Student Epistemology/Teacher Epistemology: Different Dichotomies

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(After reading through several articles within the Master Teacher Program curriculum over the past 2 years and instructing/interacting with Cadets, I became more interested in the dichotomy of beliefs about knowledge and learning between teachers and students. In our environment, Cadets often think differently from their Instructors and vise-versa. After having a discussion with a Plebe earlier in the academic year about his traffic ticket, I was convinced that there is a difference. This Plebe could not understand why he was singled out of a group of six cars (all speeding) and received a speeding ticket while the others did not get stopped. His rationale was that everyone else was speeding rather than the fact that he was breaking the speed limit law. His beliefs were different from mine. Coupled with reading several articles from the Master Teaching Program curriculum, I was led to the Student and Teacher epistemology study subject. It is a vast, abstract, and complex realm. Little did I know that I was attempting to "boil the ocean" on this topic.) The challenge is for teachers to adjust their pedagogy based on their epistemological perspective to best educate the student with their own epistemology.

Topic Overview:

Over the last 30 years, there seem to be a significant increase in the amount of literature on epistemological developments of students as well as the influence of teaching and learning paradigms and methodologies. The concept of epistemology was introduced by the Greek philosopher Aristotle (384-322 BC). According to Webster's Dictionary, epistemology is the study or a theory of the nature, origin, and limits of human of knowledge. In other words, epistemology is the study of beliefs about knowledge and learning or how we know things. Scholars are studying this symbiotic relationship of how a student understands knowledge and how a teacher uses his/her beliefs about knowledge and learning to teach (pedagogical technique). In this epistemological process, it is essential that scholars think about the specific and different methods teachers and students use to transfer and acquire knowledge. As you would expect, there is a growing interest to attempt to understand what teachers believe about the nature of knowledge and learning and how these beliefs affect their approach to teaching and, subsequently, how it is passed down to the student. A teacher's epistemology directly affects their pedagogy or profession of teaching as well as how a student's epistemology impacts how they receive knowledge. Additionally, a student's "perceptions of instructional practices are interpreted through the lens of their epistemological assumptions, but that such perspectives are evolving and instructors may influence them in multiple ways." (Hofer, 2002) Invariably, this has a direct impact on the various academic arenas and this suggests that differences in instruction and evaluation may account for some of the differences in how students approach studying. (Palmer, 311) There are several reviews that discuss differences in methods based on academic disciplines.

Key issues in Epistemology

There appear to be several different views/concepts in epistemological belief change. All of these models seem to be debated regularly.

According to Schraw & Olafson (2002), "teachers' epistemological worldviews influence the ways that they make important instructional decisions related to the curriculum, pedagogy, and assessment." They describe three kinds of epistemological world views; realist, contextualist, and relativist. A realist assumes that knowledge is acquired through experts and learning is a passive act. Contexualists see themselves as facilitators, who along with the learners collaboratively construct shared understanding. While the relativists view learners as independently and uniquely creating their own knowledge.

One scholar, Marlene Schommer, views that the belief system is comprised of five independent dimensions: the structure of knowledge, the certainty of knowledge, the source of knowledge, the control of knowledge, and the speed of knowledge acquisition (Schommer, 1992). However, Barbara Hofer and Paul Pintrich articulate the belief the epistemological change is predicated on four aspects: certainty of knowledge, simplicity of knowledge, source of knowledge, and justification of knowing. (Hofer, 2002)

Marcia Baxter Magolda (1992) developed an Epistemological Reflection model that is comprised of four types of knowing: absolute, transitional, independent, and contextual. This model emphasized the importance of the patterns of knowing used by students, and how important those patterns are to the creation of learning environments. In absolute knowing, knowledge is certain or fixed. Absolute knowledge is obtained by the student from the teacher. In this type, it is incumbent upon the teacher to communicate knowledge properly while ensuring that is understood by the student. Transitional knowledge, is partially certain and partially uncertain. Therefore, rather than just acquiring knowledge, it is the student's responsibility to understand. With independent knowledge, knowledge is uncertain because a student has his/her own belief which requires the student to think for themselves and come up with their own viewpoints. The teacher must encourage independent thought. Finally, contextual knowing, knowledge is determined on the basis of evidence in context. The teacher must present information in context and facilitate a discussion with different perspectives. Meanwhile, the student must think through the information, compare perspectives, and apply the knowledge accordingly.

Beneficial Attributes

The benefits to this study revolve around gaining a better understand of how we can best bridge epistemological gaps and at what education level. An important question concerns to what extent students are "ready to restructure their epistemological views to focus more "constructivist" issues: the conjectural, explanatory, testable, and revisable nature of theories" (Smith, 1997). Regarding the undergraduate education level, Schommer conducted studies that compared junior college students and university students and between technological science majors and social science majors on their degree of belief in simple knowledge, certain knowledge, innate ability, and quick

learning. She discovered that Junior college students were more likely to believe in simple, certain knowledge, and quick learning. While University students were more likely to believe in innate ability. Technological science majors were more likely to believe in quick learning. (Schommer, 1993)

Controversial Aspects

At a cursory level, there seems to be many shortcomings in the study of epistemology primarily due to its recent resurgence as professional discussion. S. Welte believes that our "ideas about education are so ingrained in our own experiences and ways of knowing that not only are they unspoken, but they are also often unconscious." (Welte, 1997). The question is: are we transforming our educational practice to accommodate the newer generation appropriately? Welte also states that teachers "must believe that knowledge is socially constructed and then practice that belief" (Welte, 1997). All of the studies show that personal epistemology has significant influence on comprehension of material, the way students study, their learning process and, ultimately, a student's academic performance. As teacher learn to more about student's epistemological perspectives, it is imperative that the teachers develop curriculum that will bridge any gaps in knowledge.

Annotated Bibliography

Barone, C. (May 2003) "Technology and the Changing Teaching and Learning Landscape: Meeting the Needs of Today's Internet-Defined Students. AAHEBulletin.com.

The author articulates how teachers need to change their pedagogy in order to meet the demands of today's students who are much more attune to using modern information technology via the Internet. While some are resistant to change, there is an opportunity to adapt accordingly.

Carey, S. with Smith, C. (Summer 1993) "On understanding the nature of scientific knowledge." Educational Psychologist, p235.

The authors identify an important goal of science education is to "help students understand the nature of scientific enterprise itself" without necessarily challenging their faiths and beliefs. They maintaining that students have a common sense epistemology. (I still have to re-read this article.)

Gonzales, C. with Pickett, L., Hupert, N., and Martin, W. (2002) "The Regional Educational Technology Assistance Program: Its Effects on Teaching Practices." Journal of Research on Technology in Education, p1.

This article discusses the effects of the Regional Technology Assistance Program (RETA) on the teaching practices and collegial behaviors of its participants and instructors citing that increases their use of technology in the classroom, changes some practices in the classroom, increases teacher collaboration, and other results which ultimately changes teachers' epistemologies and help them improve their teaching methods.

Howard, B. with McGee, S., Schwartz, N., Purcell, S. (Summer 2000) "The Experience of Constructivism: Transforming Teacher Epistemology." Journal of Research on Computing in Education, p455.

This work describes how the classroom of the future will educate teachers to learn to use computer-based educational tools and explore constructivist instructional approaches. The authors "hypothesized that creating a living-and-learning environment for the training would foster rapid changes in teachers' epistemological beliefs." They conducted a test and their studies revealed that teachers changed significantly on three of four factors related to constructivist teaching philosophies (Simple Knowledge, Quick Learning, and Certain Knowledge). The fourth factor (Fixed Ability) did not reveal significant changes.

Johnston, P. with Woodside-Jiron, H. and Day, J. (March 2001) "Teaching and Learning Literate Epistemologies." Journal of Educational Psychology, 223.

The authors examine the relationship of teacher epistemologies with classroom interactions and student epistemologies. In the article, the authors attempt to connect children's epistemological thinking through the discourse of the classroom to their teacher's epistemological stance. Significance of language environments in learning; Importance of classroom interaction patterns in children literacy; Identification of discursive circumstances in the development of children's literate epistemologies.

Martinez, M. (2002) "Teachers' Epistemology/Teaching Practice: Is there a System?" Issues in Education, p175.

Martinez challenges an article written by Schraw and Olafson that attempts to explain that epistemology and pedagogy are related based on three dependent goals. The differences between teachers in their dominant epistemological beliefs and how it has strong connections to their teaching practice.

McCaskey, T. with Elby, A. (2005) "Probing Students' Epistemologies Using Split Tasks." AIP Conference Proceedings, p57-60.

These authors probe in to the question whether students answer teacher's questions with answers that they really believe or answers that they think a scientist would give and explores the reasons for them while trying to delineate what makes sense. The author provides evidence that suggests that students are "more willing to reconcile physics concepts with their everyday experience if epistemological development is an explicit goal of instruction."

Palmer, B. with Marra, R. (April 2004) "College student epistemological perspectives across knowledge domains: A proposed grounded theory." Higher Education, 311-335.

In this article, the authors find results that there are, in fact, differences in epistemological development based on disciplinary areas using previous benchmarking studies. As a result, they introduce a grounded theory that describes how students' epistemologies may vary across knowledge domains.

Smith, C. with Maclin, D., Houghton, C., Hennessey, M. "Sixth-Grade Students' Epistemologies of Science: The Impact of School Science Experiences on Epistemological Development." Cognition & Instruction, p349-422.

The authors conducted a study to determine whether or not elementary school students can make significant progress in developing a more "sophisticated, constructivist epistemology of science, given a sustained elementary school science curriculum that is designed to support students' thinking about epistemological issues." They ask "to what extent students this age and younger are ready to restructure their epistemological views to focus on more "constructivist" issues: the conjectural, explanatory, testable, and revisable nature of theories."

Welte, S. (1997) “Transforming Educational Practice: Addressing Underlying Epistemological Assumptions.” The Review of Higher Education, p199-213.

Welte critiques the book, Knowing and Reasoning in College: Gender-Related Patterns in Students’ Intellectual Development (1992) written by Marcia Baxter Magolda by challenging several stances/assumptions within the book primarily due to overgeneralization or faulty assumptions. Her main premise is that Magolda advocates the prioritizing of learning and more developing more complex ways of knowing, as opposed to covering more content.

Additional Resources

Hofer, B. K., & Pintrich, P. R. (Eds.). (2002). Personal epistemology: The psychology of beliefs about knowledge and knowing. Mahwah, NJ: Erlbaum

Schommer, M. (1993) Comparison of beliefs about the nature of knowledge and learning among postsecondary students. Research in Higher Education, p.355-370.

Schraw, G. & Olafson L. (2002) Knowing, Knowledge and Beliefs. New York, Springer Netherlands.

Smith, C., Maclin, D., Grosslight, L., & Davis, H. (1997) Teaching for Understanding: A Study of Students' Preinstruction Theories of Matter and a Comparison of the Effectiveness of Two Approaches to Teaching about Matter and Density". Cognition and Instruction, 15(3), p317-393.