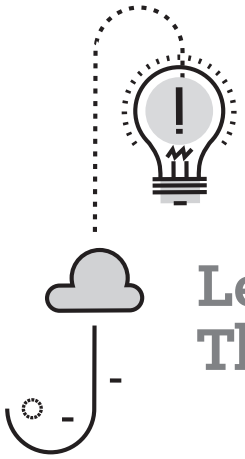

CHAPTER 2

Learning in the Digital Age: Theories and Implications

A basic understanding of processes of learning is essential for those who intend to develop activities that will have the potential to lead to effective learning taking place in the classrooms—that is, teachers.

—PRITCHARD, 2018, P. 2

For many of us, theories about learning are what excited us about becoming teachers in the first place. Theories—the accumulated wisdom of educators and scholars over time—helped us see the big picture of the educational landscape as we were entering the profession. But what is the role of theories of learning once we leave the university and become practicing educators? How can educators leverage learning theories in their own practice, especially when there are so many theories from which to choose?

In this chapter, we review the three main learning theories of how people learn—behaviorism, cognitivism, and constructivism—and their applications in learning contexts. Our focus is on sharing principles and ideas that shed light on why or how some strategies work so that you can better apply them in your instruction. We will show you how to connect these theoretical concepts of how people learn with your daily practice.

In addition to theories of learning, we will also share our practicing teacher-learners' conceptions of learning. This will help you as you design engaging, high quality lessons for all diverse learners.

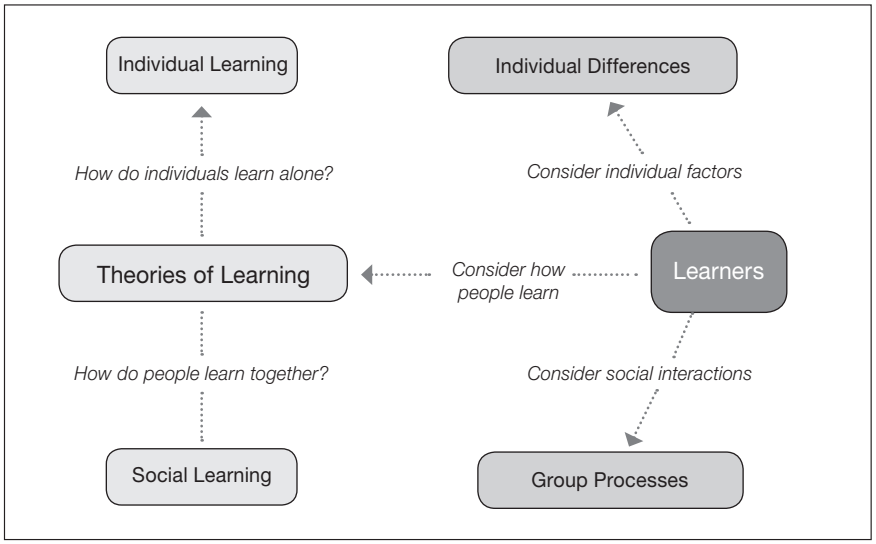

Figure 2.1 | The LITE framework applies theories of learning to consider individual and group learning.

By the end of this chapter, you will be able to:

1. Articulate a personal conceptualization of learning
2. Explain the role and impact of theories of learning in the classroom
3. Differentiate among the behaviorist, cognitivist, and constructivist learning theories
4. Examine how educators conceptualize the processes of learning through visual representations
5. Analyze the conceptual shift from teacher-centric to learner-centered educational approaches

ISTE Standards Connection

The following standards are addressed in this chapter:

ISTE Educator Standards

Learner 1a. Set professional learning goals to explore and apply pedagogical approaches made possible by technology and reflect on their effectiveness.

Learner 1c. Stay current with research that supports improved student learning outcomes, including findings from the learning sciences.

Designer 5c. Explore and apply instructional design principles to create innovative digital learning environments that engage and support learning.

Educators, Ideas, and Learning

As educators, we may not regularly consider theories of learning, primarily because the theoretical conceptions seem at times to be so far removed from our practice. We do, however, often think deeply about the processes and procedures of teaching. We think about how to present a topic or concepts, the pedagogical approach, the sequence of instructional units through the year as well as how to adjust our timing for testing, holidays and family/community events. We may consider the prior knowledge, in terms of content knowledge and skills, required to understand the material, and plan exciting activities to engage our students around the ideas. Then, we think about how to best differentiate the material for our English language and other diverse learners in our classrooms. On the commute back home from work, in the teachers' lounge or while grocery shopping, we deconstruct our teaching practices as we reflect on how well the lesson went and improvements for the next time. The degree of student learning, for many teachers, is secondary to the teaching practice. This is not a value judgment about importance or priority, but more about a focus upon quality teaching. As we reflect, the implicit assumption is that teaching practice leads to students' learning. The two ideas seem inextricably linked—teaching and learning go together.

When we ask our teacher candidates about learning, they usually describe it in terms of teaching practices and the things we do: hands-on learning, direct instruction, visual learning, or personalized learning. In the pressure to move forward with curriculum to keep up with the scope and sequence, our focus—particularly for novice and intermediate teachers—is content and how we are going to cover the

curricular requirements. Student learning outcomes are often measured by unit or end-of-chapter tests in the classroom or by reviewing standardized test results in grade level teams.

Yet for many of us, theories about learning are what excited us about becoming teachers in the first place. Theories—the accumulated wisdom of educators and scholars over time—helped us see the big picture of the educational landscape as we were entering the profession. So what is the role of theories of learning once we leave the university and become practicing educators? How can teachers leverage learning theories in their own practice, especially when there are so many theories from which to choose? In this chapter, we will show you how to connect theoretical concepts of how people learn with your daily practice. Our focus is on sharing principles and ideas that shed light on why or how some strategies work, and in doing so, empower your teaching.

How do we know our students are learning meaningful knowledge and skills? At first glance, the answer seems rather obvious—because we are teaching them, of course! But what do we learn from assessments or tests? When using unit tests for measurement, most teachers know that there isn't time to go back and talk about material students didn't understand, particularly when there is pressure to maintain a prescriptive pace of content coverage. When we reflect upon summative assessments, such as standardized tests or end-of-unit tests, the information we consider is primarily to inform us about how successful the curriculum and instruction have been and point us to potential adjustments needed when teaching next time. This kind of assessment—that is, assessment of learning (summative) is quite different from assessment for learning (formative) where the goal is to see students' current understanding so that we can provide adjustments in real time to guide subsequent learning.

Truly understanding how learning works can be transformative to your teaching practices, helping you to maximize learning outcomes despite limited time and multiple curriculum objectives. This is why educational psychology and cognitive science are at the core of the field of the learning sciences. Understanding how to assess the outcomes of your teaching and measure the impact on student learning—not just at test time but throughout the teaching day—requires an understanding of how people learn, how to effectively—and precisely—measure learning against target objectives, and how to leverage instructional practices to meet learners' needs. First, however, is understanding the idea of learning. What exactly is it?

Teaching and Knowledge Transmission

Teaching and learning are ancient practices that define us as human beings. We are wired to be social, to exchange information and interact with others. In an apprenticeship model, parents and elders taught skills to the next generation, who had guided practice and then gradual release in hunting, gathering, communicating, and parenting. Professor of Cognitive Neuroscience at the University College of London, Sarah-Jayne Blakemore, and colleagues suggest:

> ... the human brain becomes tuned to processing social information, thus paving the way to benefit from others' knowledge and instruction. This has important implications for education because it demonstrates that the fundamental social capacities, which facilitate and profit from teaching and instruction, are laid down early in development. In fact, it has been proposed that social communication among humans is adapted to facilitate the transmission of generalizable knowledge between individuals. This communication system has been termed "natural pedagogy," and is thought to enable fast and efficient social learning of cultural knowledge (Csibra & Gergely, 2009, as cited in Blakemore, Grossmann, Cohen-Kadosh, Sebastian, & Johnson, 2013, p. 288)

In the beginnings of formal education, teaching was relatively simple, and the means of knowledge acquisition and transmission were reasonably predictable, involving direct contact with knowledgeable others—teachers. Students learned directly from intensive questioning by their teachers or mentors in *Socratic circles*, developed in Ancient Greece by their namesake Socrates. This method is still used today. Lectures were replicated through memorization, and very few texts—reproduced by hand—were available. During the Middle Ages and the Renaissance, apprentices and learners worked with masters to gain understanding and were supervised, mentored, and provided with guided practice to develop expertise.

Teachers and masters directly shared their own expertise, which was gained chiefly from their experience and learning. Because of this, the transmission of knowledge was limited by physcial distance. Information and ideas spread slowly, leaving a traceable path of influence, for example along the Silk Road Trading route, "the constant movement and mixing of populations also brought about the transmission of knowledge, ideas, cultures and beliefs, which had a profound impact on the history and civilizations" (UNESCO, n.d.).

As the practice of writing developed, students bore responsibility for comprehending, synthesizing, and using new skills and concepts. Opportunities for

sharing of knowledge beyond larger cities on trade routes, that is, the realm of person to person transmission also changed. Writing and the ability to read became valuable societal differentiators because it meant that knowledge could be spread not only orally but across great distance while maintaining the essence of the originator's story. With the development of the printing press and the ability to replicate large amounts of the same printed content, the dispersal of knowledge was much more widely spread. Teachers used their perceptions of others' ideas as shared through print media to share expertise and gradually, their students were able to read themselves.

MENTAL MODELS

When we ask our educator-learners to think about what is learning, there is an interesting array of answers. Their conceptualization of learning varies depending on their ideas about their own practice. It's important to note that our *mental models*—the way we conceptualize or think—in many ways frame our understanding and approach to solving instructional problems of practice. Instructional coach Elena Aguilar explains:

> Mental models are our values, beliefs, and a series of assumptions about how the world works. Unconsciously, we create a story about other people, institutions, and the world which drives our behavior. While everyone has them (in fact, we need them to make sense of the complex world in which we live), all mental models are flawed to some extent and usually invisible to us. (2015)

Our mental models are shaped by our beliefs and change the way we actually see and respond the world. This includes our ideas about learning; as we will see in Chapter 3, many teachers believe that students can learn better in different modes (auditory, visual, and kinesthetic). This mental model has garnered a great following in the teaching field, but in fact, isn't supported by research evidence and has been discredited as a myth (Riener & Willingham, 2010).

In an oral culture, knowledge is limited to direct or indirect experience, mediated by both an orator's abilities to relay the information, and upon recipients' ability to fully comprehend. Furthermore, to acquire new information, access to a knowledgeable individual is necessary, and a limiting factor. In contrast, the advent of writing and the printing press meant that ideas could spread through written materials and books.

For educators, who usually lived and worked within small geographical ranges with few shifts in population, this meant that it could be possible to have a good understanding of learners' prior knowledge and worldview. Teaching was less complex in terms of (acknowledged) differences among learners. With the advent of the digital age and the exponential increase in both the development and dissemination of information, however, it's impossible to know the sources or extent of learners' prior knowledge. This adds to the complexity of teaching. Learner's prior knowledge is also impacted by learners'motivation, engagement, type of feedback they receive, and their learning environment. Instructional strategies and supports are also examples of variables in teaching ecologies and systems of learning.

What Is Learning?

Before we can show evidence that learning has occurred, we need to understand what it actually is and how it happens. While there are many definitions of learning, almost all descriptions contain the idea that learning is a change that happens as a result of interaction with ideas, things, or people. The prevailing view among contemporary educational theorists is that people construct their own knowledge based on their previous knowledge and their understanding of where new knowledge fits within it (Bransford & Cocking, 2000). Bransford et al. contend in the seminal first volume of *How People Learn*:

> A logical extension of the view that new knowledge must be constructed from existing knowledge is that teachers need to pay attention to the incomplete understandings, the false beliefs, and the naive renditions of concepts that learners bring with them to a given subject. Teachers then need to build on these ideas in ways that help each student achieve a more mature understanding. If students' initial ideas and beliefs are ignored, the understandings that they develop can be very different from what the teacher intends. (2000, p. 10).

It is essential for educators to understand the way in which knowledge is constructed and the crucial importance—and quality—of prior knowledge. Teachers, however, have vastly different ideas of how learning happens, based upon their knowledge gained in teacher preparation programs, their experiences in the classroom, and their beliefs as well as their misconceptions or misunderstandings, some of which may have originated from well-meaning but ill-informed sources. In his white paper, *Student Learning That Works: How Brain Science Informs a Student Learning Model*, Bryan Goodwin commented upon this anomaly:

> ... if you were to ask 100 teachers how learning works ... It's doubtful you'd hear much clarity, specificity or uniformity in the answers. Let that soak in for a moment. Something as critical to learning as how it actually works is seldom articulated or acted upon by education professionals when designing or discussing teaching strategies or addressing student learning difficulties. (2018, p. 1)

It's little wonder that educators have such a wide range of responses because until now, how learning occurs hasn't been much of a focus of teacher preparation programs or professional development; rather the emphasis has been on deepening expertise in teaching. Findings from the learning sciences can help inform this view for greater understanding. Also, there is a wide range of methodologies and approaches to support teachers to form research-based opinions, through action or design-based research, about how learning works with their own learners in learning systems. In addition to theories of learning, we will also share our practicing teacher-learners' conceptions of learning, later in the chapter.

Theoretical Frameworks

For hundreds of years, cognitive scientists and others have been trying to understand—and articulate—how learning works. Most of them express their ideas in terms of a framework or model. Think of research-based theoretical learning frameworks as educated ideas or hypotheses—with supporting evidence—about how learning works in particular contexts. Another way to view a framework is as a scaffold or skeleton; researchers may have discovered many of the essential points about what works, but you don't necessarily have to see evidence in every boundary or aspect of the frame. A theoretical framework or model created for a particular context can be used as a guide to predict outcomes. The anticipated results are stated as hypotheses, which then are studied for accuracy.

As the idea of knowledge and learning in formal contexts has changed, so has the supporting evidence as well as predicted outcomes of successful practices. For example, for a long time, the model or expectation of learning was to be able to reproduce particular sets of knowledge. A simple model of that transmission of knowledge from an expert to a novice might look like this:

Teacher talks + student listens = student learns

If a teacher uses this as a model and you are troubleshooting an instructional problem, you may immediately consider that the student wasn't listening, and any

instructional adjustments would be based upon that premise. But, as experienced educators know, this analysis reflects a very simplistic view of learning. Obviously, a more complex model is necessary to meet today's expectations of learning.

By understanding learners on a deeper level, as Linda Darling-Hammond of Stanford Graduate School of Education emphasizes, teachers are able to extend more personalized opportunities for grown for all diverse learners. She also proposed that a more complex knowledge base is needed, with specialized teacher knowledge beyond instructional strategies and content knowledge, but "This understanding of learners and learning, I would argue, is the most neglected aspect of teacher preparation in this country" (1995, p. 13).

We will discuss some more meaningful and specific instructional strategies in Chapter 4, but for now, let's review influential theories of learning which shape teaching methods and strategies. For some readers, this content will be new, whereas others you may have encountered in pre-service preparation.

Theories of Learning: A Brief Overview

Theories of learning can be useful frameworks for understanding the complicated dynamics of teaching and learning. Learning theories help us understand and answer questions about how we learn as well as provide guidance to teachers as they design educational environments and endeavor to create optimal experiences for all learners.

While there are many theories of learning, we can consider the following—and their offshoots (see Figure 2.2)—as most influential in the classroom: Behaviorism, Constructivism, and Cognitivism. The following sections present an overview of each theory with classroom applications. It's important for educators to understand that there are aspects of each theory that can be effectively applied in learning contexts, and because of the complexity of learning, we shouldn't be seeking one theory which applies in all contexts. While an in-depth analysis of learning theories is beyond the scope of this book, we do recommend additional materials for interested readers to explore in the Learn More section at the end of the chapter.

Behaviorism

Behaviorist learning theories are concerned with observable results, taking into account feelings or thoughts and responses to prompts. Watson (1930) defined behaviorism by saying that,

> behaviorism is the scientific study of human behavior. Its real goal is to provide the basis for predication and control of human beings and control of human beings. Given the situation, to tell what the human being will do: given the man in action, to be able to say why he is reacting in that way (p. 2).

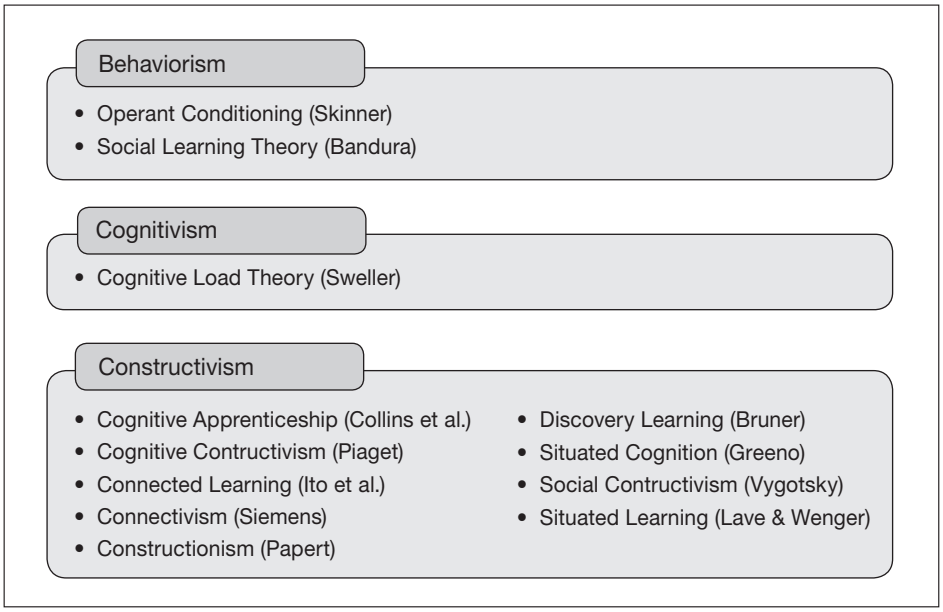

Figure 2.2 | Influential modern educational learning theories and their offshoots.

Watson based his theory of behaviorism on the idea that behaviors are acquired through *classical conditioning.* According to behaviorist learning theory, the most important thing is observable results. The focus is on good grades, good test scores, good results. B.F. Skinner (1938), another behaviorist theorist, introduced the importance of *operant conditioning*, folding the concept of reinforcement into this theory of learning. The focus is on how quickly a behavior is learned and the likelihood that a response will take place.

Some examples and applications of the behaviorist learning theory in the learning environment are rote classroom work, repetitive classroom work and practice, verbal praise as reinforcement ("You did a good job!"), and reward/point classroom management systems.

Not all educators are convinced that classical conditioning, where a student associates a particular response when recognizing a prompt, shouldn't have a role in K–12 education. Teacher Jordan Johnson, writing on the question and answer discussion site Quora, explained the possible consequences—sometimes unintended—and possible uses of this strategy for classroom management:

> I don't agree that operant conditioning has no place in K–12 education or homeschooling. I'd contend that regardless of whether you believe it should happen, it happens on a level that parents and teachers may not be conscious of, because there often are unconsidered adult behaviors that reward or punish the children's behavior (whether the adult intends it or not).

TEACHERS THINK: BEHAVIORIST STRATEGIES

> The theory of Behaviorism centers on the assertion that learning itself is a mechanical process. In practice, the behaviorist approach provides students with a stimulus, designed to provoke a response in the learner. The ideal result of this exposure to the stimulus is a new behavior. If the desired behavior is not demonstrated adequate or not at all, the desired behavior is reinforced. The measure of learning in this context is a visible change in the behavior of the learner.
>
> —CHRIS B.

> In my classroom, my students have always responded well to rewards and positive reinforcement. Therefore, in the beginning of the semester when I am teaching them to be in their seats when the bell rings and working on their warm up, on day 2 or 3 I used to walk around and give praise and candy to the students doing the right thing. The following day, all students would be in their seats doing what they are supposed to be doing because they all want the reward. I have found the ramification of this is that the reward for doing the right thing is to be expected instead of doing the right thing because it's the right thing to do.
>
> —JAMIE J.

Which Behaviorist strategies are you using? What kinds of behaviors are you reinforcing? (intended or not!)

> Classroom management is all about organizing the class environment, time, and activities to maximize learning and growth. Part of this is establishing a safe and respectful environment with open communication channels, and some procedures play into that. (2015)

In practice, educators use behaviorist strategies mostly for reinforcing positive behaviors or community building, for example, using a token economy or similar reward system, or software such as Class Dojo (classdojo.com) or Edmodo (edmodo.com). Another strategy is acknowledgement of accomplishment of behavioral or academic goals (e.g., using digital badges such as classbadges or badgr.com). This kind of interaction can be described as *transactional* and provides *extrinsic motivation* in that students receive external praise or approval for performing in expected ways.

Cognitivism

Behaviorist theories of learning were prevalent in the first half of the twentieth century, but did not consider the impact of internal events such as thoughts, beliefs, or feelings (Schunk, p. 21). These theories seemed to tell only part of the story to theorists who considered the cognitive processes of learners as important, as well as how we think and gain knowledge. Cognitivism can be described as an information processing theory because cognitivist theories of learning view the learner as a processor of information rather than an acquirer of learned behaviors. These theories are focused upon the internal processes—acquiring, encoding, and storing information; thinking; memory; knowing; and problem-solving—that take place during the learning process. In 1980, George Miller founded the Center for Cognitive Studies at Harvard with Jerome Bruner. Both Bruner and Miller are considered to be the major theorists of cognitivism. Bruner (1957) posited that the outcome of cognitive development is thinking. The mind creates from experience "generic coding systems that permit one to go beyond the data to new and possible fruitful predictions" (Bruner 1957, p. 234). The ability to invent ideas for oneself is an important outcome of cognitivism.

According to Shuell (1986), "information processing theories focus on how people attend to environmental events, encode information to be learned and relate it to knowledge in memory, store new knowledge in memory, and retrieve it as needed" (as cited in Schunk, 2012). One of the most important ideas in cognitivism is schema theory.

> A schema is a cognitive construct that organizes the elements of information according to the manner with which they will be dealt. An early discussion of schemas was presented by Bartlett (1932). He demonstrated

> that what is remembered is only partly dependent on the information itself. Newly presented information is altered so that it is congruent with knowledge of the subject matter. Knowledge of subject matter is organized into schemas and it is these schemas that determine how new information is dealt with. (Sweller, 1994, p. 296)

Schemas can be considered as a kind of classification system of thought patterns about processes, objects and ideas—a kind of mental system of categorization that includes information about defining features. The idea of schema highlights the importance of prior knowledge in organizing categories of information and creating relationships or patterns out of information bits. When misconceptions occur during learning, they can impact future knowledge building. Context can be very important in creating and differentiating schema—consider for example, the mental image you have of the concept blue. How many schema represent the idea of blue in different contexts?

A particularly important idea for educators which considers the concept of schema is *Cognitive Load Theory*, proposed by Sweller (1994). The premise of cognitive load theory is that the difficulty of tasks—even the same tasks to different leaners—differs in how much they demand cognitively of the learner. A major goal of the brain is to minimize cognitive load by creating automatic processes—which require less mental effort—for frequent sequences of thought. For example, think back on learning to drive. Remember the incredible complexity when you first began and how over time, processes became more automatic?

Sweller also explained how sequences of cognitive processes can also be formed into schema: "In a similar manner, there are schemas for dealing with problems. These schemas allow the classification of problems into categories according to how they will be dealt with, i.e., according to solution mode" (1994, p. 296). Saving problem solving strategies as *schema*—that is, a stored sequence of steps also called *heuristics* or *algorithms*—is one reason why it is critical for learners to build effective problem solving strategies and develop content knowledge for deeper learning and higher order thinking. When learners are engaged in problem solving, they will quickly do a mental check to recall strategies they've used previously to solve that particular kind of problem. If the type of problem is new or unrecognized, it can be hard to know where to begin—which is where it is helpful to prompt learners (Asking: Why don't you start here? When did you encounter this before?). Problem solving strategies or schema are associated with contexts—the contexts in which they were learned. This is why it is essential for teachers to be explicit in bridging the same kinds of thinking in different contexts, for example, understanding how to divide an 8-portion pizza into equal parts is a fraction problem.

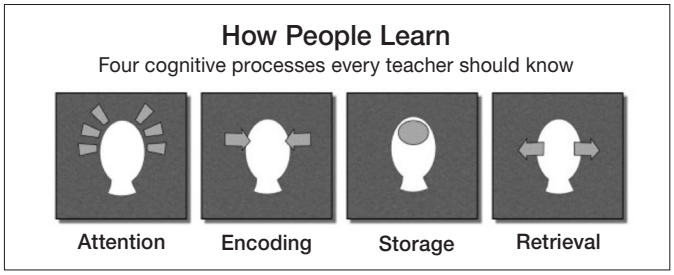

Figure 2.3 | Information Processing theory elements.

"Evidence for the importance of schemas comes from work on novice-expert differences that suggests that differential access to a large store of schemas is a critical characteristic of skilled performance" (Sweller, 1994, p. 298). The idea of schema also explain why it is critical to elicit learners' prior knowledge to uncover misconceptions—or to be patient while learners make sense of new information when they have little background in the topic!

The Cognitive Science of Education is an excellent 14-part series written by Peter Nilsson, English teacher and Director of Research, Innovation, and Outreach at Deerfield Academy. This web-based resource on cognitive science is particularly useful for educators. In the second module, Nilsson's diagram (Figure 2.3) lists the elements of the information processing theory.

TEACHERS THINK: COGNITIVIST STRATEGIES

Despite being developed as a response to Behaviorism, Cognitivism still views learning as a very mechanical process. Although no emphasis is placed on structuring behavior and the theory seeks to create active learners, the classroom remains almost entirely teacher-centered. A teacher-centered learning environment remains necessary in this approach due to the need for the students to be presented with information that they can then process and store for later retrieval. While this is a very efficient, organized way in which to structure teaching and learning, and which aims to break complex problems down into more manageable chunks, because of its rigid and mechanical approach, students find difficulty in adapting to unexpected changes

—CHRIS B

Briefly, the information processing theory proposes a model whereby a learner extends attention to a sensory input and then decides very quickly if further action is needed on the perception. The information is then passed on to working memory for further processing and perhaps being encoded into long term memory or discarded. When information in long-term memory is retrieved, at first, it's usually only in a similar context until the learner (or educator!) makes explicit connections. We'll discuss attention, memory and processing in greater detail in the following chapters.

Constructivism

This influential theory of learning builds upon aspects of behaviorist and cognitivist theories. It proposes that we actively construct our knowledge based on our unique experiences. A focus of the constructivist theory is the uniqueness of each learner.

According to educational researcher David H. Jonassen,

> The difference between a constructivist view of instructional design and what he calls an objectivist view (behavioural and cognitive) of instructional design is that the objective design has a predetermined outcome and intervenes in the learning process to map a pre-determined concept of reality into the learner's mind, while a constructivist view maintains that because learning outcomes are not always predictable, instruction should foster learning and not control learning (as cited in Ratna & Tron, 2015, [p. 10])

Constructivism has two main theorists. Jean Piaget proposed four stages of cognitive development. He conceived of learning as an individual activity. (Schunk, 2012). Lev Vygotsky, however, believed that the individual constructs their own understanding but within a social context to which it is effectively bound.

Vygotsky developed the term *zone of proximal developmental* (ZPD), which refers to the difference between what a student can do without help, and what a student can do with the help of a more knowledgeable *other*. According to Vygotsky (1986), the teacher takes on the role of the facilitator in the learning environment, tailoring their interactions to each student's ZPD in order to help them master the skill. Dixon-Krauss (1995) discusses teachers' scaffolding of students' knowledge when working with their ZPD and notes that teachers mediate learning through social interactions, maintain flexible roles, and support each student based on individual needs.

Constructivist approaches are considered more student-centric than teacher directed. Examples of constructivism in the classroom environment are inquiry-based research projects, problem-based learning, peer-led discussion groups, and heterogeneous (mixed ability) reading groups.

In adopting an approach through which learning is *doing*—making, hands-on activities, experiments—educational technologists follow the footsteps of Seymour Papert, Piaget's student and early innovator of computing for learning. Papert endorsed what he called *Constructionism*, and advocated the revolutionary idea of children as computer programmers in 1971! (Papert, 1971).

Educators should expand their knowledge of learning theories to supplement and empower the way they think about learning. By considering the implications of these theories of learning, and our desired outcomes for all our learning experiences, we are better able to create meaningful learning experiences.

"Theory is something that is able to explain what is observed, upon which strategies—what is actually done in the classroom to achieve particular learning outcomes—are based" (Pritchard, 2018, p 4). Theories should provide a basis for *what works*, *why* and *when*—with the important caveat that there's no one-size-fits-all approach or framework. Consider this knowledge as part of a teaching and learning toolkit. Like any new or unfamiliar tool, understanding the purpose, use, and impact take deliberate practice and experience.

Considering digital learners, tools and technologies adds an entirely new way of viewing the traditional big three learning theories and adds exciting new ways to look at how learning works. We will describe these theories and implications later in the chapter, but for now, in considering what the role of learning theory and classroom practices is—you should be thinking that as a best case scenario they are informing one another in a key and lock way.

Constructivism recognizes that the context of learning is a crucial element that shouldn't be separated from cognitive processes. Schunk (2012) explains:

> A core premise of constructivism is that cognitive processes (including thinking and learning) are situated (located) in physical and social contexts ... Situated cognition (or situated learning) involves relations between a person and a situation; cognitive processes do not reside solely in one's mind (Greeno, 1989, p. 233)

Situated cognition or situated learning is a highly influential theory used in instruction and educational psychology and as such it is important for schools and public learning contexts such as museums and libraries. It emphasizes the idea that learning is more meaningful in authentic contexts and applications.

> "Situated" means that knowledge is not just a static mental structure inside the learner's head; instead, knowing is a process that involves the person, the tools and other people in the environment, and the activities in which that knowledge is being applied. (Sawyer, 2008, p. 3)

Situated cognition supports the assertion that teaching is a design science. Selecting and setting the conditions, environment and materials for learning—for example, the time of day, the curriculum materials and pedagogical approaches, the digital tools and materials and instructional strategies—all have performance consequences for learners.

TEACHERS THINK: CONSTRUCTIVIST STRATEGIES

Constructivism builds upon the legacy of Behaviorism and Cognitivism, yet makes a few significant departures from the aforementioned theories. In contrast to both, Constructivism aims to develop and measure the knowledge students construct for themselves. To do this, Constructivism relies heavily on empowering students to make decisions in their learning experiences, with the goal that allowing students to carve out more meaningful and relevant experiences leads to true development of new knowledge and skills. A major point of emphasis when exploring and implementing a constructivist approach to teaching and learning is the importance of context. By emphasizing the need to situate learning in such a way that students have control of their learning, Constructivism moves learning away from an act of pure consumption of information to one that is almost entirely based on the discovery of information and new knowledge

—CHRIS B

ZPD—I consider the zone of proximal development when forming groups in my world language classroom. I find it highly effective to pair students with other students who can understand, use, and explain the information better than they can themselves. It is beneficial to learn from your peers, and I have figured out that students often times can explain it and help each other sometimes more than I can.

—JAMIE J

Representations of Learning Processes

While we may share some common ideas about how learning works, the way in which we conceptualize this processes can differ widely. So how might we best communicate our conceptualizations of learning with one another? A visual representation of a process, concept, or procedure—this can be a graphic organizer or a diagram—can illustrate how an educator conceptualizes the ideas or content.

A concept map has a distinct, different purpose than a visual organizer, in that concepts and the relationships between concepts are articulated by linking phrases between the central ideas or nodules. By using descriptive linking phrases, we can understand the relationships between the concepts. Skillfully created concept maps can reveal the underlying mental models of how people conceptualize or think about ideas.

In using visual representations, educators can explore how their colleagues conceptualize their ideas—in other words, their mental model. Group discussions around learning can be clarified and enriched when collaborators use concept maps or other kinds of visuals to share their ideas.

Chapter Takeaways

- Evidence-based theories of learning such as behaviorism, cognitivism, and constructivism are important for educators to understand in order to inform design of learning experiences.
- The predominant view of learning now is that knowledge is individually constructed through cognitive processes. These frameworks keep the learner's experience at the center.
- From a practical perspective, educators should understand how learning theories support good teaching and learning strategies by providing principles that can be applied to learning design.
- Educators form their own ideas of how learning happens, which may (unintentionally) include misconceptions.
- The trend in learning theories has been to look more deeply at the role of the learner and understanding influences in knowledge building such as culture, context, and prior knowledge.

Thinking Like a Learning Designer

Students Helping Students

Ms. Starlight and Ms. Starbright, two 5th grade teachers, have been working hard to set up groups in their respective math classes. Ms. Starlight's approach is to set up groups of students with homogeneous ability so that she can work with them in small groups together. Ms. Starbright has set up heterogeneous groups with careful attention to select students with mixed abilities. Both teachers have encouraged students to help one another. You are observing both rooms.

Questions for Reflection

- What do you think you will see?
- Which students do you think will perform better and why?

Suggested Activities

1. As a pre-service teacher, you were encouraged to begin to develop your teaching philosophy, which you've probably updated and during the course of your career. Now consider your *learning philosophy* and articulate your current beliefs and understanding of learning.
2. Examine your own patterns of learning and extrapolate general principles about when you learn best. For example, certain times of the day might be better for activities such as reading, reflecting, planning, deconstructing, or grading. Track your learning over a day, then a week, and then a month. What patterns do you see? Do you like to reflect and plan later in the day, or in the morning? How can you pace your learning and work to be more productive?
3. Reflect on your strengths as a teacher. What learning theories or frameworks do you use when creating learning impactful learning experiences?
4. Create a concept map to examine your own beliefs about how learning happens. What does "learning sciences" mean to you?
5. Spend a day as your student, viewing learning through your students' eyes.

FIELDWORK

Observe Other Educators

See learning in a formal context in a new way. Visit a colleague and observe their teaching. Consider yourself an *ethnographer*—someone who studies cultures. Before you start this activity, think about how you'd like to record what you see—the data. There are classroom culture inventories available that will help you organize your thoughts. Traditionally, however, ethnographers take copious notes to form a rich, detailed, thick description of the happenings, (Ponterotto, 2006) which they then analyze within the sociocultural context.

1. Describe elements of the classroom culture. Are learning routines clearly visible? how would you characterize the learning context?
2. In your "snapshot" or visit, is the learning context equitable? how are all students involved in the learning community … or not?
3. Consider the layout of the classroom. How are the desks/learning groups organized? what kind of visuals are in the room? do they enhance or distract from learning?
4. Compare your teaching context with your colleague's context. Which of your practices do you think would be helpful to your colleague? which of your colleague's practices would you like to try in your classroom or learning community?

Practice allowing your students to bring in their out-of-school learning interests and passions using an open, constructivist-inspired assignment. For example, have students write, blog, journal, or present on the skills they're learning by engaging in a favorite weekend activity.

Learn More: Resources for Further Exploration

The learning classroom: Theory into practice (bit.ly/2ZnBQTd)

Digitally blooming—taxonomies for a digital age (bit.ly/2RgG1NS)

How do people learn? [Video] (youtu.be/SYFAh656WCs)

Kathy Schrock's Bloomin Apps: (schrockguide.net/bloomin-apps.html) including resources aligned to Bloom's taxonomy.

Skinner—Operant Conditioning (simplypsychology.org/operant-conditioning.html)

The cognitive science of education (bit.ly/2WBpIfy)

Deep Dive

Hess, K. (2008). Developing and using learning progressions as a schema for measuring progress: nciea.org/publications/CCSSO2_KH08. pdf.

Neuroscience in the Classroom: www.learner.org/courses/neuroscience/text/text.html

Schunk, D. H. (2012). L*earning Theories: an Educational Perspective*, sixth edition. Pearson.

Weinstein, Y., Sumeracki, M., & Caviglioli, O. (2018). Understanding How We Learn: A Visual Guide. Routledge.