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ABSTRACT

Current views in educational psychology suggest that learning involves the awareness of and regulation of knowledge, beliefs, and goals. This suggests that two constructs, (1) epistemological beliefs (beliefs about knowledge) and (2) cognitive dispositions (such as willingness to consider alternative points of view) are likely candidates for influencing learning in general and course achievement in particular. Recently, a number of studies have shown that epistemological beliefs and cognitive dispositions show similar patterns of relationships to other constructs. A study examined how student beliefs about knowledge and learning relate to their cognitive dispositions (such as enjoyment of effortful thinking) and to investigate how these constructs affect college course achievement. Participants (n=182), college students enrolled in required courses in educational psychology at an urban university in the western United States, had their epistemological beliefs measured using a 36-item Likert Scale inventory called the Epistemological Beliefs Survey developed by P. Wood and CarolAnne Kardash (2002). Student dispositions were measured with an inventory consisting of 66 items based on the work of Keith Stanovich and his colleagues and developed by a variety of researchers. Students were tested in groups and received identical packets, including the two inventories and demographic questions. As expected, scores on the dispositional scales were significantly correlated with scores on the epistemological beliefs scales. Results indicated considerable overlap among the constructs measured by epistemological belief and cognitive disposition scales. (Contains 1 table and 18 references.) (BT)

Epistemological beliefs and dispositions:

Are we measuring the same construct?

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Epistemological Beliefs and Dispositions: Are We Measuring the Same Construct?

Current views in educational psychology suggests that learning involves the awareness of and regulation of knowledge, beliefs, and goals. This suggests that two constructs, epistemological beliefs (students' beliefs about knowledge) and cognitive dispositions (such as willingness to consider alternative points of view) are likely candidates for influencing learning in general and course achievement in particular.

Empirical evidence demonstrating the role of epistemological beliefs in learning can be traced back to the pioneering work of Piaget (1950) and Perry (1970). More recently, a number of researchers have expanded on this work by examining the role of individual epistemological beliefs on learning (e.g., Schommer, 1990; 1993; Hofer & Pintrich, 2002), and the relation between epistemological beliefs and other cognitive processes (c.f., Kardash & Howell, 2000;. Kardash & Scholes, 1996). Consequently, the evidence is mounting that epistemological beliefs may play an important role in college course achievement.

In addition to epistemological beliefs, researchers have found that intentional level cognitive and personality variables called "dispositions" also have a significant affect on academic performance (Stanovich, 1999). Stanovich (1999) defines dispositions as "relatively stable psychological mechanisms and strategies that tend to generate characteristic behavioral tendencies and tactics" (p. 157). One can think of dispositions as tendencies toward learning and thinking. Stanovich and his colleagues have demonstrated that the tendency to think in an open-minded fashion and to weigh new evidence against a personal belief--both considered to be dispositions--accounted for significant differences in problem solving performance (Sa, West, & Stanovich, 1999; Stanovich, 1999; Stanovich & West, 1997, 1998). Further, these dispositions accounted for differences in performance even when cognitive variables (such as cognitive capacity) are taken into account. For example, problem solvers with similar cognitive capacities who differ from their counterparts in terms of their disposition to consider alternative points of view persist are more likely to arrive at a solution (Stanovich, 1999).

Recently, a number of studies have shown that epistemological beliefs and cognitive dispositions show similar patterns of relationships to other constructs (Sinatra & Bendixen, 2001; Sinatra, Southerland, McConaughy, and Demastes, in press). Although the research on beliefs

and dispositions suggests they may play a significant role in course achievement, there is scant evidence relating these constructs to college course performance or to one another. The purpose of the current study is to examine how students' beliefs about knowledge and learning relate to their cognitive dispositions (i.e., enjoyment of effortful thinking) and to investigate how these constructs affect college course achievement.

Method

Participants were 182 college students enrolled in required courses in Educational Psychology at an urban university in the Western U.S. Students' epistemological beliefs were measured using a 36-item Likert Scale inventory called the Epistemological Beliefs Survey developed by Wood and Kardash (2002). The survey is a modified version of Schommer's (1990) epistemological beliefs survey, and measures five dimensions of epistemological beliefs (i.e., Speed of Knowledge Acquisition, Structure of Knowledge, Knowledge Construction and Modification, Characteristics of Successful Students, Attainability of Objective Truth). Higher scores on these five scales reflected more sophisticated epistemological beliefs. Students' dispositions were measured with an inventory consisting of 66 items based on the work of Stanovich and his colleagues (Sa, et al., 1999; Stanovich, 1999) and developed by a variety of researchers. Measures included *Actively Open-minded Thinking and Belief Identification* (Sa, et al., 1999; Stanovich & West, 1997), *Dogmatism* (Troldahl, & Powell, 1965), *Categorical Thinking* (Epstein & Meier, 1989), *Absolutism* (Erwin, 1983), *Values* (Costa & McCrae, 1992), and N*eed for Cognition* (Cacioppo, et al., 1996). Higher scores on the dispositional scales indicated higher levels of the construct being measured. Finally, demographic information about students' age, gender, ethnicity, year in college, major, and G.P.A. were collected. (Regarding analyses below, note that GPA was available for only 176 of the 182 students.)

Students were tested in groups in a university classroom. They received identical packets including the two inventories and demographic questions and were asked to complete them at their own pace. The testing session lasted approximately 1 hour. Final exam and course grades were collected from the students' instructors.

Results

As one would expect theoretically, scores on the dispositional scales were significantly correlated with scores on the epistemological beliefs scales. Higher scores on the Actively Open-minded Thinking, Values, and Need for Cognition scales were associated with more

sophisticated beliefs on the Speed of Knowledge Acquisition, Structure of Knowledge, Knowledge Construction and Modification, and Characteristics of Successful Students scales, with correlations ranging from .18 to .51 (all ps < .05). Attainability of Objective Truth was correlated significantly with Actively Open-minded Thinking (r = .18), but not with either Values or Need for Cognition. Not surprisingly, scores on the Absolutism, Dogmatism, Categorical Thinking, and Belief Identity scales were associated significantly and negatively with scores on the Speed of Knowledge Acquisition, Structure of Knowledge, and Characteristics of Successful Students scales. Correlations ranged from -.31 to -.50. Scores on the Belief Identity Scale were significantly with Construction and Modification of Knowledge Scale (r = -.20), and scores on the Attainability of Objective Truth scale were associated significantly and negatively with scores on the Absolutism, Categorical Thinking, and Belief Identity scales.

Consistent with previous research, we found that several of the epistemological beliefs scales and cognitive disposition scales were associated significantly and in the expected directions with college GPA. GPA correlated significantly with the Structure of Knowledge (r = .25) and Knowledge Construction and Modification (r = .24) epistemological beliefs scales (all ps < .001). GPA was correlated positively with Need for Cognition scores (r = .25, p < .001), and negatively with the Absolutism (r = -.17) and Belief Identity (r = -.18) cognitive disposition scales.

Given the numerous and generally high intercorrelations among the cognitive disposition and epistemological beliefs scales, we next factor analyzed these scales to investigate the constructs underlying the 12 separate scales. The factorability of the correlation matrix, as indicated by the Kaiser-Meyer-Olkin measure of sampling adequacy was .83. Principal axis factoring yielded three factors with eigenvalues greater than unity, and inspection of the scree plot indicated one large and two smaller factors. The three-factor solution accounted for 47.43 percent of the variance after extraction. Promax rotation yielded the best simple structure and highest magnitude of factor loadings. Factor loadings, communalities, eigenvalues, and percentage of variance accounted for by each factor appear in Table 1.

The three-factor solution indicates there is some, but not great, overlap among the constructs measured by the various epistemological beliefs and the cognitive dispositions scales. Factor 1 comprised three scales that loaded positively (Values, Actively Open-minded Thinking,

and Speed of Knowledge Acquisition, and three that loaded negatively (Belief Identity, Dogmatism, and Categorical Thinking). All of these scales, with the exception of Speed of Knowledge Acquisition, were cognitive disposition scales. By contrast, Factor 2 comprised three of the five epistemological beliefs scales (Structure of Knowledge, Characteristics of Successful Students, and Attainability of Objective Truth) and one of the cognitive disposition scales, Absolutism, which loaded negatively as would be expected. Factor 3 comprised one cognitive disposition scale (Need for Cognition) and one epistemological belief scale (Knowledge Construction and Modification).

We next regressed GPA on participants' factor scores using the standard (simultaneous) regression model. The squared multiple correlation coefficient for the entire model was .30, $F(3,172) = 5.86$, $p < .001$, which captured 9.3% of the total variance in GPA. Interestingly, Factor 3 served as the only significant predictor (beta = .26).

Discussion

Our results indicate that there is considerable overlap among the constructs measured by epistemological belief and cognitive disposition scales. This is evidenced most clearly in our factor analysis. Factor 1 comprises several of the dispositional scales that deal with rigidity/flexibility of thought. Low scores on this factor characterize individuals that value establishing clear-cut, black and white values and beliefs early on in life, and persevering and holding on to those beliefs without wavering, regardless of information that or evidence that might contradict them. At first glance, it seems odd that Speed of Knowledge Acquisition would load as well on this factor. However, a common theme among the items comprising that scale and those comprising the cognitive disposition scales loading on this factor is that learning and decision-making take time and cognitive effort (Actively Open-minded Thinking), that information is not necessarily clear-cut (Categorical Thinking), and that new information can lead one to revise one's thinking (Belief Identity, Values, & Actively Open-Minded Thinking).

Factor 2, on the other hand, deals more with the structure and certainty of knowledge. Low scores on this factor reflect beliefs that knowledge is certain and unchanging, straightforward, and composed of discrete, unambiguous pieces of information that are handed down by authority. Not surprisingly, the Absolutism disposition scale loaded on this factor. There is striking similarity between the items appearing on the Absolutism scale and items comprising the three epistemological beliefs scales that loaded on this factor. Compare, for

example, "Good teachers never let you leave the classroom with doubts about the subject matter" and A Professor's job is to communicate facts to his or her students" (Absolutism) versus, "If professors would stick more to the facts and do less theorizing, one could get more out of college " (Structure of Knowledge).

Striking similarities exist as well between items comprising the Need for Cognition scale and the Knowledge Construction and Modification scales, both of which loaded on Factor 3. High scores on this factor reflect an enjoyment of effortful cognitive processing and problem solving, and the notion that knowledge is actively constructed and should be subjected to questioning. Not surprisingly, it was scores on this factor alone that predicted college GPA for the participants in our study. However, it is likely that scores on Factors 1 and 2 may predict performance on tasks that require tolerance for ambiguity, open-mindedness, and openness to belief change and we are presently investigating these relationships with our data.

Returning to the question we posed in this study, we again ask: are we measuring the same construct with these instruments? Our data suggest that while there is considerable overlap in the assessment of beliefs and dispositions, there are also some unique and potentially important distinctions. Taken together, these measures tend to capture individuals' views of knowledge and learning, the tenacity with which they seek to maintain their views, and the degree to which they are willing to construct new knowledge. The dispositions instruments tend to measure individuals' tendencies and commitments, whereas the measure of epistemological beliefs focuses more on individuals' perspectives about learning and knowledge. Our findings suggest that both constructs relate to college course performance and both may have the potential to contribute to our understanding of the learning process.

Table 1

Factors Emerging from the Cognitive Dispositions and Epistemological Beliefs Scales, Rotated Factor Loadings, Communalities, Eigenvalues, and Variance Explained for the Three-Factor Principal Factors Extraction with Promax Rotation

Scale	F1	F2	F3	h^2
Factor 1				
Belief Identity	-.88	.19	-.11	.67
Values	.78	-.14	___	.52
Actively Open-minded Thinking	.54	___	.29	.45
Dogmatism	-.48	-.33	.33	.54
Categorical Thinking	-.44	-.32	___	.47
Speed of Knowledge Acquisition	.38	.27	.15	.43
Eigenvalue	4.66			
Percent of variance accounted for	34.72			
Factor 2				
Structure of Knowledge	-.14	.81	.25	.64
Characteristics of Successful Students	___	.59	-.13	.40
Attainability of Objective Truth	-.17	.49	___	.16
Absolutism	-.32	-.48	___	.52
Eigenvalue	1.46			
Percent of variance accounted for	7.62			
Factor 3				
Construction and Modification of Knowledge	___	___	.64	.41
Need for Cognition	.11	.32	.50	.50
Eigenvalue	1.13			
Percent of variance accounted for	5.09			

Note. Dashes indicate factor loadings with absolute values <. 10.

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