

# Learning Theory and Online Technologies

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# 1

## Introduction to Learning Theory and Technology

It is the theory that decides what we can observe.

—Albert Einstein

20th century theories 21st century knowledge age advancing knowledge appropriate knowledge  
community bad guy theory behavioral learning theory behaviorist learning theory civic  
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Chapter 1 covers the following topics:

- Introduction to learning theory in the Knowledge Age
- What is learning theory?
  - Theory and epistemology: the nature of knowledge
  - Theory and scientific method
  - Knowledge communities
- Learning theories in the 20th century
  - Behaviorist learning theory
  - Cognitivist learning theory
  - Constructivist learning theory
- Learning theory for the 21st century
  - Online collaborative learning theory.

### Introduction to Learning Theory in the Knowledge Age

Our personal, professional, social and cultural lives have been affected and transformed by the computer networking revolution: email, cellphones, text messaging, Twitter, participating in social networks, blogging and accessing powerful search engines using computers and/or mobile devices are common aspects of everyday life. Moreover, as aspiring or current members of the education profession (teachers, instructors, professors, trainers), the world in which we work and teach has been particularly impacted by networking technologies. The 21st century is referred to as the Knowledge Age, a time in which knowledge has key social and economic value. And today's youth are described as the Net Generation, raised in the culture of the Internet and viewing the Web as integral to socializing and work. Yet educational practice does not significantly reflect or address this new reality.

In such a technology-driven world, it is critical and timely to study the intersection of learning theory and technology. Opportunities for educators to reflect on the implications of how we might shape and apply new communication technologies within our practice have been limited. The field is characterized by training teachers in the use of specific online tools, but a theory-informed approach to transforming our educational practice remains elusive.

In our personal lives, we have embraced new technologies for social communication. New technologies are reshaping the way we function within our communities and how we form them. We use email, Twitter, texting; participate in online forums and social networks (such as Facebook, MySpace); search massive databases; access wikis, blogs and user-generated content sites (YouTube, Flickr); or shop online with Amazon. But in our professional lives, despite our interest or need, there has been little opportunity to consider and explore new learning paradigms.

Rather than transform pedagogy by using opportunities afforded by new technologies and the changing socio-economic context of the 21st century, a common tendency of educators has been to merely integrate technology into traditional ways of teaching. Examples of traditional didactic approaches to the Web are common and include the use of email, wikis and web portals for:

- transmission of course information and content to students;
- communication between student and teacher/tutor;
- transmission of lectures (PowerPoint slides, videoconferences, podcasts);
- administering quizzes, assessing quizzes and posting grades.

Such use of the Web for traditional teaching methods represents the most common educational applications of the Web, and for many educators, the only way of using the Web. Adopting the new technologies to serve traditional practices may not be bad in itself, but educators who restrict their use of the Internet and the Web to making traditional didactic teaching easier or more efficient are missing opportunities to introduce better, different or more advanced ways of learning.

While the Internet, Web and mobile communication technologies reshape the potential of both our professional and personal modes of communication, the challenge of how to transform how we think about learning and how we practice our profession confronts us. The transformative potential of the Internet for learning has thus far been largely limited to quantitative change; for example, improvement in educational efficiency. But qualitative change in how we perceive and practice teaching and learning remains in the early stages of development largely because it is not yet well understood by educators and researchers and the field lacks a theoretical framework to guide educational design, pedagogies and use of online technologies. There are few theory-based or research-based guidelines to assist educators to develop more effective pedagogies for

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online learning environments. Hence educators have adopted new technologies largely through trial-and-error methods and by adapting traditional didactic practices to online environments, both within formal (primary, secondary or tertiary) and nonformal (training, certification, professional development) educational settings.

Educators are challenged to respond to the Internet and the Web. There is a need to reflect on our theory of learning (even if it is implicit), and to rethink and reassess our teaching practices and pedagogical approaches in relation to the opportunities afforded by online technologies. Most professions are faced with this challenge; new technologies are transforming the world of work and the nature of the organizations in which we work. Educators are not alone in confronting the paradigmatic shift. But perhaps as educators we have the greatest responsibility and most powerful opportunity because this shift is, above all, one of learning: learning to function, survive and thrive in new contexts. For educators, learning new ways and new ways of learning are the nature of our profession.

*Learning Theory and Online Technologies* addresses the need for a theory of learning for 21st-century realities and presents educators with new ways of thinking about teaching and learning using online technologies. This book offers insight into and illuminates the type of learning and communication essential for educational practitioners and researchers today; it is both a guide to and an explanation for new educational practice that considers the ubiquity of online technology in society today.

The book is organized into four main components:

1. Introduction to learning theory and technology (Chapters 1 and 2)
2. Three major theories of learning and technology in the 20th century: behaviorism, cognitivism and constructivism (Chapters 3, 4 and 5)
3. Online collaborative learning: a theory of learning for the 21st century (Chapter 6), illustrated by exemplars and cases drawn from formal, nonformal and informal educational settings (Chapters 7, 8 and 9)
4. Conclusion (Chapter 10).

*Learning Theory and Online Technologies* begins with an overview of learning and technology from a theoretical perspective, exploring the role of learning theory in advancing knowledge. Learning has also historically been linked to technology in human development. Understanding the historical shifts in learning and technology as well as the advances in learning theory during the 20th century provides a valuable framework and context for identifying new theories of learning related to online technologies and social communication.

The second section of the book examines three major theories of learning in the 20th century—behaviorism, cognitivism and constructivism. Each theory introduces a new perspective on what learning is and how it can be facilitated through pedagogies and technologies. Learning theories and technologies reflect the changing view of education in the context of the rapid technological advances of the 20th and 21st centuries. The historical context helps us to understand how education was perceived, shaped and practiced at different stages of human development. We can see how education was perceived and to some degree how it was shaped and practiced. We can also see 20th-century learning theories as part of a continuum and as a context for learning theory and practice for the 21st century.

The third section of the book introduces a new theoretical perspective, online collaborative learning (OCL), to frame learning and teaching in the 21st century. To illuminate the OCL theory, this section provides real examples of contemporary educational practice based in both blended and fully online environments with learners of all ages, in all settings.

The final chapter concludes the book with a brief review of the trajectory the book has covered and preview of future opportunities.

**What Is Learning Theory?**

A theory is an explanation for why something occurs or how it occurs. Typically theory is generated by a question or by our curiosity, and offers a response to that question. A theory is an explanation that has been scientifically developed by scientists and scholars using state-of-the-art research methods and information of the day. A theory of learning aims to help us to understand how people learn. Many theories of learning were generated in the 20th century, and in this book we will examine the major theories and how each provides an overview and guide, or a lens, whereby education professionals (and others) gained a perspective on their field of work. As Albert Einstein stated, “theory provides the framework or lens for our observations.” The theory that we employ (consciously or not) determines what we see, what we consider to be important and thus how we will design and implement our practice. By understanding learning theory, educators can reflect on their practice, improve upon, reshape and refine their work and contribute to advancing the discipline.

Theory should not be viewed as something divorced from how we work as educators or how we understand our professional activities. Theory is integral to practice and vice versa, although not all theoreticians, or practitioners for that matter, have respected and addressed that relationship. Understanding the major theories of learning that emerged in the 20th and 21st centuries and how they were shaped by (and shaped) contemporary technologies and educational practice can help us understand how the field of education has developed and changed. As we will see, theories of learning reflect the times in which they emerged and gained precedence.

A theory is a historical construct and reflects what was possible and deemed necessary and valuable at that time. It is essential that educators understand the context of a learning theory, to understand it as a product of the discourse of that time.

Moreover, theory not only provides ways to see and understand what already has happened or is happening, but is also a means to “envision” new worlds and new ways to work. Theories establish a language and discourse whereby we can discuss, agree, disagree and build new perspectives and ways to become knowledgeable, in this case, in the use of online technologies for learning. In his article “Thoughts on Theory in Educational Technology,” Brent Wilson writes,

Theory helps us formulate ideas; it informs the creative process. When we see the world differently, we act to make things different via the relationship between theory and design or between science and technology. Such relationships allow for new technology or conversely, “...a new technology spawns new theory.” (1997a, p. 23)

TABLE 1.1 What Is a Theory?

<i>The Role of Theory</i>			
Explains:	Provides:	Shapes:	The theory we employ
Why?	A framework or lens	Understanding	(even unknowingly)
How?	A guide for practice	Discourse	shapes how we design
Where?	A means to envision	Ideas	and implement our
When?	change	Technology	practice
What?		Methodology	
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Theory is also a kind of *modus operandi*; it influences, shapes and determines our actions, even unknowingly. Whether or not we consciously intend to “operationalize” a particular theory of learning, we are nonetheless operating according to some perspective on how to teach (and concomitantly, even if unconsciously, a perspective on how people learn). As Wilson noted, “Theories shape our world just as surely as physical forces do, albeit in a different way” (1997a, p. 23). Theories shape how we make sense of ideas and information and how we then act.

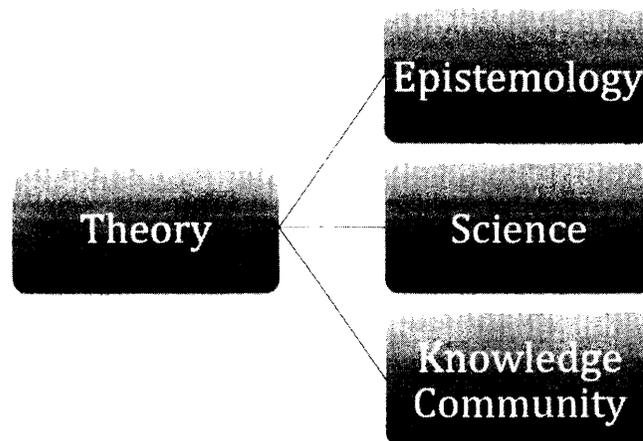
Approaches to scientific theory are also competitive. By the 20th century, theoretical approaches became compartmentalized into what can be viewed as two polar opposites: the battle between what is called “scientific” (hypothesis-driven or experimental) theory and “social” or critical theory. Other related theoretical terms include “hard” science versus “soft” social science theories, pure science versus applied science, quantitative versus qualitative scientific research.

This polarization continues to exist but there are increasing attempts to diminish the divide. The growing use of interdisciplinary collaborations in research is reducing some of the separations. Researchers are increasingly employing both quantitative and qualitative methods, especially within online applications. Moreover, while there are differences in what constitutes scientific theory, there are also important commonalities. Theories intend to explain how or why phenomena are understood in a certain way. Moreover, theories are usually linked to observations and are governed by what can be deemed as constituting evidence and reasonable explanation. Theories can also be viewed as a historical snapshot of ongoing discussions and conversations among those committed to the discipline, its study and advancement.

The history of theory development is relatively recent, the product of the scientific revolution that gained precedence in the 19th century. Understanding learning theories as part of this scientific ethos is critical and will form a key undercurrent of this book.

At the same time, theories of learning have an important philosophical component. Thoughts on learning are not new and did not emerge a mere 100 years ago. Reflection on human experience and behavior, its causation and implications, is part of human consciousness. Thousands of years of philosophical, social and religious perspectives on learning preceded the development of learning theories.

The ancient philosophers developed many important and illuminating insights into learning, and contributed to how we view “epistemology” and “knowledge.” The term “epistemology” comes from the Greek word *episteme*, meaning knowledge. In simple terms, epistemology is the philosophy of knowledge or of how we come to know.



**Figure 1.1** Three Aspects of Theory.

The discussion of learning theories in this book has an epistemological and a scientific component, and emphasizes as well the role of knowledge communities. Knowledge communities are the forums or processes of discourse and debate, whereby scholars advance the state of the art in that discipline. These three terms are discussed below as providing the cornerstones of theory. Deciding what to study when we seek to explain how people learn or deciding how to teach depends upon our disciplinary beliefs and perspectives: theories of learning are based on epistemologies, scientific methods and the views of knowledge communities of the time.

### *Theory and Epistemology*

The term “epistemology,” when we first encounter it, may seem complex and daunting. Not user-friendly. But it is worth befriending this term since it illuminates important concepts we educators need to understand. Epistemology asks: what is knowledge? How do we know? These questions are important because 20th- and 21st-century learning theories are based on epistemologies that began to nudge the concept of knowledge beyond the view of knowledge as divine that was dominant up until the 19th century. The two major epistemologies of the 20th and 21st centuries are objectivist epistemology (reflected in behaviorist and cognitivist theories of learning) and constructivist epistemology (reflected in constructivist and the online collaborative learning theories).

Until recently, epistemology in the Western world had a relatively simple foundation: we know because God told us. Kenneth Bruffee, in his book *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge* (1999), writes that up until the time of Descartes (what is called the pre-Cartesian world),

people tended to believe that the authority of knowledge lodged in one place, the mind of God. Most teachers were priests—or priestly. They derived their authority from what they and their students regarded as their godliness, their nearness to the mind of God. (p. 151)

Formal education was “authorized” by the church, the temple, the synagogue or the mosque. The teachers in ancient civilizations such as Persia and Athenian Greece were to some degree exceptions given their focus on civic laws and virtues. But even civic knowledge was viewed as having a divine origin.

“Post-Cartesian assumptions emerge in roughly the seventeenth century. They remain potent and unquestioned today in the ‘cognitive sciences’ and implicitly in the persuasion of most members of every other disciplinary community, professional and academic” (Bruffee, 1999, p. 151). These assumptions posit knowledge as existing objectively beyond our own minds, as a kind of finite truth. The implication for education and learning is the search for knowledge and truth, and imparting it to others.

One kind of knowledge that traditional college and university education especially values because it is long-lasting is knowledge of the conventions of traditional education themselves. Professors are responsible not only for imparting knowledge that was imparted to them, but also imparting knowledge *as* it was imparted to them. (1999, pp. 152–153)

Eric Mazur, well-known professor of physics, illustrates this view as part of his own teaching experiences:

Discussions of education are generally predicted on the assumption that we know what education is ... When I started teaching introductory physics to undergraduates at Harvard

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University, I never asked myself how I would educate my students. I did what my teachers had done—I lectured. I thought that was how one learns. Look around anywhere in the world and you'll find lecture halls filled with students and, at the front, an instructor. This approach to education has not changed since before the Renaissance and the birth of scientific inquiry. Early in my career I received the first hints that something was wrong with teaching in this manner, but I had ignored it. Sometimes it is hard to face reality. (2009, p. 50)

Didactic methods of teaching are the accepted and traditional way of imparting knowledge. Didactic teaching involves transmitting knowledge from the teacher to the student, just as it was earlier transmitted to the teacher when she or he was a student. This is imperative if the view of knowledge is *objectivist*, *foundational* and *absolute* according to Bruffee, who writes that the objectivist view holds that

knowledge is a kind of substance contained in and given form by the vessel we call the mind. Professors' mental vessels are full, or almost full. Students' mental vessels are less full. The purpose of teaching is to transfer knowledge from the fuller vessels to the less full. (1999, p. 152)

In contrast to the objectivist version of the authority of knowledge is the more recent constructivist epistemology, which holds that knowledge about the world is constructed through our perceptions and interaction and discussion within various communities of knowledgeable peers. Bruffee writes:

The nonfoundational social constructionist understanding of knowledge denies that it lodges in any of the places I have mentioned: the mind of God, touchstones of truth and value, genius, or the grounds of thought, the human mind and reality. If it lodges anywhere, it is in the conversation that goes on among the members of a community of knowledgeable peers and in the "conversation of mankind." (1999, p. 153)

Bates and Poole (2003) note that the two dominant epistemological positions in North American higher education today are objectivism and constructivism:

Objectivists believe that there exists an objective and reliable set of facts, principles, and theories that either have been or will be discovered and delineated over the course of time. This position is linked to the belief that truth exists outside the human mind, or independently of what an individual may or may not believe. (pp. 27–28)

On the other hand, constructivist epistemologies hold

that knowledge is essentially subjective in nature, constructed from our perceptions and usually agreed upon conventions. According to this view, we construct new knowledge rather than simply acquire it via memorization or through transmission of those who know to those who did not. (p. 28)

Epistemologies of knowledge are key to how we view and how we practice teaching and learning. An educator operating from an objectivist epistemology is "far more likely to believe that a course must present a body of knowledge to be learned" (Bates and Poole, 2003, p. 28). The objectivist epistemology underlies the didactic approach to teaching, based on the belief that students learn passively by receiving and assimilating knowledge from others. The student is

required to generate the correct answer, reflecting back the information first transmitted by the teacher. The teacher must ensure that the information to be transmitted is structured, authoritative and organized in particular ways to enable the student to acquire and repeat it “correctly.” Objectivist epistemology underlies two of the major learning theories of the 20th century, behaviorism and cognitivism, discussed in Chapters 3 and 4.

The term “constructivism” refers to both an epistemology and a theory of learning. Constructivist epistemology holds that knowledge is constructed from our perceptions and our interpretations based upon contemporary conventions. Our perceptions are shaped through interactions with others, in particular with more knowledgeable peers and/or the appropriate knowledge community. The constructivist epistemology is reflected in both the constructivist and the online collaborative learning theories, discussed in Chapters 5 and 6.

### *Theory and Scientific Method*

While philosophies of learning have been a recurrent theme and concern since the time of ancient civilizations, theory and scientific methods first emerged in the 19th century under the influence of *positivism*, a term coined in 1847 by the French philosopher, Auguste Comte. Comte (1798–1857) was the first intellectual to systematically articulate positivism and to present empirical method as a replacement for metaphysics or theism in the history of thought. Until then, metaphysics was the dominant view, which emphasized that a divine world lies beyond experience, and transcends the physical or natural world. Theism refers to the belief in the existence of one or several gods who intervene in the lives of humans. Comte rejected metaphysics and theism, arguing that a rational assertion should be scientifically verifiable, that is, demonstrated by empirical evidence or mathematical proof. Theory was an assertion or observation linked to science; the purpose of science, Comte argued, is to observe and measure phenomena that we experience and can directly manipulate. Comte believed that empiricism should be at the core of scientific endeavor and that formal experiment was the key to scientific method. Since emotions and thoughts were not directly observable, they were not accepted as legitimate areas of study and were viewed as irrelevant by positivist science. Positivism holds that theology and metaphysics are imperfect modes of knowledge, whereas positive knowledge is based on natural phenomena with properties and relations verified by empirical science. Theory must therefore be verifiable by empirical science.

The first theories of learning can be traced to the late 19th century, related to the emergence of positivism and scientific inquiry. Whereas “philosophies” of learning deal with values and worldviews, “theories” of learning emphasize an empirical element and a formalized way of study, analysis and conclusion. It is this distinguishing quality of theory, its empirical nature, that remains relevant today, although the rigid aspect of positivism that restricted the study of learning to observable behavior is less accepted by educational researchers.

### *Theory and Knowledge Communities*

Knowledge communities refer to scholarly groups associated with a particular field or related to a discipline. It is the work of the members of a knowledge community to define the state of the

TABLE 1.2 Historical Views on Knowledge

<i>Metaphysical</i>	<i>Scientific</i>
<ul style="list-style-type: none"> <li>• Belief in the sole authority of God and religion</li> <li>• Knowledge is Godliness (proximity to God’s mind)</li> </ul>	<ul style="list-style-type: none"> <li>• Belief in the authority of empirical evidence to enable knowing</li> <li>• Knowledge is what we can sense, discuss, study and improve</li> </ul>

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art and to advance that state in a particular discipline or field of work. Scholarly or knowledge communities are associated with all scientific, cultural and artistic fields of endeavor. Other terms used to describe this concept are knowledge societies, scientific communities, invisible colleges and schools of thought. The concept itself, however, is key because theory building is typically conducted by and within the context of a particular knowledge community. Members collaborate and argue, agree and disagree, and introduce new information and empirical data to contribute to and advance knowledge in the field. Scardamalia and Bereiter (2006) write:

In every progressive discipline one finds periodic reviews of the state of knowledge or the “state of the art” in the field. Different reviewers will offer different descriptions of the state of knowledge; however, their disagreements are open to argument that may itself contribute to advancing the state of knowledge. (p. 100)

Knowledge creation is a deliberate process of advancing the frontiers in a particular discipline. Knowledge, thus, is viewed as constructed through informed dialogue and conversations conducted among members of a knowledge community.

Academic, cultural, scientific and professional knowledge communities share commonalities or integrative beliefs. Kuhn (1970), whose writings on the structure of scientific revolutions (also called paradigm shifts) are considered to be intellectual landmarks explaining the process of discovery, examined the nature and role of scientific communities. Kuhn asked: “What do its members share that accounts for the relative fullness of their professional communication and the relative unanimity of their professional judgments? ... Scientists themselves would say they share a theory or set of theories” (1970, p. 182).

Knowledge communities are scientists or leading thinkers gathered or clustered around a theory and represent the state of the art in that discipline. A particular knowledge community represents the theory of the discipline, how it is defined and articulated in practice, and how it is substantiated.

The concept of knowledge communities is key in this book. The four major learning theories discussed here represent the state of the art as articulated by particular knowledge communities, which flourished at particular points in time. Theories exist in context, and both reflect and illuminate that context. Theories change and improve over time. Knowledge in a field does not merely accumulate, it advances. The next section introduces the theories of learning in the 20th and 21st centuries, and discusses briefly the essence of each theory and how it evolved within the social context of its time.

### **Learning Theories of the 20th Century**

Learning theories emerged in the 20th century, with three major theoretical frameworks shaping the study of learning:

- behaviorist learning theory;
- cognitivist learning theory;
- constructivist learning theory.

This book explores the major aspects of these theories, and the pedagogies and technologies associated with each. The use of a historical approach also illuminates the development of how we understand learning theory and technology, especially with respect to education today.

The major theoretical frameworks are thus viewed along a historical continuum, reflecting how human study and understanding of learning have developed and advanced over the past 100 years. These theories ought not to be considered as distinct silos—independent or autonomous of one another. Indeed, theorists associated with one particular theory may also have contributed to the development of other theoretical frameworks. A particular researcher may have been at the cutting edge; writing at a time of transition and exploration of new ideas and thus, his or her writings may reflect different theoretical perspectives, some of the old and some of the new. For example, Robert Gagné, an educational psychologist widely recognized for his contributions to instructional design, was linked to both behaviorism and cognitivist theories of learning: “Gagné’s (1985) conditions for learning underwent development and revision for twenty or more years. With behaviorist roots, it now brings together a cognitive information-processing perspective on learning with empirical findings of what good teachers do in their classrooms” (Driscoll, 2005, p. 352). Nor should a theory be viewed as providing a complete or finite answer to a knowledge problem; it is a step on the path to better understanding. Theoretical frameworks of learning are a dynamic and fluid part of knowledge, improving with new research and also with the new technologies that emerge and transform intellectual, social and economic horizons. Ideas improve and knowledge advances. The development of learning theory in the 20th century can be viewed as evolving, improving upon preceding schools of thought as scholars engaged in discussion, debate, conversation and responded to new information, ideas and technological opportunities.

If research programs are going well, then occasional challenging results are either quietly ignored, called interesting phenomena to be shelved for later study, or explained away. Only when an alternative view emerges, as cognitive theory emerged in the 1960s to rival behavior theory, do old problems appear significant. (Leahey & Harris, 1997, p. 44)

Change, moreover, is not a smooth process: it represents shifts and breaks in tradition. This is the case with the development of learning theories. Kuhn (1970) referred to the growth of intellectual creativity and progress as paradigmatic shifts and revolutions. Theories are products of their time and the transition from one theory to the next is based on discussion, debate and intellectual struggle as scholars try to make sense of particular knowledge problems with the information available at the time. Intellectual progress is a road of endless conversation and ongoing challenges. New theories are called epistemological breaks but also breakthroughs.

Hence the metaphor of a continuum or evolution (or, in Kuhn’s terms, a revolution) of ideas of learning, rather than a “good guy” theory versus a “bad guy” theory, is arguably essential to the study of learning. We continue to study and learn about how people learn; theories should be viewed as building upon (and reacting to) one another, enhancing and advancing our knowledge. We might think of spirals of knowledge, aggregating, advancing and improving over time. At the same time, it is essential to recognize and understand the assumptions that characterize each learning theory, and how learning was understood and organized at that time.

### *Behaviorist Learning Theory*

Behaviorist learning theory focuses on that which is observable: how people behave and especially how to change or elicit particular behaviors. Behaviorism provided a theory of learning that was empirical, observable and measurable.

Developed in the late 19th century, behaviorism was the first major theory of learning and represented a radical leap forward in terms of human science. Scientific method was still in its earliest days. The introduction of Comte’s notion of positivism represented a very profound shift in thinking; scientific method challenged and replaced metaphysics in the history of thought.

Hitherto, for millennia, metaphysics and divine intervention had been accepted as the cause of all social, human, physical and biological phenomena.

Behaviorism was one of the first examples of the use of scientific method to explain human action, psychology and learning, offering an explanation that could be empirically verified. Behaviorism introduced a way to study and to shape learning that could be repeated and replicated.

Looking back, we can see that behaviorism was limited and rigid in its perspective. But for its time, behaviorism was hailed as a breakthrough in its ability to study, measure and replicate the same results, time and again. This was a first and by no means modest achievement. Behaviorism, as one of the first positivist approaches to human sciences, was by necessity very narrow in its focus. It was a new approach and sought membership in the positivist scientific community. Behaviorism limited its lens to that which could be observed, emphasizing overt action as being most easily apparent and accessible for study. The term “overt action” refers to behavior; in other words, behaviorism focused on how we act and what impacts upon and changes how we act. Behaviorists limited their consideration to stimulus and response: a particular act stimulated a certain reaction, a response that could be observed, repeated and quantified. In this theory, there is no notion or consideration of thought processes in the mind—the mind is viewed as a black box, largely irrelevant.

Ivan Pavlov (1849–1936) is considered the intellectual founder of behaviorist learning theory. He is famous for his theory of classical conditioning. Burrhus Frederic Skinner (1904–1990) is also famously associated with behaviorist learning theory, but Skinner’s work differed from his Pavlovian predecessors in that he focused on what is referred to as voluntary or operant behavioral conditioning, a behaviorist approach different from classical conditioning.

Behavioral learning theory lent itself to instructional design based on very specific and discrete learning steps. And also, very importantly, to the mechanization of this instructional process through new forms of learning technologies such as teaching machines, programmed instruction and computer-assisted instruction (CAI).

Behaviorist learning theory is the focus of Chapter 3 in this book.

### *Cognitivist Learning Theory*

Limitations in the behaviorist framework of learning began to be recognized by the early 1920s. The major problem for researchers was that behaviorism was unable to explain most social behaviors. For behaviorist scientists, what you cannot see or measure does not count. Behaviorists would consider only what they could see and the ability to measure what was seen.

Yet, as researchers and psychologists involved in the scientific study of learning began to realize, the power of the mind to influence or make decisions that are not directly related to an external stimulus was highly significant. The mind did play a tremendous role, even if we could not “see” it.

If behaviorism treated the mind as a black box, cognitive theory recognized the importance of the mind in making sense of the material world. Cognitivism sought to understand what was inside the black box of the mind, in order to emulate it computationally. Emerging as it did during the rise of cognitive science and computer science, cognitivist learning theory absorbed and was influenced by the era. The mind became viewed as a computer: a powerful metaphor that characterized this approach was “mind as computer” (MAC). The model of students mentally processing information (just as computers processed information) is referred to as cognitive information processing (CIPs) and is a major theme in cognitivist learning theory.

Cognitivism was concerned with technology that could model the mind and represent knowledge, and cognitive scientists sought to develop educational technologies such as intelligent tutoring systems (ITS) and artificial intelligence (AI), in an attempt to mimic or replicate the human mind through computer programs. Cognitivism, while a learning theory distinct from behaviorism, nonetheless also presupposes that the primary role of the learner is to assimilate whatever the teacher

presents. Cognitive pedagogy, like behaviorist pedagogy, employed a didactic model of teaching: the cognitivist pedagogy was based on objectivist instructional design.

Cognitivist learning theory is the subject of Chapter 4.

### *Constructivist Learning Theory*

Constructivist theory refers to a theory or set of theories about learning that emerged, in part, in reaction to behaviorism and cognitivism. Constructivism emerged during a period of educational reform in the United States and was influenced by new constructivist psychological research and trends emerging in Europe, which emphasized the role of the individual in making sense of the world. Educational researchers and practitioners came to realize that humans could not be programmed, as robots are, to always respond in the same way to a stimulus. In fact, constructivists argued, the mind plays an enormous role in how people act when learning. And that role is not directly comparable to a software program based on discrete steps to consume and process information. Constructivism—particularly in its “social” forms—suggests that the learner is much more actively involved in a joint enterprise with the teacher and peers in creating (constructing) meaning.

Constructivism refers both to a learning theory (an empirical explanation of how people learn) and to an epistemology of learning (a view of the nature of knowledge). They are not identical terms, however. The constructivist learning theory explains how learners construct meaning. The constructivist epistemology refers to a philosophical view that knowledge is constructed through our interactions with one another, the community and the environment, and that knowledge is not something absolute.

The constructivist theory of learning holds that people learn by constructing their own understanding and knowledge of the world through experience and reflecting upon that experience. We are active creators of our own knowledge, reconciling our previous ideas as we encounter new experiences and information. We may change our ideas or discard the new information, based on our investigations, asking questions and assessing and negotiating what we know with others.

In the 20th century, the major psychologists and educators associated with constructivist approaches to teaching and learning were Jean Piaget and Lev Vygotsky.

Constructivist learning theories, pedagogies and technologies are examined in Chapter 5.

### **Learning Theory for the 21st Century**

#### *Online Collaborative Learning Theory*

As with learning theories of the 20th century, online collaborative learning (OCL) theory builds upon previous approaches, but presents a new perspective. OCL emerged with the invention of computer networking and the Internet, and the concomitant socio-economic shift from the industrial society to the Knowledge Age.

The three major theories of learning that emerged during the 20th century (behaviorism, constructivism and cognitivism) derived from the field of educational psychology. Robert Calfee’s (2006) article, “Educational Psychology in the 21st Century” identifies four key omissions or problems with 20th-century educational psychology that need to be addressed by theory in the 21st century:

First, educational psychology continues to struggle with the most appropriate relation to practice...

Second, the position of adults in educational psychology remains a puzzlement...

Third, neither HBEPI nor HBEPII<sup>1</sup> include “Learning” in a chapter title!...

A fourth and final set of issues centers around methodology. (pp. 30–31)

These four problems with 20th-century educational psychology reflect problems in 20th-century theories of learning, which need to be addressed in contemporary theory development.

In considering education for the 21st century, Calfee (2006) asks: “What should we be doing?” He identifies what he calls RIPs: Really Important Problems, one of which centers on “how best to provide *effective and efficient teaching and learning* for all children” (p. 35). A corollary topic, he writes, is the *role of technology in schooling*, given the incredible impact of technologies elsewhere in society. He writes:

Other than electrification, today’s classroom is remarkably unchanged from the end of the 19th century. The cast of characters and the activities remain virtually unchanged, along with the length of the school day and year and several other parameters. Schools have thwarted numerous innovations; radio, television, and even telephones have minimal presence in today’s classrooms. Systems that we take for granted outside the school walls—computers, the Internet, PDAs, handhelds—are either somnolent or prohibited. (p. 35)

These are important issues that call for new learning theories to be linked to practice and to real-world contexts and technologies.

Behaviorist, cognitivist and developmental constructivist theories of learning emphasized learning as an individualistic pursuit. Moreover, the epistemological basis of behaviorism and cognitivism was objectivism: objectivist epistemology holds that knowledge is fixed and finite, and ultimately, knowledge is truth. Knowledge is something that the teacher has mastered, and which students must now similarly master by replicating the knowledge of the teacher. The pedagogies emphasized “transmitting information” by the teacher as a way to “acquire knowledge” by the student, reflected in such didactic approaches as lectures or their mechanized versions in the form of teaching machines, computer-assisted instruction (CAI), intelligent tutoring systems (ITS) and courseware. This was the ethos of the Industrial Age, an era that emphasized the learner’s ability to acquire and retain information and associated skills. An implicit educational goal was that the student learn to follow instructions accurately to achieve the desired result.

The 21st-century Knowledge Age has introduced a very new mindset in society. Whereas the Industrial Revolution extended and leveraged our physical capabilities to manipulate objects far beyond muscle power alone, the Internet Revolution and ensuing Knowledge Age emphasizes, extends and leverages our mental capabilities. OCL is proposed as a framework to guide understanding and practice of education in the Knowledge Age. Unlike the behaviorist and cognitivist emphasis on instructions for replicating a textbook answer, OCL focuses on knowledge-building processes. OCL theory differs from constructivist learning theory, by locating active learning within a process of social and conceptual development based on knowledge discourse.

One important advantage of knowledge building as an educational approach is that it provides a straightforward way to address the contemporary emphasis on knowledge creation and innovation. These lie outside the scope of most constructivist approaches, whereas they are at the heart of knowledge building. (Scardamalia & Bereiter, 2006, p. 99)

OCL provides a learning theory and pedagogy that addresses 21st-century needs and opportunities. As discussed in Chapter 6, OCL theory is grounded in educational practice and focuses on learners of all ages as participants in 21st-century online knowledge communities, whether in formal, nonformal or informal educational settings. Chapters 7, 8 and 9 explore examples of OCL in practice.

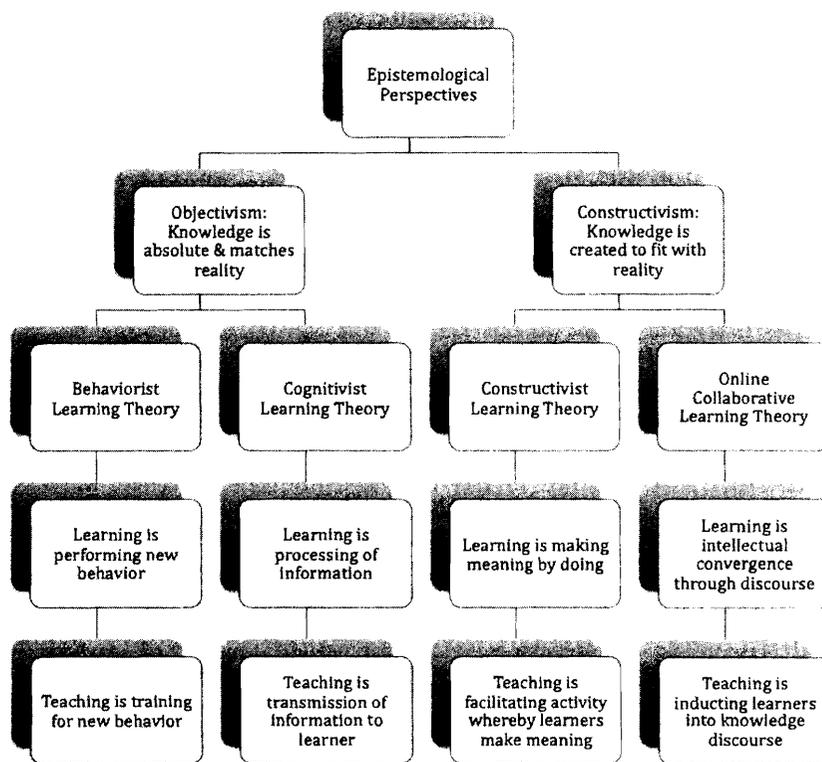


Figure 1.2 Epistemological Perspectives on Learning Theories.

**Summary**

Chapter 1 addressed the current challenges of teaching and learning in an increasingly online world, in particular the need for learning theories that can speak to and guide education in this context. It explored the definition, importance and role of a theory of learning in general, and discussed how learning theory is based on key concepts such as epistemology, scientific method and knowledge communities.

Chapter 1 revealed that the rise of learning theories was relatively recent; theories of learning, as with most scientific theories, first appeared toward the end of the 19th century and early in the 20th century, as part of the emergence of modern science and scientific method. Learning came under the scrutiny of scientific study around the same time that topics related to human and natural behavior came to be studied and organized within the framework of “theory.” During the 20th century, scientific learning theories were articulated, built upon and gained increasing importance in the study and practice of education. Three major learning theories influenced education in the 20th century: behaviorism, cognitivism and constructivism. These learning theories are also each associated with particular learning pedagogies and learning technologies. A theory of learning for the 21st century, Online Collaborative Learning, is also introduced. These four learning theories are each explored in subsequent chapters.

As Chapter 1 has introduced and Chapter 2 will expand on, learning and technology have been intertwined with one another throughout human history. Together, new learning needs and new technologies have contributed to major social and civilizational shifts, as discussed in Chapter 2.

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