Human Learning

EIGHTH EDITION

Jeanne Ellis Ormrod

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Pearson

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To Jack

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Preface

I always enjoy writing and updating *Human Learning*. Each passing year brings exciting new research findings about how human beings think and learn. As a result, each year also brings new strategies for helping learners of all ages acquire information and skills—as well as beliefs, motives, and attitudes—that will be useful and productive both inside and outside the classroom. As you explore the nature of human learning in the pages ahead, I hope that my fascination with the topic will be contagious.

I've written this book with particular readers in mind: those who want to learn about learning but don't necessarily have much background in psychology. Such readers may benefit from studying the historical roots of learning theories but prefer to focus their energies on studying contemporary perspectives and ideas. These readers might find learning theories fascinating but lose patience when they can't see much relevance of the theories to everyday practice. They don't want to be overwhelmed by nitpicky sources of disagreement among theorists of a similar persuasion who, for the most part, are explaining human learning and thinking processes in similar ways. And although these readers are quite capable of reading a dry, terse textbook, they'll probably learn more effectively from a book that shows how different concepts relate to one another, provides numerous examples, and, especially, emphasizes meaningful learning—true *understanding*—of the material it presents.

NEW TO THIS EDITION

Previous users of the seventh edition will see many changes in this eighth edition. The most obvious changes are in the book's table of contents, reflecting new chapters and a reorganization in line with current theoretical perspectives, recent research, and innovative new instructional strategies. I've combined the former Chapters 6 and 7 into what is now a single Chapter 6. I've divided the former Chapter 11 (which included both sociocultural and other contextual perspectives) into two separate chapters (Chapters 10 and 11), allowing more in-depth coverage of current contextual frameworks. I've expanded my discussions of emotions (which I previously referred to as *affect*) to acknowledge the growing recognition that emotions are closely intertwined with cognitive processes; these discussions are spread across Chapters 6, 7, 11, and 15. I've added a new Chapter 14 on "Learning and Technology"; some of its contents were previously scattered throughout various other chapters, but a good deal of it is new. I've reorganized the two chapters on motivation in ways that I'll explain shortly. And I've added a much-needed glossary at the end of the book.

As I always do, I've updated the text in countless spots to reflect current theoretical perspectives and research findings regarding learning, cognition, and instructional

practices. I've condensed sections that were unnecessarily wordy and that in some cases provided *way* too much information (TMI). I've taken out some but not all the "ancient history" of psychological perspectives on learning. I should note that I've done the last of these—the ancient history part—with some reluctance, because early views and research provided a critical foundation for my own learning about learning in the late 1960s (my undergraduate years) and early and mid-1970s (my graduate school years). I realize, however, that given all the advancements since those decades, novice psychologists in the twenty-first century might not find the early stuff as insightful and helpful as I have over the years.

More specifically, chapter-by-chapter changes are as follows:

- *Chapter 1:* Updated discussion of the evolution of learning theories (reflecting recent developments regarding contextual and systems theories), with appropriate revisions to the accompanying Figure 1.2; addition of the key term *evidence-based practice*.
- *Chapter 2:* New introductory example; new section on the importance of myelin in brain functioning; new paragraph on how the human brain is essentially a *kluge*.
- *Chapter 3:* New example of classical conditioning in human learning; a cutting-back of terminology, with some phenomena (e.g., *associative bias* and *contrast effects*) being deleted altogether and certain terms moving from the main text to footnotes to minimize their possible distracting effects for readers.
- *Chapter 4:* The terms *positive behavior support (PBS)* and *schoolwide positive behavior support* changed to *positive behavioral interventions and supports (PBIS)* and *schoolwide positive behavioral interventions and supports (SWPBIS)*, respectively, to be consistent with current terminology; PBIS and SWPBIS now placed in their own section to give these increasingly popular strategies more visibility; additional discussion of the Common Core standards to address common misconceptions about their nature and use; updated discussion of high-stakes testing to include the Every Student Succeeds Act (ESSA) of 2015.
- *Chapter 5:* Some unnecessarily wordy sections condensed; updates on some examples; new section on *teacher self-efficacy*; addition of idea that effective self-regulation requires energy and effort dedicated specifically to self-regulatory processes.
- *Chapter 6 (combination of the previous Chapters 6 and 7):* Elimination of focused sections on the early works of Edward Tolman, Gestalt psychologists, and verbal learning researchers, with findings from Gestalt psychology and verbal learning studies occasionally mentioned when relevant and some of the previous edition's figures illustrating Gestaltist principles still remaining; the "Assumptions" section revised and expanded to include general principles previously presented in the sections on Tolman, Gestalt psychology, and verbal learning; greater emphasis on the fact that the three-component (dual-store) model oversimplifies the nature of human memory; new Table 6.1 that summarizes key distinctions among the sensory register, working memory, and long-term memory in the three-component (dual-store) model.
- *Chapter 7 (previously Chapter 8):* Reorganization of the section on long-term memory storage processes to subsume the concepts *internal organization* and

elaboration under the more general concept *meaningful learning* (because, really, meaningful learning is a fairly inclusive concept); new sections on the impact of emotional content on both storage and retrieval (this content was formerly in the seventh edition's discussion of *affect* in Chapter 14); the term *suppression* offered as an alternative to the term *repression* (which has clinical overtones); addition of Wiggins and McTighe's (2005, 2011) *Understanding by Design* taxonomy; deletion of the seventh edition's section on insufficient self-monitoring as a factor in forgetting (I thought it was TMI for my readers); regretful removal of the "War of the Ghosts" example (F. C. Bartlett, 1932) because of both permissions issues and the fact that I needed room to discuss recent advancements in the field without increasing the length of the book (perhaps instructors who miss it can use the example as an in-class or online demonstration).

- *Chapter 8 (previously Chapter 9):* Removal of the seventh edition's section "How Knowledge Is Encoded in Long-Term Memory" (which seemed to be redundant with certain parts of earlier chapters), with some of its contents being either integrated into other sections of this chapter or moved to Chapters 6 and 7; expanded explanation of *autobiographical memory*; deletion of the section "Long-Term Memory as a Hierarchy" because the model is outdated and largely discredited as being *way* oversimplified; new bulleted paragraph regarding misunderstanding or rejection of science as being an additional reason for resistance to conceptual change; addition of *motivated reasoning* as a concept that helps to explain resistance to conceptual change.
- *Chapter 9 (previously Chapter 10):* A new Figure 9.4 illustrating the pendulum problem.
- *Chapter 10 (previously part of Chapter 11):* Focus now strictly on sociocultural theory and its implications; new art illustrating the variety of forms that physical and cognitive *tools* might take; the seventh edition's section on "Social Construction of Meaning" now more focused and retitled as "Mediated Learning Experiences" (with the broader ideas of social construction of meaning and social constructivism moved to the new Chapter 11); section on "Social Construction of Memories" retitled as "Scaffolded Construction of Memories."
- *Chapter 11:* New chapter on contextual views that includes several topics previously discussed in the seventh edition's Chapter 11; expanded discussion of *embodiment*; new section on "Emotional Contexts of Thinking and Learning," which includes but is not limited to the previous edition's discussions of *affect* and *emotion regulation* in the "old" Chapter 14; new Figure 11.1 depicting various ways in which emotions affect the general nature and quality of thinking and learning; new Figure 11.2 depicting the interaction between arousal level and task difficulty as they affect performance quality; movement of the discussion of anxiety and its effects (previously in the "old" Chapter 14) to this chapter; deletion of the distinction between *state* and *trait* forms of anxiety; deletion of the previous edition's lengthy discussion of Yerkes and Dodson's (1908) study (although the study is a classic, many readers can be turned off by rat studies); expanded discussion of *situated learning and cognition*; word *affordance* (previously appearing only in a footnote) now a boldfaced key term (with glossary entry) in the main text; new example illustrating project-based service learning; new sections on culture and

society as contexts for learning; updated and expanded discussion of Bronfenbrenner's bioecological systems theory (intentionally placed near the end of the chapter), to be read after readers have some knowledge about each of the layers; expanded discussion of the educational implications of contextual theories (e.g., to include implications related to culture and community membership); inclusion of the seventh edition's sections on class discussions, cooperative learning, and communities of learners.

- *Chapter 12:* Expansion of the section "Roots of Self-Regulated Learning" to include a brief mention of effortful control and the addition of a situative perspective; reorganization of the section "Effective Learning and Study Strategies" (in part to minimize redundancy of the section's content with the previous discussion of long-term memory storage processes in Chapter 7), with a new subsection "Creating Verbal and Graphic Organizational Structures"; movement of the discussion of computer programs that promote more effective cognitive and metacognitive strategies to Chapter 14; new discussion of *help-seeking* as a strategy to be encouraged (in the section "Promoting Effective Learning and Study Strategies"); new concrete example of how teachers can encourage students to self-reflect on the nature and effectiveness of their current study strategies.
- *Chapter 13:* New Table 13.1 that summarizes the chapter's distinctions among various forms of transfer; addition of the key term *interleaved practice* (personally, I think that the term "interleaved" is unnecessarily obscure—the words "mixed-up order" have worked just fine in previous editions, but this term is becoming increasingly common in educational research literature); new discussion of presenting *desirable difficulties* as a potentially beneficial strategy for promoting the development of certain problem-solving skills; considerable expansion of the section on critical thinking, reflecting much greater attention to this topic in psychological literature in recent years; expansion of the section "Fostering Critical Thinking in the Classroom" to include specific bullets, including recommendations regarding argumentative discourse, assessment, and the critical thinking skills required for learning from the Internet (the last of which is an adaptation of a discussion that was in the seventh edition's Chapter 12).
- *Chapter 14:* New chapter on "Learning and Technology" that pulls together the previous edition's discussions of computer-based instruction, intelligent tutoring systems, simulations, and technology-based collaborative learning; greatly expanded discussion of the benefits of technology in instruction; new sections on the importance of *technological literacy* and general guidelines for using technology in instructional settings; also, new discussions of *digital textbooks, distance education*, and learner-directed Internet searches.
- *Chapter 15 (previously Chapter 14):* New title, "Basic Concepts and Principles in Human Motivation," to reflect its revised content; expansion of the discussion of *engagement* (as a manifestation of motivation) to include *behavioral engagement*, *cognitive engagement*, and *emotional engagement* as key terms; movement of much of the previous "Affect" content to the new Chapter 11, but with discussions of *self-conscious emotions* and *boredom* remaining here; movement of *internalized motivation* from what is now Chapter 17 to this chapter (see the new section "Building

on the Needs for Competence, Autonomy, and Relatedness"); new Figure 15.2 illustrating the development of internalized motivation; addition of *intellectual humility* as a disposition related to but empirically distinct from open-mindedness; additional bullet regarding internalized motivation in the "Creating a Motivation Classroom Environment" section.

- *Chapter 16 (previously Chapter 15):* Revision of the previous edition's section on career goals to encompass long-term life goals; inclusion of Dweck's term *mindset* (previously only in a footnote) in the main text; more in-depth discussion of the MUSIC mnemonic for summarizing key instructional strategies for enhancing student motivation (this was previously mentioned only in a footnote, but its increasing popularity warrants its inclusion in the main text and in Table 16.3).

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Although I am listed as the sole author of this book, I have certainly not written it alone. Many people have helped me along the way:

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- My good friend Karen, who shared her mnemonic tricks with me (see Chapter 2).
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- My parents, James and Nancy Ellis, who long ago taught me the value of higher education.
- My students, who urged me to write the book in the first place.
- Other students around the globe, who continue to give me feedback about how I can make the book better. (An easy way to reach me is at jormrod@alumni.brown.edu.)

Jeanne Ellis Ormrod

Brief Contents

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Contents

PART SIX

COMPLEX LEARNING AND COGNITION

CHAPTER ONE

Perspectives on Learning

OUTLINE

LEARNING OUTCOMES

1.1. Explain what learning is and various ways in which it might be manifested in a person's behavior.
1.2. Briefly describe several types of research that psychologists have conducted to investigate the nature of learning.
1.3. Distinguish between principles and theories of learning, and describe various theoretical perspectives of learning that have emerged and evolved since the early 1900s.
1.4. Explain how both principles and theories can guide the development of effective instructional and therapeutic interventions.

When my son Alex was in kindergarten, his teacher asked me *please* to do something about his shoes. I had been sending Alex to school each morning with his shoelaces carefully tied, yet by the time he arrived at his classroom door, the laces were untied and flopping every which way—a state to which they invariably returned within 10 minutes of his teacher's retying them. Although I had given Alex numerous shoe-tying lessons, the step-by-step procedure I had taught him never seemed to "stick." I then suggested that we double-knot the laces each morning, but Alex rejected this strategy as too babyish. As an alternative, I purchased a couple of pairs of shoes with Velcro straps instead of laces, but Alex gave the shoes such a workout that the Velcro quickly separated from the leather, leading us back to the flopping laces. By March, Alex's exasperated teacher told my husband and me in no uncertain terms that our son had to learn how to tie his shoes *pronto.* So I sat down with him and demonstrated, for the umpteenth time, how to put two laces together to make a presentable bow. This time, however, I accompanied my explanation with a magical statement: "Alex, when you learn to tie your shoes, I'll give you a quarter." His eyes lit up, and he had shoe-tying perfected in 5 minutes. We didn't get a single complaint about his shoelaces after that.

When my daughter Tina was in fourth grade, she felt considerable frustration with a series of homework assignments in subtraction. She had never learned the basic subtraction facts, despite my continually nagging her to practice them, the result being that she couldn't solve many two- and three-digit subtraction problems. One night, after her typical half-hour tantrum about "these stupid problems," her father explained to her that subtraction was nothing more than reversed addition and that her knowledge of addition facts could help her with subtraction. Something must have clicked in Tina's head, because we weren't subjected to any more tantrums about subtraction. Multiplication and division continued to be problematic for her—and don't get me started about the fractions that came later—but at least she had unraveled the mystery of subtraction.

Human learning takes many forms. Some instances of learning are readily observable, such as when a child learns to tie shoes. Other instances may lie below the surface, such as when a child gains a better understanding of mathematical principles. And people learn for a variety of reasons. Some learn for the external rewards their achievements bring—for example, for good grades, recognition, or money. But others learn for less obvious, more internal reasons—perhaps to gain a sense of accomplishment and satisfaction, or perhaps simply to make their lives easier.

THE IMPORTANCE OF LEARNING

Many species have things easy compared to human beings, or at least so it would seem. For example, birds of various species seem to be biologically hardwired with home-building skills. In contrast, we humans either have to be taught something about framing, roofing, and drywalling or must hire someone else to do these things for us. And birds instinctively know how to care for their young, not only by building snug little nests but also by keeping their eggs warm and feeding newly hatched offspring with nutritious bugs and worms. Meanwhile, if we humans become parents, we must rely at least partly on instruction from more experienced individuals—perhaps through face-to-face interactions, books about child care, or Internet websites—in our early efforts to raise and nurture the future generation.

Yet compared to other animal species, we human beings seem to be the ones who have made the most progress over the long run. Mother Nature has endowed us with something very special: an ability to acquire an exceptionally large body of knowledge and a wide variety of behaviors, giving us a greater degree of flexibility and adaptability than is true for any other species on the planet. Because so little of our behavior is instinctive and so much of it is learned, we're able to benefit from our experiences. We discover which actions are likely to lead to successful outcomes and which are not, and we modify our behaviors accordingly. And as we pass on to children the wisdom we've gained from our ancestors and from our own experiences, each generation becomes just that much more capable of behaving intelligently.

To be sure, many nonhuman species learn a great deal over the course of their lifetimes. Our family dog Tobey learned that his dinner was usually served around 4 o'clock and that having a leash attached to his collar meant that a walk was imminent. Our cat Geisha learned that her litter box was in the laundry room and that a loud hiss could effectively dissuade a human from picking her up when she wasn't in the mood for cuddling.

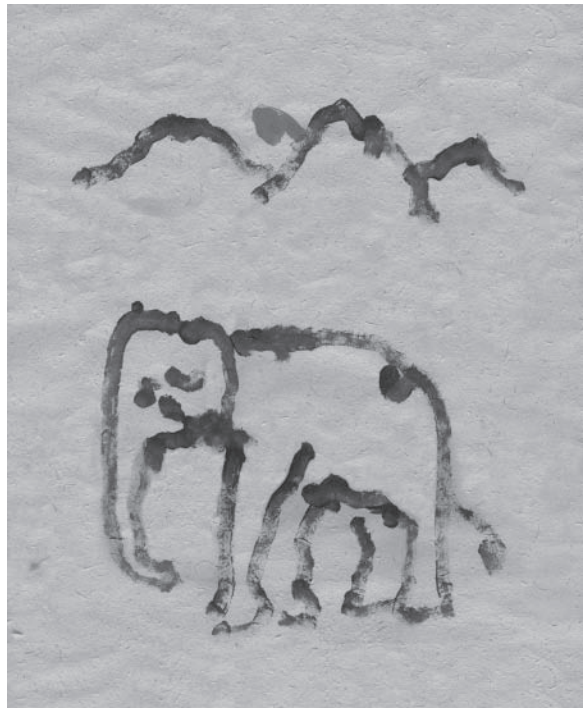

Figure 1.1 Fifteen-year-old Somjai's painting of an elephant.

When I planted blueberry bushes outside my office window one summer, the neighborhood birds quickly discovered that the bushes were an abundant source of food and that the aluminum pie plates I hung to scare them away weren't going to do them any harm.

The more I observe and read about nonhuman animals, the more I become convinced that we humans greatly underestimate their intelligence and ability to learn.[1] As an example, look at the painting shown in Figure 1.1. I watched 15-year-old Somjai paint it when I visited the Maetaman Elephant Camp in Thailand in 2006. Somjai clearly knew how to paint an elephant. What was most remarkable about this fact was that Somjai *was* an elephant. In 2006, Somjai was painting only pictures very similar to Figure 1.1, but when I returned to the camp in 2008, he had expanded his repertoire considerably and could also paint an elephant grabbing a tree branch or shooting a basketball into a basket (elephant basketball was big at the camp). And the asking price for Somjai's work had skyrocketed from 20 dollars (the price I paid in 2006) to 100 dollars. A few years later, Somjai's paintings (all of elephants) were selling online for 600 to 700 dollars.

But there seem to be limits to what nonhuman species can learn. For instance, only a very small percentage of elephants become skillful painters like Somjai, and they do so only after intensive training (you can find several videos of elephant painters on YouTube). Furthermore, their artistic repertoires seem to be largely restricted to elephants, flowers,

[1]For an enlightening discussion of intelligence and problem-solving skills in a wide variety of animal species (e.g., primates, elephants, cats, birds, whales, and octopuses), I highly recommend Frans de Waal's (2016) book, *Are We Smart Enough to Know How Smart Animals Are?*

trees, and perhaps a few simple background details (e.g., notice the mountains in Somjai's painting). Many elephants reportedly have little inclination for painting at all, and most of those that do paint can make only random strokes on the canvas.

In contrast to Somjai and his talented peers, most human beings can paint not only elephants and plants but an infinite number of other things as well, often without having had much training or guidance. Painting is, for humans, not simply executing a specific sequence of brush strokes. Instead, people seem to be guided by internal "somethings"—perhaps a mental image of an elephant or flower, and probably some general strategies for representing physical entities on paper—and they can adapt those somethings quite flexibly in their various artistic endeavors.

Thus, we human beings seem to inherit an ability to think and learn in ways that nonhumans cannot. The particular environment in which we live has a huge impact on the knowledge and skills we do and don't acquire, of course, but our capacity to be versatile and adapt to many *different* situations and environments far exceeds that of other animal species.

DEFINING LEARNING

Alex's learning to tie his shoes and Tina's learning the addition–subtraction relationship are both examples of human learning. Consider these additional examples:

- The mother of a 6-year-old boy insists that her son take on a few household chores, for which he earns a small weekly allowance. Whenever he saves his allowance for 2 or 3 weeks, he has enough money to buy an inexpensive toy of his own choosing. In the process of being regularly paid for his work and saving his earnings, the boy acquires an increasing appreciation for the value of money.
- A college student from a small town is, for the first time, exposed to political viewpoints quite different from her own. After engaging in heated debates with classmates, she reflects on and gradually modifies her own political views.
- A toddler is overly affectionate with a neighborhood dog, and the dog responds by biting the toddler's hand. After this incident, the child cries and runs quickly to his mother every time he sees a dog.

As you can see, learning is the means through which we acquire not only skills and knowledge, but also values, attitudes, and emotional reactions.

For purposes of our discussions in this book, we'll define **learning** as a long-term change in mental representations or associations as a result of experience. Let's divide this definition into its three parts:

- Learning is a *long-term change.* It isn't just a brief, transitory use of information—such as remembering a phone number long enough to call someone and then forgetting it—but it doesn't necessarily last forever.
- Learning involves *mental representations or associations*—entities that reside inside the head. Psychologists and neuroscientists haven't yet pinned down exactly what one or more forms these entities might take, but presumably they have their basis in the brain.

- Learning is a change *as a result of experience,* rather than the result of physiological maturation, fatigue, use of alcohol or drugs, or onset of mental illness or dementia. By "experience" here, I mean some sort of new information that a learner gains from the environment.

As you will see in upcoming chapters, learning is sometimes a very passive process: It happens simply by virtue of something happening *to* a learner. More often, however, it requires the learner to *do* something—something physical, something mental, or, ideally, something *both* physical and mental.

DETERMINING WHEN LEARNING HAS OCCURRED

Many psychologists would agree with the definition of learning I've just presented. However, some would prefer that the focus be on changes in *behavior* rather than on changes in mental representations or associations (I'll return to this point a bit later in the chapter). In fact, regardless of how we define learning, we know it has occurred only when we actually see it reflected in a person's behavior. For example, we might see a learner:

- Performing a completely new behavior—perhaps successfully tying shoes for the first time
- Changing the frequency of an existing behavior—perhaps more regularly cooperating with (rather than acting aggressively toward) classmates
- Changing the speed of an existing behavior—perhaps recalling certain subtraction facts more quickly than before
- Changing the intensity of an existing behavior—perhaps throwing increasingly outrageous temper tantrums as a way of obtaining desired objects
- Changing the complexity of an existing behavior—perhaps discussing a particular topic in greater depth and detail after receiving instruction about the topic
- Responding differently to a particular stimulus—perhaps crying and withdrawing at the sight of a dog after having previously been eager to interact with dogs

Throughout the book, we'll continue to see these and other approaches to assessing learning. Furthermore, we'll discover that the ways in which people's learning is assessed can either directly or indirectly have a significant impact on their *future* learning.

TYPES OF LEARNING RESEARCH

Although psychologists may differ in their views of how best to define learning and determine when it has occurred, virtually all of them agree on one point: They can best understand the nature of learning by studying it objectively and systematically through research. The systematic study of behavior, including human and animal learning processes, has emerged only within the past century or so, making psychology a relative newcomer to scientific inquiry. But in a century's time, countless research studies have investigated how people and many other species learn.

When studying the nature of human learning, some psychologists conduct **basic research**: They investigate specific learning processes under tightly controlled conditions, often looking at people's responses to contrived learning experiences in a laboratory. Others conduct **applied research**: They investigate people's learning in more "real-world" tasks and settings, for instance by looking at how children learn certain science concepts in middle school classrooms. The kinds of data collected vary from study to study as well. In some instances the data collected are **quantitative**, taking the form of measurements and other numbers. In other cases the data are **qualitative**, in that they're complex verbal or behavioral performances that a researcher must closely analyze and then judge for the presence or absence of specific contents or skills. All of these forms of research and data—basic and applied, quantitative and qualitative—have contributed immensely to our understanding of human learning, and thus I will draw heavily from all of them throughout the book.

LEARNING PRINCIPLES AND THEORIES

Consistent patterns in research findings have led psychologists to make generalizations about learning processes through the formulation of both principles and theories of learning. **Principles** of learning identify certain factors that influence learning and describe the specific effects these factors have. For example, consider this principle:

> A behavior that is followed by a satisfying state of affairs—a reward—is more likely to increase in frequency than a behavior not followed by a reward.

In this principle, a particular factor (a rewarding consequence) is identified as having a particular effect (an increase in the behavior's frequency). The principle can be observed in many situations, including the following:

- A pigeon is given a small pellet of food every time it turns its body in a complete circle. It begins rotating in circles quite frequently.
- Dolphins who are given a piece of fresh fish for "speaking" in dolphinese quickly become quite chatty.
- A boy who completes a perfect spelling quiz and is praised for it by a favorite teacher works diligently for future success in spelling assignments.
- A textbook author who receives compliments when she wears her hair in a French braid brushes her hair into a braid more often, especially when going to parties or other social events.

Principles are most useful when they can be applied to many different situations. The "reward" principle—many psychologists instead use the term *reinforcement*—is an example of such broad applicability: It applies to both humans and nonhuman animals and holds true for different types of learning and for a variety of rewards. When a principle such as this one is observed over and over again—when it stands the test of time—it is sometimes called a **law**.

Theories of learning provide explanations about the underlying mechanisms involved in learning. Whereas principles tell us *what* factors are important for learning, theories tell

us *why* these factors are important. For example, consider this key idea in social cognitive theory (described in Chapter 5):

> People learn what they pay attention to. A reward increases learning when it makes people pay attention to the information to be learned.

Here we have a possible explanation of why a reward affects learning: It increases attention, which in turn brings about learning.

Principles of learning tend to be fairly stable over time: Researchers observe many of the same factors affecting learning over and over again. In contrast, theories of learning continue to change as new research methods are developed, new research studies are conducted, and new research findings come to light.

How Theories of Learning Have Evolved over Time

When psychologists first began to study learning in earnest in the late 1800s, two dominant perspectives regarding how we human beings learn were *structuralism* (e.g., Wundt, 1897) and *functionalism* (e.g., Dewey, 1896). Although these two perspectives differed considerably in their underlying assumptions and topics of study, they shared a common weakness: They lacked a precise, carefully defined research methodology. The primary means of investigating learning and other psychological phenomena, especially for structuralists, was a method called *introspection:* People were asked to "look" inside their heads and describe what they were thinking.

In the early 1900s, some psychologists began to criticize the introspective approach for its subjectivity and lack of scientific rigor. Without more objective research methods, they argued, psychology as a discipline would never be a true science. They proposed that to study learning in an objective, scientific manner, theorists must focus on two things that can be observed and objectively measured: people's behaviors (*responses*) and the environmental events (*stimuli*) that precede and follow those responses. Since then, many psychologists have attempted to describe and understand learning and behavior primarily through an analysis of stimulus–response relationships. Such psychologists are called *behaviorists,* and their theories of learning are collectively known as **behaviorism**.

The behaviorist perspective has contributed immensely to our understanding of how people learn and how instructional and therapeutic environments might help them learn and perform more effectively. Over the years, however, its limitations have become apparent. For example, early behaviorists believed that learning can occur only when learners actually *behave* in some way—perhaps when they make a response and experience the consequences of that response. But in the 1940s, some psychologists proposed that people can also learn a new behavior simply by watching and imitating what *other people* do (N. E. Miller & Dollard, 1941). This idea of *modeling* provided the impetus for an alternative perspective, **social learning theory**, that focused on how people learn from observing those around them.

Behaviorism and social learning theory developed largely in North America. Meanwhile, many early-20th-century researchers in Europe took an entirely different tack, presenting situations and tasks that might reveal the nature of people's internal mental processes. For instance, beginning in the 1920s, Swiss researcher Jean Piaget documented numerous ways in which children's reasoning processes change as they grow older, and

Russian psychologist Lev Vygotsky conducted studies about how children's social and cultural environments can help them acquire more complex thinking skills. And in Germany, theorists known as *Gestalt* psychologists described a variety of intriguing findings related to such mental phenomena as human perception and animal problem solving.

Over time, as psychologists continued to explore the various forms that human learning might take, it became clear that a study of behavior alone couldn't give us a complete picture of learning—that we had to take human thought processes, or **cognition**, into account as well. A very different perspective emerged—one known as **cognitive psychology** or, more simply, **cognitivism**—with objective, scientific methods for studying a wide variety of mental phenomena (e.g., Neisser, 1967). Social learning theorists, too, gradually incorporated cognitive processes into their explanations of learning, resulting in a perspective now more often called **social cognitive theory**.

But even with a focus on cognition as well as behavior, we can't completely pinpoint the distinct advantage that we humans have over nonhuman animal species. Many nonhuman animals are *thinking* creatures. For example, several species (e.g., gorillas, chimpanzees, dolphins, elephants—remember Somjai?—and crows) can recognize themselves in a mirror, suggesting that they have a mental image of what they look like (de Waal, 2016; S. T. Parker, Mitchell, & Boccia, 1994; Prior, Schwarz, & Güntürkün, 2008). Furthermore, some animal species can create and use simple tools to get things they want, and they can mentally plan ahead to solve a problem or ensure their future well-being (de Waal, 2016; Emery & Clayton, 2004; Köhler, 1925). Crows, for instance, can craft rudimentary tools to get hard-to-reach food, and they plan ahead by stashing away what they don't immediately eat in locations that they can later remember.

So how can we explain the human advantage in thinking and learning? For one thing, our physical "thinking" equipment—especially the upper part of the brain known as the cortex—is more complex than is true for other species. But in addition, thanks in part to our incredibly flexible language skills, we communicate and collaborate with one another to a much greater extent than other species do, and through the elaborate cultures we've created for ourselves and our communities, we pass along our accumulated knowledge to successive generations (de Waal, 2016; Tomasello & Herrmann, 2010). Furthermore, our social and cultural environments provide many physical and social support systems (e.g., technology, schools) that can boost our ability to tackle new challenges and problems. Building on Russian psychologist Lev Vygotsky's early ideas, in the past few decades some psychologists have developed theories about the critical roles that social interaction and cultural legacies play in human learning and cognitive development, often referring to their perspectives as **sociocultural theory**.

Some psychologists are now broadening their theories to encompass additional contexts that affect human learning, including factors intimately tied to our bodies (e.g., our physical actions and our emotions) and factors external to our physical being (including both our immediate physical and social environments and our broader social, cultural, and political contexts). Such perspectives, which include sociocultural theories, are often referred to as **contextual theories**. And when these perspectives encompass multiple layers of context, all of which interact with one another in myriad ways, they are also known as **systems theories**.

In the meantime, recent technological innovations in the fields of medicine and neurology have enabled us to "look inside" the brain—to study its structures and functions

in increasing detail (more about such technologies in Chapter 2). Some neurologists, cognitive psychologists, and scientists from other disciplines have teamed up to discover how the brain influences people's behavior and learning, and, conversely, how people's behavior and learning experiences can influence brain development. This rapidly expanding field is known as **cognitive neuroscience** and has already made noteworthy contributions to our understandings of the complexities of human learning. And some contextual theorists—especially systems theorists—have incorporated neuroscientific findings into their explanations of how body-based contexts might both influence and be influenced by people's external physical and social environments.

Figure 1.2 provides a graphic depiction of how various theories of learning have evolved over time. Be careful, however, that you don't interpret the boxes in the figure as depicting mutually exclusive entities. In contemporary psychology, many theorists draw from two or more theoretical perspectives to better capture the complex nature of human thinking and learning (notice the two-way cross-communication arrows between various boxes in the lower part of the figure). As we consider the many aspects of human learning in the chapters ahead, we, too, will occasionally find it helpful to draw from two or more perspectives simultaneously.

Advantages of Theories

Certainly the changeable nature of theories can be frustrating, in that we can never be confident that we have the ultimate truth—the real scoop—on how people learn. Yet it's precisely the dynamic nature of learning theories that enables us to gain increasingly accurate understandings of a very complex, multifaceted phenomenon.

Theories have several advantages over principles. First, they allow us to summarize the results of many, many research studies and integrate numerous principles of learning. In that sense, theories are often quite concise (psychologists use the term *parsimonious*).

Second, theories provide starting points for conducting new research; they suggest research questions worthy of study. For example, if we theorize that rewards bring about learning because they increase a person's attention to whatever needs to be learned, we can make the following prediction:

> When a particular situation or task draws an individual's attention to the information to be learned, learning occurs even in the absence of a reward.

In fact, several research studies have supported this prediction (e.g., Cermak & Craik, 1979; Faust & Anderson, 1967; Hyde & Jenkins, 1969).

Third, theories help us make sense of and explain research findings. Research conducted outside the context of a particular theoretical perspective can yield results that are trivial and nongeneralizable; interpreted from a theoretical perspective, however, those same results can be quite meaningful. For example, consider an experiment by Seligman and Maier (1967). In this classic study, dogs were placed in individual cages and given a number of painful and unpredictable shocks. Some dogs were able to escape the shocks by pressing a panel in the cage, whereas others were unable to escape. The following day, the dogs were placed in different cages, and again shocks were administered. This time, however, each shock was preceded by a signal (a tone) that the shock was coming, and