Chapter 8

KNOWLEDGE AND KNOWING: THE JOURNEY FROM PHILOSOPHY AND PSYCHOLOGY TO HUMAN LEARNING

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> And is it not shameless when we do not know what knowledge is, to be explaining the verb "to know?". . . Thousands of times have we repeated the words "we know," and "do not know," and "we have or have not science or knowledge," as if we could understand what we are saying to one another, even while we remain ignorant about knowledge. (Plato, *Theaetetus*, trans. 2006)

In the dialogue *Theaetetus*, Plato captures a poignant exchange between Socrates and a bright, if somewhat confident, young man who steps into a proverbial hole in reasoning that he has unwittingly dug for himself. In this exchange, Socrates makes it evident to Theaetetus that "from the very beginning," their discussion was about "a search after knowledge, of which we are assumed to know the nature" (Bostock, 1988, pp. 110–111). Yet, as the opening lines of this chapter make apparent, Socrates held that we truly know little about the nature of knowledge despite our unabashed use of the term and our frequent claims to know this or understand that.

For this chapter, we have been tasked with a goal that Socrates might perceive as fruitless or at least foolhardy. That is, we have been asked to capture the nature of knowledge and knowing and to position that nature within the discipline of educational psychology. So that we do not follow Theaetetus down that proverbial hole in reasoning, we immediately refute any notions that we possess truth about knowledge and knowing or that we are purveyors of epistemological wisdoms. In fact, what we will endeavor to show herein is that there is not one truth about what it means to know that has or ever will represent the whole of our discipline, much less other learning-related disciplines (e.g., psychology or philosophy). Rather, there are many interpretations of the noun *knowledge* and many conceptual variations of the verb *to know* that populate our discourse and guide our inquiries.

Indeed, even a cursory review of contemporary philosophical, psychological, and educational literatures reveals countless conceptualizations of knowledge and knowing (Moser & vander Nat, 2003; Reynolds, Sinatra, & Jetton, 1996). This myriad of conceptualizations is not simply indicative of these professional literatures but can also be found within the ways in which educational practitioners, policymakers, and the general public use these everyday constructs. The difficulty, of course, is that just as Socrates admonished Theaetetus centuries ago, it is problematic that individuals so commonly speak of knowledge or invoke the verb *to know* despite remaining relatively ignorant as to their nature. It is for this very reason that the variability in conceptualizations of knowledge and knowing present in everyday parlance represents a deeper concern for educational psychologists than mere differences in communication style.

Specifically, the ways in which individuals use the terms *knowledge* and *knowing* can signify underlying epistemic beliefs (i.e., beliefs about knowledge and knowing) that color perceptions and guide

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actions. For instance, this claim can be made of classroom teachers who routinely make judgments regarding the extent to which their students have acquired valued knowledge or teachers who construct lessons that they believe will promote knowledge acquisition or enhance the process of knowing (Edwards, 2007). Indeed, some have argued that every student and every teacher has constructed a personal theory of knowledge and knowing, however unvoiced or untested that theory might be (Chinn, 1998).

What compounds this communication issue even further is that there is a plethora of knowledge terms that populate everyday discourse as well as the professional literature. Introductory educational psychology texts are replete with such terminology, including prior or background knowledge; domain and topic knowledge; and declarative, procedural, and conditional knowledge, to name but a few. Yet, this unbridled spawning of knowledge-related terms has not resulted in any greater conceptual clarity for the everyday users, and the situation is not appreciably better for members of the educational psychology community (Alexander, Schallert, & Hare, 1991). Thus, it is essential for us to explore the many faces of knowledge and knowing and do so in a manner that would contribute to a deeper and more integrated understanding of these constructs, lest we "remain ignorant about knowledge" (Plato, *Theaetetus*, trans. 2006).

For that reason, we first look back to the historical and philosophical roots of present-day theory and research on knowledge and knowing. We do so by overviewing several classical philosophical theories of knowledge and knowing (e.g., foundationalism, coherentism, and contextualism) and by delineating their defining features. We then carry those theories forward into more contemporary discussions of knowledge and knowing both in philosophy and educational psychology.

We begin our historical journey with a summary of the types and sources of knowledge that classical and contemporary philosophers have considered in discussions of knowledge and knowing and then traverse into how these constructs have been considered in learning theory. As we travel this epistemic journey, what will become painfully apparent are the profound influences and interconnections between classical and contemporary philosophical conceptualizations of knowledge and knowing and the ways in which these constructs have become embodied in theories of learning. Arguably, nowhere is knowledge and knowing more intricately intertwined within our disciplinary heritage than in the study of human learning and in the articulation of theories and models of learning. For that reason, we dedicate a substantive portion of this chapter to the complex yet critical association between knowledge and knowing and theories of learning.

To aid our discussion of conceptions of knowledge and knowing as represented in philosophical theories and learning theories, we discuss each theory in turn while simultaneously positioning the collection of theories within epistemic vector space so that their contrasting views are more apparent. We have found that this notion of epistemic vector space facilitates discussion of critical differences in views of knowledge and knowing (Alexander, 2006, 2007). This positioning also serves as a visual tool for linking philosophical stances with contemporary learning theories. The epistemic vector space, as shown in Figure 8.1, is formed by the intersection of two critical questions about knowledge and knowing. The first question, forming the horizontal axis, focuses on the source of knowledge, whereas the second, positioned along the vertical axis, pertains to where knowledge ultimately resides.

Because of the importance the two aforementioned questions play in establishing the epistemic vector space, we want to describe each question in some detail. Specifically, the horizontal axis, or abscissa, asks the critical question about where knowledge derives. As we will come to see in the historical and philosophical discussions that follow, there are those who would hold that knowledge is solely the construction of one's mind and has nothing to do with physical or metaphysical reality. This extreme position is depicted at the end of the abscissa as "individually formed" (see Figure 8.1). At the other extreme on the horizontal axis is "socially derived" knowledge. Those positioned at this extreme take the antithetical stance that knowledge is completely derived from the social, cultural,

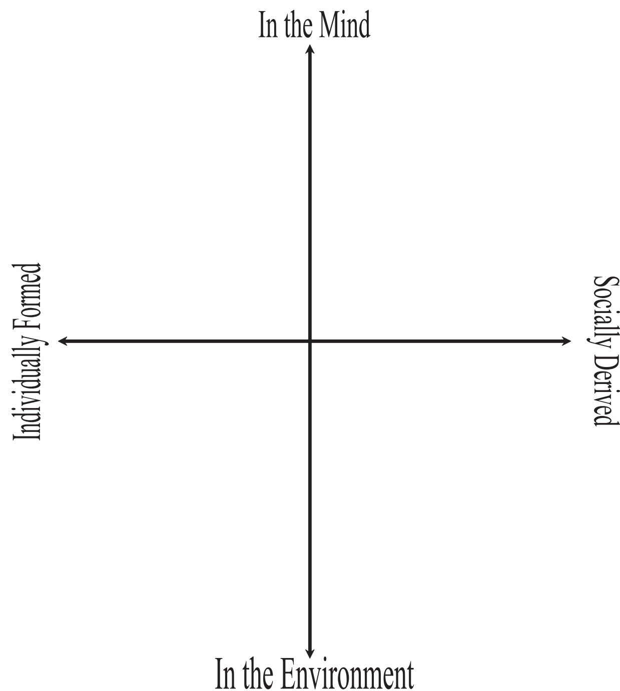

FIGURE 8.1. Representation of the epistemic vector space formed by the intersection of positions on questions regarding the source of knowledge (horizontal axis) and where knowledge resides (vertical axis). From "Bridging the Cognitive and Sociocultural Approaches in Conceptual Change Research: Unnecessary Foray or Unachievable Feat?" by P. A. Alexander, 2007, *Educational Psychologist, 42,* p. 68. Copyright 2007 by Taylor & Francis, http://www.tandf.co.uk/journals. Adapted with permission.

and physical world in which the individual exists. From this perspective, all knowledge is socially constructed. It is seeded and continually fed by the physical environment and the social and cultural interchanges that transpire in that environment; the mind has no independent role to play in its formation. Positioned between these two extreme points on the abscissa are beliefs about the source of knowledge that give some acknowledgment to both the individual mind and the sociocultural, physical context in which that mind is situated.

By comparison, the vertical axis, or ordinate, addresses the question of where knowledge ultimately resides. There are those who contend that knowledge is entirely held in the mind or brain of the knower. We position those individuals at the upper end of the vertical axis labeled "in the mind." From this more extreme position, minds are conceptualized as storehouses of knowledge, and the process of knowing entails acquiring or possessing knowledge, which can later be retrieved and applied as the situation demands (Sfard, 1998). Conversely, from the other extreme, marked as "in the environment," knowledge is held to exist only in the world, bound to some specific time or place or part of a greater social consciousness. Those who position themselves at this point on the continuum believe that individuals may respond, react, or participate in that knowing but that no one person can ever "possess" knowledge. Sfard fondly described those espousing this knowledge in the context perspective as PMs (participation metaphors) and contrasted them with the AMs (acquisition metaphors) at the other end of this axis who privilege the individual mind. Between these two points are a multitude of views about the home of knowledge and knowing that pay homage to both the individual mind and the sociocultural, or physical, environments as the receptacles of knowledge. Before delving into these views, we begin with a brief definition of philosophy's epistemology, or theory of knowledge.

PHILOSOPHICAL MUSINGS ABOUT KNOWLEDGE AND KNOWING: FROM PAST TO PRESENT

The theory of knowledge, or epistemology (from the Greek words *epistem* for knowledge and *logos* for explanation), is the study of the nature of knowledge and justification (Honderich, 1995; see Chapter 9, this volume; because of the complexity and potential unfamiliarity of some terminology in the ensuing discussion, we have provided a glossary at the end of this chapter (see Appendix 8.1) that defines key historical and philosophical terms marked in italics within this section, e.g., *epistemology*). From the ancient Greek philosophers, like Socrates, Plato, and Aristotle; to the medieval philosophers, like Saint Augustine and Saint Thomas Aquinas; and from the early modern philosophers, including Descartes, Hobbes, Locke, Hume, and Kant; to more contemporary philosophers like Moser, BonJour, Rorty, Chisholm, and Dretske, attempts have been made to answer three traditional epistemological questions: (a) What are the limits of knowledge and justification? (b) What are the substantive conditions or

sources of knowledge? and (c) What are the defining features of knowledge?

These three questions have resulted in centuries of controversy over whether there is any knowledge or justification and, if so, what the genuine sources of knowledge include and how that knowledge is acquired and represented. Moreover, evaluation of the nature of knowledge concerns the analysis of concepts that are foremost in discussions of knowledge. The two most prominent concepts are *knowledge* and *justification*. What does it mean to know something? What does it mean for a proposition to be justified? Justification, from an epistemological standpoint, is ascribed to a belief, or proposition, when that belief satisfies some evaluative norms concerning what an individual ought to believe. Justification may include supporting reasons or evidence, which are judged by the extent to which truth is obtained and error is avoided. As we discuss in subsequent sections, many philosophers have debated whether a justified belief constitutes knowledge.

To exemplify the justification process, let us say that Sam believes the sky is blue. When asked why he believes it is blue, Sam responds, “Because I can see that it is blue.” In this case, he is justified in believing that the sky is blue given his empirical evidence (i.e., he sees it as such). Sam, then, is epistemically justified in believing the sky is blue because his evidence is appropriate. The concern for what is justified (i.e., the belief) and what provides that justification (i.e., reasons, evidence, or otherwise) is central to the nature of justification itself (Arner, 1972).

Prior to delineating epistemological positions relevant to educational psychology, it is necessary for us to establish a priori that although we discuss various theories of knowledge separately, this should not be taken to mean that they are mutually exclusive. Rather, there are many similarities and derivations that we could not possibly cover in a page-constrained chapter. To simplify our task, we have made some generalizations where necessary but highlight what we believe to be important distinctions and similarities among them. Finally, prior to taking the journey down the epistemological road, we first demarcate the types of knowledge, as well as the sources of that knowledge, that philosophers have described in their discussions of knowledge and knowing.

Types of Knowledge

Like educational psychologists (e.g., Alexander et al., 1991), philosophers have identified several types of knowledge that are either explicit or tacit (Moser, 1996). *Explicit knowledge* is self-conscious knowledge in which the knower is aware. For example, explicit knowledge is something that an individual can document, share, define, measure, or represent in some way: knowledge that can be articulated in formal language and includes, for example, grammatical statements, mathematical expressions, and the exact sequences of steps or actions necessary to accomplish or perform something. In contrast, *tacit knowledge* is unconscious knowledge of which the knower is not aware, and is defined as personal knowledge embedded in individual experience. According to Moser, much of our knowledge is tacit and, in this regard, resembles many of our psychological states. Even if we become aware of that knowledge after some reflection, it is still regarded as tacit knowledge. Tacit knowledge includes representations such as personal beliefs, perspectives, value systems, the actual performance of skills, and other noncodified, disembodied know-how that is acquired through behavior and experience.

The specific types of knowledge that philosophers have discussed include various kinds, five of which we describe here. The first is *propositional knowledge*, or knowledge that something is so, which is similar to educational psychologists’ declarative knowledge. An example of propositional knowledge is “the capital of Canada is Ottawa.” The second type of knowledge is *nonpropositional knowledge* of something, which was originally proposed by Russell (1912/2007). According to Russell, only objects of immediate experience are known by acquaintance through our direct awareness of them. For example, we have knowledge of the color of this paper because of our direct awareness of it. A third type of knowledge is *empirical*, or *a posteriori*, *propositional knowledge*, which is knowledge obtained by experience or sensorial information. The natural and social sciences are typically considered a posteriori

disciplines, and examples include "all things fall down on earth" (an empirical proposition about gravity), and "water is H_2O: two parts hydrogen and one part oxygen."

Another type of knowledge is *nonempirical*, or *a priori*, *propositional knowledge*, which refers to any knowledge that is justified independently of experience. Examples include knowledge that 12 + 18 = 30, the square on the hypotenuse of a right-angled triangle equals the sum of the squares on the other two sides, and bachelors are unmarried. Finally, the last type of knowledge is *procedural knowledge*, or knowledge of how to do something. Examples include knowing the method for carrying out a science experiment, writing an essay, or solving a mathematics problem. The focus of most philosophical discussions about knowledge and knowing has centered primarily on propositional knowledge (Moser, 1996). For that reason, the various positions on the theory of knowledge that we present here include considerations of propositional knowledge.

Sources of Knowledge

Just as knowledge can be divided into several types, philosophers have also divided knowledge according to the sources from which it arises. Whereas some philosophers have proposed that there are four sources of knowledge, others have argued for six. That is, traditionally, philosophers suggested there were four sources of knowledge: sensation (i.e., perception), memory, introspection, and reason (Honderich, 1995). More recently, however, philosophers have also included testimony and inference as plausible sources of knowledge (Bernecker & Dretske, 2007). Here, we present five common sources of knowledge: perception, introspection, memory, testimony, and inference. In subsequent sections, we detail Kant's perspective on reason as a source of knowledge.

Perception. *Perception* entails the extraction and use of information about one's environment and one's self through the senses (i.e., sight, hearing, touch, smell, and taste). Thus, considerations of perception as a source of knowledge include discussions of how perceived information becomes knowledge as well as what type of reality, if any, that information represents. Bernecke and Dretske (2007) reported that there are several different views on the nature of perception, but the primary division is between *direct* and *indirect realism*. Direct realists argue that what we are directly aware of in sense perception are real objects, things that exist even when we are no longer aware of them. In contrast, indirect realists claim that although there is a world of mind-independent objects that cause us to have experiences, what we perceive are the effects of these objects, which are accurate representations of some external reality. Just like a television is a portrayal of some other remote cause, our perception of external objects is indirect.

Introspection. Introspection from a philosophical perspective is similar in some ways to educational psychologists' notion of metacognition, with introspection being more general. *Introspection*, or consciousness, is the attention the mind gives to itself and its own operations (Cassam, 1994; Dretske, 1995). When we engage in introspection, we are attempting to figure out what we want, think, or feel, which typically results in some self-ascription of some psychological property, such as, "I want food," "I am confused," or "I am happy." Although many theorists have argued the fallibility of the mind and that introspective beliefs are subject to misinterpretation, self-deception, and error, they do possess some kind of epistemic authority. That is, the thoughts, feelings, and needs that an individual has are things that no other person can claim to have. This is called *first-person authority* or *privileged self-knowledge* (Dretske, 1995).

Memory and testimony. *Memory*, the retention of or capacity to retain information or past experience, has been a controversial topic among philosophers with regard to whether it is a genuine source of knowledge (Audi, 1998). Whereas some philosophers have argued that memory only retains and preserves knowledge, others have claimed that memory also produces knowledge (e.g., Ginet, 1988). Those who have suggested that memory can produce knowledge insist there are cases in which a person first comes to know by remembering. What passes into the mind is first a belief or datum but not

knowledge; that datum or belief must be processed in some way (e.g., via cognitive mechanisms) before it becomes knowledge. Alternatively, as Audi (1998) noted, there may be cases in which an individual might use memory to construct new knowledge. That is, an individual may have an experience but does not understand that experience as knowledge at the time it occurs. After coming to understand the concepts involved, he or she may then remember that a personal experience applies to the new concepts learned. For example, young children are sometimes able to describe from memory experiences that they had before they learned any language adequate to describe those experiences (Ginet, 1988). As another example, an individual may learn about how many windows there were in the house in which he or she grew up by imagining walking through the house and counting all of the windows in each room. In this situation, that individual would need to remember what the rooms were and what each room looked like. In this regard, one's memory of something is used to create new knowledge.

In contrast to memory, some philosophers view *testimony* as the primary source of the majority of our knowledge. According to this stance, when one learns from a teacher, for example, one may judge that person to be a reliable source of information. Therefore, any information from that person must be true (Sosa, 1991), much like the authority as a source of knowledge dimension in epistemic belief research in educational psychology. As Reid (1764/1997) suggested, these types of testimonial beliefs are typically noninferential; we normally believe what people tell us without question. Hume and others argued, however, that testimony can be reduced to some form of memory, perception, or inference, which excludes testimony from being an independent source of knowledge (Coady, 1992).

Inference. The last source of knowledge that has received attention in philosophical discussions of knowledge is *inference*. As a source of knowledge, inference can be inductive or deductive (Bernecker & Dretske, 2007). In a valid deduction, the conclusion necessarily follows from the premises so that it is not logically possible for the conclusion to be false. In inductive reasoning, however, the derivation of knowledge is not so straightforward. Through inductive reasoning, we begin with a set of observations about something (e.g., this swan is white, and that swan is white) and derive generalizations (e.g., all swans are white) or predictions about unexamined instances (e.g., the next swan we see will be white).

This type of reasoning runs into obvious difficulty; unless all swans are examined, there is no guarantee that the conclusion will be true. It is possible that we might come across a swan that is not white. Accordingly, in a valid induction, the evidence does not entail the conclusion, unlike deductive reasoning. At best, inductive arguments make their conclusions probable. The probability of an inductive argument being true ranges from 0 to 1 with .50 representing an equal probability of being true or false (Russell, 1912/2007). At a probability of .50, one may as well guess, but as Plato and other ancient philosophers argued, lucky guessing does not count as knowledge.

In summary, philosophers have identified several types of sources of knowledge, which traditionally were sensation, memory, introspection, and reason. Today, philosophers also consider testimony and inference as plausible sources of knowledge. Moreover, like educational psychologists, philosophers have also discussed various types of knowledge, ranging from propositional (i.e., declarative) to non-propositional knowledge and procedural knowledge. In fact, discussions of what counts as knowledge were primary considerations with ancient philosophers and continue to be so today. To illustrate the various positions on what constitutes knowledge, we next describe ancient and modern classical positions in philosophical epistemology, beginning with Plato. To aid readers along this historical journey, a summary of the various philosophers' positions and other views is presented in Table 8.1.

Ancient Classical Views: The Classical Period in Greece (500–300 BC)

> And what, Socrates, is the food of the soul?
>
> Surely, I said, knowledge is the food of the soul; and we must take care, my friend, that the Sophist does not deceive

TABLE 8.1

A Summary of the Ancient and Modern Classical Views of Knowledge

Person or stance	Views of knowledge and reality	Source of knowledge	Justification of knowledge	Where knowledge resides
Plato (427–347 BC)	There are three necessary and sufficient conditions for knowledge: justification, truth, and belief. Knowledge is justified true belief and represents an objective reality (i.e., an imperceptible world of eternal ideas).	Reason	Rationalism	Internal, in the mind
Aristotle (384–322 BC)	Knowledge represents a mirror image of reality (i.e., perceptible world of concrete objects).	Perception (direct realism)	Empiricism	External, in the environment
René Descartes (1596–1650)	Knowledge is constructed from the ground up; no belief can be justified as knowledge unless it is founded on a basic principle. Knowledge must be certain.	Rationalism, but observation and hypothesis testing also important for knowledge acquisition	Rationalism	Internal, in the mind
John Locke (1632–1704)	Knowledge differs from belief. Knowledge is accompanied by belief but is not identified with it. Knowledge is direct awareness of some fact.	Perception (indirect realism)	Empiricism	External, in the environment
Logical positivism/ behaviorism (1920s–1950s)	Knowledge is traceable to elements of experience and must be verifiable through experience or observation.	Perception	Empiricism	External, in the environment
Immanuel Kant (1724–1804)	Knowledge results from the organization of perceptual data on the basis of inborn cognitive structures.	Intuition and understanding	Intuition and understanding	Internal, in the mind

> us when he praises what he sells us. . . . If therefore you have understanding of what is good and evil, you may safely buy knowledge. (Plato, trans. 2004, p. 159)

Plato. In the dialogue between Plato and Socrates just quoted, Plato discusses whether virtue can be taught and whether it counts as a branch of knowledge. Socrates's fear was that virtue could not be taught and that if ignorance was considered evil, then it was an ignorance of the soul and an inability to understand. Plato warns Socrates that we must be careful about what we consider knowledge, for if we are wrong, then certainly we are ignorant—and thus, evil. Plato then postulates that we must be able to make the distinction between *knowledge* and *belief*, and if we can, then we can buy knowledge. In this regard, the "purchasing" of knowledge reflects Plato's belief that individuals do not actively construct knowledge but rather passively consume knowledge. This belief in a passive acquisition of knowledge was prominent in many of the ancient classical views.

Ancient classical views, which can be traced back to Plato's *Theaetetus* and *The Republic*, claim that what distinguishes knowledge from true belief and lucky guessing is that knowledge is based on justification (Everson, 1990). In *The Republic* (trans. 1993),

Plato suggested that for a proposition to be considered knowledge, it should be free from error. To Plato, the major concern about the nature of knowledge was what distinguished knowledge from belief (*doxa* in Greek). Returning to his original ideas in *Meno* (trans. 2005) and *Theaetetus*, Plato contemplated that true belief can be construed as knowledge by justifying it by means of reason (i.e., rationalism) or cause, but he failed to provide an adequate account of what that cause or reason might sufficiently entail (Burnyeat, 1990; Woodruff, 1990). In *Theaetetus* and *Meno*, Plato proposed that propositional knowledge has three individually necessary and sufficient conditions: justification, truth, and belief. These three conditions have led to the traditional analysis of propositional knowledge: You know that *P* if and only if you have a justified true belief that *P* (Moser, 1996). Using formal logic, the standard analysis of propositional knowledge can be expressed in the following syllogistic form:

1. *P* is true.
2. *S* believes that *P*.
3. *S* is justified in believing that *P*.

That is, knowledge requires three conditions: a belief condition, a truth condition, and a justification condition. Not only must the belief and truth conditions be satisfied, but also the satisfaction of the belief condition must be appropriately related to the satisfaction of the truth condition. This requirement leads to the justification condition for knowledge, wherein the condition excludes coincidental phenomena such as lucky guessing (Moser, 1996). From this view, propositional knowledge is, by definition, justified true belief (Everson, 1990; Rorty, 1996).

Aristotle. Even as a pupil of Plato, Aristotle's position on the justification of knowledge stood in contrast to the Platonistic view. Specifically, although Aristotle was aware of challenges to claims of knowledge, the justification of knowledge claims in response to such challenges was at best peripheral to Aristotle's concerns. Aristotle did not argue that knowledge is possible but, assuming its possibility, attempted to understand how it is realized in various fields of mental activity and how the states in which it is realized relate to other cognitive states of the individual. Aristotle thus placed more emphasis on empirical methods (i.e., empiricism) for gathering knowledge but accepted Plato's view that such knowledge is an apprehension of necessary and universal principles (Taylor, 1990).

Skepticism. Although many philosophers attempted to answer the traditional questions that arose from the standard analysis, one ancient school of thought refused to grant that there is any knowledge or justification (Sosa, 1994). Influenced by Socrates's observation, "All I know is that I know nothing" (Popkin, 2003, p. xvii), the Greek skeptics challenged the belief that humans can acquire knowledge or be justified in knowing. Their challenges led to a set of arguments to establish that (a) no knowledge is possible, or (b) there is insufficient and inadequate evidence to determine if any knowledge is possible; thus, judgment on all questions about knowledge should be suspended (Popkin, 2003). After maintaining its status for over 2 centuries, *skepticism* ended as a school, but its challenges have been long influential, as evidenced in writings from modern philosophers, such as Descartes and Kuhn, to more contemporary pragmatist philosophers like Rorty (Sosa, 1994).

Modern Classical Views: The Era of European Colonization (1600–1800)

> *Cogito ergo sum* (I think, therefore I am).
> (Descartes, *Meditations)*

Descartes's rationalism: The beginning of a foundationalist philosophy. Following the Renaissance, two main epistemological positions were dominant in philosophy: *rationalism* and *empiricism* (Packer & Addison, 1989). Descartes, the originator of modern rationalism, focused on the need for the mind to examine itself both actively and systematically, emphasizing the analysis of reason and logic (Cottingham, 2008). That is, Descartes challenged previous conceptions of a passive acquisition of knowledge and further proposed that knowledge must be certain. This notion of certainty led to the development of what is known today as *foundationalism*.

More generally, Descartes viewed mathematics as a paradigm for all human understanding, which led to the development of his Cartesian science and

dualism (i.e., Cartesian meaning that which relates to Descartes and his ideas). The foundation of Descartes's science was that of innate ideas, primarily those of mathematics. He argued that these innate ideas were reliable given that God implanted those ideas in our minds at birth, hence, innate. Moreover, he believed that to improve understanding of scientific phenomena, wherever possible, attempts should be made to reduce those phenomena to quantitative descriptions of arithmetic and geometry (Cottingham, 2008). That is, Descartes proposed to mathematize science and described the material world as an indefinite series of variations in shape, size, and motion, which he called *res extensa* (i.e., extended substance; Cottingham, 2008). This extended substance included all physical and biological events and complex animal behavior.

There was, however, one exception to this rule of reducing phenomena to quantitative descriptions: namely, conscious experience. Descartes argued that thought was distinct from matter, which subsequently led him to propose a dualism between mind and body, now famously known as his Cartesian dualism. According to Descartes, the mind and body have nothing in common; in contrast to the body, the mind is invisible, indivisible, and immortal. He construed the mind as a *res cogitans*, or thinking substance, which is entirely independent of the res extensa. Moreover, each individual is a unique "thinking substance" and, as Descartes described,

> this "I," that is to say, the mind by which I am what I am, is wholly distinct from the body, and is even more easily known than the latter, and as such, that although the latter were not, it would still continue to be all that it is.

Hence, "I think, therefore I am." (Descartes, 1637/2008, p. 27)

Additionally, in his famous simile representing his Cartesian system, he described philosophy as a tree: The roots of the tree are *metaphysics*, the trunk physics, and the branches various sciences (Cottingham, 2008). This analogy captures three important aspects of his Cartesian system. First, in contrast to Aristotelian conceptions of the sciences as a series of separate and unrelated disciplines, the roots captured Descartes's view that all knowledge is essentially united and linked together. The second aspect, the tree, reflects his belief that the utility of philosophy should not be for its theoretical musings but rather for its pragmatic purposes; that is, the knowledge that we achieve should be useful in life, and knowledge should be gathered from the practical sciences (i.e., the branches).

Finally, Descartes's likening of metaphysics to the root of the tree captures the primary tenet of foundationalism—that knowledge must be constructed from the ground up and that no belief can be justified as knowledge unless it is founded on a basic principle (Cottingham, 2008). Although Descartes is typically labeled as a rationalist, he also suggested that we cannot rely solely on reason alone given the mind's imperfections. Rather, he considered empirical observation, hypothesis testing, and quantitative explanations as playing an important role in the construction of knowledge. Nonetheless, central to his philosophy was that the fundamental building block of knowledge was innate (i.e., inborn) ideas, chiefly those of mathematics (Cottingham, 2008).

Locke's empiricism: The basis for logical positivism. In contrast, Locke, the founding father of modern empiricism, disagreed with Descartes's views about extended and thinking substances. Locke maintained that none of our ideas are innate; rather, the mind at birth is like a *tabula rasa*, or blank tablet, and all of our ideas are derived from experience (Wolterstorff, 1996). These ideas, however, do not automatically make up our knowledge, thus knowledge is not derived from our senses. Rather, knowledge is a product of reason that works through the connections between those ideas, which are acquired through experience. Locke further argued that all ideas and knowledge could be accounted for by examining the ways in which the mind processes information via sensation and reflection (e.g., self-awareness).

In this regard, Locke's empiricism about ideas was in some ways influenced by a rationalist perspective about knowledge. However, the main distinction between Descartes and Locke is that Locke maintained that the materials that make up knowledge come from the external world, not internally

from our minds. For example, he described the primary qualities of objects in the world, such as solidity, extension, figure, motion or rest, and number, as ideas being resemblances of these qualities (Packer & Addison, 1989). Locke's account, then, is one that positions knowledge acquisition as being passive, of the mind as being blank at birth but, over time, filled with ideas through experiences, which mirror an external reality. His views of knowledge and belief differ, wherein knowledge is typically accompanied by belief but is not identified with belief. Rather, knowledge is a direct or explicit awareness of some fact, the perception of some agreement or disagreement among things. In contrast, belief consists of taking some proposition to be true whether or not one is aware of the corresponding fact (Wolterstorff, 1996). Therefore, according to Locke, only that which we perceive through our senses can be considered knowledge; all else is mere belief (Wolterstorff, 1996).

"Empiricisms" and "rationalisms." Both Descartes's and Locke's accounts of rationalism and empiricism, respectively, influenced the development of other derivations of these theories resulting in various rationalisms and empiricisms. For example, one philosophical movement inspired by Locke's empiricism was *logical positivism*, which began in the 1920s and flourished until the 1950s. These "radical empiricists" believed that knowledge was traceable to elements of experience and, therefore, must be verifiable through experience or observation (Audi, 1999). The verifiability criterion reflected radical empiricists' view that ideas are composed of simple, traceable elements in experience. Radical empiricists argued that if thoughts (i.e., what they called *mentalistic expressions*) about the empirical world are developed from ideas, then all thoughts about the world must represent some form of experience. Thus, verification of knowledge occurs when those thoughts can be observed.

Take, for example, that Megan sees a table in front of her. For that table to be meaningful, it must be possible for Megan to accumulate evidence or justification that would guarantee the existence of the table, which would make it impossible for the table not to exist. As another example, let us say that Paula believes that all swans are white. To justify this belief as knowledge, Paula must confirm that all swans are white by looking for white swans. When she sees several white swans in a row, she has justified this belief with confirmatory evidence. Of course, this type of justification is vulnerable to many objections, as it is doubtful that any set of observations could ever conclusively verify them.

Given the weakness of the extreme version of the verification principle, most logical positivists adopted a foundationalist epistemology, wherein all justified beliefs rely on beliefs that are noninferentially justified. Noninferentially justified beliefs include beliefs that are described as basic or self-evident; they do not require further justification and are merely accepted as knowledge without justification. This foundationalism drove most positivists to adopt an extreme reductionism, the view that very complex statements about the physical world could be reduced to their constituent parts, which could be expressed as statements about sensations (Audi, 1999). These statements, in turn, represent mentalist expressions, or thoughts, which can be further reduced to human behavior.

Thus, logical positivists who reduced talk to human behavior were known as logical behaviorists (see Figure 8.2 for placement of logical behaviorism along the epistemic vector space). These logical behaviorists further claimed that statements containing mentalistic expressions can be translated into some publicly testable and verifiable statements that describe behavior and bodily processes. Accordingly, *logical behaviorism*, and logical positivism in general, undergirded psychology's scientific behaviorism, which was first proposed by Watson and later expanded by Skinner (Audi, 1999).

According to Packer and Addison (1989), although Descartes's and Locke's accounts of the nature of knowledge, and variations of them, seem at opposite ends of the spectrum, they share assumptions about knowledge. The first commonality is a dualistic view of the mind and world as two distinct bodies. The second commonality is a belief that they had identified the genuine source of knowledge and that physical science provided a clear and satisfactory model for all analytical inquiry. Differences, however, can also be clearly

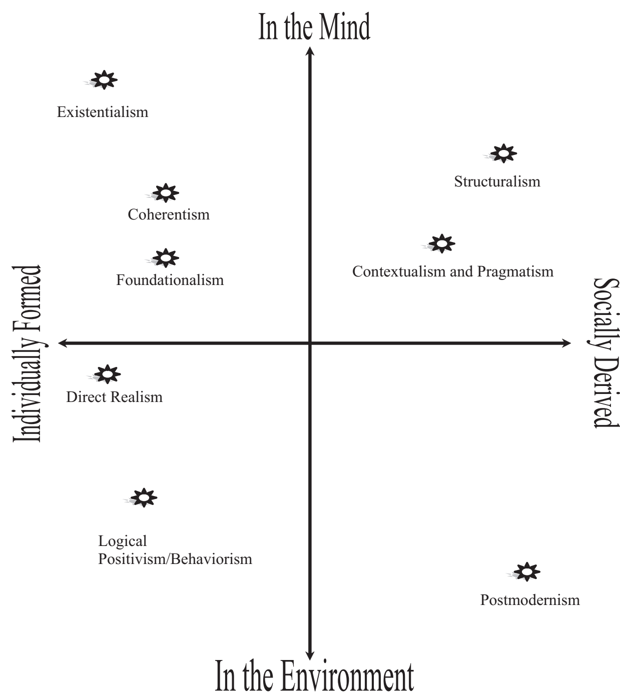

FIGURE 8.2. The positioning of philosophical theories within epistemic vector space formed by the intersection of positions on questions regarding the source of knowledge (horizontal axis) and where knowledge resides (vertical axis). From "Bridging the Cognitive and Sociocultural Approaches in Conceptual Change Research: Unnecessary Foray or Unachievable Feat?" by P. A. Alexander, 2007, *Educational Psychologist, 42,* p. 68. Copyright 2007 by Taylor & Francis, http://www.tandf.co.uk/journals. Adapted with permission.

articulated. For example, empiricists like Locke assumed that the process of scientific inquiry was value free, interpretation free, and uninfluenced by human concerns or practices. Its primary goal was to discover lawful generalizations about events in an objective universe. Empiricists argued that the foundation for scientific inquiry lies in the form of independent entities with absolute properties, unquestionable observables that are mapped directly onto the senses. They further contended that the structure of knowledge includes statements of regularities among data that are in the form of causal laws. If these structures correspond with reality, then they are justified knowledge.

In contrast, rationalists like Descartes attempted to restructure human knowledge and experience into formalistic abstractions that give greater credence to those formal syntactical structures than to the experiences themselves (Triadafillidis, 1998). That is, rationalists argued for a construction of knowledge that was built on the creation of meaning through the use of formal mathematical equations and representations (e.g., syntax) rather than through individuals' experiences. Illustrations of these formal abstractions continue today, as can be seen in the following mathematical representation of the human respiratory control system by the Henderson–Hasselbalch equation, which describes the relationship between pH (the acidity of a solution), carbon dioxide concentration, and the salts of carbonic acid:

$$\text{pH} = p\text{K} + \log(\text{HCO}_3^-)/(\text{CO}_2)$$

Rationalists also believed that mathematical representations of knowledge could illuminate the structure and function of the universe and bring order to the chaos and insecurity of human existence by translating the real world into the arithmetical. Their dependence on such *formalism* was a result of their belief that the senses can be deceiving (e.g., we can hallucinate). That is, rationalists argued that because the senses can be deceiving, we may be misled to believe that sensory qualities mistakenly represent real qualities, which would not lead to knowledge. Thus, the underlying structure of knowledge is assumed to be formal, written in the form of mathematical axioms and principles, and composed of syntactical rules and elements (Triadafillidis, 1998). For rationalists, the foundation of knowledge includes formal structures underlying appearances, and justification is provided by consistent procedures of formal logic (Packer & Addison, 1989).

A priori and a posteriori knowledge. The debates between rationalists like Descartes, Spinoza, and Leibniz, and empiricists like Locke, Berkeley, and Hume, continued throughout the 17th and 18th centuries. A primary concern at the time was what counted as genuine knowledge (Moser, 1996). Rationalists contended that all genuine knowledge is a priori, whereas empiricists argued that all knowledge was a posteriori. A priori knowledge is that which is independent of experience. Within this position, a belief is justified a priori if its epistemic justification does not depend on any sensory, introspective, or other type of sensory experience.

Moreover, for the acquisition of knowledge, an a priori concept or idea is one that is not derived from experience and does not require any experience for that concept or idea to be realized; rather, concepts are innate (i.e., inborn; BonJour, 1998).

In contrast to a priori knowledge, knowledge that is considered a posteriori (i.e., empirical) depends on external experience. From this perspective, a belief is justified if its epistemic justification is contingent on experience. Experience may include sensory or introspective experience as well as kinesthetic experience. Similarly, a posteriori or empirical knowledge is a concept or idea that is derived directly from experience via a process of abstraction (BonJour, 1998).

Kant's *Critique of Pure Reason*: Unifying rationalism and empiricism. Near the end of the 18th century, Kant aimed at reconciling modern empiricism and rationalism by bringing them together to form one coherent framework. In his *Critique of Pure Reason*, Kant (1781/1998) viewed both positions as inherently wrong and argued that both made a similar mistake. Specifically, both schools of thought assumed there was only one source of knowledge. The rationalists intellectualized sensation, treating sensation and perception as confused episodes of thought, whereas the empiricists sensationalized thought, treating pure thought as instances of weak perception. Like many empiricists, Kant distrusted the rationalists' declarations of knowledge about the natural world being based solely on speculative rationalist accounts. To him, claims based on pure reason could as readily be contradicted by logical argument as they could be supported by logical argument (Tarnas, 1991). However, like many rationalists, Kant believed that anything that existed beyond sensory experience, such as God or the infinity of the universe, was inevitably entangled in a contradiction or illusion.

To reconcile these two positions, Kant's solution was to propose that Descartes's mind–world dualism was indeed vindicate but not as originally presumed. Rather, the mind–world correspondence could be conceived of in a critical sense, wherein the natural world was a world already ordered by the mind's own cognitive apparatus. In this regard, the mind does not passively receive sense data but instead actively assimilates and structures that data. Individuals, therefore, know objective reality to the extent that reality conforms to the fundamental structures of the mind. From this, Kant declared that there were two independent and equally necessary sources of knowledge: intuition (i.e., the sensory aspect of experience) and understanding (i.e., the faculty of concepts and judgment). He argued that knowledge results from the organization of perceptual data on the basis of inborn or innate cognitive structures, called categories, which include space, time, objects, and causality. These categories, which exist a priori, therefore structure all perceptions (deVries, 1991).

The consequences of Kant's revolution. According to Tarnas (1991), the epistemological consequences of Kant's reconciliation of empiricism and rationalism had a profound influence not only on philosophy but also on science, religion, metaphysics, and the modern mind. First, Kant had rejoined the knower and the known, which were previously treated as distinct entities. This marriage of the knower and the known, however, resulted in a divorce between the knower and objective reality, to the object itself. In this regard, individuals had no way of knowing whether knowledge had some fundamental relation to a universal reality or whether it was merely a human reality. Knowledge was now viewed as necessarily subjective and limited to the phenomenal; individuals no longer had insight into the transcendent or into any such world.

A second long-term consequence of Kant's position was that it repositioned the individual from the center of the universe to the genuine cognition of that universe. That is, Kant placed individuals back to the center of their universe by virtue of the mind's central role in constructing knowledge. By doing so, Kant humanized science but removed it from any certain foundation of knowledge independent of the human mind. Knowledge was now grounded in the human mind, ennobling it as the new epistemological center. Despite this shift, it also became apparent that because knowledge was subjectively constructed, it was relative to the intellectual certainties of other eras and to the world itself (Tarnas, 1991). The result was a rude

awakening: Kant had effectively eliminated any pretensions of certain knowledge. Knowledge was no longer absolute and timeless, and the mind could no longer be relied on as an accurate judge of reality.

Subsequent philosophical developments now had to take this epistemological shift into consideration. From this point on, philosophy was largely concerned with the clarification of epistemological problems, the analysis of language, the philosophy of science, and the analysis of human experience. The philosophical enterprise was redirected toward the analysis of linguistic problems and scientific and logical propositions. We describe these contemporary philosophical positions on knowledge and knowing next.

Contemporary Stances on Knowledge and Knowing: 1800 AD to the Present

> Our knowledge is a receding mirage in an expanding desert of ignorance. (Durant, n.d., para. 2)

According to Tarnas (1991), by the 19th and 20th centuries, science was thought to be the only discipline that could rescue the Kantian mind from uncertainty. During this time, science achieved a golden age with widespread institutional and academic research, and with practical applications proliferating with the integration of science and technology. Optimism grew with regard to the resurgence of the certainty of knowledge, particularly as the scientific method improved its precision in measurement and explanatory powers. The consequences of Kant's epistemological revolution seemed to have come to an end, and a new sense of intellectual progress emerged. Misconceptions and ignorance of past eras were left behind, and new philosophical positions about knowledge and knowing were born. Two of the influential stances that emerged during this time were foundationalism and coherentism. Although variants of each framework have been identified, there are common central tenets for each, which we highlight here.

Traditional foundationalism. The central thesis of traditional *foundationalism* is the claim that certain beliefs, called basic beliefs, have some degree of epistemic justification; they do not depend on the justification of other beliefs but are somehow intrinsically justified (BonJour, 1978). These noninferential (i.e., foundational) beliefs form the foundation on which all other knowledge rests. As Steup and Sosa (2005) highlighted, there are three features of basic beliefs: They are noninferential, they must be justified, and they include a *nondoxastic justification*. First, by definition, they cannot be inferential beliefs because otherwise they would not be basic beliefs. Second, these beliefs must be justified because otherwise they could not serve as the justifier for all other nonbasic beliefs. However, the justification of these beliefs must be nondoxastic; that is, justification must come from a source other than beliefs. Traditional foundationalist perspectives simply assumed these basic beliefs were justified intuitively or by some act of God.

As an example, let us say that we believe that Socrates was a person and that all people are mortal. From this, we might form a new belief that Socrates was mortal. If our two existing beliefs, that Socrates was a person and people are mortal, were themselves justified, then via this inference, we have acquired a newly justified belief (i.e., Socrates was mortal). At some point, of course, one cannot possibly justify all beliefs via other beliefs (i.e., a *doxastic justification*). This necessitates the need for nondoxastic beliefs (i.e., justified via nonbeliefs), or basic beliefs.

Another central tenet to the traditional foundationalist view is that beliefs serve as the only viable and sufficient means of justification. Accordingly, this view of knowledge and justification, as Descartes proposed, can be construed as a two-tiered structure. Variants on foundationalism differ, however, on two aspects regarding the explanations of (a) the nature of foundational knowledge and justification and (b) how foundational knowledge is transferred to inferential (i.e., nonfoundational) beliefs. Descartes's position, called radical or strong foundationalism, for example, requires that foundational beliefs be certain, which then guarantees the justification of the nonfoundational beliefs they support (Moser, 1996).

Traditional coherentism. Similar to traditional foundationalism, traditional coherentist views of knowledge agree that knowledge claims are constructed from beliefs. Because both foundationalism

and *coherentism* rely on beliefs for justification and because their sources of justification are internal to the individual, these two positions are characterized as doxastic, or considering the only viable and sufficient means of justification as via one's beliefs. Coherentists disagree, however, that certain beliefs are intrinsically justified. That is, the coherentist thesis is that not all knowledge rests on the foundation of noninferential knowledge. Rather, in place of Descartes's knowledge like a foundational tree simile to describe the structure of knowledge, coherentists characterize their position with a metaphor that models knowledge as a ship at sea whose seaworthiness rests on how well that ship is built and held together. In essence, coherentist theories of knowledge propose that beliefs are justified as knowledge by their relations to other beliefs, that is, by belonging to a coherent system of beliefs (Moser, 1996).

Philosophical problems for traditional foundationalism and coherentism. Here, we consider three philosophical conundrums that pertain to knowledge and knowledge perspectives: the epistemic regress problem, the Gettier problem, and internalism versus externalism.

The epistemic regress problem. A major distinction between foundationalist and coherentist theories of knowledge is typically delineated in terms of their response to the *epistemic regress argument* (Moser, 1996). This argument, which originated in Aristotle's *Posterior Analytics* (Ross, 1951), results in the following issue for justification. Given any justified belief, *P*, this belief occurs in an evidential chain including at least two links: (a) the evidence or supporting link and (b) the supported link or justified belief. Evidential chains result in four possible outcomes: circular chains, endless chains, chains ending in unjustified beliefs, or chains anchored in foundational beliefs that do not derive their justification from other beliefs.

The crux of the regress argument is the issue of whether all justification could be inferential. Stated another way, if *P* is justified by another justified belief, *B*, then how is *B* allegedly justified? Also, if *B* is justified by another justified belief, *A*, then how is *A* justified? We see quickly that we have a circular chain if *A* is justified by *B* and vice versa. Conversely, for the endless chain, if each belief is justified via another belief ad infinitum, we encounter the epistemic regress problem (Moser, 1996).

Realistically, it is implausible for anyone to reason his or her way through this regression. To respond to this issue, some philosophers have argued three possibilities to end the regress: (a) explain why an endless regress of required justifying beliefs is not problematic, (b) demonstrate how to end the regress, or (c) accept the skeptical position that inferential justification is not possible. Traditionally, coherentist theories were incapable of demonstrating a satisfactory end to the regress problem, whereas traditional foundationalists were via the noninferential beliefs, or basic beliefs, that provide justification for inferential beliefs (BonJour, 1978).

The Gettier problem. A second substantial issue for both traditional foundationalist and coherentist theories of knowledge, and all doxastic theories of knowledge, was brought to the forefront in discussions of theories of knowledge when Gettier (1963) published "Is Justified True Belief Knowledge?" In this paper, he challenged the traditional analysis of propositional knowledge, which claims that what distinguishes knowledge from lucky guessing is that it is based on some form of justification, evidence, or supporting reason that qualifies knowledge as a justified true belief (Bernecker & Dretske, 2007). To demonstrate that the traditional analysis of knowledge was inadequate, Gettier presented two examples wherein a person has justified true belief but lacks knowledge, both of which have the following pattern: Suppose Jordan walks into a coffee shop and believes that he sees Avery, called *P*, which happens to be false. Jordan bases his belief that Avery is in the coffee shop, called *Q*, because he sees her there. Whom he saw, however, was Avery's twin sister, Graysen, who was with Avery at the coffee shop. Avery just happened to be at a table around the corner where Jordan could not see her. In this case, Jordan is justified in believing *Q*, that Avery is at the coffee shop because he erroneously sees her there (i.e., evidence *P*). *Q* is also true, Avery really is at the coffee shop, but he does not know that she is there because his belief that he sees her is false (i.e., he actually saw Graysen). That is, Gettier claimed that Jordan does not know that *Q* given that *P* is

actually false, ergo knowledge cannot be identified with justified true belief. In short, the Gettier problem reveals the issue of cases in which a person has a justified true belief but lacks knowledge.

According to Bernecker and Dretske (2007), responses to this problem were overwhelming. Some philosophers claimed that Gettier-style counterexamples were flawed and failed to identify some important aspect of justification, whereas others accepted the challenge and amended the traditional analysis of knowledge by proposing additional conditions on knowledge designed to avoid the possibility of justification based on a false belief (i.e., nondoxastic theories). Still others made attempts to change the existing conditions rather than adding more conditions (i.e., doxastic theories).

Internalism versus externalism. Since Gettier's (1963) paper, nondoxastic frameworks have developed, and major revisions to traditional foundationalism and coherentism perspectives have populated the contemporary philosophical literature. Taken as a whole, all frameworks, whether doxastic or nondoxastic, can be divided into two positions in terms of whether the additional or alternative conditions for justification are based on internalism or externalism. *Internalism* refers to the notion that everything necessary to provide justification for a belief must be internal to the individual. BonJour and Sosa (2003) argued that for internal justification, an individual must be consciously aware of the claims, reasons, or other evidence to be epistemically justified. In other words, epistemic justification is internal if one can identify directly, perhaps through reflection of one's mental properties or attitudes, what one is justified in believing. For example, a flock of Canada geese have just landed on the waterfront at Sandra's house. Sandra calls Dermot to tell him that the geese have landed, which makes her joyous, as this is one sign of the return of warmer weather. The information that Sandra has imparted to Dermot is now knowledge of which he is aware, based on her testimony. This knowledge is considered as justified internally; by knowing that the geese are on her waterfront, Dermot also knows or is aware of that knowledge on the basis of Sandra's testimony.

In contrast, externalists deny that such access to internal mental states or attitudes is always available or that individuals can always be aware of the basis for one's knowledge or beliefs (BonJour & Sosa, 2003). They argue that something other than mental states must serve as justifiers of one's knowledge. That is, *externalism* stipulates that an individual is justified in believing a proposition if and only if that belief is produced or sustained by a process or method that is reliable. Returning to the Canada geese example, externalists would argue that Dermot's belief that the geese have landed on Sandra's waterfront falls short of knowledge. Without external justifiers, Dermot cannot claim that he knows anything about the geese. Why might this be the case? Externalists would argue that Sandra might be an unreliable source, perhaps because her eyesight is poor (e.g., the birds were ducks not geese) or that she is known to lie about such things (i.e., Sandra is a compulsive liar). If, however, a journalist happened to be taking photos of the very geese that landed at Sandra's waterfront, and later featured those photos in the local newspaper, then Dermot would be justified in believing that the geese had landed.

In summary, internalism preserves an accessibility requirement on what gives rise to justification, whereas externalism does not. In particular, current debates over internalism versus externalism concern what sort of access, if any, individuals have to judge the validity of their cognitive processes to provide support for their beliefs. Validation of those cognitive processes is judged based on preestablished norms. In contrast, externalists judge the validity of cognitive processes based on external standards like scientific theories and externally derived data (Moser, 1996).

Contemporary modern and postmodern stances. Today, countless contemporary theories of knowledge and knowing can be found throughout the philosophical literature. Each one establishes its commitment to some version of empiricism (the majority of them adopt empiricist accounts; Tarnas, 1991), rationalism, or some combination of the two. Each framework also adopts an internalist or externalist perspective and declares allegiance to one of the principal stances or argues that beliefs and justification should be eliminated from considerations

of knowledge altogether. Moreover, each of the principal stances can be categorized into modernist or postmodernist accounts of knowledge and knowing.

In its broadest sense, *modernism* refers to qualities pertaining to thought, character, or practice. More specifically, it describes a set of cultural tendencies and movements that arose in Western society in the late 19th and early 20th centuries to move away from more traditional forms of art, literature, religion, social organization, and architecture. Traditional practices were becoming outdated with the rise of new technologies and new social and political conditions of an emerging industrialized society (Tarnas, 1991). Examples of contemporary modernist stances include foundationalism, coherentism, direct realism, probabilism, reliabilism, pragmatism, contextualism, infinitism, structuralism, evolutionary epistemology, and virtue epistemology.

In contrast to modernism, *postmodernism*, literally meaning after modernism, is a reaction against modernism and its values and assumptions. Like modernism, postmodernism broadly refers to cultural tendencies and perspectives, with critical theory as a central point of reference. Moreover, whereas modernism is more concerned with identity, unity, and certainty, postmodernism is often associated with separation, uncertainty, and skepticism (Tarnas, 1991). Examples of postmodern stances include existentialism, Marxism, feminism, hermeneutics, poststructuralism, and postempiricist philosophy of science (Tarnas, 1991).

Clearly, to articulate each of these principal stances is beyond the scope of this chapter. Instead, we delineate those that have either directly or indirectly, via the development of other theories, influenced theories of learning within educational psychology. These include foundationalism, coherentism, contextualism, pragmatism, structuralism, and postmodernist frameworks. A summary of each of these six principal stances is presented in Table 8.2. Moreover, as

TABLE 8.2

A Summary of Contemporary Views of Knowledge

Principal stance	Views of knowledge	Justification of knowledge
Foundationalism	Knowledge is derived from beliefs. Certain beliefs possess a degree of epistemic justification, which does not depend on the justification of other beliefs.	Inferential beliefs are justified via minimally warranted noninferential beliefs or justification via reliable nonbelief.
Coherentism	Knowledge is derived from beliefs. Knowledge involves a higher order processing of lower order information. We certify whether that information is trustworthy in terms of our own knowledge and experiences.	The entire system of beliefs is justified via its relations to an appropriately structured system of beliefs.
Contextualism	A statement or claim is considered knowledge if a person is able to meet certain objections; the objections must be met, and whether they are met is relative to certain goals.	The objections must raise reasonable doubt and responses to those objections must meet the standards of the referent group. When objections are satisfactorily met, then knowledge is justified.
Pragmatism	Knowledge is irreducibly individual, social, fallible, and socially constructed and cannot be separated from doing.	Criteria for what is considered knowledge must be determined as a function of the goals sought, values instantiated, its usefulness, and the community.
Structuralism	Knowledge is organized by communication and exchange and represents a social rationality. Social phenomena are explained via a comprehensive elaboration of their structures.	Knowledge is derived by inference and deduction from observed empirical data, not by direct observation.
Postmodernism	Knowledge is subjectively determined by multiple factors and is tentative and fallible. Knowledge is interpretation mediated by signs and symbols and constituted by historically and culturally variable predispositions.	

mentioned previously, we position these influential stances in epistemic vector space along the two continua (see Figure 8.2) pertaining to where knowledge resides (i.e., in the mind or the environment) and how knowledge is constructed (i.e., individually or socially).

Foundationalism. Contemporary variations of foundationalism differ on many important aspects of knowledge, particularly on how they address the regress problem. However, the central tenet for all remains the same: Certain beliefs possess a degree of epistemic justification that does not depend, inferentially or otherwise, on the justification of other beliefs. Rather, justification is immediate or somehow intrinsic (BonJour, 1978). One popular foundationalist framework, which contrasts itself to Descartes's strong take on basic beliefs, is called weak or modest foundationalism; proponents include Russell, C. I. Lewis, and Chisholm. Weak foundationalism allows for certain beliefs to have some independent epistemic justification, which does not arise from inference or coherence. Rather, these foundational beliefs have a low degree of warrant, insufficient by itself to satisfy the justification condition for knowledge.

These minimally warranted beliefs must be augmented in some way if knowledge is to be achieved, and the usual appeal is to coherence with other minimally warranted beliefs. Other appeals include justification by nonbelief, and justification by a reliable nonbelief (e.g., perception, memory, or introspection). By combining beliefs into larger coherent systems, the degree of warrant is gradually enhanced until knowledge is finally achieved (BonJour, 1978). Weak foundationalism then, as presented in this example, represents a hybrid between traditional foundationalism and coherentism. How we position this perspective in Figure 8.2, then, is reflective of weak foundationalists' belief that knowledge is internally derived through our interactions with the environment and stored in the mind.

Coherentism. Like contemporary foundationalism, the central tenet of *coherentism* and its focus on the standard analysis of knowledge has not changed (Lehrer, 1986). Rather, what has changed is the content, and today, there are two kinds of coherent theories of knowledge: those that focus on coherence for justification and those that are doubly coherent wherein both justification and truth require coherence. (We focus here solely on coherence for justification.) In response to the epistemic regress problem, coherentists stipulate that beliefs are not the primary locus of justification; the entire system of beliefs is justified via their relations to an appropriately structured system of beliefs. One type of approach is explanatory coherentism, which defines coherence as a function of what makes for a good explanation. As BonJour and Sosa (2003) noted, there are five features that provide a good account of a coherent justification: logical consistency; the extent to which the system of beliefs is probabilistically consistent; the extent to which inferential connections exist between beliefs in terms of the number of connection as well as their magnitude; the inverse of the degree to which the system is divided into unrelated, disconnected subsystems of beliefs; and the inverse of the degree to which the system of beliefs includes unexplained anomalies.

As Lehrer (1986) argued, a fundamental feature of human knowledge is that we have the capacity to discern whether the information we process by means of our senses is to be trusted. The trustworthiness of information is determined when the probability of that information being veracious is high and the probability of error is small. Moreover, coherentists assert that it is not solely the acquisition of information but our ability to certify whether that information is trustworthy in terms of our own knowledge and experiences that is the hallmark of human knowledge. Such knowledge, therefore, involves a higher order processing of lower order information, and the essential aspect of human knowledge is that it is metaknowledge. Given the personal metaknowledge and judgment of information aspects of a coherentist perspective, we have positioned this stance in Figure 8.2 in the individually formed quadrant for where knowledge is derived and in the mind for where knowledge resides.

Contextualism. In contrast to the normative, doxastic foundationalist and coherentist stances, *contextualism* denies that there are basic beliefs that

provide justification for other inferential beliefs and that coherence is sufficient for justification (Annis, 1996). Contextualists have argued that both these theories fail to consider contextual parameters essential to justification. Notable contextualists include Dewey, Popper, Austin, and Wittgenstein (Audi, 1999). The basic premise of contextualism is that of a person's ability to meet certain objections; the objections must be met, and whether they are met is relative to certain goals. In one situation, accepting a statement as knowledge may be reasonable, whereas in another situation, it may not be reasonable. Thus, contextualists propose two primary epistemic goals: having true beliefs and avoiding having false beliefs. Moreover, subgoals include simplicity, conservation of existing beliefs, and maximization of explanatory power (Annis, 1996).

Given these goals, we can now assess how a statement may or may not be justified as knowledge. Take the following example: If Carson claims that some statement *h* is true, then we may object that (a) Carson is not in a position to know *h* or (b) that *h* is false. Consider (a). Suppose we ask Carson how he knows *h* and that he responds by giving us various reasons e_1, e_2, . . . e_n to support the truth of *h*. We may object that one of Carson's reasons, e_i, does not provide adequate support or that all of his reasons including his responses to our subsequent objections do not provide support, or we may be satisfied with one or more of his reasons to say that he does not know *h*, that *h* is false (in the first two cases), or that Carson does in fact know *h*. Alternatively, there may be situations (i.e., contexts) wherein he is not required to provide support or give reasons for his claim that *h* is true. For example, if he tells us that it is sunny today, we usually do not require reasons. However, in some situations, Carson may not be a reliable source (e.g., he says it is sunny every day regardless of the actual weather), so we deem him not in a position to know *h*.

Naturally, it would be too strong a condition to require that a person meet all possible objections. For example, one person may object by stating that in some distant time, new evidence may arise as a result of advances in our scientific knowledge, which would call into question the truth of statement *h*. If Carson had to meet the objection, he would have to be in a better epistemic position than his current situation, as would the objector. As contextualists argue, this is not reasonable. Rather, any objections that are raised must be raised in the present context with evidence that is currently available (Annis, 1996). Moreover, any objections that are raised must be an expression of real doubt. As Dewey (1949/1989) noted, it is only when "jars, hitches, breaks, blocks . . . incidents occasioning an interruption of the smooth, straightforward course of behavior" (p. 282) occur that doubt arises.

One final, central feature of contextualism that we present here is the notion of the social nature of justification. That is, when we ask if Carson is justified in believing *h*, this has to be considered relative to an issue context. For example, we ask Carson, a nonmedically trained person, what is the cause of polio? If his response is that a virus causes polio and that he read that information in a paper by a medical professional, then we accept this as reasonable evidence. If, however, the context is an examination for a medical degree, then this answer would be deemed unacceptable and inadequate. In the examination situation, we would expect much more than a simple response. Thus, the issue context determines the level of understanding and knowledge that a person must exhibit and establishes an appropriate objector group. In our example of the examination situation, the appropriate objector group would be medically trained, qualified examiners.

Key to the justification of knowledge, then, is the social information—the beliefs, information, and theories currently available—that plays an integral part in determining what objections will be raised and how to respond to them, as well as what responses the objectors will accept (Annis, 1996). To determine whether an individual is justified in believing something to be true, we must consider the standards of justification of the community of people to which that individual belongs. It follows that justification must be naturalized given that we cannot neglect the social practices and norms of justification of the referent group (Annis, 1996). Because of this social influence, we position contextualism, along with pragmatism, in Figure 8.2 along the social dimension for how knowledge is derived. However, because of the focus on the individual, we

place contextualism along the mind dimension for where knowledge resides.

Pragmatism. One movement that influenced contextualism was that of *pragmatism*. Formulated by Pierce in the early 1870s and further elaborated by James, Dewey, and Mead around the turn of the 20th century, pragmatism stresses the relation of theory to praxis, knowledge and action, and facts and values (Putnam, 1995). Emphasis on the reciprocity of knowledge and action follows from its post-Darwinian understanding of human experience, which includes cognition as a developmental process. According to pragmatists, concepts are habits of belief, and knowledge cannot be considered true by epistemic criteria alone; the adequacy of such criteria must be determined as a function of the goals sought and values instantiated (Putnam, 1995). Moreover, knowledge is confirmed in the course of experience, which is fallible and subject to further revision.

The pragmatic philosophy, particularly James's and Dewey's views of knowledge and their criticisms of the assumption that there should necessarily be theories about such matters, has been interpreted by some scholars as a reaction against the Kantian epistemological tradition (Rorty, 1996). Rather than make philosophy a foundational discipline, James and Dewey requested liberation of knowledge, value, morals, beliefs, and culture from Cartesian quests for certainty and from the Kantian grounding of thought in a permanent ahistorical matrix. Simply put, their pursuit was one of saying something useful about truth. That is, James and Dewey viewed knowledge as instrumental, a device for organizing experience. They claimed that knowledge and values, which arise in historically specific cultural situations, should be appropriated only when they satisfactorily resolve problems and are judged worthy of keeping. Knowledge, then, is irreducibly individual and social and proposes as criteria the value it brings, which is determined by all individuals affected by the actual or projected outcomes (Putnam, 1995).

According to Rorty (1996), although Dewey and James did not have specific theories of knowledge per se, their portrayals of knowledge, truth, and belief can be characterized as three central doctrines, which encapsulate pragmatism. First, pragmatism is *antiessentialism* (i.e., all things cannot be precisely defined or described) applied to notions like knowledge and truth. As James (1890/1950) argued, truth does not have an essence: "*There is no property ABSOLUTELY essential to any one thing*. The same property which figures as the essence of a thing on one occasion becomes a very inessential feature on the other" (p. 959). Given this antiessentialism, then, it is useless to be told that truth corresponds to reality. It is practice rather than theory, and action rather than contemplation, wherein knowledge is pragmatic (Rorty, 1996). We are more likely to decide what to do when the contemplative mind is presented with stimuli rather than decide whether its representation is accurate.

A second central doctrine of pragmatism is that there is no epistemological difference between truth about what ought to be and truth about what is and that the pattern of all scientific inquiry is deliberation concerning the relative attractions of various concrete alternatives (Rorty, 1996). That is, pragmatists criticize the traditional Platonic pursuit of describing beliefs as true via mechanical procedures, of searching for a way to avoid deliberation and simply accepting claims as true without contemplation. Rather, as Dewey (1929) suggested, we need to break from the traditional "spectator theory of knowledge" (p. 215) and the false problems to which it gives rise. What Dewey meant by a spectator theory of knowledge is that of the passivity of the knower before the object, or the photographic view of knowing. To Dewey, knowing cannot be separated from doing.

The third characterization that Rorty (1996) presented as fundamental to pragmatism is the doctrine that there are no constraints on inquiry with the exception of conversational ones—constraints by inquirers within our community. Like the contextualist stance, then, our cultural and social practices are important considerations to what constitutes knowledge, knowledge that has some pragmatic use. Moreover, objections to that knowledge may be raised, and knowledge is constrained to the extent that even under the condition that all objections raised are satisfactorily addressed, that view still

might be false. Thus, pragmatists claim that there is no method for knowing when one has reached the truth or when one is closer to it than before. Rather, what is important to the pragmatist then is a sense of community, an identification with that community wherein our intellectual heritage is heightened when we construe the community as ours rather than nature's, shaped rather than found, and one among many that have been constructed over time and will continue to be reconstructed. Finally, as Rorty (1996) stated, "In the end, the pragmatists tell us, what matters is our loyalty to other human beings clinging together against the dark, not our hope of getting things right" (p. 225).

Structuralism. Like contextualism and pragmatism, the structuralist movement from the 1950s through the 1970s also acknowledged the importance of the social aspect of knowledge. Influenced by Kant's work, *structuralism* is typically perceived as deriving its organizing principles from de Saussure, the founder of structural linguistics, which were then further developed by Lévi-Strauss, the founder of modern structuralism (Williams, 1999). Inspired by Durkheim's notion of a social fact, Saussure viewed language as the repository of discursive signs shared by a given linguistic community. Lévi-Strauss further proposed that society is organized by communication and exchange, whether it is information, knowledge, myths, or members themselves. The organization of social phenomena could therefore be explained via a comprehensive elaboration of their structures, which collectively give evidence to a deeper and all-inclusive social rationality. The social structures are then revealed by inference and deduction from observed empirical data (Williams, 1999). Sense data are meaningless without interpretation. Thus, the role of the individual as interpreter of data becomes a central focus that was clearly absent in the traditional rationalist perspective.

According to Packer and Addison (1989), the structuralist aim is to reconstruct a competence or deep social structure that underlies performance. These social structures are revealed by inference and deduction from the observed empirical data and not by direct observation. Moreover, because these structures are models of specific relations, which in turn communicate the various properties of the component elements in question, the structural analysis is both readily formalizable and susceptible to a wide range of applications. Examples of more contemporary structuralists include Chomsky, Piaget, and Kohlberg. For Chomsky, who studied language; Piaget, who examined the domain of operational intelligence; and Kohlberg, who looked at the realm of moral judgment, the aim was to provide an orderly reconstruction that introduced intelligibility into areas pervaded by ambiguity and error (Packer & Addison, 1989). Because of the focus on the individual as interpreter, we position structuralism in Figure 8.2 along the mind dimension for where knowledge resides. However, because of the focus of social rationality and society, we have placed this stance along the social dimension for how knowledge is derived.

Postmodernist views. By the 1980s, a number of individuals were discontent with contemporary modernist and structuralist views and with the belief that science brought the certainty of knowledge to the world around us. In particular, two developments had occurred over the course of the 20th century, which radically changed the course of scientific history. First, several major developments occurred in physics, including Einstein's general theories of relativity and the formulation of quantum mechanics. Among others, these developments seriously questioned the long-established certainties of Newtonian physics (Tarnas, 1991). By the end of the 20th century, physicists were no longer able to come to a consensus regarding how existing evidence should be interpreted with respect to defining the nature of reality. With relativity theory and quantum mechanics, the certainty of the old paradigm was shattered, and Kant's skeptic concern over the mind's capacity for certain knowledge resurfaced once again. This time, however, philosophers challenged the Kantian tradition in its entirety, realizing that the categories of space, time, and substance were no longer applicable to all phenomena. Knowledge was now standing on shaky ground.

This disenchantment that pervaded Western Europe and North America led to discussions beyond structuralist and modernist theories. To a

greater extent than the various modern theories, postmodernist perspectives are profoundly complex and ambiguous, but generalizations can be made despite their complexities. The central figure in postmodernism was Nietzsche, who adopted a radical perspectivism, sovereign critical sensibility, and ambivalence toward the emerging nihilism in Western culture (Tarnas, 1991). Today, postmodern positions vary considerably depending on the context but may be considered as an open-ended, indefinite collection of attitudes shaped by various widely known positions, including existentialism, Marxism, feminism, and hermeneutics. Influential theorists include Kuhn, with his conception of paradigms; Derrida; Althusser; Baudrillard; Foucault; Nietzsche; and Heidegger, to name a few (Audi, 1999).

Although there is little agreement on a central tenet of postmodernism, its varieties all disagree with foundationalism, essentialism, and realism. That is, postmodern views are typically regarded as antiepistemological and antirealistic and reject positions that present knowledge as accurate representations as a correspondence to reality. Postmodern views further reject principles, final vocabularies, and descriptions that are thought to be binding across all times, persons, and places. In addition to being against everything modern, postmodernists also oppose dualisms and being labeled as relativists and skeptics (Tarnas, 1991).

As Tarnas (1991) highlighted, other shared principles that have emerged include postmodernists' recognition of the plasticity and constant change of knowledge. They also stress the importance of concrete experience over fixed abstract principles and believe that no single a priori thought system should dominate belief or investigation. Postmodernists have argued that knowledge is subjectively determined by multiple factors, and things in themselves are neither comprehensible nor positable. Further, postmodernists stress that all knowledge and assumptions must be continually subjected to direct testing. Those in search of advancing knowledge must be tolerant of ambiguity and pluralism and recognize that knowledge is tentative and fallible rather than absolute and certain. Postmodernists further claim that in the process of knowing, the individual can never be disengaged from the body or the world, and thus knowledge can never be wholly objectified.

Moreover, postmodernists have argued that although knowledge may be bound by innate subjective structures, with a degree of indeterminacy and imagination, there is an element of freedom of cognition. Thus, there is a relativized critical empiricism and a relativized rationalism; both are essential to rigorous investigation, but neither can produce anything absolute or foundational. All human knowledge and understanding is interpretation, which is mediated by signs and symbols and constituted by historically and culturally variable predispositions influenced by human interest. The human mind cannot stand outside the world, nor can the world exist as a thing in itself. In this regard, in Figure 8.2, we have positioned postmodernism along the extreme ends of the environment for where knowledge resides and is socially derived.

In summary, over the history of philosophical thought, many views have been presented, views that have been challenged and revised and that have influenced the development of other theories of knowledge and knowing. Theories have ranged from describing knowledge as being derived from internal sources to external sources, and from beliefs being the focus of justification to nonbelief objects as necessary for the justification of knowledge. Philosophers have also debated whether individuals are passive recipients of knowledge or are capable of constructing knowledge and whether that knowledge reflects a real, objective world or a world that is a social construction relevant only to those situated within that context.

Finally, theories of knowledge have progressed from describing knowledge as fixed and certain to more contemporary explanations of knowledge as tentative and fallible. Clearly, to define knowledge has not been a simple task, and over the course of history, no one position has dominated as the hegemony of knowledge. Like the philosophical literature, the history of conceptualizations of knowledge and knowing within the educational psychology literature has also been a clashing of positions, a battle over which theoretical orientation holds sway over the members of the psychological community. We describe these various positions next.

EXAMINING KNOWLEDGE AND KNOWING THROUGH THE LENS OF LEARNING THEORIES

In this section, we look critically at varying and even contrasting views of knowledge and knowing that individuals or communities of practice may espouse. Moreover, we do so through the lens of learning theories. Our rationale for framing this more detailed exploration of knowledge and knowing within the context of learning theories is threefold. For one, although we have duly acknowledged the flood of knowledge-related terms that inundate the professional literatures within education generally and educational psychology more particularly, scholarly writings already exist that offer an encyclopedic examination of these terms (Alexander et al., 1991; de Jong & Ferguson-Hessler, 1996; Murphy & Alexander, 2004; Murphy & Woods, 1996; Schraw, 2006). Thus, we find no compelling need to revisit that well-trodden territory in this particular treatise.

Beyond this rather pragmatic rationale, however, lies more compelling reasons for the unique approach to the analysis of knowledge and knowing that we take herein. In particular, as Alexander, Murphy, and Greene (see Chapter 1, this volume) strongly argue, a focus on human learning being a defining feature of educational psychology since its birth at the dawn of the 20th century remains a pillar of the discipline even today. Nonetheless, as with the constructs of knowledge and knowing, it might be argued that the level of understanding as to what constitutes each of these learning theories is oftentimes not fully reflective of their complex, multifaceted nature. Indeed, it sometimes seems that the passion and commitment with which individuals proclaim themselves to be constructivists, socioculturalists, or not behaviorists belie the limited conceptual understandings that fuel such strong ideological stances (Harris & Alexander, 1998).

This aforementioned paradox of high commitment and low knowledge can also come with oversimplified notions about how learning theories represent or value the nature of knowledge or the process of knowing and can potentially lead to judgments that one theoretical orientation is somehow good and another bad. Consequently, by juxtaposing the discussion of knowledge and knowing to a consideration of learning theories, we have the goal not only of delineating the nature of knowledge and knowing further but also of enriching understanding about key learning theories and what assumptions about knowledge and knowing each make. It is, therefore, our hope that those within the educational research community and the community of practice are better equipped to reflect critically and analytically on their own beliefs about knowledge and knowing and how such beliefs align with their espoused orientations toward learning.

Finally, and related to the prior rationale, it is our contention that much is to be gained in this chapter by examining notions about knowledge and knowing represented in individual learning theories (e.g., behaviorism or socioculturalism) while simultaneously positioning the collection of theories within epistemic vector space so that their contrasting views of knowledge and knowing are more apparent. We recognize that there are specific chapters in this volume dedicated to select learning theories, including constructivism (see Chapter 3, this volume), information processing (see Chapter 4, this volume), and sociocultural and situated theories (see Chapter 6, this volume). There is also an extended exploration of epistemology (see Chapter 9, this volume). Yet, our intention is to consolidate and integrate these components to illuminate distinctions in the nature of knowledge and in the process of knowing that might otherwise be overlooked. Sometimes those distinctions are subtle and not readily identified, whereas at other times, they are in sharp contrast.

Of course, as suggested, one of the reasons that the differences in perspectives on knowledge and knowing are nontransparent to the educational researcher or practitioner is because learning theories are often dealt with in isolation, as in the case of the current volume, or viewed antithetically (Bredo, 1996). Thus, individuals are exposed to behaviorism with its emphasis on the conditioning of human actions, seemingly divorced from knowledge or even thought. This learning orientation is set against some cognitive or constructivist perspectives, cast in terms of information processing or as knowledge

construction, which are seemingly disembodied from human behavior. So depicted, the pivotal role of knowledge and knowing in their differentiation is not expressly stated, nor are any potential epistemic similarities between these theoretical orientations given due consideration.

Yet, it is not facilitative to cast views of learning, or knowledge and knowing for that matter, in overly simplistic or even dichotomous terms. Rather, from an epistemic standpoint, one point of separation among learning theories is the emphasis placed on the universe within and without the human mind, that is, within the confines of the individual's mind or within the sociocultural or physical context in which that individual is situated. For instance, do proponents of a given learning theory assume that knowledge resides in the mind of the knower or in the environmental context? Moreover, is their focus within the theory on the one (i.e., the individual mind) or the many (i.e., groups, society, or culture)? Further, how is the process of knowing conceptualized? Do adherents of learning theories regard the mind of the individual as the sole source of knowledge, or do they contend that all knowledge is socially derived or some amalgam of these two polar views? In building our epistemic vector space, we have endeavored to consider such fundamental questions about knowledge and knowing. We have done so by casting learning theories within the quadrants formed by two intersecting lines (see Figure 8.3).

In what follows, we examine knowledge and knowing within six different theoretical frameworks: behaviorism, information processing, radical constructivism, social constructivism, socioculturalism, and situated cognition. In considering the placement of these learning theories in our vector space of source of knowledge *X* where knowledge resides, we were forced to make several governing decisions. For one, we have chosen to sharpen the boundaries that exist between the various theories to make their boundaries more apparent.

In reality, delineations and interpretations of these theories are often more vague and fuzzier. Further, the placement of each learning theory should be regarded as only an approximation, an important caveat in interpreting the discussion that ensues. In light of the inevitable theoretical variance among those ascribing to any given theory, it is to be expected that there would be variability in how specific proponents of that theory would position themselves within the epistemic matrix. Our goal herein is to focus our placements of the various theories with an eye toward between-group differences more than on within-group differences.

Truthfully, what is proposed in Figure 8.3—our mapping of the six learning theories in epistemic vector space—represents a compromise among the authors of this chapter, a compromise reached after prolonged discussions. We appreciate that proponents and opponents of these theoretical perspectives rarely achieve consensus when it comes to questions about knowledge and knowing. Moreover, formal theories, like our personal theories, are not set in stone but are fluid and dynamic, and we fully expect these theories to morph over time.

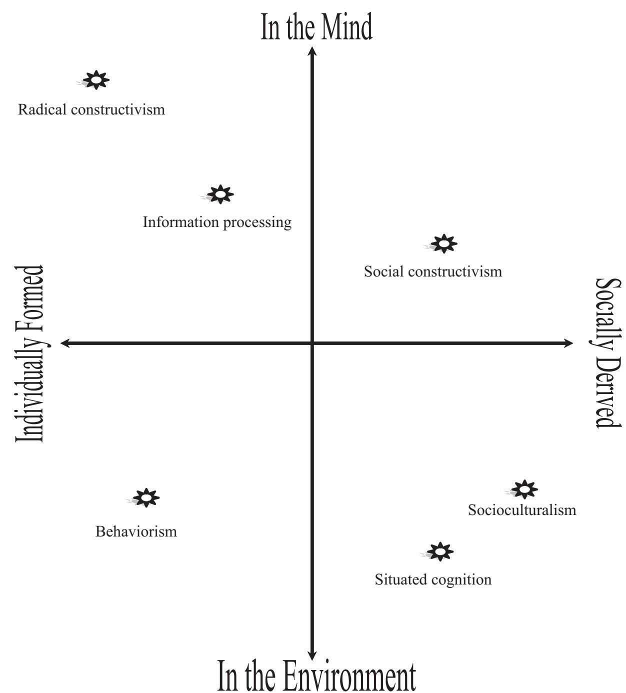

FIGURE 8.3. The positioning of six established learning theories within epistemic vector space. From "Bridging the Cognitive and Sociocultural Approaches in Conceptual Change Research: Unnecessary Foray or Unachievable Feat?" by P. A. Alexander, 2007, *Educational Psychologist, 42,* p. 68. Copyright 2007 by Taylor & Francis, http://www.tandf.co.uk/journals. Adapted with permission.

Behaviorism

> Skinner's reconceptualization of "knowledge" can be stated simply as that knowing is behaving, and it exists, as any other behavior, only as it occurs. (McCorkle, 1978, p. 46)

Countless volumes on learning theory or educational psychology begin with a discussion of behaviorism, which was the dominant theory of human learning in the first half of the 20th century (see Chapter 1, this volume). In the early 20th century, behaviorists like Watson (1924) and Thorndike (1924) set out to purge the study of human learning of the brand of mentalism advocated by James (1890/1950), Dewey (1902/1956), and others. What James and other pragmatists encouraged was a scientific method for philosophy, whereas Watson (1913) took issue with the investigative introspectionist paradigm predominant at the turn of the 20th century. Instead, Watson (1913) embraced a science of psychology similar to that forwarded in other natural sciences like astronomy, and held that the only legitimate object of investigation for psychology was the study of observable behavior (Cooper, Heron, & Heward, 2007).

Generally speaking, behaviorism can be understood as a deterministic philosophy of the science of behavior in which the only suitable form of evidence is behavior (Cooper et al., 2007). Within such an account, learning can be understood as a relatively permanent change in behavior. It is important to note, however, that as with any science, behaviorism is characterized by many theoretical variants, many of which are the result of the historical development of the theory. These theoretical variants can be categorized into at least three major types: methodological behaviorism, psychological behaviorism, and logical or analytical behaviorism (Cooper et al., 2007). Given space limitations herein, we focus our discussion on methodological and psychological behaviorism.

Methodological behaviorism is reflective of the earliest and most extreme forms of behaviorism, such as those proposed by Watson (1913, 1914). Influenced by logical positivists, what was sought in these theoretically extreme forms of behaviorism was a purely scientific investigation of human and animal behavior that relied strictly on the observable (Wolterstorff, 1996). As Watson (1914) averred, "The time seems to have come when psychology must discard all reference to consciousness; when it need no longer delude itself into thinking that it is making mental states the object of observation" (p. 7). This early behaviorism in the United States was, necessarily, the study of human actions presumably devoid of the interference of human thought or reasoning (Bredo, 1996; Greeno, Collins, & Resnick, 1996). As a result, considerations of representational structures or cognitive architecture of the human mind were absent in behavioral treatments of teaching and learning. From this perspective, learning is a matter of conditioning behavior not enhancing thinking or knowledge (Watson, 1924). Likewise, behaviorists had little regard for knowledge conceptualized as the cognitive corollary of learning because these corollaries could not be observed or documented as causally related (Watson, 1914).

By comparison, psychological behaviorism is a program of research within psychology that attempts to explain human and animal behavior in terms of external stimuli, responses, experiences, or reinforcers (Graham, 2009). This type of behaviorism is present in (a) Thorndike's (1911) experiments on animal intelligence, (b) Pavlov's experiments involving physiological reflex responses (i.e., classical conditioning), and even (c) Watson's investigations of contiguity involving emotions. That being said, Skinner was probably the most influential in shaping understandings regarding this type of behaviorism because of his studies of operant conditioning, reinforcement schedules, and the effects of consequences on behavior (Morris, 2003). This era in the study of behaviorism is often referred to as the neobehavioral period.

Important distinctions can be made between the object of research for the various researchers categorized as representing this type of behaviorism. The key distinguishing feature seems to be the nature of the behavior under investigation and the extent to which that behavior is respondent or operant (Skinner, 1935). Respondent behavior can best be understood as a reflexive or involuntary behavior elicited

or brought out by stimuli that immediately precede the behavior. It was this type of respondent behavior and the association or contiguity between the stimulus and response that was of particular interest to both Pavlov (e.g., salivation studies) and Watson (e.g., Little Albert study). The archetypal example, of course, is Pavlov's dog salivation experiment in which an object like a tuning fork is sounded in the presence of a dog 1 second before the presentation of food that naturally elicited salivation in the dog. After carrying out this sequence multiple times, the sounding of the tuning fork ring alone elicited salivation in the dog, demonstrating that the dog had been conditioned (i.e., the dog learned; Pavlov, 1927/1960).

Skinner, however, felt that classical conditioning was lacking in many ways, and was convinced that a great number of behaviors were voluntary as opposed to involuntary. Moreover, he contended that many behaviors appeared to have no singular, detectable antecedent stimulus. In response, Skinner set out to develop an experimental analysis of behavior through the study of consequences of behavior (Cooper et al., 2007). Through the use of this new experimental method of the study of behavior, Skinner determined that what seemed to strongly affect behavior were the consequences of behaving in a particular way, and he termed this type of conditioning operant conditioning. When the consequences were positive, then the behavior was said to be reinforced. Skinner defined a reinforcer as anything that increases a desired behavior (Morris, 2003). The essence of operant conditioning is in the contingency of reinforcement; that is, the occurrence of reinforcement is dependent on the occurrence of some specified behavior (Ferster & Skinner, 1957; Skinner, 1935). Target behaviors that are positively reinforced are more likely to increase in probability and frequency.

Despite these and other distinctions between classical conditioning and operant conditioning (e.g., involuntary versus voluntary behaviors), they have one key similarity that is reflected in the placement of *Behaviorism* in Figure 8.3. The family of behaviorist theories reflects a strong empirical base, a focus on mechanisms for altering behavior, and a conception of learning as a relatively permanent change in behavioral tendencies (Greeno et al., 1996). We also suggest that there are commonalities in how knowledge and knowing are understood across these behavioral variants. Specifically, it could be argued that the process through which the conditioned stimulus comes to elicit the conditioned response or the reinforcer increases the incidence of a target behavior is akin to the process of knowing. Also, the act of successfully eliciting salivation when the conditioned stimulus is presented or the action itself in operant conditioning is analogous to knowledge. Therefore, across the behavioral paradigm, such knowledge is individually formed as the knower interacts, involuntarily or voluntarily, with the environment, and necessarily, such patterned response (i.e., knowledge) remains dependent on environmental conditions required to elicit that response.

Information Processing Theory

> There is beauty in the intricacy of human thinking when an intelligent person is confronted with a difficult problem. But there is a deeper beauty in the basic information processes and their organization into simple schemes of heuristic search that make that intricate human thinking possible. (H. A. Simon & Newell, 1971, p. 159)

As a perspective on learning, information processing theory was in many ways a reaction to radical behaviorism, a reaction to the behaviorists' distain for all things mental or not readily observable. Influenced by direct realism, the central premise of the theories comprising the information processing paradigm is that there exist a number of critical mental operations between stimulus and response that effectively transform information from the external world into internal mental representations (i.e., knowledge) that guide human actions or reactions. Indeed, whether one looks to Tolman's (1948) visual trial-and-error analysis, Miller's (1956) work on working-memory capacity, or J. Anderson's (1983) studies of cognitive architecture, information processing researchers are invested in understanding the cognitive processes and mechanisms at play from input,

through internal processing, to output. Although both information processing and behaviorism share this emphasis on processing, the information processing theorists view that process as a means to their desired end: the acquisition of knowledge.

Although there are competing models that seek to depict how humans process information, the majority are rooted in the early multistore model created by Atkinson and Shiffrin (1968). This early model consists of a sensory register that filters input, short-term memory where sensory information is initially encoded, long-term memory storage, and a response generator that aids in eventual behavioral output. Since this early model, empirical understandings about how humans process information have become more sophisticated. For example, the term *working memory* is used rather than *short-term memory* to clarify the explicit, workbench function of this aspect of memory, and researchers are careful to acknowledge the role of executive functioning in the transformation of external data into internal representations (Baddeley, 2003).

Also, recent neuropsychological studies lend support to models of human information processing in that they suggest that representations are stored throughout the brain and are activated based on their relations or connections to the object of input (i.e., connectionist models; e.g., Long, Baynes, & Prat, 2005; McClelland, 1988; Thomas & McClelland, 2008). Moreover, it is evident that the process of converting information to knowledge is mediated by characteristics of the learner, such as prior knowledge (MacGregor, 1999), attentional patterns (Mauer & Borkenau, 2007; Reynolds & Shirey, 1988), strategic capabilities (Fleming & Thorson, 2008), beliefs (Muis, 2007; Murphy, 2001), and memory capacity (Klapp, Marshburn, & Lester, 1983), as well as features of the object of interest, such as the genre of a text (Goldman, 2003), the credibility of the information source (Lord & Putrevu, 1993), or the intensity of the exposure to the object (Gasper, 2004). Further, it seems that more information processing models are acknowledging the power of human intention and executive control in the efficiency and effectiveness of information processing. That is, they are embracing a more active rather than passive processing system (e.g., Foltz, 2003; Kintsch, 2005; van den Broek, Rapp, & Kendeou, 2005). Finally, although information processing theorists, like behaviorists, see learning as a relatively enduring change in behavioral potentiality, they hold that it is the acquisition of knowledge that ultimately accounts for that transformation.

By no means do we intend to suggest uniformity across models of human information processing. To be sure, as detailed extensively in the literature (Zwaan & Singer, 2003), information processing models vary on a number of dimensions (e.g., representation generation or the nature of cognitive architecture). Despite these variations, knowledge is generally understood as internalized representations that have undergone some level of cognitive processing (Zwaan & Singer, 2003). As depicted in Figure 8.3, we contend that the formation of knowledge from an information processing viewpoint is largely an individual activity and that the knowledge resulting from this activity is stored in the mind of the individual. That being said, it is important to acknowledge the role of both social and environmental inputs in this process. As such, in positioning information processing within our epistemic space vectors, we placed it slightly toward the center of the source continuum and more toward the mind end of the reside continuum.

Radical Constructivism

> The fact that we *do* agree on certain things and that we *can* communicate does not prove that what we experience has *objective reality* in itself. (von Glasersfeld, 1991, p. xv)

Although both behaviorists and information processing theorists acknowledge the role of the individual in learning and knowledge formation, individuality is even more central to the tenets of radical constructivism. Exemplified by the writings of von Glasersfeld (1991), radical constructivism has been described as the educational equivalent to the existentialism within philosophy (Woods & Murphy, 2002). As such, this theoretical orientation reflects a Nietzschian and, thus, a postmodern perspective on knowledge justification. Specifically, as we discussed under the rubric of postmodernism,

the source of justification for what is true does not exist in authorities, in standards set by particular social or professional communities, or in empirical verification. Rather, the justification for what constitutes knowledge remains in the mind and perceptions of the individual (i.e., is doxastic), and reality and intention are virtually meaningless beyond what the individual perceives or deems them to be (Kaufmann, 1968).

Similar beliefs about knowledge and justification thread through radical constructivism. To radical constructivists, the struggle to attain and internalize ideas that are valued or held as legitimate by some external standard (e.g., mathematical standards or literacy conventions) is a questionable or fruitless enterprise. In fact, the very concept of an objective reality or truthfulness is merely a social or educational illusion to radical constructivists. There is only the reality that the individual mind can construct, and the only justification for what we call knowledge rests with the individual and his or her experiences and reason.

It is interesting to note that most radical constructivists, as with von Glasersfeld, came from the fields of mathematics and science. Perhaps their extremely individualistic stance toward knowledge and knowing was, thus, an understandable reaction to the commonly held views of mathematical and scientific information as unquestioned truth or individuals' response to mathematical or scientific content as simply right or wrong, black or white, without any place for individualism or creative thought, much like Descartes's position. One only needs to observe teacher and student interactions during mathematics or science lessons to appreciate this concern among radical constructivists for the unquestioned acceptance of authority or testimony or the limited opportunity for invention that would be witnessed. What these learning theorists seemingly prize in their writings is the learning environment where students are guided to reflect on the ideas they construct and to examine their own sources of justification: whether the outcome is conventional in form or commonly accepted in content (M. A. Simon, 1995).

For these reasons, we have chosen to plot radical constructivism within the individual (source) and mind (reside) quadrant in Figure 8.3. Given its existentialist orientation, there is no question that radical constructivism should be positioned toward the extreme, individually formed end of the source continuum. Although there is a place for the social other, that place remains in service of the individual's personal construction. Likewise, because of the value placed on the individual mind, we have positioned radical constructivism high on the mind side in response to the question of where knowledge is stored, although this concern is less addressed in theoretical writings.

Social Constructivism

> In what way will the event be enriched if I succeed in fusing with the other? If instead of two, there is now just one? What do *I* gain by having the other fuse with me? He will know and see but what I know and see, he will but repeat within himself the tragic dimension of my life. Let him rather stay on the outside because from there he can know and see what I cannot see or know from my vantage point, and he can thus enrich essentially the event of my life. (Bahktin, as quoted in Todorov, 1984, p. 108)

Whereas behaviorism, information processing, and radical constructivism place an emphasis on the role of the individual in knowledge and knowing, the three remaining theories (i.e., social constructivism, situated cognition, and sociocultural theory) are increasingly more attuned to the social nature of knowledge and the pivotal role of the sociocultural context for knowing. Drawing heavily on the writings of Vygotsky (1934/1986) and influenced by contextualism, those within the social constructivist paradigm understand learning (i.e., knowledge acquisition) as a socially mediated and culturally embedded higher ordered psychological process. Further, social constructivists stress the direct and undeniable effect of such social and cultural factors on knowledge construction.

From the social constructivist perspective, individuals come to know through authentic or meaningful participation in learning-rich environments

and are apprenticed into communities of practice by more knowledgeable others (e.g., parents, teachers, and more capable peers; A. L. Brown & Campione, 1990). For example, a child would acquire the skills and abilities related to animal husbandry on the family's ranch working closely with a parent or caregiver (i.e., a more knowledgeable other). Similarly, students in a mixed-age classroom might be placed in heterogeneously mixed literacy groups in which they discuss their understandings of the events of a mystery and what they saw as clues to the story ending. Through these interactions, individuals acquire the language, tools, and signs of the community of practice (Kelly & Green, 1998).

Moreover, it has been argued that through the process of interacting with others in a group in deep and meaningful ways, the outcomes or results produced by students are beyond the abilities and dispositions of the individual students who make up the group (Wertsch, Del Rio, & Alvarez, 1995). To be sure, the knowledge that students acquire as a result of participation in communities of practice is different, and possibly richer, than what they acquire working independently. As Bahktin (1981) suggested, students bring their own unique social and cultural values and individualized experiences (e.g., background experiences and prior knowledge and assumptions) to the learning experience, and these experiences become intricately woven into the fabric of the discourse. As participants in the discourse, learners incorporate ways of thinking and behaving that foster the knowledge, skills, and dispositions needed to support knowledge acquisition, transfer, and even independent learning (R. C. Anderson et al., 2001). In the context of discussion, students make their perspectives on issues arising from the public text, consider alternative perspectives proposed by peers, and attempt to reconcile conflicts among opposing points of view. This process is sustained and negotiated through the standards of reasoning governing the group behavior and discourse (Wilkinson, Soter, & Murphy, 2010).

Along these same lines, Bakhtin's (1981) work suggests that one's reasoning is necessarily a response to what has been said or experienced, as well as an anticipation of what will be said in response; that is, reasoning is inherently dialogical. The guiding premise is that reasoning is dynamic and relational. It is not so much that one cannot reason individually but rather that reasoning is mediated by prior experiences and the anticipation of future social experiences. As R. C. Anderson and colleagues (2001) stated, "thinkers must hear several voices within their own heads representing different perspectives on the issue. The ability and disposition to take more than one perspective arises from participating in discussions with others who hold different perspectives" (p. 2). Given the strong influence of the social milieu in the construction of knowledge within this paradigm, we chose to position social constructivism toward the socially derived end of the source continuum.

However, it is important to emphasize that even though social constructivists, following in the footsteps of Vygotsky and others (Bakhtin, 1981; Luria, 1976), see society and culture as essential for learning, they still acknowledge the individualistic character of knowledge and individual cognition. Despite the influence of social mediation and construction, knowledge remains a uniquely personal construction. Social and cultural influences notwithstanding, mental structures and cognitive development fall squarely within the social constructivist paradigm. For this reason, we chose to place social constructivism closer to the mind end of the reside continuum.

This placement is meant to reflect the fact that social constructivists hold to individual mental constructions. Certainly, such constructions have an inherent conception, but they are individually instantiated in the mind of the knower. The same, however, cannot be said for other frameworks, such as socioculturalism or situated cognition, that are even more process or group oriented than social constructivism. Indeed, as will be highlighted in our discussions of the remaining socially oriented theories, social constructivism is the only theory that we have placed in the social by mind epistemic quadrant.

Socioculturalism

> The result of intimate association, psychologically, is a certain fusion of individualities in a common whole, so that

> one's very self, for many purposes at least, is the common life and purpose of the group. Perhaps the simplest way of describing this wholeness is by saying that it is a "we"; it involves the sort of sympathy and mutual identification for which "we" is the natural expression. (Cooley, 1909, p. 23)

As discussed at the outset of this section, attempting to differentiate the various theories based on their conceptualizations of knowledge and knowing is both important and potentially treacherous. As a mechanism for dividing between very closely related theories, we chose to consider what we regard as more extreme or hard-line versions of the theory. This was particularly necessary for differentiating among those theories that embrace the more social and cultural aspects of learning and knowledge. This is due, in part, to overlaps between the underlying theoretical frameworks and research communities endorsing the social learning paradigms (Sawyer, 2002). Despite the fact that all theories positioned to the socially derived side of Figure 8.3 emphasize social and cultural or environmental factors, we feel strongly that the conceptualizations of knowledge and knowing within these communities are distinct enough to warrant situating them differentially in our epistemic vector space.

Nowhere in learning theory is the influence of social and cultural currents as readily apparent as within sociocultural learning theory. The rise of sociocultural theory in the late 20th century has been attributed to postmodernist, particularly pragmatist, philosophers and anthropologists such as Dewey and Mead, as well as Marxian social theory through the work of Soviet scholars like Vygotsky and Luria (Cole, 1996; Giddens, 1979). Sociocultural theory has also been traced to Cooley (1902/1922), who some consider the first to introduce one of the primary tenets of sociocultural theory, the claim of inseparability of the individual and society (Sawyer, 2002). In his classic treatise on human nature and the social order, Cooley wrote, "'society' and 'individuals' do not denote separable phenomena" (p. 37). It is on this tenet of inseparability that sociocultural learning theory is most easily distinguished from social constructivist learning theory.

The implications of this tenet of inseparability are particularly important in terms of knowledge. Arguably, from this vantage point, knowledge is possessed not by the individual but by the collective, that is, Cooley's "we." Based on Cooley (1902/1922), it would likely be best to understand the knower as the community or the primary group (e.g., family, classroom members, or play group) that serves as the repository of legitimate cultural practices rather than knowledge (Lave & Wenger, 1991). Thus, the removal of the boundary between the individual and the environment requires that the unit of analysis be reconceptualized (Rogoff, 1997). Developmentally, rather than focus on individual knowledge acquisition, educators holding to this perspective would need to think in terms of children appropriating or mastering patterns of participation in group activities (Rogoff, 1996). As one of the strongest contemporary advocates of inseparability, Rogoff rejected the Vygotskian notion of internalization because it suggests separate psychological planes for the individual and the community (Sawyer, 2002, 2005). "The child and the social world are mutually involved to an extent that precludes regarding them as independently definable" (Rogoff, 1990, p. 28).

A second tenet underlying sociocultural learning theory is a process ontology, which suggests that process "is the fundamental nature of reality" (Sawyer, 2005, p. 12). The socioculturalists, like situated cognitivists, have strong negative reactions to the word *knowledge* because the term carries with it images of individual acquisition and possession rather than shared social or cultural process understandings (Sfard, 1998). As Hutchins (1995) made clear, "Culture is not a collection of things . . . it is a process . . . and the *things* that appear on list-like definitions of culture are residua of the process" (p. 354). Similarly, Lave and Wenger (1991) made very strong claims regarding process ontology. Essentially, these theorists suggested that learning involves reproducing the social and cultural structure through participation in the everyday practices of the community. Schools are fundamentally conduits of cultural knowledge.

The influences that social and cultural anthropology have brought to bear on this theoretical framework are particularly evident. From Mead's (1928) studies of cultural enclaves or groups like the Samoan people to contemporary studies by Gauvain and Rogoff (1986) and Lave (1988) pertaining to how Girl Scouts go about selling cookies and how dieters practice their skills of selecting, weighing, and measuring food servings, sociocultural theorists are invested in the legitimate social practices of communities. As such, classrooms and schools, with their particular values, customs, and participatory structures, have likewise become fertile grounds for sociocultural study. Based on the inseparability of sociocultural purists, we chose to situate this theory on the extreme social endpoint on our source continuum (see Figure 8.3).

Placement along the reside continuum was a bit more difficult because of the process ontology. The sociocultural understanding of process ontology does not suggest that knowledge resides in the environment but rather privileges knowing in this epistemic space. Such knowing is thereby conceptualized as individuals' continuous engagement with the multiple sociocultural communities that undergird learning. We contend that this knowing versus knowledge orientation is more environmentally oriented than mind oriented. Consequently, we positioned sociocultural theory in the social by environment epistemic quadrant.

Situated Cognition

> [We] argue that knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used. (J. S. Brown, Collins, & Duguid, 1989, p. 32)

The final learning theory we position in our epistemic vector space is situated cognition, which has also been called situativity theory and situated action in the educational psychology literature (Greeno & Middle School Mathematics Through Application Project Group, 1998). One of the more contemporary orientations toward human learning, situated cognition also presents one of the more intriguing perspectives toward knowledge and knowing that has ever populated the educational literature. Among the particularly unique tenets of this learning theory, especially in its more uncompromising iterations, is the argument that views of the mind as storehouses of knowledge are indefensible. Situated cognitivists also hold to the premise that it is in the continuous interaction between person and environment that knowledge is not only formed but also where it remains. More to the point, you would rarely find the words *knowledge*, *mental representation*, or *memory* within the discourse of situated cognitivists, who are PM people to the extreme (Sfard, 1998).

At first glance, it may appear that situated cognitivists and behaviorists have much in common because both privilege environment in their conceptions of learning. However, there are marked contrasts between these two theoretical orientations that ultimately position situated cognition within the socially derived and environment quadrant of Figure 8.3. Perhaps the most salient distinction is that learning for a behaviorist entails an enduring change in the individual. By comparison, for the situated cognitivist, the individual remains in a state of flux, the only stability pertains to invariants within the environment, and learning occurs when the individual perceives the invariants. These notions about perceptions and invariants are legacies of the research of Gibson that has been a profound influence on situated cognitive views of human learning.

For instance, in reference to Gibson's (1966) research, situated cognitivists are concerned with how the environment, with all of its resources, affords human thinking. On the basis of his studies of visual perception and his observation of the way in which humans respond to subtle changes in light and texture, he concluded that human perceptions are direct, automatic, and continuous. The need to contemplate, mentally represent, or remember what was perceived did not play a role in the perception–action cycle that Gibson described.

Situated cognitivists advocate somewhat similar views about human learning and have attempted to carry these ideas of perception–action into their theory of human learning. Affordances to situated cognitivists are potential resources available to those who can recognize and take advantage of them.

Again, it is the moment of interplay between individuals and the environment that is the crux of knowing, and the need to convert this dynamic and context-based process into knowledge or knowledge structures is removed (Greeno & Middle School Mathematics Through Application Project Group, 1998). Also, such a perspective means that the process of knowing can never be divorced from the time or place in which it is unfolding.

Beyond the writings of Gibson, several factors have helped form this unique view of human learning. First, just as the views of radical constructivists were influenced by the perceptions of mathematical and scientific knowledge common within the educational setting and among the general populace, the tenets of situated cognition appear to have been shaped by experts in the fields of artificial intelligence and educational technology (Clancey, 1993). This technological orientation may be one reason that there is strong interest on human–machine interactions among situated cognitivists and why they talk as much about physical resources as they do human resources within the environment (Gillingham, Young, & Kulikowich, 1994). Indeed, it appears that the computer-based technology can serve the role of the more knowledgeable other that Vygotsky, Bahktin, and the socioculturalist would reserve only for human presence.

This conception of environment is one of the distinctions between situated cognitive and sociocultural perspectives on knowledge and knowing, which are closely positioned within our epistemic vector space. Although social aspects of learning are acknowledged within situated cognition, it is not only human–human interactions that are of concern, as is the case with the socioculturalists. Rather, when situated cognitivists discuss social interactions, those discussions may just as often entail human–machine interfaces or pertain to collaborative problem solving that involves technology (Cognition and Technology Group at Vanderbilt, 1996).

Another important difference between situated cognitive and sociocultural theories of learning relates to the unit of analysis or grain size. Much of situated cognition deals with individuals' immediate response to the environment, whereas socioculturalists have little interest in the behavior or thinking of the one. Instead, they are much more invested in the knowledge or understandings that become part of the social or cultural collective. The awareness of this dividing feature was one of the reasons that Greeno pushed for a change in name for this learning theory from situated cognition to situativity theory.

CONCLUDING THOUGHTS

Even as individuals who have collectively devoted a half century to the study of knowledge and knowing, we must admit that daily we speak of knowing this or not knowing that without the thoughtful reflective that Socrates sought from Theaetetus in the dialogue that opened this chapter. This is as it will always be in everyday discourse. Yet, we also realize that the complexity of what constitutes knowledge or the personal or communal standards that are applied to the justification of knowledge cannot exist solely as unexamined beliefs, especially for those who populate the educational psychology community or guide the learning and development of others. For that reason, we devoted this chapter to a journey into the realm of knowledge and knowing.

We began this journey by building what we called our epistemic vector space (see Figure 8.1), formed by the intersection of two central questions about knowledge: (a) What is the source of knowledge? (b) Where does knowledge reside? We then moved to an examination of the historical and philosophical foundations of knowledge and knowing. Our goal was to introduce readers to eight classical and contemporary philosophical theories and use the epistemic vector space to illustrate how classical and contemporary philosophical theories differently conceptualize knowledge and knowing (see Figure 8.2). Finally, we progressed in our journey to a consideration of how six prevailing theories of human learning mirror many of the philosophical debates about knowledge and knowing. As with those philosophical theories, we position these learning theories in our epistemic vector as a way to contrast their views on the questions as to where knowledge comes from and where it resides (see Figure 8.3).

We recognize that this epistemic journey may have been arduous, especially for those who are new

to this terrain. Nonetheless, we consider it to be a pilgrimage that all educational psychologists should take, given the centrality of knowledge and knowing to all other constructs that matter to us, from learning to self-concept, and from motivation to assessment. Without some deeper understanding of what we mean when we speak of knowledge or claim to know or not know, our personal journeys as educators or educational psychologists can be misdirected, and the guidance we afford others may be off course. Clearly, there is no guarantee that the information presented in this chapter, which derives from philosophy, psychology, and learning theory, will carry one to the desired educational end. Yet, we hold that the journey will be richer and the traveler less at peril as a result of the understandings—dare we say knowledge—gained.

APPENDIX 8.1: GLOSSARY OF KEY HISTORICAL AND PHILOSOPHICAL TERMS

antiessentialism: The position that all things cannot be precisely defined or described.

a posteriori propositional knowledge: *See* empirical propositional knowledge.

a priori propositional knowledge: *See* nonempirical propositional knowledge.

belief: A statement, proposition, or idea that is thought to be true.

coherentism: A school of thought that argues that the only viable means of justification is one's beliefs. Unlike foundationalism, however, coherentist theories of knowledge propose that beliefs are justified as knowledge by their relations to other beliefs, that is, by belonging to a coherent system of beliefs.

contextualism: A school of thought that denies that there are basic beliefs that provide justification for other inferential beliefs and that coherence is sufficient for justification. The basic premise is that of a person's ability to meet certain objections; the objections must be met, and whether they are met is relative to certain goals. Key to the justification of knowledge is the social information—the beliefs, information, and theories currently available—that plays an integral part in determining what objections will be raised and how to respond to them, as well as what responses the objectors will accept.

direct realism: In relation to perceptual experiences, what individuals are aware of are real objects, which continue to exist even after we are no longer aware of them.

doxastic justification: The position that beliefs serve as the only viable and sufficient means of justification.

dualism: Denotes a state of two parts. In philosophical epistemology, it is typically in reference to the division between the mind and body as two separate entities.

empirical (a posteriori) propositional knowledge: Knowledge obtained by experience or sensorial information.

empiricism: A school of thought that argues that knowledge is derived through sensory experience and justified by the reliability of information that is acquired through that experience. That knowledge also is acquired externally from the body and mind.

epistemic justification: *See* justification.

epistemic regress argument: The issue of whether all justification could be inferential. This argument results in the following issue for justification. Given any justified belief, *P*, this belief occurs in an evidential chain including at least two links: (a) the evidence or supporting link and (b) the supported link or justified belief. Evidential chains result in four possible outcomes: circular chains, endless chains, chains ending in unjustified beliefs, or chains that are anchored in foundational beliefs that do not derive their justification from other beliefs.

epistemology: The philosophical study of the theory of knowledge and justification of belief.

explicit knowledge: Knowledge of which the knower is aware (e.g., when the knower is able to overtly specify the steps to solve a mathematics problem).

externalism: Stipulates that an individual is justified in believing a proposition if and only if that belief is produced or sustained by a process or method that is reliable.

first-person authority: The thoughts, feelings, and needs that an individual has are things that no other person can claim to have (also called privileged self-knowledge).

formalism: The doctrine that formal structure, like mathematical equations, rather than content is what should be represented.

foundationalism: A school of thought that assumes that all knowledge is built on certain beliefs, called basic beliefs, which have some degree of epistemic justification. These basic beliefs do not depend on the justification of other beliefs but are somehow intrinsically justified. These noninferential (i.e., foundational) beliefs form the foundation on which all other knowledge rests.

indirect realism: In relation to perception, although there is a world of mind-independent objects that cause us to have experiences, what we perceive are the effects of these objects, which are accurate representations of some external reality.

inference (inductive and deductive): One source of knowledge, divided into inductive versus deductive knowledge. Inductive inference begins with a set of observations, which are then generalized. In contrast, with deductive inference, the conclusion necessarily follows from the premises so that it is not logically possible for the conclusion to be false.

internalism: Refers to the notion that everything necessary to provide justification for a belief must be internal to the individual.

introspection: One source of knowledge, also known as consciousness, which is the attention the mind gives to itself and its own operations.

justification: What is ascribed to a belief when that belief satisfies some evaluative norms concerning what an individual ought to believe.

knowledge: Philosophically understood as a justified, true belief.

logical behaviorism: A school of thought that developed from the logical positivism movement. Logical behaviorists argue that talk can be reduced to human behavior and that statements containing mentalistic expressions can be translated into some publicly testable and verifiable statements that describe behavior and bodily processes.

logical positivism: A school of radical empiricist thought that argues that knowledge is traceable to elements of experience and that, therefore, knowledge must be verifiable through experience or observation.

memory: One source of knowledge, which refers to the retention of or capacity to retain information or past experience.

mentalistic expressions: Thoughts derived from the human mind.

metaphysics: A branch of philosophy that investigates the nature of reality.

modernism: A set of cultural tendencies and movements that arose in Western society in the late 19th and early 20th centuries to move away from more traditional forms of art, literature, religion, social organization, and architecture.

nondoxastic justification/theories: The position that anything other than beliefs serves as viable and sufficient means of justification.

nonempirical propositional knowledge: Knowledge that is justified independently of experience.

nonpropositional knowledge: Knowledge by acquaintance or through direct experience.

perception: One source of knowledge that entails the extraction and use of information about one's environment and oneself through the senses (i.e., sight, hearing, touch, smell, and taste).

postmodernism: Literally meaning after modernism; a reaction against modernism and its values and assumptions. Like modernism, postmodernism broadly refers to cultural tendencies and perspectives, with critical theory as a central point of reference. Moreover, postmodernism is often associated with separation, uncertainty, and skepticism.

pragmatism: A school of thought that stresses the relation of theory to praxis, knowledge and action, and facts and values. According to pragmatists, concepts are habits of belief, and knowledge cannot be considered true by epistemic criteria alone; the adequacy of such criteria must be determined as a function of the goals sought and values instantiated. Moreover, knowledge is confirmed in the course of experience, which is fallible and subject to further revision.

privileged self-knowledge: *See* first-person authority.

procedural knowledge: Knowledge of how to do something.

propositional knowledge: Knowledge that something is so, like declarative knowledge.

radical empiricists: *See* logical positivism.

rationalism (a priori): A school of thought that emphasizes that knowledge is derived via an analysis of reason and logic. Specifically, knowledge is derived internally from the mind and is independent from experience.

res cogitans: The mind, or thinking substance, which is distinguished from res extensa.

res extensa: A description of the material world as extended substance, an indefinite series of variations in shape, size, and motion, which includes all physical and biological events and complex animal behavior.

sensation: *See* perception.

skepticism: A school of thought that doubts or questions whether there is adequate evidence to claim knowledge or justification and thus argues that all investigations should be suspended.

structuralism: A school of thought that acknowledges the importance of the social aspect of knowledge. Structuralists propose that society is organized by communication and exchange, whether it is information, knowledge, myths, or members themselves. The organization of social phenomena is explained via a comprehensive elaboration of their structures, which collectively give evidence to a deeper and all-inclusive social rationality. The social structures are then revealed by inference and deduction from observed empirical data.

tabula rasa: A blank tablet; used to represent the status of our minds at birth.

tacit knowledge: Unconscious knowledge of which the knower is unaware; personal knowledge that is

embedded in individual experience, such as beliefs or values.

testimony: One source of knowledge, which is knowledge acquired from another reliable individual, like a teacher.

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