The domain generality–specificity of epistemological beliefs: A theoretical problem, a methodological problem or both?

Margarita Limón*

Facultad de Psicología, University Autónoma of Madrid, Cantoblanco, 28049 Madrid, Spain

Abstract

Research on epistemological beliefs has clearly increased in the last decade. Even though the construct is clearer and relevant data are being collected, there are important theoretical and methodological issues that need further clarification. One of them is the debate about the domain generality–specificity of epistemological beliefs.

I argue that there are both theoretical and methodological difficulties that hinder a more fruitful approach of the domain generality–specificity debate. Differences in goals and scope of the diverse conceptualizations about epistemological beliefs and how they devise the role of content-domain and context are a major source of difficulties. Methodological problems such as whether such epistemological beliefs can be measured “in isolation”—free of content and context influence—or the impossibility of collecting direct measures of epistemological beliefs may influence how the domain generality–specificity question is approached. Some suggestions about how these difficulties may be overcome are developed. The relevance of exploring epistemological beliefs across domains and across contexts is emphasized.

© 2006 Elsevier Ltd. All rights reserved.

Keywords: Epistemological beliefs; Domain; Context; Learning; Methodology

*Tel.: +34 91 497 52 02; fax: +34 91 497 52 15.
E-mail address: margarita.limon@uam.es.

0883-0355/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ijer.2006.08.002
1. Introduction

Research on epistemological beliefs and students’ beliefs about different domains has clearly increased in the last decade, as a review of literature shows (e.g. Braten & Stromso, 2004; Hofer, 2004; Hofer & Pintrich, 2002; Schraw & Sinatra, 2004; Sinatra & Kardash, 2004). Even though as a result of it the construct is clearer and relevant data are being collected, there are some important theoretical and methodological issues that, from my view, need further clarification in order for research in this field to move forward.

One of these problems (e.g. Buehl, Alexander, & Murphy, 2002; Hofer & Pintrich, 2002) has been the generality–specificity of epistemological beliefs, which has been often formulated in terms of providing an answer to the question “Are epistemological beliefs domain general or on the contrary, are they domain specific?” As it has been pointed out in this special issue (see the introduction to the special issue) several criticisms have been made regarding the adequacy, the relevance and the fruitfulness of this question and subsequently, of research inspired from it.

One of these criticisms has referred to the conceptualization of domain. Sternberg (2005) argues that in order to further address the problem of domain generality versus domain specificity, a theory of “domain” is needed, and particularly, a clear definition of “domain” is essential. This is not a new problem, but a rather old one (see for instance, Alexander, 1992; Alexander & Judy, 1988; Ceci, 1989; Limón, 1995; Marini & Case, 1989; Wellman & Gelman, 1992) that has affected areas beyond epistemological beliefs, such as thinking and problem-solving skills, conceptual change, motivation and even creativity (e.g. Kauffman & Baer, 2005).

A second criticism has been that the consideration of the dichotomy between domain generality vs. domain specificity yields a kind of “false” dichotomy (Sternberg, 1989), as was also the case of other “classical” controversies in psychology (e.g. nature vs. nurture). That is, it is widely accepted that in all likelihood posing this question as an either … or one is not productive at all, because within a domain there will be both domain-general and domain-specific aspects. In the case of epistemological beliefs, this would mean that some epistemological beliefs will be domain-general and some of them will be domain-specific (Buehl & Alexander, 2001, this issue; Schommer-Aikins, 2002).

These two general criticisms apply not only to the particular problem of the domain generality–specificity of epistemological beliefs, but rather to psychological research focused on establishing comparisons across domains and on identifying what can be transferred from one domain to another.

Given that in the introduction of this special issue I have already referred to these criticisms, here I will introduce my view on some of the main obstacles researchers are facing in dealing with the domain generality–specificity of epistemological beliefs, and I will present some suggestions about how they might be overcome in order to make this problem more productive for research.

Thus, I will address two major obstacles I consider that are impeding a higher clarification of this debate: namely, the differences among the current conceptualizations of epistemological beliefs, and some methodological problems derived from these differences. The latter obstacle refers to the measure of epistemological beliefs: what should be measured and how. The first one is a clear theoretical problem, while the second one is mainly methodological, though how epistemological beliefs are conceptualized clearly influence how researchers try to measure them and what specific aspects of epistemological beliefs intend to measure.
The question of the domain generality–specificity of epistemological beliefs can be approached and answered in very different ways depending on how researchers conceptualize epistemological beliefs and accordingly, how they define their methodology to measure them. Therefore, both theoretical and methodological difficulties might influence how this question is being approached.

2. Difficulties on approaching the domain generality–specificity of epistemological beliefs

I will refer in this section to two major sources of obstacles researchers face on dealing with the domain generality–specificity of epistemological beliefs:

(a) The disparity of conceptualizations about epistemological beliefs.
(b) The methodological problems that exist in measuring epistemological beliefs.

2.1. Disparity in the conceptualization of epistemological beliefs

The domain generality–specificity of epistemological beliefs has been approached in several different ways. As Table 1 intends to show and as Hofer (2004) has pointed out, to date three main types of conceptualizations of epistemological beliefs have been proposed: the developmental approach, the system of beliefs approach and the epistemological resources approach. There are some common features among all these approaches, but also important differences I will discuss in Section 2.2.

2.2. A comparison of epistemological beliefs conceptualizations with the domain generality–specificity question in the background

In this comparison, it is important to note that the developmental perspective has been developed for a rather long time, specifically, since the late seventies and the eighties, although it has often been given other labels, such as postformal reasoning, dialectical thinking, or relativistic and dialectical thought. Therefore, the developmental approach has accumulated more research data and it has reached a higher level of elaboration in comparison to the other two more recent approaches.

I will begin by referring very briefly to some common features shared by all the approaches. As Pintrich (2002) noted, there is a wide agreement about defining epistemological beliefs as individuals' beliefs about knowledge and knowing. Although those representing the epistemological resources approach (Hammer & Elby, 2002; Louca, Elby, Hammer, & Kagey, 2004) would disagree about the existence of proper beliefs in children and novices, they may agree with this definition for describing expert epistemologies.

There are very important differences regarding when and how epistemological beliefs develop, but there is agreement about the developmental nature of epistemological beliefs. However, it does not require that a developmental stage-model is assumed.

2.2.1. Differences with regard to the development and consistency of epistemological beliefs, and the role of content and context

Firstly, I will review and compare the models presented in Table 1 within each approach, regarding the development and consistency of epistemological beliefs, and the role of
<table>
<thead>
<tr>
<th>Model and author/s</th>
<th>Label employed and working definition</th>
<th>Intended scope of model</th>
<th>Development of epistemological beliefs</th>
<th>Role of context</th>
<th>Role of content</th>
<th>Consistency of EB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Developmental models</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development of epistemological understanding (Kuhn et al., 2000; Kuhn &amp; Weinstock, 2004)</td>
<td>Epistemological understanding/thinking, that involves the coordination between the subjective and objective view of knowledge</td>
<td>To account for the development of epistemological understanding from childhood to adulthood</td>
<td>Four main stages:</td>
<td>The model does not consider context differences, though epistemological thinking may be approached as a “theory in action”</td>
<td>There may be content domain differences</td>
<td>Yes, within every stage, though stages capture the broad progression from absolutist to multiplist to evaluativist, not a nuanced picture of individuals’ progression</td>
</tr>
<tr>
<td>Development of reflective thinking (King &amp; Kitchener, 1994, 2002, 2004)</td>
<td>Reflective thinking, that is complex reasoning that late adolescents and adults use when they have to solve controversial (ill-structured) problems</td>
<td>To account for the development of reflective reasoning from late adolescence to adulthood</td>
<td>Three main stages:</td>
<td>The model does not consider context differences</td>
<td>Even some significant effect of content was found (Wood et al., 2003), in general it is assumed a rather high rate of content consistency</td>
<td>The model admits variability in reasoning across stages, but individuals’ only move along adjacent patterns</td>
</tr>
<tr>
<td>Development of epistemological reflection (Baxter Magolda, 1992, 2001, 2002, 2004)</td>
<td>Epistemological reflection: Assumptions about the nature, limits, and certainty of knowledge</td>
<td>To account for the development of epistemological reflection during young adulthood</td>
<td>Four main stages:</td>
<td>Context-bounded, linked to personal experiences of learning and instruction</td>
<td>The model does not consider domain differences</td>
<td>Stages consistency is assumed, though different personal experiences and situations may lead individuals to reach a particular stage. Different within-stage patterns</td>
</tr>
<tr>
<td>Model and author/s</td>
<td>Label employed and working definition</td>
<td>Intended scope of model</td>
<td>Development of epistemological beliefs</td>
<td>Role of context</td>
<td>Role of content</td>
<td>Coherence and consistency of EB</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------</td>
<td>------------------------</td>
<td>----------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td><em>(b) The system of beliefs approach</em>&lt;br&gt;Epistemological belief system (Schommer-Aikins, 2004)</td>
<td>Epistemological belief system: More-or-less independent beliefs about:&lt;br&gt;(a) The stability of knowledge,&lt;br&gt;(b) The structure of knowledge,&lt;br&gt;(c) The source of knowledge,&lt;br&gt;(d) The speed of learning and&lt;br&gt;(e) The ability to learn</td>
<td>To account for the development of independent beliefs about knowledge, knowing and learning&lt;br&gt;How these epistemological beliefs develop and how they relate to and interact with other aspects of cognition and affect is not clear yet&lt;br&gt;Basically, it applies to learning in academic contexts</td>
<td>It is not a stage model&lt;br&gt;Development of beliefs may be asynchronous&lt;br&gt;Beliefs support higher order thinking: those with more mature beliefs will be more able to develop higher order thinking skills</td>
<td>Quantitative measure of epistemological beliefs (using the Schommer Epistemological Questionnaire, though) should just measure epistemological beliefs, not the classroom or learning context</td>
<td>Quantitative measure of epistemological beliefs (using the Schommer Epistemological Questionnaire, though) should just measure epistemological beliefs, avoiding domain-specific beliefs</td>
<td>Epistemological beliefs are independent each other, therefore, coherence is not expected, though some individuals' EB may be coherent&lt;br&gt;EB are difficult to change, to this regard they seem to be rather persistent</td>
</tr>
<tr>
<td><strong>Beliefs about academic knowledge</strong> (Buehl &amp; Alexander, 2001, this issue; Buehl, Alexander &amp; Murphy, 2002)</td>
<td>Epistemological beliefs: Individuals' conceptions of knowledge and knowing&lt;br&gt;They constitute the individual's epistemological belief system</td>
<td>To provide an explanation of the nature of EB and their role in learning in academic settings&lt;br&gt;Basically, it applies to learning in academic contexts</td>
<td>Developmental changes on EB should be expected&lt;br&gt;Differences on EB due to the expertise level should be expected&lt;br&gt;Domain-specific beliefs developed from domain-general beliefs</td>
<td>Epistemological beliefs multilayered and therefore, they may be context dependent</td>
<td>Epistemological beliefs multilayered and therefore, domain-general and domain-specific beliefs may coexist&lt;br&gt;E.g. beliefs about knowledge and about particular types of knowledge</td>
<td>Given that EB may be content and context dependent consistency/correlation among individuals' EB may not be necessarily found&lt;br&gt;Once domain-specific beliefs become more differentiated from domain general beliefs, likely a higher level of within domain-specific beliefs consistency may be found</td>
</tr>
<tr>
<td>Model and author/s</td>
<td>Label employed and working definition</td>
<td>Intended scope of model</td>
<td>Development of epistemological beliefs</td>
<td>Role of context</td>
<td>Role of content</td>
<td>Coherence and consistency of EB</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------</td>
<td>------------------------</td>
<td>----------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>(c) Personal epistemology and epistemological resources models</td>
<td><strong>Personal epistemology</strong> (Hofer &amp; Pintrich, 1997; Pintrich, 2002; Hofer, 2000, 2001, 2004)</td>
<td>Cognitions and beliefs about: (a) The certainty of knowledge; (b) The simplicity of knowledge; (c) The source of knowledge; (d) Justifications for knowing (Pintrich, 2002)</td>
<td>To elaborate an explanation on “how the individual develops conceptions of knowledge and knowing and utilizes them in developing understanding of the world” (p. 4, Hofer, 2002)</td>
<td>Personal epistemology might be expected to develop over time (developmental nature) but also</td>
<td>Beliefs about knowledge and knowing are situated in practice and activated in context</td>
<td>– Personal epistemology might follow predictable patterns of development</td>
</tr>
<tr>
<td><strong>Personal epistemology</strong> is a set of beliefs, organized into theories, operating at the metacognitive level (Hofer, 2004, p. 46)</td>
<td>– Valid not only for academic/learning sphere</td>
<td>– Beliefs about knowledge and knowing are situated in practice and activated in context</td>
<td>– Personal epistemology seems to be discipline dependent (Hofer, 2000)</td>
<td>– Beliefs about knowledge and knowing operate at both the domain-general and the domain-specific levels</td>
<td>– Individuals’ ideas about knowledge and knowing may organize into theories, showing a rather coherent organization</td>
<td></td>
</tr>
<tr>
<td>Epistemological resources (Elby &amp; Hammer, 2002; Louca et al., 2004)</td>
<td>Epistemological resources: a range of cognitive resources for understanding knowledge. Units of cognitive structure at a finer grain size than stages, beliefs, or theories</td>
<td>To achieve a better understanding of science learning by knowing the effect of epistemological resources on science learning. Basically, it applies to science learning in academic contexts</td>
<td>A developmental view, but not a stage model of development is assumed. “Belief” connotes a degree of stability and articulateness that cannot be applied to children’s views of knowledge. Naïve and expert epistemologies differ in content (views supported) and in the form. Acquiring expertise involves that fine grained resources will develop to form epistemological beliefs</td>
<td>Epistemological resources are context dependent: Different contexts activate different epistemological resources</td>
<td>Their meaning of context include disciplinary changes, thus, if domains are defined as synonymous of academic disciplines, epistemological resources would be context dependent as well</td>
<td>– Children’s epistemological resources are context dependent, thus, no consistency is expected</td>
</tr>
</tbody>
</table>

Table 1 (continued)
content-domain and context. Secondly, I will discuss briefly the differences among the three views at the end of this section.

**Developmental approach**: As it was mentioned above, the developmental approach focuses on explaining developmental changes in epistemological thinking and the underlying epistemological beliefs. The three models I have selected as representatives of this approach (see Table 1) are stage models. However, none of them are “traditional stage models”.

King and Kitchener’s model adopted the Rest’s (1979) complex stage model. This model allows variability in reasoning across stages. Individuals are not “in” or “at” a particular stage, but their pattern of reflective thinking development is characterized by “… waves across a mixture of stages, where the peak of the wave is the most commonly used set of assumptions … this developmental movement is better described as the changing shape of the wave, rather than as a pattern of uniform steps interspersed with plateaus” (King, Kitchener & Wood, 1994, p. 140, quoted as well in King & Kitchener, 2004, p. 10). In sum, this model asserts that individuals usually move through just two adjacent stages.

While exploring the possible domain differences in the development of reflective thinking, King and Kitchener (2004) have found that individuals use their epistemic assumptions in a highly consistent way, although some of their results have shown some significant content differences (King, Kitchener, Wood, & Davidson, 1989; Wood, Kitchener, & Jensen, 2003) that were more pronounced in individuals with a higher level of education (i.e. college or graduate students).

Kuhn & Weinstock (2002) asked whether the general developmental sequence of the epistemological understanding they proposed may occur in a domain-dependent manner. That is, they explored whether people could reach a different level of epistemological understanding depending on the content from which they were assessed. Kuhn and Weinstock proposed five type of judgement considered as domains: judgments of personal taste, esthetic judgments, value judgements, judgments of fact about the social world and judgments of fact about the physical world. They reported some domain differences.

Authors of these two models have emphasized that their models intend to capture the development of epistemological thinking in molar rather than fine-grained terms. According to King and Kitchener (2004) this is why their model is less sensitive to content differences.

Therefore, even if these models do not deny the possible influences of domain in the development of epistemological thinking, and in fact, they have detected some of them, they seem not to be sensitive enough. On the other hand, these models are more focused on the development of reasoning and the qualitative changes to be achieved in every stage, rather than on identifying domain differences. The two models use a different meaning of domain, making more difficult to compare the evidence regarding these differences.

Regarding context, Baxter-Magolda’s model (Baxter Magolda, 2002, 2004) is context-bound and linked to individuals’ experiences of learning and instruction. This model does not seem to consider, at least explicitly, possible domain differences. However, the role of context becomes essential for epistemological reflection to develop. King and Kitchener’s model does not consider explicitly the role of context on explaining epistemological beliefs. Referring to the application of epistemological beliefs and epistemological thinking in daily life, Kuhn and Weinstock emphasized that daily life activities require making judgments. Our epistemological theories would be like “theories in action” that seem to be sensitive to context.
Regarding consistency, some of the models have recognized some variability within stages. For instance, King and Kitchener (2002, 2004) assumed the complex stage model developed by Rest (see above). Kuhn and Weinstock (2002) identified some domain differences in the transitions from absolutist to multiplist and from multiplist to evaluativist, and Baxter Magolda (2002, 2004) found some different patterns in males vs. females. Despite this evidence, it can be said that, in general, these models assume a rather high level of within stage consistency.

The system of beliefs approach: As mentioned earlier, these models have focused more on describing the nature, features and structure of epistemological beliefs, adopting a rather static view instead of mainly focusing on the development and the changes epistemological beliefs may suffer, as was the case of the developmental approach. Accordingly, these models offer an alternative view to the already existent developmental models.

Schommer-Aikins (2002) stated that epistemological beliefs do not develop in synchrony, that is, someone may think that knowledge is highly complex and simultaneously that it is highly certain. This synchrony or asynchrony will vary depending on an individuals’ point of development. The development of epistemological beliefs may be recursive throughout the lifespan. Given that she considers that epistemological beliefs are multidimensional at a particular time, that is, an individual may sustain different beliefs at different dimensions, no coherency or consistency across domains should necessarily be expected.

Schommer-Aikins (2002) also stated that domain-specificity may vary over development. She considered as a possibility that personal epistemology would be domain-general early in life and become later more domain-specific as a consequence of the exposure to ideas coming from family, peers, culture, school, etc. However, she suggests it cannot be sustained that there is no domain generality of epistemological beliefs. She assumes that there is a general core of epistemological beliefs from which domain-specific epistemological beliefs would spring forth. That general core of epistemological beliefs will be transferred or employed for learning in a new domain.

The Schommer Epistemological Questionnaire measures epistemological beliefs avoiding the possible effects that context or domain may provoke. Schommer-Aikins (2004) explained that:

“If researchers narrow the focus of assessment on domain-specific epistemological beliefs, or epistemological beliefs within the context of a specific classroom, they will likely get higher reliability. On the other hand, they will be assessing not only epistemological beliefs, but also the idiosyncrasies of the teacher, the textbook, and the classroom ambience” (pp. 22–23).

Therefore, it seems that the goal of the Schommer Epistemological Questionnaire should be just to measure “pure epistemological beliefs” avoiding the possible effects of domain and context. The items of the questionnaire do not seem to be designed for being sensitive to potential domain and context differences. As epistemological beliefs are seen as independent of each other, coherence is not expected though it may occur. Consistency among dimensions is not expected either.

Buehl and Alexander (2001, and this issue) and Buehl et al. (2002) have emphasized that their model applies only to academic knowledge and subsequently, their research has focused on academic domains (e.g. mathematics or history). They contend that there are both qualitative and quantitative changes along the development of epistemological beliefs.
and as a consequence of developmental changes there may also be shifts in the differentiation and specialization of beliefs about knowledge.

A differentiation of domain-specific epistemological beliefs should be expected in higher levels of development when individuals have gained both more domain-specific knowledge and experience. Therefore, they would share with Schommer-Aikins the idea that the earlier epistemological beliefs would be domain-general and that later as an effect of both development and of gaining expertise in a particular domain (this latter assumption is assumed only by Buehl and Alexander), epistemological beliefs would become more differentiated and more domain-specific.

Buehl and Alexander contend that epistemological beliefs are multilayered (individuals possess beliefs about knowledge in general and about specific types of knowledge—e.g. academic knowledge), so an individual may possess both domain-general and domain-specific beliefs. They also defend the contextual character of epistemological beliefs and the need of measuring them across contexts.

Once domain-specific beliefs become more differentiated from domain-general epistemological beliefs as a result of gaining expertise in a particular domain, they will likely show a higher level of coherence and consistency within the domain. As both domain-general and domain-specific beliefs may coexist, measures of epistemological beliefs may not necessarily reflect consistency or coherence across domains.

Hofer and Pintrich (1997) considered that individuals’ beliefs about knowledge and knowing may be organized as personal theories, instead of being a system of independent beliefs. Therefore, personal epistemology implies more integration in individuals’ perspectives than those models that consider epistemological beliefs as rather independent beliefs. Regarding the development of epistemological beliefs, Hofer (2001) stated that developmental stage models have a good heuristic value to provide a road map of development. However, epistemological beliefs development will not likely follow a single ladder path, but rather a web of developmental pathways.

Recently, Hofer (2004) considered personal epistemology as a form of meta-knowing (knowing about knowing), defining personal epistemology as

... a set of beliefs, organized into theories, operating at the metacognitive level. Such theories develop in interaction with the environment, are influenced by culture and education and other context variables, operate at both the domain-general and domain-specific level, are situated in practice, and are activated in context. (p. 46)

This definition clearly recognizes a relevant role of both domain and context on characterizing epistemological beliefs. This is the model that suggests that individuals’ epistemological beliefs have a higher level of coherence (epistemological beliefs are organized into theories), at least at the metacognitive level. If measures of epistemological beliefs are sensitive to domain and context differences, it is likely that they should not reflect much consistency across domains or across contexts.

Epistemological resources approach: Louca et al. (2004) provide an excellent comparison between the epistemological resources approach and the developmental and systems of beliefs approaches, respectively. Thus, here I will just mention very briefly a few points relevant for my discussion. Regarding development of epistemological resources, Louca et al. contend that as people gain knowledge and experience with learning, their epistemological resources become richer and better articulated. Then, the contextual cueing strengths evolve, making epistemological resources activated more often and in a
stronger way. In this sense, epistemological resources become more interconnected toward an expert epistemology in which individuals already sustain “beliefs” strictly speaking instead of just epistemological resources. Thus, they consider both expertise and development as factors responsible for the changes in individuals’ epistemological beliefs.

According to their definition of context, it can be said that Louca et al. (2004) consider epistemological beliefs/epistemological resources as both domain and context dependent. Accordingly, not much consistency across domains or contexts is expected, at least in novices (as most learners are).

**Discussion:** What are the main differences among these approaches regarding development and consistency, and the role of the content-domain and the context? As pointed out by Hofer (2001), basically the developmental approach has provided a road map for understanding the development of epistemological beliefs. As both King and Kitchener (2004) and Kuhn and Weinstock (2002) have indicated, their models have tried to capture the process of epistemological beliefs development in molar rather than fine-grained terms, but in general, they show a linear progression. Other models (e.g. those representing the system of beliefs) have suggested that other type of paths could be followed along development (e.g. a web path, a recursive path along lifespan, etcetera).

Even if these developmental models do not deny the possible influences of domain in the development of epistemological thinking, and in fact, they have detected some of them, they seem not to be sensitive enough. The Schommer Epistemological Questionnaire does not seem to have been designed for identifying domain and/or context differences. Buehl et al. (2002) found that domain-specific epistemological beliefs can be measured and arose when the instruments developed intend to capture these differences. Hofer (2000) and Limón (2004) have also reported domain differences (domain is understood as academic discipline in these studies).

Only Buehl et al. (2001, 2002, this issue) have explicitly considered the level of expertise as a variable that, together with development, may affect individuals’ epistemological beliefs. All models acknowledge there will be qualitative shifts in the development of epistemological beliefs, that is, all models admit developmental changes, but it is not clear how context and domain influence the path followed along this development.

In general, developmental models do not recognize the context or domain-specificity of epistemological beliefs (they are domain-general for most of the representatives of the developmental approach), the belief system proposed by Schommer-Aikins does not recognize them either. However, the models proposed by Buehl et al (2002, this issue), Hofer and Pintrich (1997, 2002) and Louca et al. (2004) consider that domain-general and domain-specific epistemological beliefs may coexist and that epistemological beliefs are situated and activated by context.

2.2.2. Differences with regard to the different goals and scope of epistemological beliefs conceptualizations

There are important differences; however, I will just focus in some of them that I will discuss briefly below:

i. The primary goal of developmental models (especially those developed by King & Kitchener and Kuhn & Weinstock) was to explain the stages through which epistemological thinking/reflective thinking (i.e. thinking skills) evolve, whereas the
system of beliefs models focused primarily on the nature and characteristics of beliefs (i.e. declarative knowledge).

Epistemological resources appear in context, and they have been defined as cognitive structures at a finer grain size than stages, beliefs or theories. This rather loose definition does not allow us to know whether epistemological resources should be considered as being declarative or procedural knowledge, both of them, or none of them.

ii. The developmental approach focuses on characterizing and identifying changes in epistemological thinking (dynamic view), whereas the system of beliefs approach has focused more on the nature and characteristics of epistemological beliefs (static view). The epistemological resources approach seems to focus on the effects of these resources on learning science (instructional view).

iii. With the exception of some of the developmental models (King & Kitchener, 1994, 2002; Kuhn & Weinstock, 2002) and the personal epistemology model (Hofer & Pintrich, 1997, 2002), these models basically apply to school or academic learning and to students’ beliefs.

I will discuss these three main differences more in detail.

(i) The developmental approach focuses mainly on thinking skills whereas the system of beliefs approach focuses on beliefs considered as conceptual knowledge.

Developmental models (especially those developed by King & Kitchener, 1994, 2002; Kuhn & Weinstock, 2002) intend to describe the development of the skills needed for reflecting a particular understanding of knowledge and knowing and as a secondary goal, to describe the progression of the underlying beliefs about knowledge and knowing. But what they measure is individuals’ reasoning or problem-solving.

This lack of a clear separation between beliefs (declarative knowledge) and skills (procedural knowledge) might be generating some confusion when these developmental models are applied to evaluate individuals’ epistemological beliefs. What is being measured: individuals' beliefs about knowledge and knowing, individuals’ epistemological thinking or a mixture of both of them? Are epistemological beliefs inferred from individuals’ performance on ill-structure problem solving such as controversies or dilemmas? When they have explored the possibility of finding domain differences, are they measuring differences on reasoning about controversies with a different content, or the consistent use of a similar set of epistemic assumptions across domains?

It seems to be clear that epistemological beliefs and the skills needed for reaching every stage of the models are closely related. For instance, in order to decide that you need to evaluate evidence to judge its reliability before reaching to a particular conclusion, you need to believe that knowledge is uncertain, that sources of knowledge are not equally reliable and therefore, they may not deserve the same weight in our process of decision making. But, from my view, mastering the skill of evaluating and comparing potential sources of knowledge and developing particular beliefs are two different aims; although, both of them may be necessary for showing a particular level of epistemological understanding when individuals solve an ill-structured problem.
The methodological (and theoretical) problem that arises here is whether, in practice, epistemological thinking skills and epistemological beliefs can be measured separately or not, and secondly, whether the current methods usually employed in this field are adequate for this purpose.

The system of beliefs approach has focused mainly on epistemological beliefs themselves, trying to characterize their nature and features, but without considering them linked to particular thinking skills. This important difference between the system of beliefs and the developmental approach derives from departing from different theoretical perspectives, pursuing different goals and from using different methodological approaches. The developmental approach has tried to measure epistemological thinking skills and the underlying epistemological beliefs in practice, through problem-solving tasks. Using the terms introduced by Louca et al. (2004) this approach has intended to capture the *individuals’ enacted epistemology*. On the contrary, not always but often, in the system of beliefs approach, self-reports instruments seem to have measured, as best, *individuals’ professed epistemology*.

Some authors (e.g. Schommer-Aikins’s model) have intended to measure epistemological beliefs “alone”, that is, avoiding measuring the possible effects of content and context. In this case, the goal pursued seem to be to obtain a measure of “pure epistemological beliefs”, but given that instruments that were employed were self-report questionnaires, individuals’ professed epistemology was assessed. Differences between individuals’ enacted and professed epistemology have been reported (Bell & Linn, 2002; Leach, Millar, & Ryder, 2000; Olafson & Schraw, this issue; Schraw & Olafson, 2002) perhaps indicating that neither professed nor enacted epistemologies are measuring “pure epistemological beliefs”.

However, it could be said that both approaches—developmental and the system of beliefs—have pursued the goal of obtaining a measure of “pure epistemological beliefs,” trying to separate the potential influences of domain and context. On the contrary, the epistemological resources approach has focused on how context (understood in a wide sense that includes domains as well) activates different epistemological resources in the case of naïve epistemologies, or beliefs (in the case of expert epistemologies). Given this approach is interested basically in the learning and instructional effects of activating a set of epistemological resources, it does not seem to be much concerned about the nature of the “beliefs” or “pre-beliefs” that might be in the base of these epistemological resources, or how they develop, but just on how they can be activated for promoting learning.

(ii) The developmental approach sustains a dynamic view (beliefs and skills changes) whereas the system of belief approach sustains a rather static view (nature and characteristics of beliefs).

Developmental models intend to explain developmental changes, therefore they assume a dynamic process approach, whereas the belief system approach, although it may also share that a developmental trend occurs in epistemological beliefs, does not emphasize a dynamic approach, but rather a static one. Basically, up to now, their main focus has been to describe and characterize the nature of epistemological beliefs much more than focusing on the change of epistemological beliefs. However, recently, researchers are increasing their attention to the change of epistemological beliefs (e.g. Bendixen, 2002; Bendixen &

(iii) Just a few models intend to provide a general view of individuals’ epistemological thinking and beliefs, most of them basically apply only to academic learning.

With the exception of the models proposed by Kuhn and Weinstock (2002), King and Kitchener (1994, 2002, 2004) and by Hofer and Pintrich (1997, 2002), which intend to provide a general view of individuals’ epistemology that can be applied both in daily life (e.g. for making personal decisions, solving interpersonal conflicts, giving or withdrawing support to a particular educational or health policy) and in academic learning settings, the intended scope of application of the remainder of the models is simply learning in academic settings. In some cases, this difference has affected what these models understand as domain. For instance, in the model proposed by Buehl et al. (2001, 2002, this issue) domain is used synonymously with academic discipline. However, Kuhn and Weinstock (2002) consider personal taste, esthetic and value judgments, and judgments of fact about the social and the physical world as domains. Therefore, empirical results provided by these views to explore differences across domains will have a different meaning and they will be interpreted in a different way, even though authors will refer to both as domain-specific differences.

Also recently, some authors have emphasized the links and interactions of epistemological beliefs with other constructs such as prior domain-specific knowledge, motivation, goals, culture, classroom performance, self-regulated learning, affect, mechanisms of change, role of peers and other social agents, etc. (see for example, Bendixen & Rule, 2004; Braten & Stromso, 2004; Buehl & Alexander, this issue; Schommer-Aikins, 2004). Epistemological beliefs seem not to be isolated, but embedded in a complex system of interactions and relationships that may partially explain empirical data, showing significant differences between individuals’ professed epistemology and enacted epistemology (e.g. Hofer, 2002; Leach et al., 2000; Louca et al., 2004; Olafson & Schraw, this issue; Schraw & Olafson, 2002; Tobin & McRobbie, 1997).

The constructs and elements that may be candidates to become part of this complex network of interactions, in which epistemological beliefs seem to be embedded, will differ if the scope of the network reduces to learning in academic settings or, if on the contrary, the scope is much broader and intends to locate epistemological beliefs in individuals’ cognitive, motivational and affective system to describe and to predict their behavior in daily life and not only in learning in academic settings.

As mentioned, most of these models basically apply to academic learning, and coherently, those sustaining that scope have focused almost exclusively on students’ epistemological beliefs, rather than on teachers’ (although there is a wide literature on teachers’ epistemological beliefs, e.g. Pajares, 1992; Torff, 2005; Valanides & Angeli, 2005) or parents’ epistemological beliefs that as social agents may also play an important role in development, and in general, in epistemological beliefs. If epistemological beliefs are understood in a broader sense—not only conceived as a relevant factor in academic learning- it would be interesting to study individuals outside of the school settings facing tasks where epistemological beliefs may be relevant but extend beyond classroom learning.

Although it may seem trivial to say it, learning in academic settings is just one area (a domain?) in which epistemological beliefs can be applied (and in which they seem to play
a relevant role), but there are other areas in which epistemological beliefs are also relevant
and applied. I assume epistemological beliefs are beliefs about knowledge and knowing
that can be applied to many spheres of daily life and not only to academic learning. In
this sense, it could be said that epistemological beliefs would be domain-general by
definition.

On researching and discussing the domain generality–specificity of epistemological
beliefs, explaining its role in academic learning versus in individuals’ daily life, or
explaining how epistemological beliefs develop or change in academic settings versus in all
spheres of everyday life represent different research goals and aims and therefore, these
results obtained may not be comparable. Consequently, I think the intended scope of the
theoretical models should be explicitly mentioned and taken into account in the debate of
the domain generality–specificity of epistemological beliefs.

2.3. Methodological problems for measuring epistemological beliefs that may affect to how
the domain generality–specificity question is approached and answered

The key questions around which methodological problems arise are very basic, but
essential: what to measure and how. The different conceptualizations of epistemological
beliefs provide different answers to these questions. In addition, some features of
epistemological beliefs may also be the origin of some of these methodological difficulties. I
will enumerate some here, and I will discuss them and will make some suggestions to cope
with them in the next section.

(1) Is it possible to measure “pure epistemological beliefs”, that is, eliminating domain-
content and context\(^1\) influence? Are there a core of domain-general beliefs that can be
measured or on the contrary, only “contaminated” domain-specific and context
activated epistemological beliefs can be measured?

(2) Often individuals’ are not aware of their epistemological beliefs. Recently, Hofer (2004)
has proposed that epistemological beliefs operate at a metacognitive level. How can
these epistemological beliefs, often implicit for the individual, be measured? A measure of
epipistemological beliefs in children is particularly difficult to obtain because children are
not aware of their own beliefs (in case it would be assumed that small children can
reach to the articulateness needed for having “beliefs” strictly speaking).

Self-report instruments and think aloud procedures have been employed for
assessing individuals’ professed epistemology. But there is empirical evidence (e.g. Leach
et al., 2000; Olafson & Schraw, this issue; Schraw & Olafson, 2002; Tobin & McRobbie,
1997) showing that there are differences between individuals’ professed and enacted
epipistemologies. This seems to indicate that neither professed nor enacted epipistemologies
are measuring individuals’ epistemological beliefs, in other words, “pure epistemological
beliefs”.

This methodological difficulty takes us back to a traditional problem of cognitive
psychologists: how to collect a direct measure of cognitive processes and cognition. Self-
report instruments and think aloud procedures provide a measure of individuals’ professed

\(^{1}\)Context is understood in a rather broad sense. It refers to the circumstances and conditions that surround a
particular situation. For instance, social factors influence would be included in context, according to this working
definition.
epistemology, but it may be said they are “introspectional” measures, becoming objects of the well-known criticisms present in much of the history of the field of psychology. Enacted epistemology is more ecological, as it evaluates individuals’ epistemological beliefs “in action”, that is, in a particular context and operating about a particular domain-content. However, it could be said that it is measuring an application of individuals’ epistemological beliefs, but not really these beliefs.

On the other hand, sometimes epistemological beliefs (the set of assumptions used by individuals) have to be inferred from individuals’ performance in a problem-solving task. This task may be designed for evaluating individuals at their functional level (Fisher & Pipp, 1984; Fisher & Pruyne, 2002; Lamborn & Fischer, 1988), that is, the performance displayed in everyday situations, or at their optimal level -performance that is at individuals’ upper limit, in which individuals receive contextualized support. This latter level is especially interesting for learning and instruction, although as it happens with the zone of proximal development (ZDP), it is methodologically problematic to evaluate “a priori”—before performing the task—each individual’s ZDP or optimal level.

In sum, how enacted epistemology is measured may lead to different inferences about the epistemological beliefs an individual displays.

(3) Developmental models seem to provide a molar view of the developmental changes involved in achieving a more sophisticated epistemology, but they seem not to be so useful for measuring domain and context differences. How can both domain and context differences along development be measured?

(4) The domain generality–specificity of epistemological beliefs is affected by the lack of definition or the loose definition of some key terms. This is an additional difficulty for reaching a consensus among researchers about what must be measured and how. As Sinatra (2001) pointed out, the frontiers between knowledge and beliefs are blurred. It is not easy to define where beliefs finish and knowledge begins and vice versa. This is an important issue when epistemological beliefs have to be located in the complex network of interactions in which they seem to be embedded, and on deciding what constructs and what elements may be candidates to become part of this network.

As it has been already mentioned in this paper and in the introduction of this special issue, domain has been conceptualized in many different ways. As domain is understood in very different ways, what some authors may decide to measure in order to identify domain differences can be different, and also the procedures employed may provide incommensurate data. The same applies to context.

(5) Louca et al. (2004) have proposed that not only the content of epistemological beliefs changes with time and experience (changes due to development and expertise level), but also their form, going from unstable small units in novices to becoming real beliefs that are more stable and articulated in experts. If this assumption is accepted, how can the form of epistemological beliefs be measured? Is the form of epistemological beliefs affected by the content-domain and the context? What instruments could be used to capture epistemological beliefs changes of form along development and/or when individuals gain expertise in a domain?
3. How could theoretical and methodological difficulties be overcome? Some suggestions

Of course, there is not a magic wand that can suddenly make disappear the difficulties presented here (and many others that other researchers, may add), so I will just present modestly how I think some of them may be overcome.

First, regarding the loose definition of terms such as domain or context, I think in the short term, given the disparity of meanings it will be likely difficult to reach to a major consensus among researchers. It would be, of course, highly desirable to reach it. However, I don’t think the polysemy of these terms is a reason to stop considering the question of the domain generality–specificity of epistemological beliefs (or of other constructs such as thinking skills or conceptual change processes). From my view, what it is absolutely necessary is: (a) that researchers become aware of the polysemic meaning of these terms, (b) that researchers should explicitly clarify their understanding of these terms in order to facilitate the interpretation of the results obtained, and (c) of course, trying to reach to a major consensus among researchers or at least, to some agreements that may affect a particular area of research. For instance, if the scope of the study of epistemological beliefs reduces to academic learning, perhaps domain may be considered synonymous to discipline as some authors have proposed (e.g. Buehl et al., 2002; Hofer, 2000; Limón, 2004).

Second, I think the possibility/impossibility of measuring epistemological beliefs eliminating the influence of content-domain and context (that is, if to measure ‘‘pure epistemological beliefs’’ is possible or not, and if it is worthy or not in case it would be possible) is both a theoretical and a methodological question that is relevant for the domain generality–specificity debate. The underlying methodological problem is how to get a direct measure of epistemological beliefs. As it happens with other cognitive constructs, it does not seem possible—at least with the current methods employed- to get a direct measure. Therefore, indirect measures have to be used. One possibility is to collect measures of professed epistemology, that is, to collect self-report measures such as self-report questionnaires or think aloud protocols. A second possibility is to collect measures of enacted epistemology, that is, to infer or to extract epistemological beliefs from the observation of behavior or from analyzing individuals’ performance in ill-defined problem solving tasks. Both types of measures have been used. But are ‘‘pure epistemological beliefs’’ being measured or on the contrary, are just domain and context specific epistemological beliefs being measured?

Research data have shown differences between individuals’ professed and enacted epistemologies. These differences have been interpreted as showing that neither of the two types of measures are capturing the ‘‘real’’ ‘‘pure’’ epistemological beliefs. But they could also mean that different contexts may be activating different beliefs or a different application of them. This is precisely one of the main assumptions of the epistemological resources approach supported by empirical evidences (Louca et al., 2004). Other studies have provided evidence of measuring domain-specific beliefs in several domains (in mathematics: e.g. De Corte, Op’t Eynde, & Verschaffel, 2002; Schoenfeld, 1985, science: e.g. Hammer, 1994; Smith, Maclin, Houghton, & Hennessey, 2000; Songer & Linn, 1991, history: e.g. Boscolo & Mason, 2001; Buehl et al., 2002; Limón, 2001, 2004; Mason, 2002). These data seem to support that measures taken are sensitive to both content-domain and context differences in epistemological beliefs. But there is also evidence supporting some stability and generality of epistemological beliefs (e.g. Olafson & Schraw, this issue; Schraw & Olafson, 2002 and data from developmental models).
Is it possible to measure “pure epistemological beliefs”? Do they really exist? Which instruments could be used to measure these “pure epistemological beliefs”?

Then, the theoretical part of this problem appears and the answer to these questions depends on the conceptualization of epistemological beliefs sustained. My view can be summarized into the following assumptions:

(1) Direct measures of epistemological beliefs cannot be taken (at least with our current methods), therefore researchers need to rely on indirect measures. Measures of both professed and enacted epistemologies may contribute to characterize individuals’ epistemological beliefs.

(2) Epistemological beliefs are activated in context and individuals may sustain different epistemological beliefs when they are applied to different domains (domain understood as academic discipline).

(3) Epistemological beliefs only can be measured in context and referred to a content-domain. However, this is not incompatible with the theoretical existence of a core set of domain-general beliefs (“pure” epistemological beliefs), operating at the metacognitive level, rather stable beliefs that may be transferred from one domain to another, especially when individuals are novices in the new domain.

(4) The degree of awareness of those “pure” domain-general epistemological beliefs will likely vary depending on individuals’ developmental and expertise level, although empirical studies are needed to confirm or disconfirm this statement.

(5) Given that the core set of domain-general epistemological beliefs (“pure” epistemological beliefs) would be rather stable, and that they might be rather coherent, perhaps the label “personal epistemology” could be used to refer to these “pure” epistemological beliefs that would differ from one individual to another, as result of each individual’s experience, development, educational level, social context, etc.

According to these assumptions, “pure” epistemological beliefs cannot be measured directly. Unless new methods to collect direct measures or new ways of applying our current methods are developed, I believe these “pure” beliefs, free of domain-content and context influence, can only be measured by inferring them from individuals’ epistemological beliefs across domains and across contexts. We may measure how consistent across domains and across contexts individuals are, that is what it is kept from one domain/context to another, helping to get a measure of what it is stable and how long those aspects remain without changes.

Given that epistemological beliefs are considered multidimensional by most specialists in the field, maybe domains and/or context differences may affect only some dimensions—but not to all of them. On the other hand, maybe some patterns of consistency could be identified depending on individuals’ characteristics such as their level of development. By exploring many different contexts and domains (= disciplines) we could try to model individuals’ personal epistemology.

Considering that personal epistemology would change with time and experience, longitudinal studies would be more appropriate to capture both wide qualitative changes and domain or context specific changes. In the case of learning, longitudinal studies would allow better measurement of the possible effects of instruction. They might be useful as well for trying to capture the development of the form of epistemological beliefs. However, new methods or new ways of applying those usually employed to date will be needed for
better capturing the nature, structure and changes of personal epistemology and how individuals apply it to different domain-contents and contexts.

4. Conclusions: Is it worth exploring the domain generality–specificity of epistemological beliefs?

My answer is definitively, yes. As I have tried to point out in this paper, I consider that exploring how epistemological beliefs are applied across domains and across contexts may provide us with data about the differences about their application, but also about their similarities. These latter data may provide us with another indirect measure of individuals’ “personal epistemology”. Of course, this is just one possible path for trying to overcome some of the theoretical and methodological problems currently present in research about epistemological beliefs.

However, some cautions should be taken as well. The confusion the polysemy of terms such as domain and context may introduce should be avoided by explicitly clarifying the meaning those terms have for researchers. Also, researchers should explicitly indicate the intended scope and goals of their studies and theoretical models in order to avoid confusion. Finally, it cannot be forgotten that our current methods (or the way in which we employ them) only allow us to collect indirect measures of epistemological beliefs with all the consequences and limitations this has.

In terms of learning and instruction, exploring epistemological beliefs across domains (= academic disciplines) and across contexts in relation to learning may also provide valuable data. For instance, it would be interesting to study if instruction designed to involve students on solving problems at their optimal level may help to develop epistemological beliefs toward a higher level of sophistication.

Acknowledgments

This manuscript was prepared owing to the support of the Spanish Ministry of Education (Grants SEJ2004-01879/EDUC and PR2003-0026) and to the Comunidad Autónoma of Madrid (Grant 06/0114/2003).

References


