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Beliefs About Knowledge and Knowing: Integrating Domain Specificity and Domain Generality: A Response to Muis, Bendixen, and Haerle (2006)

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In their review of the empirical research, Muis, Bendixen, and Haerle (2006) bring closure to the debate between domain specificity and domain generality of epistemic beliefs and provide a framework for future research. In response to their review, this article comments on issues that remain for those who wish to examine the nature of the interaction between epistemic domain specificity and domain generality and its relation to learning. These issues include methodological concerns, philosophical contributions, terminology, epistemology beyond academic domains, and educational implications.

KEY WORDS: Epistemic beliefs; domain specificity.

The issue of whether epistemic understanding occurs at either the domain general or domain specific level now seems as passé as the issue of whether intelligence is a function of nature or nurture. Much as psychologists now consider the interactive contributions of environment and heredity, those who now study personal epistemology generally acknowledge levels of both domain specificity and domain generality and have become interested in how they operate together. We can be grateful to Muis *et al.* (2006) for helping to bring closure to the specificity-generality debate. What begs analysis now is the precision of those levels, the role of context in making particular levels salient, the nature of the interaction between generality and specificity of epistemic beliefs, and the effect that each might have

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on cognitive processes, academic achievement, and outcomes outside the school environment. Muis *et al.* provide researchers with an excellent starting point and an intriguing framework for these next levels of investigation. In response to their article, I comment on several particular topics: domain specificity, methodological concerns, philosophical contributions, terminology, epistemology beyond academic domains, and educational implications.

DOMAIN SPECIFICITY ISSUES

As noted, there is little dispute that domain specificity exists. As stated elsewhere (Hofer, 2000), domains have different epistemologies, which are defining characteristics of academic disciplines. Academic disciplines differ with regard to standards of evidence and justification, the structure of knowledge, and the likelihood of certitude. Art historians, economists, and geologists do not use similar methodological approaches nor substantiate their knowing in similar ways. Even in those fields where empiricism is dominant, notable differences exist: chemistry and physics have elevated particular truth claims to the status of laws, but the scholarly community in psychology is unlikely to achieve this. Not surprisingly, then, Muis *et al.*'s (2006) review of empirical research on this topic indicates that all eight between-subject studies reported support for domain specificity and that nine of the eleven within-subjects studies reported support for domain specificity, some with additional evidence of domain generality. No one suggests that domain specificity is nonexistent.

Assessing domain specificity relative to domain generality is complicated by measurement problems (Hofer, 2000; Muis *et al.*, 2006). Measuring domain specificity with a domain general instrument is imprecise. A second complication is the role of expertise. Muis *et al.* note that it is not until graduate school that students' beliefs compare to experts (presumably because they are in the process of becoming experts themselves), but few studies actually include graduate students as participants. Thus some of the important questions Muis *et al.* raise cannot be answered by existing research. Although students make distinctions among the disciplines even during the first year of college (Hofer, 2000), more cross-sectional and longitudinal studies that reflect the development of expertise are needed in order to better understand both domain specificity and the interaction with domain generality over time. Presently, only limited snapshots of this development are available. In order to create a richer developmental picture of epistemology that effectively incorporates domain specificity, the field also needs to better integrate the expertise literature from cognitive psychology. In addition, as Muis *et al.* suggest, there is a need to distinguish between differences in

the structure of the disciplines themselves and the beliefs about those disciplines, which vary based on the development of expertise. Knowledge in chemistry might be more certain than psychology, but a chemist likely sees knowledge in chemistry as more fluid than does a first-year college student, or than does a psychologist, for that matter.

The concern about domain specificity is largely whether the general beliefs one has about knowledge and knowing vary by domain. However, some studies cited in the Muis *et al.* (2006) review as support for domain specificity (e.g., Stodolsky, 1991; Schoenfeld, 1989) are actually studies of beliefs *about* disciplines, not investigations of whether generalized epistemic beliefs differ at the domain specific level. In addition to whether one believes that knowledge is certain and simple in mathematics, one might also hold particular beliefs about mathematics (Muis, 2004), or about history, or science, etc. Believing that history is knowing dates and timelines or wars and their victors, that mathematics is formula driven, or that doing science is replicating experiments are also epistemic beliefs with considerable influence on learning. Researchers have identified, for example, epistemic beliefs in mathematics (De Corte *et al.*, 2002; Hofer, 1999; Mason, 2003; Mason and Scrivani, 2004; Schoenfeld, 1992), history (Wineburg, 1991, 1998), and science (Bell and Linn, 2002; Conley *et al.*, 2004; Mtetwa and Garofalo, 1989; Songer and Linn, 1991).

Therefore, as noted elsewhere (Hofer, 2005), individuals can be queried about their *general epistemic beliefs* (e.g., “Truth is unchanging”), *disciplinary perspective on beliefs* (e.g., “Truth is unchanging in this subject”), and *discipline-specific beliefs* (e.g. “A good way to know if something is true is to do an experiment”). The latter two appear confounded in the Muis *et al.* (2006) review. It may be useful to distinguish between them in future considerations and applications of the proposed framework. Such distinctions are increasingly important in understanding the relations among beliefs, cognition, and academic performance, and are critical in addressing beliefs in teacher education, particularly in math and science education.

METHODOLOGICAL ISSUES

Affirming the persistent claims of numerous colleagues, Muis *et al.* (2006) call for more methodological rigor in epistemological research. As the field moved from interview-based methodology to an increasing array of paper and pencil instruments and Likert-type survey instruments, it is not surprising that clarity of meaning was sacrificed. Muis *et al.* provide valuable suggestions for improving methodological precision at the design level (particularly with regard to levels of domain investigations),

instrumentation, and the use of statistical techniques. The authors aptly describe the difficulties researchers have in knowing what students are actually thinking when completing questionnaires, especially those that vary point of view (Hofer and Pintrich, 1997), and they make a persuasive case for improving instrumentation. An additional suggestion for improvement is to use cognitive interviewing in the refinement of existing questionnaires (Willis, 2005), a process my colleagues and I are beginning to apply to epistemological research (Hofer and Karabenick, 2005 November). By listening to individuals' responses to particular questions and determining whether their interpretation of questions is consistent with intended meaning, researchers can gain more measurement precision.

PHILOSOPHICAL CONTRIBUTIONS

Most of the early research on students' epistemic development and beliefs paid little attention to the philosophical origins of the field. I appreciate the work that Muis *et al.* (2006) have done to bring these historical underpinnings to our attention. In recent years, there have been several calls for deeper explorations of the philosophical literature in regard to the pursuit of epistemology at the psychological level, and this review responds to that call authoritatively. An earlier review that addresses philosophical foundations regarding belief and knowledge (Southerland *et al.*, 2001) was unfortunately overlooked by Muis *et al.* Although Southerland *et al.* directed their attention to epistemological foundations in science education explicitly, their work has general relevance to this enterprise. Readers eager to learn more about underlying philosophical issues in epistemology should refer to Southerland *et al.*'s article and to a special issue on philosophy and educational psychology (Murphy, 2003).

I encourage Muis *et al.* (2006) to press further in linking their philosophical framework to the task of defining personal epistemology; although stated as a primary goal of the article, the explicit connections between philosophy and a definition of personal epistemology are not evident. For example, the authors provide philosophical support that validates the dimensional structure proposed by Hofer and Pintrich (1997) but do not apply this structure in their analyses of the studies reviewed. Included in the Muis *et al.* review are empirical studies that incorporate a range of constructs that appear to lie well outside the territory of epistemology delineated at the outset of their review. For example, in their review of domain specificity, the authors include studies that incorporate measures such as beliefs about the malleability of intelligence (Schommer-Aikins *et al.*, 2003), the speed of learning (Jehng *et al.*, 1993), the need for

effortfulness (Buehl *et al.*, 2002), and attributions of success or failure (Schoenfeld, 1989). It would be helpful to acknowledge these distinctions and to evaluate the findings of domain specificity studies in light of the authors' definition of epistemology at the psychological level and based on their philosophical review. The field of epistemology is in dire need of improved construct validity, and these authors could help meet that need.

The primary framework used by Muis *et al.* (2006) to link the philosophical and the psychological is that of Royce (1959), although little rationale is provided for reliance on this particular framework to the exclusion of others that are foundational for the current research on epistemic understanding. Royce's approach to epistemology appears traitlike (e.g., individuals are described as partial to the cognitive process that reflects their predominant epistemology), a view that seems out of step with much of the research that followed. Royce was a contemporary of Perry (1970), whose work has been more influential in bringing epistemological issues to the attention of educators and psychologists (Baxter Magolda, 1992; Belenky *et al.*, 1986; King and Kitchener, 1994; Schommer, 1990). I question why Muis *et al.* attend more to Royce than to Perry in tracing the history of the field. Perhaps their future work can further explain the benefit of Royce's model and its links to current research on epistemic beliefs and development.

TERMINOLOGY

The review by Muis *et al.* (2006) refines terminology in this field and suggests substitutions for some existing terms. The use of "availing" as a substitution for "sophisticated" beliefs seems problematic on several counts, however. Part of what educational psychologists do as they explore the influence of epistemic beliefs is investigate what actually is availing—and availing of what (performance, conceptual change, etc.)—and in what context. Thus, labeling beliefs as availing, by definition, presumes their universal effectiveness. Which beliefs are actually productive might depend on the discipline, the context, and the role of expertise (Elby and Hammer, 2001). One study (Lonka and Lindblom-Ylanne, 1996) showed that novice medical students had more "naïve beliefs" than advanced students and such naïve beliefs might actually be productive in that setting, as accepting authority and embracing the certainty of knowledge in the first year of a medical program could be a wise strategy. This type of finding also helps explain the recursiveness that Chandler described (Chandler *et al.*, 2002), provides support for the rationale offered in the Muis *et al.* review, and suggests the need to more carefully consider when a belief is availing and why—rather

than labeling a belief as such. Furthermore, I question whether the goal of lessening recursion, as the authors suggest, is always desirable. A more nuanced understanding of why this takes place and when it might actually be productive is needed.

The distinction that Muis *et al.* (2006) make between “general epistemic beliefs” and “academic epistemology” seems troubling as well. Identifying “general academic beliefs” as those that develop in non-academic contexts is a disservice to those researchers who have made much broader claims about the nature and extensiveness of generalized beliefs (Belenky *et al.*, 1986; King and Kitchener, 1994) and about the pervasive influence such beliefs have across domains. I hope that in dismissing the earlier debate about domain specificity and embracing its existence that we do not go so far as to diminish the recognition and importance of domain general beliefs and the sweeping territory they cover—certainly both in and out of school. I do understand that in building a framework, distinguishing levels has a useful function, but I am unclear how to separate beliefs that develop outside school and beliefs that develop inside school. This division ignores the dynamic interplay of lived experience. Even the theory of mind studies that are cited by Muis *et al.* as evidence for beliefs developing outside of school are based on studies that take place largely in preschools and connote issues about authority and received truth that certainly transcend the school experience as well.

BEYOND THE ACADEMIC REALM

In surveying the extant research on domain specificity, it is not surprising that Muis *et al.* (2006) focus on epistemic understanding largely within the academic realm. As the authors note, however, epistemological perspectives are not limited to academic domains. Although those who study personal epistemology as beliefs tend to be educational psychologists interested in how these beliefs influence learning, some developmental psychologists who study epistemic understanding are interested in how these world views have broader implications. This extension of epistemic judgments into areas such as juror reasoning (Kuhn *et al.*, 1994; Weinstock and Cronin, 2003), argumentation about criminal recidivism (Kuhn, 1991), or fictitious wars (Kuhn and Weinstock, 2002) remind us that epistemic understanding matters. It is implicated in reasoning about *real* wars, environmental issues, medical care, and social policy. Our epistemic awareness has consequences throughout our lives. Learning what counts as authority and evidence influences our interpretation of what we read, experience, and ultimately know. Constraining personal epistemology to epistemic

understanding of schooled knowledge is, therefore, extremely problematic. Educators need to teach for transfer, and creating artificial distinctions between academic and nonacademic epistemology may work against this.

Even within domains, educators should assist students in developing skills that enable them to evaluate competing knowledge claims. Part of this process involves making underlying epistemic assumptions of the disciplines more explicit. In teaching educational psychology, for example, instructors can address teachers' ways of knowing. One critical role of educational psychology within a teacher education curriculum is helping students understand evidentiary claims, the role of empirical research, when to listen to their own experience, what authorities to accept, and what to question.

EDUCATIONAL IMPLICATIONS

Teaching, particularly at the college level, involves helping students understand what counts as knowledge within a particular field and the discipline-specific methods of knowing. Induction in a discipline requires understanding these epistemic assumptions. As an educational psychologist, for example, I hope that my students not only develop "true, justified beliefs" about educational psychology, but also understand the premises for truth claims and the methods for justification. These outcomes represent more than received knowledge; they are a means of continuing to evaluate new information as individuals progress as educators or researchers. Fundamentally, epistemic understanding is as critical a part of "learning to learn" as are self-regulation and learning strategies.

Those of us who teach educational psychology are in a somewhat unusual position in the academy because we typically teach an upper-level course to students who are majoring in a wide variety of other fields, often with little socialization in the epistemological assumptions of psychology. One of the challenges is helping teacher education candidates from humanities accept the privileging of empirical research as a foundation for knowing, or helping those from natural science, where knowledge appears relatively certain, to accept the more tentative nature of psychological claims without dismissing psychology as relativistic. An open area of investigation is whether epistemological understanding within a new domain brings about domain general changes concomitantly. From my own observations, I suspect that exposure to such domain distinctions at the epistemological level, although initially confusing, enhances students' general epistemological sophistication. Although Muis *et al.* (2006) make a strong case for this reciprocal influence, it remains an empirical issue worth testing.

In their historical overview of philosophy, Muis *et al.* (2006) suggest how various perspectives dominated at different points in time, concluding with the role of postmodernism. These prevailing philosophical trends color educational institutions and help interpret students' epistemological thinking. Congruent with Muis *et al.* analysis, Perry (1970) took a structuralist approach in offering a stage theory in which the modal stage for first-year college students was that of dualists. Based on Perry's developmental scheme, faculty members have been advised for several decades to help students move from their black-and-white thinking toward a more relativist stance. Research suggests that colleges aided this transition reasonably well. However, in the post-modern world, college students are less likely to arrive as dualists (Hofer, 1997). Current students speak the language of social construction and postmodernism, and their epistemological worldviews are derived from years of exposure to ideas about the social construction of knowledge. Perhaps confusing relativism and tolerance, they might readily accept others' conflicting beliefs and opinions. Such acceptance requires little of them. What is more difficult, however, and worthy of our attention as educators, is for students to learn to understand one another's premises and assumptions, challenge another's ideas as well as one's own, argue meaningfully, and learn to support one's position in such an argument. The move from relativism to evaluativism is a particularly difficult challenge in a post-modern educational environment, and Muis *et al.*'s historical reflections of philosophical currents may be useful in interpreting these patterns and developing educational strategies accordingly.

Among Muis *et al.* (2006) many fine suggestions for the educational implications of their work, the authors provide a suggestion that is problematic. Making students aware of their own epistemic beliefs seems conflated with making students aware of the epistemology of the disciplines; these are two distinctly separate issues. I suspect that the latter may be more productive. If direct exposure to discipline-based assumptions were more commonly a part of instruction (Hofer, 2001), then we might see earlier congruence between individuals' beliefs and the epistemic premises of the discipline, currently a hallmark of expertise. I look forward to future work by these authors that helps educators understand why students should become aware of their own beliefs and how to approach this task.

Muis *et al.* (2006) have laid the persistent debate of domain specificity vs. domain generality to rest, instructed epistemology scholars in the philosophical foundations of our work, and provided researchers with a productive framework for further investigations. I appreciate the substantive review they have offered and look forward to the work that may flower as a result.

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