1 Personal epistemology in the classroom: a welcome and guide for the reader

Florian C. Feucht *University of Toledo*
Lisa D. Bendixen *University of Nevada, Las Vegas*

Introduction

Knowledge? One doesn't need to learn it – one simply knows it. One knows that a tire is round because one can see it. Knowledge sometimes can be heard too. (Amy, age 10)

Actually, one cannot know anything for sure. This is because it has been invented by someone. New inventions can make old ones illogical or false. But one can discuss with other people what they think about it. The numbers and objects have been invented. What does 1 and 1 equal? So one needed to think out what this will be. Then one discussed it at length and decided that it should be named "2." (Hannah, age 9)

Knowledge is what you know and what you can look up. (Josh, age 12)

I know that knowledge about the woodlands is true by doing experiments that are in my science book and seeing if they come true. Another way to know what is true is you could go with your family during vacations to the woodlands. I am looking at the animals, the plants, their habitat, and watching how they react. By watching what they do you can know if your science book is telling the truth or not. Then I come back and tell it to the teacher. I do this so she can tell it to the class or other classes. I ask her so I can talk about my experiences to the class. (Evan, age 10)

When the Earth originated there were first the bacteria, and the fish, and the dinosaurs. The fish must have known how to swim and the dinosaurs how to walk. This is where knowledge is coming from. (Gwen, age 10)

Knowledge is coming from Greece. That is where they started to write and count… A scholar or a wizard invented the ABCs and the related rules… He told all of this to the king and the king told it to the teacher. The king made the rules for the city, if you don't stick to the rules, you go to prison. The king wants all people to know what he thinks is interesting. He made a rule that everybody should read and write.

He also nominated the teacher. One doesn't need to tell the king everything though. (Linda, age 11)

The previous quotations were made by fourth-grade students from Germany and the US (Feucht, 2008; Haerle, 2006). As can be seen, their views of knowledge and knowing (i.e., personal epistemology) are fascinating, varied, and often linked to educational issues. Personal epistemology and its relevance in the classroom is the topic we pursue in this edited book.

This book incorporates both theoretical and empirical work pertaining to personal epistemology (i.e., beliefs about knowledge and knowing) in the classroom. A large body of theory and research in the field of personal epistemology has been dedicated to college students. Rarely have we addressed the epistemic beliefs of children and young adolescents. How it matters in the everyday classroom has also not been investigated thoroughly. Therefore, this book aims to bring together leading-edge research on preschool through secondary students' personal epistemology and that of their teachers, re-examine existing epistemological frameworks, introduce new models, and provide an empirical foundation for learning and instruction.

Different conceptual frameworks have emerged that define personal epistemology, such as: (1) a developmental progression through different patterns of epistemological thinking (e.g., Baxter Magolda, 1992; King and Kitchener, 1994; Kuhn *et al.*, 2000); (2) epistemological beliefs (Schommer, 1990); (3) epistemological theories (Hofer and Pintrich, 1997); and (4) epistemological resources (Hammer and Elby, 2002).

In an effort to integrate these conceptual frameworks Hofer and Pintrich (1997) define personal epistemology as four identifiable and interrelated dimensions. The first two dimensions describe the *nature of knowledge*: (1) the certainty of knowledge is focused on the perceived stability and the strength of supporting evidence, and (2) the simplicity of knowledge describes the relative connectedness of knowledge. The remaining two dimensions relate to the *process of knowing*: (3) the justification of knowledge explains how individuals proceed to evaluate and warrant knowledge claims, and (4) the source of knowledge describes where knowledge resides, internally and/or externally.

A growing body of research provides evidence that personal epistemology plays a crucial role in the learning of individuals, such as its impact on argumentation, problem-solving, and achievement. The key question of how teachers' and students' views of knowledge interact is another area of research that is just beginning to be explored. In addition, personal epistemology's relation to other fields such as conceptual change,

self-regulated learning, theory of mind, nature of science, motivation, as well as mathematics and science education, is currently emerging.

This book brings together international scholars in the field of personal epistemology. In addition, this group will represent interdisciplinary perspectives that are key to a more complete and applicable understanding of personal epistemology research.

As the link between personal epistemology and learning and instruction becomes established, the more we will understand the role of personal epistemology in the classroom. Thus, the impetus of the book is to fill a significant gap in our understanding of the relevance of personal epistemology in preschool through secondary education. Finally, we consider the broader implications of this work as it pertains to the importance of personal epistemology and its role in critical thinking development and the education of our future citizens.

The journey to personal epistemology in the classroom

We would like to invite the reader to join our academic journey to personal epistemology in the classroom. In due course, we provide here a brief overview of the terrain/field covered by personal epistemology research since its existence over four decades ago (e.g., Perry, 1970). This brief review does not provide an exhaustive representation of our field. Rather, it aims to provide a contextualized starting point for the reader of this book (see Hofer and Pintrich, 1997, for a more comprehensive review). We overview a selection of frameworks that have made an important contribution to the field of personal epistemology and that play a crucial role in learning and instruction in the classroom context. We also revisit and consider the frameworks in terms of their meaning for education in general, and personal epistemology in the classroom in particular. In addition, we hope that for the reader new to our field, this will be an effective and efficient base camp for overlooking the existing landscape of personal epistemology and an aid in anticipating what is yet to come in our journey to personal epistemology in the classroom.

Personal epistemology as a developmental trajectory

A variety of frameworks exist that define personal epistemology as a cognitive construct that progresses in its qualities along a predictable developmental path, driven by a process of cognitive disequilibrium (e.g., Baxter Magolda, 1992; Belenky *et al.*, 1986; King and Kitchener, 1994; Kuhn *et al.*, 2000; Perry, 1970). Most notable is Perry's (1970)

pioneering *Scheme of the intellectual and ethical development* of college-aged students. We also briefly summarize the influential models of King and Kitchener (1994) and Kuhn and colleagues (e.g., Kuhn and Weinstock, 2002).

Summarizing the Scheme of the intellectual and ethical development. Perry's (1970) scheme encompasses nine stages of personal epistemology as *intellectual and ethical development*, which can be summarized in four developmental levels. (1) *Dualism* describes the belief that knowledge and truth are absolute. Individuals at this level hold a polarized, black-and-white view of the world and label knowledge in clear-cut, right-and-wrong categories. Authorities are perceived as an omniscient source of knowledge and empowered to administer and communicate knowledge to the learner. In contrast, (2) *Multiplicity* encompasses the belief that individuals can hold differing knowledge claims. Competing knowledge claims are acceptable (i.e., everyone has the right to be right). Subsequently, the nature of knowledge is perceived as uncertain and its absolute truth value is doubted. (3) *Relativism* describes individuals who believe that valid knowledge claims can only be made in relation to their context, such as in a certain domain or era (e.g., history versus science). By using a specific context as a frame of reference some competing knowledge claims are believed to be better than others. (4) *Commitment in relativism*, the last developmental level, describes the identification of individuals who are certain about the contextualized truth of a knowledge claim but that this is subject to an ongoing process of doubt and refinement.

Summarizing the Reflective judgment model. King and Kitchener (1994, 2002, 2004) developed a framework similar to Perry's (1970) and further differentiates its upper levels. The *Reflective judgment model* defines personal epistemology as *epistemic cognition* (i.e., a cognitive process superior to, and influential on, both cognition and meta-cognition), which develops along seven stages. These stages can be summarized in three developmental levels: (1) *Pre-reflective thinking* describes the epistemic assumption that knowledge is gained through an authoritative figure or through first-hand observation. Knowledge is perceived as absolute and can be known with complete certainty. (2) *Quasi-reflective thinking* is characterized by the recognition that the certainty of knowledge depends on the method of obtaining knowledge. Because aspects of what is known may be wrong or missing, the nature of knowledge is perceived to be ambiguous to a certain extent. (3) *Reflective thinking*, the final developmental level, encompasses the belief that knowledge is actively constructed and must be evaluated within its context to estimate its validity. Knowledge is perceived as uncertain and changing in its nature.

Clearly, the overlap between the developmental levels of Perry's (1970) scheme and King and Kitchener's (1994) model is evident; both could be categorized as late-onset developmental models (Chandler *et al.*, 2002). That is, in late adolescence and adulthood and coinciding with the exposure to higher education, the epistemologies of individuals could progress towards more advanced developmental levels. Until then, individuals, such as elementary and most secondary students, would hold dualistic beliefs about knowledge and/or conduct simple pre-reflective judgments.

Summarizing the Framework of epistemological thinking. Kuhn and colleagues also propose a developmental model of personal epistemology that considers children as well as adolescents and adults (Kuhn, 1991; Kuhn, *et al.*, 2000; Kuhn and Weinstock, 2002). Their framework defines personal epistemology as epistemological thinking and encompasses three general developmental levels. At the level of (1) *Absolutism* a person perceives knowledge as an objective entity, which is located in the external world and can be known with certainty. (2) *Multiplism,* the contrasting second level, focuses on internalized knowledge source. Subjectivity of knowing and uncertainty of knowledge are important characteristics of this level. At the most advanced level of (3) *Evaluativism*, both objective and subjective aspects of knowing are incorporated when making knowledge claims. Knowledge is perceived as uncertain, but can be validated within its context.

Revisiting the developmental frameworks. How can epistemic development frameworks inform personal epistemology in the classroom? In order to assess and foster personal epistemology of learners and teachers alike, these frameworks provide an important theoretical basis for education as well as teacher training and development. A variety of theoretical and empirical work has proposed that teachers' personal epistemology, in particular their epistemic development, influences not only their choices of teaching strategies and use of educational materials, but also openness to educational reform and further professional development (e.g., Feucht, 2008; Feucht and Bendixen, in press; Patrick and Pintrich, 2001; Schraw and Olafson, 2002; Tsai, 2002). For example, absolutist teachers may tend to perceive teaching as transferring knowledge from teachers as experts to students as naïve and passive learners, while evaluativist teachers may promote learning activities in which students collaboratively construct knowledge and are expected to justify their knowledge commitments.

As we have stated, both King and Kitchener's (1994) and Perry's (1970) work can be considered as late-onset developmental models. That is, the bulk of epistemic development happens during late adolescence

and adulthood and in combination with learners' exposure to higher education. Other research, in contrast, has begun to demonstrate that children around the age of ten display some aspects of more advanced epistemic beliefs, such as multiplism and evaluativism (e.g., Feucht, 2008; Haerle, 2006; Mason, 2003). This is consistent with the early-onset understanding of epistemic development (e.g., Chandler *et al.*, 2002). In the context of personal epistemology in the classroom, we see the need for the extension and differentiation of developmental frameworks in terms of providing more detail regarding epistemic development in earlier ages. For example, the strength of King and Kitchener's (1994) and Perry's (1970) models is that they provide great detail in the developmental stages of older students. This developmental precision should also be extended to learners in preschool through secondary schools. In other words, current developmental models could be revamped and/or new models could be conceptualized that would allow for more systematic and informative recommendations for education.

Education also plays an important role in the epistemic development frameworks. Perry (1970) stresses that it was within the context of higher education, the expectation of independent and critical thinking, and exposure to multiple viewpoints that boosted the epistemic development of the students he studied. Additionally, he provides suggestions for learning environments that are conducive to epistemic development. Similarly, King and Kitchener (1994) and Kuhn and colleagues (e.g., Kuhn and Weinstock, 2002) consider critical thinking as an important factor in the development of reflective judgment and epistemological thinking, respectively. In general, the experience of critical thinking has become an important consideration of general education in elementary and secondary classrooms as well (e.g., Barnes, 1970; Paul *et al.*, 1990). Therefore, the fostering of critical thinking provides an important potential for nurturing epistemic development in elementary and secondary learning environments and should not be limited to tertiary education. Following this line of thinking, we encourage the field of personal epistemology to further research and theorize the reciprocal link between epistemic development and critical thinking and the key influence of educational experiences.

While some educational programs and environments can advance epistemic development, others may have a counter productive influence. It has been proposed that certain instructional approaches (e.g., monocultures of absolutistic instruction), assessment procedures (e.g., focus on factual knowledge), and/or education in general have the potential to suppress epistemic development (e.g., Chandler, *et al.*, 2002; Feucht, 2008; Walton, 2000). Consistent with our previous comments, we

think that this aspect of educational influence should also be a part of research in personal epistemology development.

Personal epistemology as an epistemological belief system

Summarizing the epistemological belief system. Schommer-Aikins (e.g., Schommer, 1990; Schommer-Aikins, 2002, 2004) conceptualized personal epistemology as a system of more-or-less independent beliefs about knowledge and learning, drawing from a variety of different research programs (e.g., Perry, 1970; Dweck and Leggett, 1988; Schoenfeld, 1985, 1989). Her framework and its accompanying paper-and-pencil measure enjoys considerable popularity in the field of personal epistemology, and this is evident in the number of studies that are designed around her framework and the application of her measure and the development of its derivations (e.g., Jehng *et al*., 1993; Schraw *et al*., 1995; Wood and Kardash, 2002). The framework encompasses five belief dimensions that are proposed to progress in a more asynchronous pattern and are described along the following continua: (1) the *structure of knowledge*, ranging from discrete to complex knowledge; (2) the *stability of knowledge*, ranging from unchanging to evolving; (3) the *source of knowledge*, ranging from a reliance on authority to observation and reasoning; (4) the *speed of learning*, ranging from quick or not-at-all learning to gradual learning; and (5) the *ability to learn*, ranging from innate ability to improvable learning. Due to this conceptualization, Schommer-Aikins' framework is in contrast to the developmental frameworks previously described that propose more cohesive and predictable levels of personal epistemology (e.g., King and Kitchener, 1994; Kuhn *et al*., 2002; Perry, 1970).

Revisiting the epistemological belief system. How can the *epistemological belief system* inform personal epistemology in the classroom? There are several empirical studies that exist that provide a link between epistemic beliefs and aspects of academic achievement (e.g., Schommer *et al*., 1992; Qian and Pan, 2002). For instance, epistemological beliefs have been shown to be associated with science learning (e.g., Bell and Linn, 2002; Elder, 2002), mathematical learning (e.g., DeCorte *et al*., 2002; Schoenfeld, 1985), cognitive processes (e.g., Kardash and Scholes, 1996; Schommer, 1990), motivation (e.g., Bråten and Strømsø, 2004), and study strategy use (e.g., Schommer *et al*., 1992; Schrieber and Shinn, 2003).

A small amount of work has also focused on the epistemic beliefs of secondary students and how they are related to achievement in different

school subjects (e.g., Cano, 2005; Cano and Cardelle-Elawar, 2004; Schommer-Aikins *et al.*, 2005). Such results clearly substantiate the need for more research along these lines looking at the impact of epistemological beliefs on elementary and secondary school students. For example, are some beliefs more conducive to academic achievement than others? Are some beliefs more important in physics learning than, for example, learning in history? How can teachers better assess students' epistemological beliefs to help them instruct and improve the academic achievement of their students?

It is the multidimensional nature of Schommer-Aikins' framework of epistemological beliefs that is quite intriguing to us and where we see great potential in informing the advancement of epistemic beliefs and to make recommendations for learning and instruction. Differentiating epistemic beliefs along assorted dimensions provides more detailed information on the personal epistemology of preschool, elementary, and secondary school students and their teachers. For example, researchers could map the epistemic beliefs of students on all five dimensions and/or conduct more in-depth studies on selected dimensions. Such approaches can provide valuable insights into how epistemic beliefs might differ from school subject to school subject. For example, a reliance on authority may be an important aspect of knowledge/learning in mathematics while the sources of knowledge in social studies may be more diverse and relative. In addition, are some dimensions not addressed at all in a typical classroom environment? How often are students required to justify their claims/arguments/opinions in preschool through grade twelve classrooms?

Personal epistemology as epistemological theories

Summarizing the framework of epistemological theories. Hofer and Pintrich (1997, 2002) synthesized a framework on the basis of key aspects identifiable across the fields of personal epistemology and philosophy and define personal epistemology as epistemological theories. This definition incorporates a neo-Piagetian understanding of cognitive development (Bidell and Fischer, 1992), which is characterized by a more fluid rather than stage-like development, and conceptualizes personal epistemology as more theory-like rather than as a set of independent beliefs. More specifically, Hofer and Pintrich describe epistemological theories as four identifiable dimensions, that are interrelated and develop in predictable directions: (1) the *certainty of knowledge* (i.e., stability of knowledge and the strength of the supporting evidence); (2) the *simplicity of knowledge* (i.e., relative connectedness of knowledge); (3) the *justification*

of knowledge (i.e., procedure to evaluate and warrant knowledge claims); and (4) the *source of knowledge* (i.e., knowledge resides internally and/or externally). The first and second dimensions describe the nature of knowledge while the third and fourth entail the process of knowing.

Revisiting the framework of epistemological theories. One of the main strengths of Hofer and Pintrich's framework is that, in our view, it combines a more developmental perspective with a dimensional view of personal epistemology. Considering personal epistemology as theory-like allows the opportunity to research how epistemological beliefs may change while at the same time it permits important detail to be investigated by way of the various dimensions that comprise it. This more complete picture of personal epistemology has great promise and offers guidance for future research as well as many implications for learning and instruction. For example, do different dimensions of epistemological beliefs develop at different rates? Are some dimensions more important to learning than others at different ages?

In addition, Hofer and Pintrich's (1997) conceptualization of personal epistemologies as theory-like overlaps with frameworks of conceptual change learning (Mason, 2003; Vosniadou, 2003; Vosniadou and Brewer, 1992). This conceptual overlap offers significant opportunity to borrow from the theoretical insights made in the field of conceptual change. For example, the conceptual change literature focuses on the stability of students' conceptions (i.e., are students' personal epistemologies in constant flux?), the role of emotions in change, the benefits of intentionality (i.e., the more students are aware of their epistemological theories the more likely substantive change will occur), and processes involved in mechanisms of change.

There are also important educational implications we can draw upon from the conceptual change literature. For instance, in conceptual change learning it is critical for the teacher to assess the prior knowledge of their students. In terms of personal epistemology development, assessing epistemic beliefs of students before instruction and lesson planning could also be extremely valuable. In line with the conceptual change principle of offering student's more elaborate and/or alternative conceptions, teachers could make the epistemology of the content knowledge explicit in their teaching to then challenge students' existing epistemic beliefs. Do teaching strategies and interventions, such as refutational text and anomalous data found in the conceptual change literature, also apply for personal epistemology change in classroom settings?

Personal epistemology as epistemological resources

Summarizing the framework of epistemological resources. Hammer and Elby (2002, 2003) propose an epistemological framework that defines personal epistemology within the context of learning in specific subjects such as physics. In essence, students' personal epistemology is comprised of a set of fine-grained cognitive resources that are categorized in four areas: (1) *nature and sources of knowledge* (e.g., knowledge as propagated stuff, knowledge as free creation, and knowledge as fabricated stuff); (2) *epistemological activities* (e.g., accumulation, formation, and checking); (3) *epistemological forms* (e.g., stories, rules, facts, and games); and (4) *epistemological stances* (e.g., acceptance, understanding, and puzzlement). These epistemological resources are activated by, sensitive to, and dependent upon the context of each individual and are not necessarily subject to a developmental progression.

Revisiting the framework of epistemological resources. A clear strength of Hammer and Elby's (2002, 2003) conceptualization of epistemological resources is that it stems from classroom research on children and young adolescents, and therein, applies directly to understanding personal epistemology in the classroom. For example, their situated approach to researching personal epistemology within specific school subjects and the fact that it is anchored even within particular lesson plans allows them to derive specific, concrete, and teacher-friendly epistemic recommendations that are conducive to students' learning.

Although Elby and Hammer's goal is not to generalize too far beyond individual classrooms, we see valuable educational implications in their work. We see this approach as fundamental in establishing portfolios of varied instructional practices (i.e., a bag of epistemic tricks) that can be used to influence students' personal epistemology and, therein, to strategically foster their learning. The transferability of such pedagogical practices across different contexts and school subjects could also become part of more experimental research designs. For example, the methodological question remains as to what kind of categories can be used to differentiate between epistemic resources that are more conducive to the learning of content knowledge than others and to distinguish between educational contexts that are more influential on epistemological resources.

Organization of the book

We decided to organize the book into five parts: (I) *Introduction*; (II) *Frameworks and conceptual issues*; (III) *Students' personal epistemology,*