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Practical Applications of the Research on Epistemological Beliefs

Theories of epistemological beliefs focus on individuals' perceptions about what knowledge is and where knowledge comes from. These beliefs are part of, and may in fact direct, the cognitive processes involved in learning (Kitchener & King, 1990; Perry, 1999; Schommer, 1990). Research stemming from these theories offers varied explanations as to how beliefs relate to student learning and academic success.

Although the results of this research are equivocal at best, they do offer several general insights into the impact of beliefs on learning. First, some research focuses on the relationship between beliefs and monitoring. Some researchers (e.g., Ryan, 1984) found that epistemological beliefs influence how students monitor the acquisition of knowledge. Students who were classified as dualists reported trying to recall facts from the text, but those classified as relativists reported trying to paraphrase and summarize the text in their own words. However, when Glenberg and Epstein (1987) used Ryan's scale to examine learning in science courses, they found no significant relationship between epistemological beliefs and students' ability to accurately monitor their comprehension of scientific text. Second, research has focused on the issue of domain and beliefs. Some researchers found differences in beliefs depending on domain or discipline (Palmer & Marra, 2004; Schommer-Aikins, Duell, & Barker, 2003). For example, Palmer and Marra (2004) found differences in the epistemological beliefs of engineering and science students across the disciplines of the sciences and the humanities. However,

Buel, Alexander, and Murphy (2002) found evidence of domain-generality in undergraduates' epistemological beliefs. Third, research has examined the relationship between task and beliefs. Simpson and Nist's (1997) research on how students learn and study history found that in order to be successful, students either had to have beliefs about history that were similar to their professor's or have a clear understanding of course task.

Other research indicates that epistemological beliefs might affect the depth to which individuals learn (Schommer, 1990, 1993; Schreiber & Shinn, 2003). There is evidence that students with naïve epistemic assumptions tend to endorse surface-level strategies while students with sophisticated epistemological beliefs tend to endorse deep-level strategies (Holschuh, 1998; Schommer, 1990; Schreiber & Shinn, 2003). Thus, epistemological beliefs may function as a benchmark against which individuals compare comprehension and learning to the task demands, which, in turn, would influence students' strategy selection and use (Hofer & Pintrich, 1997; Ryan, 1984). For example, when encountering complex tasks, individuals holding naive epistemological beliefs, may not understand the necessity of choosing deep-level processing strategies. In fact, individuals with naïve beliefs may not be able to discriminate between surface- and deep-level strategies. Such students may choose to make flash cards to study for an exam and would believe they were well-prepared when they memorized all of the facts or bold-faced terms. In addition, given an exam where the professor expects students to synthesize ideas or to analyze information, students with naïve beliefs would be unprepared for the task and would have no idea where the questions were coming from because they do not match their conception about what knowledge is and where knowledge comes from.

One of the leading researchers in the area of epistemological beliefs and how they influence studying and learning is Marlene Schommer (now Schommer-Aikins). Her work has had a considerable influence on our approach to introducing students to the role of beliefs in the classroom. Schommer (1990) conceptualized an individual's epistemological beliefs as consisting of five independent, nonhierarchical, non-developmental dimensions: certain knowledge, simple knowledge, omniscient authority, quick learning, and innate ability. Each of the five dimensions is viewed as a continuum beginning at a naive perspective and moving toward a mature perspective.

The first dimension, certain knowledge, deals with the extent to which a person sees knowledge as fixed (set) or changeable. The belief that knowledge is absolute is readily apparent and common in first year students. Such students believe that there are no shades of gray—things are

black or white, true or false, right or wrong. Students who are absolute learners have a particularly difficult time in courses where they are expected to evaluate theories or where there is no one decisive explanation for something. They want the professor to give them an answer. In addition, they may not be open to exploring or, in some cases, even being exposed to alternative explanations of the world, especially when it has to do with religious or political beliefs (Schommer, 1990).

The second dimension, simple knowledge, is the extent to which a person sees knowledge as a group of individual facts or as concepts that are related to each other (Schommer, 1990). For example, two students who are studying for their chemistry exam can take very different approaches. One student believes that knowledge is a series of unrelated facts, so he tries to memorize all of the formulas and key terms to prepare for the exam. The other student believes that knowledge consists of interrelated ideas, so she tries to understand the chemical processes and their underlying theories when she studies for the exam. The first student does not even attempt to link ideas together because his beliefs are such that he actively attempts to keep each concept discrete (Schommer, 1990).

The third dimension, omniscient authority, is the extent to which students believe that knowledge is external and is transmitted to individuals from an outside authority such as a teacher or a parent, or is internal and comes from within the individual—(Schommer, 1990). A good number of first year students hold the belief that their professors own the key to their learning rather than believing that learning ultimately should be a shared experience. This belief manifests itself in a number of ways, from being intimidated by professors to students believing that it is their professors who are responsible for their learning. We call this the "empty vessel syndrome" because these students regard themselves as passive participants in the learning process. Such students believe that it is the professor's role to dispense all of the important information and the student's role to simply absorb it. Thus, if students struggle in the course or perform poorly on exams, they can always say that the professor wasn't a good teacher, didn't care about students, or made up tricky exams. Unfortunately, students holding a belief in omniscient authority tend not to take credit for their failures or their successes. If they hold the belief that the professor is in charge of their learning, when they experience success, they are likely to say that it was because they had a good professor, an easy test, or just plain luck—not that they worked hard and studied appropriately.

The fourth component, quick learning, deals with beliefs about the speed of learning. Some college students believe that learning happens

quickly or not at all, while others believe that learning happens gradually. This belief probably arises because in previous learning experiences, students have been given tasks that required little time to complete. In addition, many students believe that if learning is going to happen it is going to happen immediately or not at all rather than viewing the learning process as something that is gradual. Students who believe in quick learning find it difficult to stick with a task or to try a different approach when their first doesn't work. Their attitude is if I can't learn this quickly I can't learn it at all (Schommer, 1990).

The fifth and final component, innate ability, deals with beliefs about the control of learning (Schommer, 1990). Some students believe that the ability to learn is fixed at birth while others believe that people can learn how to learn. For example, if students have always struggled with math they may believe that they "just can't do math," no matter how hard they work at it. Students who hold this belief will not make much effort to learn because they believe that their success in math is related to their lack of ability. Students like this are much less likely to seek out help when they don't understand something. They are also more apt to give up. Although most students are stronger in some subjects than others, students who believe that they cannot learn a specific discipline show poor persistence and often will avoid enrolling in those courses until they absolutely have to.

What strikes us as interesting about the research on epistemological beliefs is that to our knowledge, none of the researchers has shared his or her results with students. Although Baxter Magolda (1992) shared general findings with students, she did not disclose individual scores to each student. It may be that by informing students about their own beliefs, educators may be able to help students move towards more mature epistemological perspectives. Intuitively, it seems that providing such diagnostics would bring objective beliefs into awareness, perhaps even directing motivational effort towards intentionally developing subjective beliefs and strategic learning approaches. In other words, it may be that if students know what is possible, they may rise to the challenge.

Because epistemological beliefs seem to have such a great impact on student thinking and learning, we routinely include it in our textbooks and in the curriculum of our Learning to Learn courses. These courses already address affective issues such as motivation, attitude, and stress management so discussing beliefs seems a natural addition.

The Instruction

As with much of our teaching, the first thing we try to do is create awareness in our students by having them take a brief assessment of

epistemological beliefs. Students read a scenario, which describes how Chris, a college student, approaches studying and learning in biology course (Holschuh, 1998). The Epistemological Scenario is used to help students think about their own epistemological beliefs within the context of an introductory science classroom. Previous research has indicated that scenarios help students focus on a particular topic (Grossman, 1994). Research using scenarios as a means of assessment has also found that individuals are more willing to share their own views after reading a scenario, because the cases provide a focus for their views (Echiejile, 1994; Grossman, 1994). Following reading, students respond to 15 Likert-type items that ask them to what extent they agree with Chris's approaches.

The next step is to have students read about beliefs and how they impact college learning. They read the chapter on this topic from their textbook (Nist & Holschuh, 2000). Then the class engages in a discussion about each of the five dimensions of epistemological beliefs (Schommer, 1990), focusing on the implications and impact on classroom learning. In this discussion we are careful to present many examples tied to research to help make this abstract theory more concrete for students. For example, when discussing the role of speed of learning we talk about Schoenfeld's (1985) research, which found that most mathematics problems students encounter before they enter college are able to be solved in under two minutes. In a college setting, students enrolled in calculus might get frustrated or give up when unable to complete a problem within that timeframe. Students may be unaware that they held this arbitrary time as a standard (and probably have some conceptions about how long it should take to write a paper, read a textbook chapter, take an essay exam, or other academic tasks that are also based on K–12 educational experiences) for solving mathematics problems. Once students become aware that they might simply be giving up too soon, they may make an attempt to spend more time on calculus before becoming frustrated. This is just one of the many examples we discuss with students. In addition to teaching through examples, we ask students to examine their score on the assessment and write a reflection about what it means for them as college learners. As we present new strategies we discuss how an individual's beliefs affects the perceived benefit of the strategy.

Some preliminary research has suggested that providing instruction to undergraduates about epistemological beliefs increases their awareness of their own beliefs and how those beliefs affect everyday decision-making and classroom learning (Holschuh, Hubbard, Francis, & Randall, 2000). In response to open-ended interview questions, students said that

learning about the concept of epistemological beliefs and considering their current beliefs helped them think about learning differently. Additionally, students reported that thinking about their relationship to knowledge helped them make better strategic learning decisions.

One of the most obvious influences that beliefs have on learning is students' selection of study and test preparation strategies. Students who define learning as memorizing are going to select strategies that lead to memorizing, regardless of the task. A large number of first year students fall into this category for two reasons. First, for many college freshmen, memorizing is what they have had to do for twelve years of schooling. That's what the task has been and the majority of college bound high school students easily meet this challenge. They have earned top-notch grades in high school and perhaps even have scored well on the SAT or ACT. But when students get to college, most professors expect students to think on higher levels. They are expected to apply, to synthesize, and to analyze; yet they continue to use the strategies that made them successful memorizers. Second, few students receive any formal, extended instruction on how to be an efficient and effective learner. For some reason, learning how to learn has been kept a secret from them. Thus, when they enter the college classroom, students may not bring with them the strategies to do anything but memorize.

Five Suggestions for "Nudging" Students' Epistemological Beliefs

There are many ways that we can "nudge" students' beliefs to move closer to the mature rather than the naïve side of the scale. In addition to talking to students about their own beliefs, structuring class assignments to reflect mature beliefs can be very effective. We offer five suggestions.

First, one of the most informative assignments we have used is to ask our students to define our content. Students write responses to the following questions: What is learning? What is studying? How do learning and studying differ? How do people typically go about learning? How the students respond to these questions tell use volumes about their beliefs about learning. For example, when students say that learning is "absorbing information from teachers," we know that they probably hold a belief in omniscient authority. We use student responses as a jumping board for discussion about learning and studying issues throughout the semester.

Second, we teach students strategies that promote higher-level thinking and then give them complex problems to solve. For example, after we teach students strategies for reducing, organizing, and elaborating on information, we give them a piece of text with the conclusion miss-

ing. At first, students are likely to try to oversimplify the issue. We ask students to write their own conclusion and discuss all possible solutions with a small group (this can help them see that there is often more than one answer to a problem).

Third, we teach students how to monitor their learning. One approach we take to help students monitor is to remind students that not all learning happens quickly. We talk about our experiences as learners and have students share their own experiences where they have spent a lot of time learning (for example, playing an instrument or pursuing a hobby). We also find it helpful to discuss the notion that even their college professors are spending a good deal of time learning new things.

Fourth, we help students recognize the importance of understanding the academic task demands in each of their classes. As with solving complex problems, students tend to oversimplify the tasks in their classes. For example, for science classes we discuss the importance of understanding each concept as it is taught because the concepts build on each other. If students don't understand something early on, it may impact future understanding. This may be obvious to us, but it is often news to students.

Fifth, we talk with students about the support available on campus. This can include seeking out tutoring, coming to office hours, forming study groups, attending review sessions (if available), and using old exams for studying. Students with naïve beliefs tend not to utilize the supports available to them. We believe that they more they hear about the options for support, they more they will consider them in times of need.

Although there are no definitive answers about the extent to which epistemological beliefs influence how students study and learn, from our experiences, we believe that creating awareness and providing students with appropriate assignments can nudge their beliefs in the right direction. We have seen students who believe knowledge is simple or quick rethink these stances and take measures to change their approaches to learning and studying. Still, additional research is needed to connect the role of epistemological beliefs to actual classroom learning and experience.

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