Section VI
Future Directions for Epistemic Cognition Research
Reflections and Future Directions

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Regardless of the terminology used, the chapters in this Handbook all converge upon a common point: epistemic cognition matters. As the modern world becomes more and more complex, it creates an ever-greater press for knowledge, something known from which people can begin to explore the questions that have not been answered, yet. Epistemic cognition is needed to sift through the vast amount of information encountered in the world to separate the justified claims from the questionable assertions, the reliable processes from the untrustworthy practices, and the availing beliefs from the recalcitrant dogma. People make myriad decisions each day based upon the results of previous acts of epistemic cognition (e.g. “I know that if I deposit money in this bank, it will be there to withdraw when I return” or “I know this finding was published in a journal I trust, so I do not need to verify it myself”). The great irony in epistemic cognition research is that the feeling of certainty, this sense of knowing what is and will happen in the world, is a necessary, frequent, often tacit everyday experience that nonetheless beguiles those who attempt to make explicit how or why that sense comes about. The research problem, and its importance, are both clear: effective epistemic cognition is necessary to navigate the complexities of the modern world, but how does it develop, what form or forms does it take, and how does it vary across the contexts in which people act?

The chapters in Section I of this Handbook make strong arguments for the developmental origins of epistemic cognition in children's initial attempts at logic, argument, and understanding others. Such youthful evaluations, of testimony from others and perceptions of the world, evolve into the tacit knowledge, beliefs, and practices that young children invoke in formal and informal learning environments. Reliable processes that work for young children (e.g. direct perception, asking for help from parents) become less reliable as these children age and face more complex challenges (e.g. “This website looks very professional, does that mean the information is trustworthy?” or “Whose testimony should I believe regarding climate change?”). The authors of psychological models of epistemic cognition have focused upon how children's initially viable beliefs about their world, which some researchers argue are knowledge is simple, certain, and taught to me by adult authorities, shape and are
shaped by exposure to education and learning, how they develop along with maturing
cognitive complexity, and how they predict learning outcomes.

Disciplines form as humans coalesce around each other and their ideas, and
knowledge and normative practices emerge. As shown in the chapters in Section II
of this Handbook, novices to disciplines experience varying degrees of disconnect
between their “folk” knowledge and practices and those that others have deemed
normative. Such disconnects require educators who are willing to help these novices
acquire the tools for critical reflection and participation in these disciplines, such as
science, history, mathematics, and literature. As the authors in this Section describe,
education for greater expertise in the disciplines, and the transfer of expert-like prac-
tice to authentic settings, is no easy task.

The chapters in Section III make clear that epistemic cognition is not solely the
province of formal educational environments or disciplines. The dynamic
interactions between contexts, and their norms, can lead to both examined and unexamined
consequences for how people engage their epistemic cognition, or not. Differences
in epistemic cognition between formal and informal environments can shed light
on the phenomenon itself, and how it shapes, and is shaped by, context. As argued
in Section IV, without an understanding of the developmental origins of epistemic
cognition, or the social, contextual, and disciplinary forces that shape its nature and
expression, interventions designed to guide such development are likely underspecified.
To truly understand the effects of epistemic cognition interventions, researchers must
develop ways of assessing both short-term and long-term changes in people’s views,
behaviors, and understanding. Understanding epistemic cognition, and its develop-
ment, requires efforts such as those outlined in Section V, including careful measure-
ment that is informed by thoughtful conceptualization of the phenomena. Necessarily,
these conceptualizations should be aligned with, and differentiated from, other factors
affecting the human experience, both in terms of the products (e.g. knowledge ver-
sus other kinds of propositions) and processes (e.g. source evaluation versus need for
closure) of epistemic cognition. Such conceptualizations would benefit from incorpor-
ating work across the many academic disciplines in which scholars are studying
epistemic cognition.

When we decided to bring together authors who spanned psychological,
disciplinary, and philosophical views of epistemic cognition, we knew some
authors would be surprised to find their work characterized as epistemic cognition,
and some authors may be even more surprised to see others’ work characterized
similarly. We believe the multi- and interdisciplinary scope of this Handbook is one
of its greatest strengths. Taken together, the chapters in this Handbook advance
the field’s understanding of how epistemic cognition has been conceptualized, the
diversity of cognitive processes related to and drawn on by epistemic cognition, and
the cultural, social, and situational factors that influence epistemic cognition as it
occurs across diverse contexts. At the same time, the chapters in this Handbook
clearly illustrate that there is much that is not yet known about epistemic cognition.
In this last chapter we reflect upon four salient issues: the proliferation of terms with
some form of the adjective “epistemic” attached, key similarities and differences
between domain-specific and situated views, how changes in epistemic cognition
occur over time, and what epistemic cognition is and is not. We conclude this
chapter with a multi- and interdisciplinary call for more collaborative research into
epistemic cognition, and its effects, across contexts.
PROLIFERATION OF TERMS

One noticeable trend in the literature is the increase in the number of terms that researchers have used to describe aspects of epistemic cognition, or the contexts and factors that interact with it. Alexander (2016/this volume) has called this the “epistemic lexicon” (pp. 98). Attaching the adjective “epistemic” to phenomena implies that there is something qualitatively different about their epistemic versions as compared to the non-epistemic ones, for example “epistemic emotions” have been differentiated from other “academic emotions” (Pekrun & Stephens, 2011). Some researchers have questioned whether so many terms are needed, or whether there is utility in differentiating “epistemic” versions of constructs and phenomena (e.g. Barzilai & Zohar, 2014; Hofer & Bendixen, 2012).

In this Handbook, we counted over 100 different variations of “epistemic” or “epistemological” terms (see Table 30.1 for a partial list). While we continue to believe that the field benefits from divergent thinking and research on what epistemic cognition is, we recognize that it is equally important to investigate the utility of these terms, and cull the ones that are synonymous, do not prove useful, or are not substantially different than the phenomena without the “epistemic” adjective. After carefully reviewing each chapter in this Handbook, and consulting other work in the field, we have identified four categories of “epistemic” something terms (see Table 30.1). This review does not include terms used to describe the field overall (e.g. epistemic cognition, epistemic beliefs, epistemological beliefs, personal epistemology), or epistemic development or change, as these terms have been discussed well elsewhere (e.g. Bendixen, 2016/this volume; Bråten, 2016/this volume; Hofer & Bendixen, 2012; Kitchener, 2002; Sinatra, 2016/this volume).

Processes, Products, and Standards

Barzilai and Zohar (2014, 2016/this volume) have argued that the field we are calling epistemic cognition is better described by a more omnibus term, epistemic thinking, which is comprised of two aspects: epistemic cognition and epistemic metacognition. They show how various phenomena within the field of epistemic cognition could be conceptualized as cognitive or metacognitive processing focused upon the epistemic. Many authors in this Handbook use language from models of cognition and metacognition (e.g. Flavell, 1979; Nelson & Narens, 1994) or self-regulated learning (e.g. Winne, 2001) to describe how people think about epistemic issues. For example, metacognitive processing language, such as that described by Winne (2001), can also be used to posit how epistemic cognition occurs: when a person’s monitoring of content (e.g. a text) results in the recognition of an epistemic issue (e.g. is this text a reliable source for knowledge?), the person enacts epistemic activity, processing, or reasoning (e.g. evaluation of the source of the text) that creates epistemic products or stances (e.g. identifying the author of the text as a reputable researcher in a particular field) that could be compared to epistemic criteria or standards (e.g. reputable researchers are reliable sources for knowledge) to determine whether those products were adequate (e.g. evidence that a text’s author is a reputable source is sufficient to resolve the epistemic issue), or in need of further refinement through additional epistemic activity.

The frequent use of terminology and ideas akin to those in models of metacognition or self-regulated learning was in notable contrast to the less frequent, but still salient,
use of terminology regarding specific disciplinary practices. Many of the authors in Section II, and some in Section III, either directly or indirectly refer to epistemic norms within disciplines regarding specific reliable practices or processes (e.g. control of variable strategies, historical empathy and reasoning). Kelly (2016/this volume) makes the most explicit case for the need to include such specific reliable practices within epistemic cognition research, from a perspective of viewing knowledge as situated and contextual. More research is needed to determine whether epistemic cognition can be sufficiently modeled using ideas from metacognition and cognition models, and one potential source of misfit could be whether those models can adequately account for discipline-specific reliable processes, epistemic standards, and outcomes.

Motivation and Affect

In the epistemic cognition literature, the factors that can influence the processes and products of epistemic cognition go by many names, such as epistemic aims (Chinn, Buckland, & Samarapungavan, 2011). Chinn and Rinehart (2016/this volume) describe epistemic aims as “goals related to developing some sort of representation of how the world is” (pp. 461). On the other hand, Buehl and Fives (2016/this volume) expand upon this term to include teachers’ goals when helping others acquire information, knowledge, or understanding. Whereas epistemic aims seem to have a more contextual or situated aspect to them, the terms epistemic values, virtues, and vices (Chinn et al., 2011) and epistemic or epistemological dispositions (Buehl & Fives, 2016/this volume; Lee, Goldman, Levine, & Magliano, 2016/this volume) imply a more person-centered, stable proclivity to view knowledge and knowing in particular ways (e.g. need for closure, absolutism). Clément (2016/this volume) argues for a seemingly even more person-focused and stable aspect of epistemic cognition in his discussion of the epistemic vigilance hypothesis (Sperber et al., 2010), which outlines an innate, biologically based set of epistemic cognition processes. One prominent question is whether epistemic aims, goals, dispositions, emotions, etc., are fundamentally different in kind, frequency, or impact compared to their non-epistemic counterparts (cf. Sinatra, 2016/this volume). Another critical question is the degree to which these factors are maturational versus learned or contextual.

“Sophisticated” Epistemic Cognition

The realization that the “sophistication” of epistemic cognition is more nuanced, and situated, than originally conceptualized (cf. Greene, Sandoval, & Bråten, 2016/this volume) has led to some difficulty determining the proper terminology to describe this idea (Chinn et al., 2011; Hammer & Elby, 2002; Hofer & Bendixen, 2012; Sandoval, 2012). The terms in Table 30.1 reflect this changing view of the optimal forms of epistemic cognition; it is clear that many researchers are no longer willing to characterize particular beliefs, views, or stages as universally “sophisticated.” This begs the question of what criteria should be used to judge the adequacy of epistemic cognition both in and between contexts. One emerging idea is that, ideally, people should be able to adapt their epistemic cognition to match the norms of the context in which they enact their thinking (e.g. epistemic adaptiveness). Murphy and Alexander (2016/this volume) refer to this ability as epistemic competence. Such views are promising, but if borne out by research, will require careful consideration of how to teach people to
reconcile their own epistemic ideals and standards with those of the various contexts in which they learn and act.

**Tasks and Contexts**

The increase in terminology used to describe the products, processes, and desired functioning of individuals’ epistemic cognition has coincided with an expanding list of ways to describe the epistemic qualities of phenomena outside of the individual, including the epistemic aspects of various tasks and contexts (see Table 30.1). Whether epistemic cognition is enacted or not is likely due in some part to intraindividual factors (e.g. epistemic aims, Chinn, Buckland, & Samarapungavan, 2016/this volume; epistemic awareness, VanSledright & Maggioni, 2016/this volume). Nonetheless, many researchers have developed terms to differentiate tasks that seem to require epistemic cognition (e.g. evaluating the reliability of multiple conflicting sources to construct an argument) from those that seem less dependent upon epistemic cognition (e.g. memorizing the acronym PEMDAS for order of operations in mathematics). As researchers explore how epistemic cognition varies, or not, across tasks, it will be important to document and account for the intended, and unintended, epistemic challenges (Barzilai & Zohar, 2016/this volume), demands (Lee et al., 2016/this volume), or character (Elby, Macrander, & Hammer, 2016/this volume) of those tasks. However, we would caution against assuming that tasks with epistemic demands are always desirable, and that those lacking any epistemic character are inherently poor. As Bråten (2016/this volume) discusses, the likelihood of a person successfully traversing the epistemic aspects of a task is dependent upon the person’s familiarity with the relevant content and epistemic norms, as well as the context. It seems likely that some minimum amount of declarative and procedural knowledge is needed for epistemic competence in a particular discipline or context.

There have been numerous calls for increased scholarly attention upon the epistemic aspects of contexts, with a similarly numerate list of terms used to capture these aspects (see Table 30.1). Some of these terms refer to the epistemic qualities of disciplines (e.g. epistemic landscape, parameters) while others refer to the physical, psychological, or sociological spaces in which people find themselves (e.g. epistemic climate, community). As Bricker and Bell (2016/this volume) discuss, epistemic cognition occurs within and beyond the classroom, and can be very different depending upon context. More research is needed to understand the kinds of epistemic messages that disciplines and contexts send, how they are interpreted, and how they interact in contexts where multiple epistemic systems are salient (Greene, 2016/this volume). Again, the likelihood of enacting epistemic cognition is almost certainly an interaction between intraindividual factors (e.g. epistemic awareness, knowledge of relevant epistemic norms, motivation) and aspects of context (e.g. the clarity of instructions to jurors; Weinstock, 2016/this volume). Researchers need clear terminology that captures the dynamic interaction between what people perceive, what they do, and the ways in which contexts require, support, or dissuade epistemic cognition.

**Summary of Terms**

Scientific progress involves, among other things, a process not unlike environmental selection, where useful terms and ideas become more prominent, and less useful ones eventually fade away. Nonetheless, some active pruning of terms, including the
intentional selection of a particular term to be used instead of a number of others, seems needed. In addition, it seems clear that paradigmatic views of knowledge, put simply as “knowledge in the head” versus “knowledge as the interaction of people and context,” would dictate choices among many of the terms in Table 30.1 (see Greene et al., 2016/this volume). Better understanding, and investigation, of these views of knowledge would help to integrate findings from across the disciplines focused upon epistemic cognition.

LAYERS OF CONTEXTS FOR EPISTEMIC COGNITION

As noted in the introduction to this Handbook and demonstrated throughout many of the chapters that followed, the contextual nature of epistemic cognition is in many ways now taken for granted by researchers. Domain-general models of epistemic cognition have slowly evolved into domain-specific or even task-specific ones, if not fully contextualized ones (Chinn et al., 2011; Hofer & Sinatra, 2010; Muis, Bendixen, & Haerle, 2006; Sandoval, 2016/this volume). Yet, there is a good deal of variability both in the forms of cognition theorized and the phenomena thus identified and studied by researchers interested in epistemic cognition. There are multiple layers of context that can be identified as situations where epistemic cognition occurs and its nature can be variably described. The chapters in the Handbook make clear that researchers are considering these contexts in sometimes quite different ways. Articulating these differences is one way to point to productive directions for research.

Multiple, Overlapping Contexts of Epistemic Cognition

People have cause to think about what they know, whether they can trust some new claim to knowledge, and so on in a wide range of overlapping contexts. It is now quite clear that people’s epistemic cognition is sensitive to the differences in these contexts. What such differences mean with respect to the cognitive structures and processes individuals use to navigate their way through these multiple, often overlapping contexts is not well understood.

School is often treated as one context for epistemic cognition, but multiple contributors to this Handbook show that students often experience it as multiple contexts. The chapters on learning in the disciplines show that students often display different forms of epistemic cognition when learning history versus science, for example. Bendixen (2016/this volume) reviews a broad range of research about learning in elementary school that shows how learners construe various contexts during their school day. At the same time, there are aspects of school shared across specific subject matter contexts, perhaps the most important being that school work is often experienced as unrelated to life outside of school.

Bricker and Bell (2016/this volume) provide examples of how students’ epistemic cognition can be studied as they move through the contexts of their daily life. They draw attention to the social and cultural aspects of context in ways that emphasize how shifts in context shift the goals people pursue, including epistemic aims. As they suggest, research on epistemic cognition moving forward must find ways to characterize the multiple contexts through which people move, when and how such contexts evoke epistemic aims, and the forms of epistemic cognition people use to meet those aims (Greene, 2016/this volume).
Cognitive Processes versus Collective Practices

One way to consider shifts in context is to examine the difference between individual cognitive processes and collective practice. Kelly (2016/this volume) explicitly frames his focus on epistemic cognition as a feature of collective work, and his frame highlights the ways in which epistemic aims emerge through interaction and how the reliable processes to satisfy those aims are also shaped by the interactions of participants. This cultural psychology perspective shows how individual cognition is, at least partially, responsive to collective activity. As epistemic cognition scholars move toward capturing social features of specific contexts, such as the epistemic climate of a classroom (Muis & Duffy, 2013), researchers must bear in mind that such features are themselves interactional accomplishments achieved by groups of people.

Analyses of interaction can show how individual members of groups can contribute to framing what it means to explain the rock cycle (Rosenberg, Hammer, & Phelan, 2006), to make a good topographical map (Enyedy, 2005), or argue scientifically (Ryu & Sandoval, 2012). Such analyses make individual cognition visible only momentarily, however. The recognition that cognition is contextual and social does not obviate a concern for the individual, cognitive consequences from collective activity. One of the challenges for epistemic cognition research moving forward is to create methods that can link individual cognitive processes and collective practice, to describe and explain their mutual influence in specific ways. Bricker and Bell’s (2016/this volume) description of the tendency for research participants to interpret individually oriented tasks as school-like is one challenge to this effort, as it suggests that invoking “natural” epistemic aims during research studies can be difficult.

Related to this is the challenge of synthesizing findings across studies of collective practice or individual processing carried out by different researchers often working from different theoretical perspectives. One way synthesis might be supported would be for researchers to be explicit about the epistemic aims research tasks are intended to trigger, and collect evidence (i.e. a kind of manipulation check) on the epistemic aims participants actually seem to pursue during those tasks. It might then be possible to organize research synthesis around epistemic aims and their pursuits, rather than broader categories of epistemic cognition. That is, the operating epistemic aim might be a fruitful aspect of context to explicate in order to aggregate findings across a range of studies.

Knowledge as Contextual

Research on epistemic cognition inevitably contends with the variability of philosophical and psychological perspectives on the nature of knowledge. These variations abound in the chapters in this Handbook in ways outlined in the introduction. Both Kelly (2016/this volume) and Chinn and Rinehart (2016/this volume) explicitly assert the contextual nature of knowledge, drawing largely from philosophy and sociology of science. Many of the chapters in this Handbook show that epistemic cognition is contextual; that is, how people think about what and how they know is contextualized. These are related but different forms of contextualization, and they frame different questions for research. One question concerns the extent to which people see knowledge as contextual, both their own and others’. Epistemic cognition scholars have long asked about individuals’ perceptions of the complexity of knowledge, generally with a focus on tentativeness. Contextuality is a separate facet of knowledge, and there is
much more to learn of the extent to which people see knowledge claims as contextual, or what makes them so.

A separate question concerns the obverse of the now accepted contextual nature of epistemic cognition: what aspects of epistemic cognition, or belief, generalize and how? To the extent that research showing the contextual nature of epistemic cognition has cast doubt on extant developmental models and mechanisms, it generates a need for research that can explain what people generalize across the contexts of epistemic cognition they encounter, how such generalization occurs, and what are its consequences for future epistemic cognition.

**EPISTEMIC DEVELOPMENT AND CHANGE**

Much current research on epistemic cognition is rooted in Perry’s (1970) longitudinal interview studies at Harvard, resulting in a scheme describing the development of students’ thinking about knowledge and the process of knowing during the college years. That Perry’s focus on development has been retained by several prominent scholars in the field (e.g. Baxter Magolda, 2008; King & Kitchener, 2002; Kuhn, 2001) implies that change has been at the forefront of epistemic cognition research for decades. After all, change is at the heart of any developmental process, with development generally described as “the progressive series of changes in structure, function, and behavior patterns that occur over the life span of a human being” (VandenBos, 2007, p. 274).

When researchers interested in epistemic cognition interventions discuss change, however, they tend to distinguish between epistemic change that may result from interventions and change occurring during epistemic development (Kienhues, Ferguson, & Stahl, 2016/this volume; Muis, Trevors, & Chevrier, 2016/this volume). In doing this, they describe epistemic development as a slow and broad maturational or naturalistic process of change, and the form of change resulting from interventions as a more rapid and specific, more or less enduring, adaptation to environmental influences that does not depend on maturation. This distinction seems problematic for several reasons. First, distinguishing between epistemic development and epistemic change in a way that parallels the distinction between maturation and learning in classic educational and developmental psychology literature (e.g. Cronbach, 1962; Johnson & Medinnus, 1965), with maturation being genetically controlled and learning resulting from environmental stimulation, is problematic because epistemic development to a large extent may depend on systematic, organized schooling, which can hardly be described as being naturalistic or devoid of environmental stimulation. Second, describing epistemic change as independent of maturation seems to overlook the possibility that interventions to change epistemic cognition may be more or less successful depending on the more general developing epistemic thinking of individuals, be it genetically or environmentally determined. Finally, researchers trying to distinguish epistemic change from epistemic development may fail to take into consideration that more rapid and specific changes in epistemic cognition resulting from interventions designed to promote such change may generalize to influence individuals’ developmental trajectories as described by Perry (1970) and his successors within the developmental approach (e.g. Baxter Magolda, 2008; King & Kitchener, 2002; Kuhn, 2001).

Much further work, conceptual as well as empirical, is thus needed to clarify the relationship between the form of epistemic change targeted by epistemic interventions and the form of epistemic change described by developmentalists, including the possibility
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for mutual influences between those forms (Sinatra, 2016/this volume). Moreover, the underlying mechanism of change needs to be tested in future experimental (i.e. intervention) work as well as in longitudinal developmental studies.

Several models or mechanisms of epistemic change have been suggested in the literature. For example, Elby and Hammer (2010) described how the activation of fine-grained epistemological resources in a specific context over time may form a stable network with belief-like qualities (i.e. an “epistemological frame”) that is typically activated in that context and sometimes generalized across contexts. According to them, such change may involve volition on part of learners but not necessarily result in new epistemic beliefs because much epistemic change consists of the stabilization and generalization of already existing resources.

More widely adopted by epistemic intervention researchers, however (see Section IV), is the mechanism of change proposed by Bendixen and colleagues (Bendixen, 2002; Bendixen & Rule, 2004; Rule & Bendixen, 2010), involving epistemic doubt, volition, and resolution strategies. Whereas this may seem like a plausible way to describe the cogs of epistemic change, Bråten (2016/this volume) notes that this mechanism really needs empirical backing. Thus, there is plenty of room for increased clarity regarding the exact components involved in epistemic change, whether the same components are involved in all forms of change, and whether they need to appear in any fixed order. For example, if different components and different orderings of components may be involved, it is conceivable that the exact nature of the mechanism instigated by an intervention may influence the longevity and generality of the epistemic change taking place. Regarding long-term epistemic development in relation to a more abrupt epistemic change due to specific interventions, it is also highly pertinent to investigate whether the same mechanism of change components are involved or whether there are different mechanisms underlying the two forms of epistemic change. To the extent that the mechanism of change normally unfolding over longer periods of time is merely compressed in shorter time periods during interventions, consistent with Vygotsky’s (1978) experimental-genetic approach, the amount of compression could also indicate the endurance and generality of a particular intervention. That is, shorter and less extensive interventions, implying more compression, might lead to more short-lived and specific effects than longer and more extensive interventions, implying less compression. In brief, more attention to the potential mechanisms of change by means of diverse methodologies such as think-alouds, interviews, and observations is needed in both intervention and developmental studies (Mason, 2016/this volume). Moreover, extensive crosstalk between researchers conducting interventions to change epistemic cognition and researchers engaged in longitudinal studies of epistemic development is needed to clarify the nature of the mechanisms of change that are involved in the two settings, as well as the similarities and differences between them.

Regardless of the exact mechanism of epistemic change, the conditions that can set such a mechanism in motion deserve careful attention from researchers. These conditions are summarized by the term “dissonance” in Bendixen’s work (Bendixen & Rule, 2004; Rule & Bendixen, 2010), indicating that individuals perceive their current thinking about knowledge and knowing to be out of step (i.e. dissonant) with new information. Moreover, the new information creating such dissonance and, thereby, starting the mechanism of change is typically described in terms of multiple conflicting perspectives on an event, topic, or issue by researchers discussing epistemic cognition interventions (see Section IV). However, as noted by Bråten (2016/this volume),
working with multiple conflicting perspectives in educational settings may require adaptive epistemic cognition at least as much as it promotes it, a view consistent with cognitive flexibility theory (Spiro, Coulson, Feltovich, & Anderson, 1994; Spiro, Vispoel, Schmitz, Samarapungavan, & Boerger, 1987) as well as preliminary empirical findings (Bråten & Strømsø, 2006; Jacobson & Spiro, 1995). Thus, while designing and implementing interventions that create sufficient conditions for epistemic change should doubtless be high on the list of priorities among epistemic cognition researchers, using multiple conflicting perspectives as a pedagogical means may not be equally beneficial for all learners. For example, some students may need to build a knowledge base by producing accurate and coherent summaries of important information from single textbook-like sources before they are confronted with multiple conflicting perspectives in a content area, and others may require some additional scaffolded support in multiple perspective contexts (Bråten, Gil, & Strømsø, 2011). Also, teachers may provide scaffolded support by assigning tasks involving work with multiple perspectives that can be completed in groups where less resourceful students participate in discussions and shared writing, or other task-relevant production, with more resourceful peers (Schwarz, 2003). In any case, without designing and implementing epistemic cognition interventions that are differentially adapted to the individual differences of learners, including their epistemic cognition, it is difficult to see how epistemic cognition researchers can translate their work into meaningful educational practice.

WHAT IS EPISTEMIC COGNITION, AND WHAT IS IT NOT?

Finally, despite our conviction that there are real advantages to resisting the urge to too quickly lay down boundaries, we acknowledge the benefits that would arise by achieving some kind of consensus as to what epistemic cognition is, and is not (Alexander, 2016/this volume; Barzilai & Zohar, 2014; Chinn, Rinehart, & Buckland, 2014; Hofer, 2016/this volume). The proliferation of terms, described previously, and the integration of ideas from developmental psychology, educational psychology, disciplinary education, learning sciences, and philosophy, has made the field of epistemic cognition seem quite large, indeed. Arguments for domain-specificity, and contextuality, of the phenomena suggest that more domain-general conceptualizations of epistemic cognition (e.g. epistemic metacognitive skills; Barzilai & Zohar, 2014) must, at minimum, be supplemented with a bevy of discipline-specific epistemic norms, reliable processes (e.g. control of variable strategies in science, historical empathy) and epistemic ideals (e.g. falsifiability in science, elasticity in history). Studies of epistemic cognition in informal settings suggest important differences from formal settings that should also be captured (Bricker & Bell, 2016/this volume). These findings are one aspect of a larger argument about the situated nature of epistemic cognition (Kelly, 2016/this volume; Sandoval, 2016/this volume). After finishing the chapters in this Handbook, readers can be forgiven for feeling that the scope of the field of epistemic cognition is overwhelmingly, and unmanageably, massive. The desire to draw tighter boundaries around the field is a natural and reasonable one.

Chinn et al. (2014, 2016/this volume) have argued that one way to identify what is and is not epistemic cognition is by determining the individual’s epistemic aims, or lack thereof. The argument is that epistemic cognition is a subset of cognition, determined by the nature of the person’s aims. Barzilai and Zohar (2016/this volume) have
taken a different approach, arguing that epistemic thinking is comprised of cognition and metacognition about the epistemic. This conceptualization allows them to posit how research in cognition and metacognition can inform investigations of what people do and think when the object of their thinking is knowledge, or processes of knowing. Sinatra (2016/this volume) suggests that epistemic cognition is the process, and epistemic beliefs and knowledge, among other things, are the content upon which this process acts. Finally, of course, there continues to be productive work on epistemic cognition as a developmental process (Barzilai & Weinstock, 2015; Iordanou, Kendeou, & Beker, 2016/this volume), as sets of dimensions or theories (Bråten & Ferguson, 2014; Hofer, 2016/this volume), and as contextualized epistemological resources (Danielak, Gupta, & Elby, 2014; Elby et al., 2016/this volume).

Ultimately, the progress of scholarship on epistemic cognition will determine what it is and is not. Each of these conceptualizations, and the many epistemic “something” phenomena that populate this Handbook, can and should be pursued through ongoing research. Their viability is an empirical question that will likely require quantitative, qualitative, and mixed methods, and multiple studies, to resolve (Kelly, 2016/this volume; Mason, 2016/this volume). At the same time, productive lines of inquiry, and likely unproductive lines, can be identified through rigorous reviews of the philosophical, psychological, and educational literatures. As we believe this Handbook shows, before any particular subdiscipline or group of scholars makes a decision about what epistemic cognition is or is not, it would be wise to engage in more cross- and interdisciplinary thinking and research.

CONCLUSION

This Handbook serves as evidence that there is much to be gained from reading broadly across the many academic disciplines that consider epistemic issues and ideas. Directions for new research, and potential explanations of seemingly contradictory findings, can often be found outside of one’s own training or focus. At the same time, it is not possible for a single researcher to become an expert in education, psychology, philosophy, and all the other disciplines in which issues of epistemic cognition have become ever more salient. Familiarizing oneself with these literatures is crucial, but pursuing expertise in all of them is folly. Instead, the science of epistemic cognition must depend upon the division of cognitive labor, as all scholarly disciplines do, to synthesize and integrate the collective wisdom of each academic discipline into a larger, and more powerful, epistemic system. Philosophers doing naturalized epistemology would benefit from partnerships with education researchers. Psychologists wishing to describe and predict how laypeople conceptualize knowing should do so while considering the normative efforts of philosophers and disciplinary educators. Education researchers who restrict their scholarly lens to the classroom are likely to have a myopic, and overly contextualized, view of what epistemic cognition is, and how it happens. Colleagues across the disciplines can help each other identify and resolve the expertise blind spots, Gordian misconceptions, and motivated reasoning that challenge everyone who invests deeply in their work. It is our hope that this Handbook leads to profitable new connections between ideas and scholars, within and across scholarly boundaries. We can think of no more reliable process for knowing than through discourse, reflection, research, and partnership within and among the disciplines and scholars who study epistemic cognition.
Table 30.1 Categories and lists of epistemic “something” terms, and the chapter authors who used them

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<tr>
<th>Category</th>
<th>Term</th>
<th>Handbook Authors Who Use the Term</th>
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<td>Processes, products, and standards</td>
<td>Processes</td>
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<td>Epistemic activity or activities</td>
<td>Chinn &amp; Rinehart; Elby et al.; Stromso &amp; Kammerer; Weinstock</td>
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<td>Epistemic assessments</td>
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<td>Epistemic awareness</td>
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Table 30.1 (Continued)

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REFERENCES


Bråten, I., Gil, L., & Stromso, H.I. (2011). The role of different task instructions and reader characteristics when learning from multiple expository texts. In M.T. McCrudden, J.P. Magliano, & G. Schraw (Eds.), *Text relevance and learning from text* (pp. 95–122). Greenwich, CT: Information Age.


