This is very good news, and it also has enormous implications for teaching and learning. It suggests that providing meaningful experiences—in areas varying from academic to personal, social, and emotional—is arguably our most important task as teachers. When we succeed, we don't just help our students acquire knowledge and skills; we literally change their brains. It has implications for learners as well. "Students who understand that their brains are plastic are more willing to struggle to learn difficult content" (Dubinsky et al., 2013, p. 319).

Neuroscience also helps us answer the second and third questions we asked in *Ed Psych and You.* Emotions do indeed influence both motivation and learning. Positive emotions, such as joy, are generally linked to increased motivation and achievement, whereas the opposite is true for negative emotions (Legault & Inzlicht, 2013; Lövheim, 2012). There's something to the old adage, "Let's sleep on it"; neuroscience research indicates that memories are often consolidated and linked during sleep, resulting in more coherent and usable patterns (Nieuwenhuis, Folia, Forkstam, Jensen, & Petersson, 2013).

Because neuroscience contributes to our understanding of learning and its implications for teaching, we include sections on the topic in several of the chapters of this text.

Educational Psychology and Teaching: Applying Your Professional Knowledge in Today's Classrooms

Much of educational psychology is interesting for its own sake, because it provides insights into how we all learn and develop. It can also make an important contribution to your teaching, but only if you know how to apply its content to your work. As you see in the title of this section, *applying* the content of educational psychology to your teaching is the

focus here, and one or more sections devoted to application will appear in each chapter of this book. This is why you're taking this course and studying this text—so you can use your knowledge of learning and teaching, the content of educational psychology, to increase your students' achievement.

To understand how applications of educational psychology can influence your teaching, let's return to the questions we asked at the beginning of the chapter.

> "How was Jan's approach to teaching word problems different from Keith's?"

and

> "Why were their approaches so different, and how will these differences affect their students' learning?"

We now want to examine these questions again, using professional knowledge as the lens through which we look. Let's begin by considering the first. Keith's approach to teaching word problems was to ". . . explain the stuff so carefully," and when the kids sat with blank looks on their faces, to ". . . explain it even more carefully." He was conscientious and sincere in his attempts to help his students learn to solve problems, and his approach—to explain—is the one most commonly used in classrooms. The problem he encountered is also common; explaining—alone—is often ineffective in helping students understand difficult ideas, such as problem solving. In contrast, Jan built her lesson around concrete and real-world examples—the costs of the 12-ounce soft drink can, the 20-ounce bottle, and the 6 pack.

To promote student involvement, she had them work in pairs to determine which one was the best buy, and she provided them with enough guidance to ensure that they were making progress toward a solution. In contrast with Keith, she didn't use explaining as her primary approach to helping them learn to solve problems.

Now, let's answer the second question. Their approaches were different because Jan possessed more professional knowledge than did Keith, and, as a result, Jan's students are likely to learn more. They both had ample knowledge of content; they both understood decimals and percents and the processes involved in problem solving. However, the fact that Keith used verbal explanations—an often ineffective teaching strategy—as his only approach indicated that he lacked pedagogical content knowledge, general pedagogical knowledge, and knowledge of learners and learning—the other forms of professional knowledge needed for expert teaching. He explained, and when that didn't work, he was only able to explain some more. In contrast, Jan was able to provide concrete and real-world examples of decimals, percents, and problem solving, which demonstrated her pedagogical content knowledge. The fact that she knew her students needed the concrete examples and needed to be actively involved in the learning activity indicated her knowledge of learners and learning.

The differences between Jan's and Keith's professional knowledge are not surprising. Keith is a first-year teacher, whereas Jan has four years of experience, and she continues to grow professionally by taking classes that focus on this knowledge. Because Keith is a rookie, he is less knowledgeable than Jan, but he is no less committed. With study and practice he will learn and grow, and the same applies to you. You won't be an expert immediately, but with effort you can be, and in doing so, you *will* become more effective and more satisfied with your teaching.

ENHANCED etext *self check*

chapter 1

Summary

1. Describe expert teaching and explain how expert teaching influences student learning.
   - Experts are people who are highly knowledgeable and skilled in a particular domain, such as teaching. Students taught by expert teachers learn more than students taught by teachers with less expertise.
   - Expert teachers can produce learning in their students and do so despite challenging circumstances.

2. Describe the different kinds of professional knowledge that expert teachers possess.
   - Expert teachers thoroughly understand the topics they teach, and their knowledge is reflected in their actions when they use their pedagogical content knowledge to illustrate those topics in ways that make sense to learners.
   - Expert teachers apply general pedagogical knowledge to organize learning environments and use basic instructional skills in ways that promote learning for their students.
   - Expert teachers' knowledge of learners and learning allows them to design learning activities that involve students, promote motivation to learn, and use developmentally appropriate practice.

3. Describe different types of research, and explain how research and theory contribute to teachers' professional knowledge.
   - Research is the process of systematically gathering information in an attempt to answer professional questions, and it is an important source of the knowledge needed for expert teaching.
   - Quantitative research is the systematic examination of events using numerical data and statistical and mathematical techniques. Quantitative research exists in descriptive, correlational, and experimental forms.
   - Descriptive research uses tests, surveys, and observations to describe the characteristics of some phenomena; correlational research looks for relationships among variables that allows the prediction of changes in one variable based on changes in another variable; experimental research systematically manipulates variables in attempts to determine cause and effect.
   - Qualitative research attempts to describe complex educational phenomen in a holistic fashion using nonnumerical data.
   - Action research is applied research designed to answer a specific school- or classroom-related question. It can use both quantitative and qualitative methods.
   - Influencing classroom practice is the goal of design-based research, and its characteristics include collaboration between researchers and teachers, a focus on educational interventions, the use of multiple iterations, and mixed methods. Unlike action research, it includes both the solution of local problems and efforts to contribute to theory.
   - Theories are sets of related patterns that help explain and predict events in the world. Theories can provide valuable guidance for teaching.

4. Identify factors that influence teaching in today's classrooms.
   - Standards, statements describing what students should know or be able to do after a given period of study, and accountability, the process of requiring students to demonstrate that they have met standards as measured by standardized tests, are parts of professional reality in today's classrooms.
   - Teachers are required to pass a licensure exam before they're allowed to work full time in today's classrooms, and they will also be regularly evaluated during their teaching careers.
   - Teacher evaluation systems commonly include a combination of measures. Virtually all include classroom observations, but they may also include other items, such as student and parent surveys, lesson plans, and student artifacts. A number of states are now including student scores on standardized tests as well.
   - Today's schools are now attended by students whose backgrounds are the most diverse in our country's history. In addition to differences in cultural and language backgrounds, large numbers of students from low-income backgrounds are now attending our nation's schools.
   - Technology is now an integral part of our lives, and it is becoming an increasingly significant factor in today's classrooms.
   - Neuroscience, the study of how the nervous system develops, how it's structured, and what it does, is contributing to our understanding of teaching and learning, with neuroplasticity, the ability of the brain to physically remodel itself in response to experience, a being one of the most important. It suggests that providing high-quality experiences for students might arguably be teachers' most important role.

Practice Using **What You've Learned**

In the Pearson etext, apply concepts from the chapter to teaching.

Demonstrating Professional Knowledge in Classrooms

ENHANCED etext *application exercise*

A Principal's View of Professionalism

ENHANCED etext *application exercise*

Preparing for **Your Licensure Exam**

Understanding Professional Knowledge

You will be required to take a licensure exam before you go into your own classroom. This exam will include information related to the different types of professional knowledge teachers need to become experts, and the following exercises are similar to those that appear on licensure exams. They are designed to help you prepare for the exam in your state. This book and these exercises will be a resource for you later in your program as you prepare for the exam.

The following episodes illustrate four teachers at different classroom levels working with their students. As you read the episodes, think about the different types of professional knowledge that the teachers demonstrate in their lessons.

The segments you study here are based on the video episode you saw in "Practice Using What You Have Learned" Exercise 1.1. To make the written segments more meaningful, you may want to review the video episode again.

Rebecca Atkins, a kindergarten teacher, is talking with her children about planting a garden. She sits on a small chair at the front of the room and has the children seated on the floor in a semicircle in front of her.

She begins, "We had a story about gardening the other day. Who remembers the name of the story? . . . Shereta?"

"'Together,'" Shereta softly responds.

"Yes, 'Together,'" Rebecca repeats. "What happened in 'Together'? . . . Andrea?"

"They had a garden."

"They planted a garden together, didn't they?" Rebecca smiles. "The boy's father helped them plant the garden."

She continues by referring the children to previous science lessons during which they had talked about plants and soil. She then asks them about their own experiences helping their parents plant a garden.

"I helped put the seeds in the ground and put the dirt on top of it," Robert offers.

"What kinds of vegetables did you plant? . . . Kim?"

"I planted lots of vegetables . . . tomatoes, carrots."

"Travis?"

"I planted okra."

"Raphael?"

"I planted beans."

She continues, "Tell about the story 'Together.' What did they have to do to take care of the garden? . . . Carlita?"

"Water it."

"Bengemar?"

"Pull the weeds from it."

"Pull the weeds from it," Rebecca smiles. "What would happen if we left those weeds in there? . . . Latangela?"

"It would hurt the soil."

"What's another word for soil?"

"Dirt," several of the children say in unison.

"How many of you like to play in the dirt?"

Most of the children raise their hands.

"So, planting a garden would be fun because you get to play in the dirt," Rebecca says enthusiastically.

"I like to play in the mud," Travis adds.

"You like to play in the mud," Rebecca repeats, attempting to stifle a laugh.

We turn now to Richard Nelms, a middle school science teacher, as he illustrates the concept of symmetry for his seventh graders.

Richard begins his discussion of symmetry by holding up a sponge as an example of an asymmetrical animal; he demonstrates radial symmetry using a starfish; and he then turns to bilateral symmetry.

"We have one more type of symmetry," he says. "Jason, come up here. . . . Stand up here."

Jason comes to the front of the room and stands on a stool.

"Would you say," Richard begins, "that Jason is asymmetrical—that there is not uniformity in his shape?"

The students shake their heads.

He has Jason extend his arms out from his sides as you see here and then asks, "Would you consider this radial, because he has extensions that go out in all directions? . . . Jarrett?"

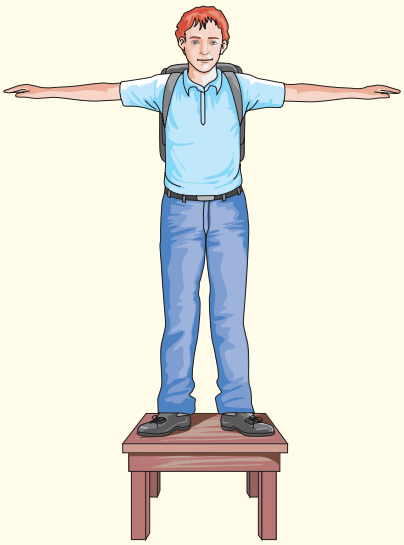
"No."

"Why not? Explain that for us."

"There's nothing there," Jarrett says, pointing to Jason's sides.

"There's nothing coming from here, is there, and the arms, legs and head are all different?" Richard adds.

"So, we move to the third type of symmetry," he continues, as Jason continues to stand with his arms extended. "It's called *bilateral*. . . . Bilateral means that the form or

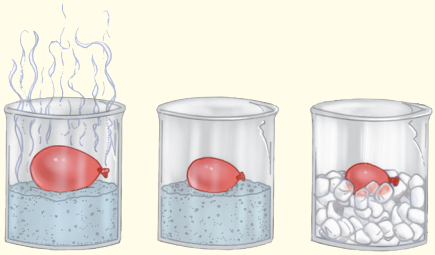


shape of the organism is divided into two halves, and the two halves are consistent. . . . If I took a tree saw and started at the top," he says, pointing at Jason's head as the class laughs, "the two halves would be essentially the same."

"Now, tomorrow," he continues, "we're going to see how symmetry influences the ways organisms function in their environments."

Let's look in now at Didi Johnson, a 10th-grade chemistry teacher, as she attempts to help her students understand Charles's law of gases, the law stating that an increase in the temperature of a gas causes an increase in its volume if the pressure on the gas doesn't change.

To illustrate that heat causes gases to expand, Didi prepares a demonstration in which she places three identical balloons filled with the same amount of air into three beakers of water. She puts the first into a beaker of hot water, the second into a beaker of water at room temperature, and the third into a beaker of ice water, as you see here.



"This water is near boiling," Didi explains as she places the first balloon in the beaker. "This is room temperature, and this has had ice in it, so it is near the freezing point," she continues as she puts the other two balloons into the beakers.

"Today," she continues as she begins writing on the board, "we're going to discuss Charles's law, but before we put it on the board and discuss it, we're going to see what happened to the balloons. . . . Look up here. . . . How is the size of the balloon related to the temperature of the water we placed it in?"

"The balloon in the hot water looks bigger," Chris responds.

"Can you see any difference in these two?" Didi continues, pointing to the other two balloons.

"The one in the cold water looks smaller than the one in the room-temperature water," Shannon adds.

"So, from what we see, if you increase temperature, what happens to the volume of the gas?"

"It increases," several students volunteer.

Didi writes, "Increase in temperature increases volume" on the board, emphasizes that the amount of air and the pressure in the balloons were kept essentially constant, and then asks, "Who can state Charles's law based on what we've seen here?"

"Increased temperature will increase volume if you have constant pressure and mass," Jeremy offers.

Didi briefly reviews Charles's law, writes an equation for it on the board, and has the students solve a series of problems using the law.

Finally, let's look at Bob Duchaine's work with his students. An American history teacher, he is discussing the Vietnam War with his 11th graders.

Bob begins by saying, "To understand the Vietnam War, we need to go back to the beginning. Vietnam had been set up as a French colony in the 1880s, but by the mid-1900s, the military situation had gotten so bad for the French that they only controlled certain enclaves like the little city of Dien Bien Phu."

He explains that the French surrendered this city in the summer of 1954, and peace talks followed. The talks resulted in Vietnam being split, and provisions for free elections were set up.

"These elections were never held," Bob continues. "Ngo Dinh Diem, in 1956, said there will be no free elections: 'I am in charge of the South. You can have elections in the North if you want, but there will be no elections in the South."'

He continues by introducing the "domino theory," which suggested that countries such as South Vietnam, Cambodia, Laos, Thailand, Burma, and even India would fall into communist hands much as dominos tip over and knock each other down. The way to prevent the loss of the countries, he explains, was to confront North Vietnam.

"And that's what we're going to be talking about throughout this unit," he says. "The war that we took over from the French to stop the fall of the dominos soon was eating up American lives at the rate of 12 to 15 thousand a year. . . . This situation went from a little simple plan—to stop the dominos from falling—to a loss of over 53,000 American lives that we know of.

"We'll pick up with this topic day after tomorrow. . . . Tomorrow, you have a fun day in the library."

Questions for **Case Analysis**

In answering these questions, use information from the chapter, and link your responses to specific information in the case.

Multiple-Choice Questions

1. The two teachers who most nearly demonstrated pedagogical content knowledge were:
   - **a.** Rebecca and Richard.
   - **b.** Richard and Didi.
   - **c.** Richard and Bob.
   - **d.** Didi and Bob.
2. The teacher who *least* demonstrated general pedagogical knowledge was:
   - **a.** Rebecca.
   - **b.** Richard.
   - **c.** Didi.
   - **d.** Bob.

Constructed-Response Question

3. What type or types of professional knowledge did Bob most nearly demonstrate?

ENHANCED etext *licensure exam*

Important **Concepts**

accountability
action research
Common Core State Standards Initiative (CCSSI)
correlation
correlational research
descriptive research
design-based research
developmental differences
developmentally appropriate practice
educational psychology (ed psych)
experimental research
experts
general pedagogical knowledge
interactive whiteboard
neuroplasticity
neuroscience
pedagogical content knowledge
professional knowledge
qualitative research
quantitative research
reflective practice
research
standards
teacher evaluation
theories
value-added modeling