Issues in Accounting Education
Vol. 13, No. 1
February 1998

Accounting Students' Beliefs About Knowledge: Associating Performance with Underlying Belief Dimensions

Fred Phillips

ABSTRACT: This study examines accounting students' beliefs about knowledge and learning, and the relation between these beliefs and student performance in accounting. Undergraduate students in an introductory financial accounting class were surveyed to identify their general beliefs about knowledge and learning. A factor analysis of survey responses suggested three belief dimensions. Students held varying beliefs about (1) the certainty of knowledge, (2) the acquisition of knowledge, and (3) the degree of abstraction and complexity in knowledge. The overall sophistication of students' beliefs distinguished between good and poor performances on an accounting case, but failed to differentiate performance on multiple-choice exam questions. When students' beliefs were disaggregated into the three underlying dimensions, only the belief about knowledge certainty/uncertainty was associated with differences in accounting case performance. Implications for accounting educators are discussed.

As educators, one of our goals is to instill in our students beliefs about knowledge and learning that promote future success. To achieve this goal, we first must answer many questions. For example, what beliefs are important to students' future successes? Do our students already possess these beliefs or are they prepared to acquire them? How should belief structures be imparted? Researchers only recently have begun to explore these questions. In education, Schommer (1990, 1993) identifies certain beliefs about knowledge and learning that may be more important to students' future successes. In accounting, Friedlan (1995) finds that the beliefs imparted by case-based instructional methods may differ from the beliefs imparted by lectures, and speculates that different beliefs may produce different effects on student performance. The purposes of the current study are to identify what beliefs accounting students hold about knowledge and learning, and to determine whether these beliefs are associated with superior performance in accounting.

Fred Phillips is an Associate Professor at University of Saskatchewan.

Thanks are extended to three anonymous reviewers, and Jim Bierstaker, Rick Burke, Barb Phillips and Robert Yaansah for helpful comments, and to the University of Saskatchewan for a start-up grant that helped fund this project. Data is available upon request from the author.

This study contributes to both theory and practice in accounting education. From a theoretical perspective, this study advances the developing model of factors that influence performance in accounting settings. In general, accounting research has related performance to ability, knowledge, experience and effort (Libby 1995). Within accounting education research, cognitive ability has received the greatest attention (e.g., Shute 1979; Amernic and Beechy 1984; Jones and Davidson 1995). This study is the first to identify accounting students' beliefs about knowledge and learning, and to demonstrate the relationship between these beliefs and performance in accounting tasks.[1] Because beliefs about knowledge are thought to influence learning strategies and cognitive development (Schommer et al. 1992), they also are likely to influence student performance. By testing the relationship between accounting students' beliefs and performance, the current study provides a basis for future research that further develops and tests relationships among elements of the expanding accounting performance model.

From a practical perspective, accounting educators need to know what kinds of beliefs students hold about the nature of knowledge and learning to anticipate responses to instructional materials and methods. For example, do our students hold varying beliefs about the amount of effort required to learn? Do some of our students think "solutions" can be viewed from only one perspective, whereas others entertain multiple interpretations? If students naively believe that learning is quick and easy, we might anticipate that they will devote insufficient resources to analyzing accounting problems. On the other hand, if they hold a belief such as "knowledge is uncertain," they may be more likely to recognize the ambiguity inherent in accounting information. A complete understanding of these beliefs and their links to student performance should better equip educators for developing instructional materials and methods, and for evaluating student performance. Further, this understanding can provide a basis for educators to invite student discussions that evaluate varying beliefs about knowledge and learning.

The remainder of this article is organized as follows. In the next section, relevant prior research is reviewed. The third section describes the belief survey and results. The fourth section presents the method and analyses relating student beliefs to performance, and the last section provides a discussion of limitations and conclusions.

REVIEW OF PRIOR RESEARCH

For some time, accounting educators have been interested in determining student and classroom features that contribute to superior accounting performance. In studies of Piaget's theory of cognitive development (see Inhelder and Piaget 1958), Shute (1979) and Jones and Davidson (1995) report that higher levels of "formal reasoning" are associated with superior student performance on difficult, but not easy, accounting exam questions. Presumably, the cognitive reasoning abilities measured by Piagetian tasks in a generic domain are transferable to problems in more applied domains such as accounting.

[1] *Beliefs* about knowledge and learning are one dimension of *world knowledge*. Prior accounting research describes world knowledge as the understanding that is gained through individual life experiences and instruction (Bonner and Lewis 1990, 4). Although this definition encompasses *beliefs* about knowledge, the prior research does not examine beliefs—opting instead to focus on a general understanding of business. The term "knowledge," as used in the current study, relates most closely to the *general domain knowledge* described by Bonner and Lewis (1990).

Consequently, on unstructured exam questions that require considerable cognitive manipulation, students who possess greater reasoning abilities outperform those with less developed reasoning abilities.

Amernic and Beechy (1984) also studied the relationship between cognitive ability and exam performance. Using a test that measured cognitive abilities on a generic, unstructured task, undergraduate students were classified into groups comprising high, medium and low levels of "cognitive complexity." Subsequent analyses found that students who scored the highest on the cognitive complexity task performed significantly better on unstructured accounting case questions than students who scored the lowest on the cognitive complexity task. However, average performance on structured accounting problems did not differ significantly between the highest and lowest ability groups. Presumably, greater cognitive abilities enabled students to cope with the lack of structure in accounting case questions, but provided no additional benefit on other well-structured accounting problems.

Although accounting education research is beginning to identify features that contribute to superior performance, its reliance on uni-dimensional characterizations of cognitive development limits conclusions concerning *relative* contributions. That is, the research does not inform educators whether levels of cognitive complexity are more important than levels of formal reasoning or vice versa, and eventually leads to questions about the separability or independence of the constructs (Jones and Davidson 1995, 176). Further, although cognitive ability may comprise several dimensions, the uni-dimensional measures used in prior research fail to indicate which *specific* facets of cognition should be developed in the classroom. Without this guidance, instructors are left to develop their own *ad hoc* theories from personal experience.

Recently, research in educational psychology has expanded conceptualizations of cognition and knowledge, and discovered that *beliefs* about knowledge and learning are associated with student performance. This stream of research, initiated by Schommer (1990), has found that these beliefs can be separated into several specific dimensions. For example, students may vary in the degree that they believe knowledge to be (1) certain, (2) simple, (3) acquired quickly, and (4) without limit. The first dimension—certain knowledge—indicates that some students believe knowledge is certain and indisputable, whereas others hold a more sophisticated view that knowledge is tentative and subject to revision.[2] The second dimension reflects students' varying beliefs about whether knowledge comprises simple compartmentalized facts or complex groups of integrated elements. The third dimension includes a continuum ranging from a naive belief that learning is quick and easy to a more sophisticated view that learning may require substantial effort. Finally, the fourth dimension shows that some students maintain a naive perspective that knowledge is predetermined by innate ability, whereas others adopt a more sophisticated view that knowledge can be incremented over time. These particular dimensions of beliefs—called "epistemological beliefs" in the educational psychology literature—exist among

[2] Following Schommer (1990) and other researchers in educational psychology, the terms "sophisticated" and "naive" reflect opposite ends of a continuum. *Sophisticated* beliefs are viewed by education experts as "fully developed" or "more realistic," whereas *naive* beliefs are underdeveloped or unrealistic.

students in the social sciences and math domains (Schommer and Walker 1995); however, the degree to which the same belief dimensions exist among students in an applied discipline like accounting is not yet known.

In addition to identifying multiple dimensions of beliefs about knowledge and learning, research in education is significant because it demonstrates that these belief dimensions can be associated with student performance. Specifically, students who believe in quick and easy learning are likely to draw oversimplified conclusions, perform poorly on knowledge tests, and hold greater confidence in answers than warranted by their performance (Schommer 1990). Also, students who view knowledge as simple and discrete are likely to rely on learning strategies that involve memorization, and downplay the importance of integration and synthesis (Schommer et al. 1992). Consequently, these students encounter greater difficulty in acquiring knowledge from unstructured materials and in applying that knowledge in unfamiliar settings (Jacobson and Spiro 1993).

If these findings from educational psychology generalize to applied disciplines, accounting students will have identifiable beliefs about knowledge that may affect their performance. Further, as prior accounting education research has shown, the relationships between beliefs and performance are likely to vary across types of accounting tasks. In tasks such as multiple-choice tests where a single solution exists and relevant information is well-defined, student performance is not likely to be influenced by beliefs about knowledge. However, in settings where ambiguity often exists and information needs to be evaluated from several perspectives to reach an appropriate solution, sophisticated beliefs about knowledge may be beneficial. The latter setting is approximated most closely in the classroom by accounting cases, such as the instructional cases that appear in *Issues in Accounting Education*. In a case setting, students who believe knowledge is uncertain and ambiguous may evaluate more carefully the relevance of case information, perhaps entertaining the possibility that certain case facts support one accounting treatment at the same time that other case facts support an alternative accounting treatment. Similarly, students who believe more strongly in effortful learning may be less confident in solutions that appear quickly to them and, consequently, may avoid performing oversimplified analyses of case issues. The following two sections of the article empirically examine these propositions.

BELIEF DIMENSIONS—METHOD AND RESULTS

Survey Instrument

A survey instrument was used to assess the dimensions underlying students' beliefs about knowledge and learning. The survey instrument was a shorter version of a questionnaire developed and validated by Schommer (1990, 1993).[3] The instrument included

[3] Validation of Schommer's 63-item survey instrument is reported in Schommer (1993). The instrument consistently replicates the factor structure reported in her original study (Schommer 1990), and test-retest reliability is 0.74. The Schommer questionnaire was shortened for the current study for two reasons. First, because the questionnaire was distributed as part of a larger survey to obtain general information about students' backgrounds (e.g., personal interests, work experience, etc.), it was shortened to encourage students to complete all survey questions with care. Second, the questionnaire was revised to eliminate certain statements pertaining to one belief dimension investigated by Schommer (called *Omniscient Authority*). The revised instrument has been tested with 129 undergraduate business students who did not participate in the current study. The factor structure derived from this large sample of students is identical to the factor structure reported later in this article. Also, test-retest reliability for the revised instrument is 0.67.

TABLE 1
Expected Epistemological Beliefs, Subset Dimensions and Survey Instrument Examples

Expected Beliefs	Subset Dimensions	Examples[a]
Knowledge is uncertain.	Multiple perspectives are possible.	There are at least two sides to every story.
	Single "truths" do not exist.	The best answer to most questions is "It depends."
Knowledge is complex.	Knowledge is integrated.	Knowledge of the "whole" is more important than knowledge of the "parts."
	Knowledge implies an ability to apply.	People never really know if they have learned something until they try to apply it in a new and unfamiliar situation.
Learning is gradual.	Learning is neither quick nor easy.	*Successful students learn things quickly.*
	Concentrated effort is rewarded.	The majority of people learn the most when they read information the second or third time.
Development is unlimited.	Knowledge capacity is not constrained.	*Some students will never understand a difficult concept no matter how much explanation they receive.*

[a] Examples presented in *italics* (regular font style) represent naive (sophisticated) beliefs.

statements that were constructed to represent subsets of beliefs about knowledge and learning, and were presented from both naive and sophisticated points of view. Table 1 reports the four belief dimensions that were expected in this study based on Schommer's (1990, 1993) research, along with seven subsets of beliefs related to these belief dimensions, and an example statement from each subset.

Subjects were instructed to respond to each statement on a Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. Responses that agreed (disagreed) strongly with sophisticated (naive) points of view, using norms established by Schommer (1990), were assigned scores of 5. In contrast, responses that agreed (disagreed) strongly with naive (sophisticated) points of view were assigned scores of 1. This method also was used to assign scores of two and four to *Disagree* and *Agree* responses, producing higher belief scores for relatively more sophisticated beliefs about knowledge and learning.

Subjects

Students voluntarily completed the belief questionnaire during the first meeting of a sophomore-level class in introductory financial accounting at a large state university in the southwestern United States. These students (37 male and 36 female) had completed an

average of 1.4 years of college-level courses, were approximately 19 years of age, and had an average self-reported cumulative grade-point average (GPA) of 3.04.[4]

Results and Discussion

Factor analysis was used to determine how many and which factors could account for students' questionnaire responses. Following the method applied by Schommer (1990, 1993), average ratings were computed for each of the seven subsets of items in table 1, and these subsets were used as variables in the factor analysis. Using orthogonal varimax rotation and the default eigenvalue factor of 1, a principal components extraction produced three factors that accounted for 59.0 percent of the variance. The loadings on the subsets of beliefs are presented in table 2.

By examining the loadings for each of the factors in table 2, descriptive titles were generated for the three factors. Factor 1 is labeled "Knowledge can be acquired through committed effort" (*Committed Effort*); Factor 2 is labeled "Knowledge is uncertain" (*Uncertain Knowledge*); and Factor 3 is labeled "Knowledge is abstract and complex" (*Abstract, Complex Knowledge*). Although the titles reflect only the more sophisticated views of knowledge, readers should recognize that students' beliefs ranged from naive to sophisticated along each of the three dimensions.

Some interesting observations can be made by comparing the factors generated in this study to those identified by Schommer (1990). As discussed in the preceding section, Schommer (1990) observed four underlying beliefs related to knowledge certainty, complexity, acquisition and flexibility. In the current study, beliefs about knowledge acquisition and flexibility are represented by a single factor—*Committed Effort*.[5] As the

[4] Admission criteria require students entering the class to have taken at least 30 credit hours in the College of Business Administration. Entry to the College is competitive; in the year of the study, the average CBA student achieved a high school ranking in the top 9.8 percent. Although these screening criteria are likely to limit the range of GPA and, possibly, the beliefs held by study participants, they are not unusual when compared to screening criteria applied at other institutions. In addition, the range of GPAs in this study (1.50 to 3.90) is comparable to that noted in other studies (e.g., see table 1 in Jones and Davidson (1995)). Five students who did not report their GPAs were excluded from the sample, but the results do not change if these students are included in the analyses.

[5] To examine whether *Committed Effort* might be comprised of two independent factors, a four-factor solution was computed in the current study by decreasing the eigenvalue cut-off. Because this alternative depiction led to less interpretable factors, only the three-factor solution is presented and described in the article.

TABLE 2
Factor Loadings on Subsets of Beliefs[a]

Subset Dimension	Factor 1	Factor 2	Factor 3
Knowledge capacity is not constrained.	**0.78**	0.15	0.02
Concentrated effort is rewarded.	**0.74**	–0.26	0.09
Learning is neither quick nor easy.	**0.58**	0.28	–0.22
Multiple perspectives are possible.	0.09	**0.80**	–0.10
Single "truths" do not exist.	0.00	**0.75**	0.03
Knowledge is integrated.	0.12	0.15	**0.88**
Knowledge implies an ability to apply.	0.16	0.30	**–0.52**

[a] High loading factors (0.50 or higher) are identified in **bold**.

subset dimensions for this factor in table 2 suggest, students in the current study varied in the extent to which they believed knowledge was something that could be acquired by anyone given the requisite amount of effort. That is, some students believed that all individuals could learn over time while others were more likely to believe that only inherently smart students learned concepts and learned them quickly.

As in Schommer's (1990) research, the accounting students appeared to vary in the belief that knowledge was certain or uncertain, as indicated by Factor 2—*Uncertain Knowledge*. Some students possessed a relatively naive belief that knowledge is certain and indisputable, while others held a sophisticated belief that knowledge is ambiguous and subject to multiple interpretations.

The final factor generated in the current study—*Abstract, Complex Knowledge*—represents a combination of both positive and negative factor loadings (see table 2). Specifically, the belief that "knowledge is integrated" did not correspond with the belief that "knowledge implies an ability to apply," as was suggested by Schommer's (1990) research. In fact, students who perceived that knowledge is comprised of complex relationships also were likely to represent it in an abstract (i.e., non-applied) manner. Interestingly, this view has been proposed by a number of educational psychologists as the most appropriate way of characterizing knowledge in complex, ill-structured domains such as the professions (e.g., Spiro et al. 1991). Students possessing a more naive view, on the other hand, were likely to associate concrete, applied examples with isolated facts.

In summary, three dimensions of beliefs about knowledge and learning were identified, with beliefs ranging from relatively naive to sophisticated on each dimension. The following section analyzes whether these beliefs are related to student performance.

STUDENT PERFORMANCE—METHOD AND RESULTS

To investigate the relationship between belief dimensions and exam performance, students answered exam questions on both structured (multiple-choice) and unstructured (case) problems. The following analyses compare the scores on these problems to belief dimensions described in the preceding section.

Multiple-Choice Test Scores

As part of a mid-term examination, students completed 25 multiple-choice questions that required them to retrieve knowledge of accounting principles and apply it to well-defined problems. The test questions were developed from material presented in Chapters 1–5 of Granof and Bell (1991). The questions were weighted equally but varied in difficulty, addressing topics related to cash accounting, accrual accounting and revenue recognition. The average score on the 25 questions was 14.55 and the standard deviation was 3.87.

Accounting Case Scores

The accounting case addressed issues pertaining to the capitalizing or expensing of travel costs incurred in connection with a prospective business acquisition. Included in the case information were facts about the company and the travel costs in question. Specifically, the case facts included two statements supporting cost capitalization, two statements supporting expensing, and four statements describing background

information.[6] The resolution of the case issue was ambiguous and unstructured.[7]

Students were informed that the goal of their case analysis was to recommend whether the company should capitalize or expense the travel costs. As part of their analysis, students indicated whether each of the case facts supported capitalizing or expensing, or whether it was background information. As Friedlan (1995) suggests, students must carefully evaluate case facts to determine the extent to which they support or refute a recommended course of action. If students misclassify irrelevant facts as relevant, they are likely to build inappropriate justifications for their recommendations (see Hackenbrack 1992). On the other hand, students who misclassify relevant facts as irrelevant are likely to build weak or indefensible arguments. By scoring whether students properly interpreted and classified the case facts, this study measures an important facet of case performance. Moreover, because evaluations of case facts are thought to depend on beliefs about knowledge and learning, as proposed in the preceding section, this performance measure is likely to be sensitive to varying beliefs. The mean classification score for the case was 5.29 out of 8, with a standard deviation of 1.90.

Belief Factor Scores and Groups

The three-factor structure reported in the preceding section was used to calculate belief factor scores for each subject, as follows. First, responses for each of the seven subset dimensions (reported in tables 1 and 2) were standardized. Second, factor score coefficients were calculated for each combination of the seven subset dimensions and three factors. Finally, the standardized subset dimension scores (obtained in the first step) were multiplied by the respective factor score coefficients (obtained in the second step) and summed to obtain a factor score for each of the three belief dimensions.

An overall level of belief sophistication was determined by calculating the average of the belief factor scores. This aggregate measure of beliefs was used to classify participants into three levels of beliefs: the top (bottom) 30 aggregate scores were classified into high (low) groups, and the remaining 13 scores were designated the medium group. A similar procedure was used to reclassify participants into high, medium and low categories for each of the three underlying belief dimensions. The second column of table 3 reports belief factor scores, partitioned by the high, medium and low categories.

Results

The third and fourth columns in table 3 report descriptive statistics for the multiple-choice and accounting case scores, cross-classified by belief group. An examination of these columns in panel A suggests that scores on multiple-choice questions do not vary systematically with students' overall beliefs about the nature of knowledge and learning. In contrast, performance on the case analysis does appear to correspond to overall beliefs, with students in the

[6] To validate the classification of statements into capitalize, expense and background categories, eight financial accounting professors independently rated the case facts on a scale anchored by −5 ("Strongly Supports Capitalizing") and +5 ("Strongly Supports Expensing"). As expected, the average rating for the background statements (0.36) did not differ from zero ($t = 1.06$, $p = 0.322$). Also, as expected, the capitalize (−1.2) and expense (3.2) statements differed significantly from the background statements in the expected direction ($t = 2.50$, $p = 0.020$ and $t = 4.87$, $p = 0.001$, respectively), thereby validating statement classification.

[7] Of the 73 subjects, only 23 (31.5 percent) recommended the capitalization resolution that was adopted by the company on which the case was based (see Phillips 1997).

TABLE 3
Belief Factor Scores and Student Performance on Multiple-Choice and Accounting Case Tasks by Partitioning Variable[a]

	Belief Factor Score[b]	Multiple-Choice Score[c]	Accounting Case Score[d]
Panel A: Overall Beliefs[e]			
High (n = 30)	0.57 [0.56] (0.28)	14.1 [14.0] (4.3)	5.7 [6.0] (1.7)
Medium (n = 13)	−0.02 [−0.01] (0.09)	15.3 [16.0] (3.4)	5.1 [5.0] (2.2)
Low (n = 30)	−0.53 [−0.47] (0.33)	14.7 [15.0] (3.7)	4.9 [5.0] (1.9)
Panel B: Underlying Dimensions[f]			
Committed Effort			
High (n = 30)	0.95 [0.94] (0.52)	14.3 [14.5] (4.1)	5.5 [6.0] (2.0)
Medium (n = 13)	−0.16 [−0.15] (0.19)	13.4 [13.0] (3.3)	4.5 [5.0] (2.1)
Low (n = 30)	−1.00 [−0.90] (0.53)	15.1 [15.0] (3.9)	5.4 [5.5] (1.7)
Uncertain Knowledge			
High (n = 30)	0.95 [0.96] (0.46)	14.9 [15.0] (3.6)	5.8 [6.0] (1.6)
Medium (n = 13)	0.12 [0.13] (0.13)	14.5 [14.0] (4.4)	5.5 [6.0] (1.9)
Low (n = 30)	−0.84 [−0.62] (0.71)	14.2 [15.0] (4.0)	4.7 [5.0] (2.0)
Abstract and Complex			
High (n=30)	0.99 [0.73] (0.60)	13.9 [14.0] (4.1)	5.2 [5.0] (1.8)
Medium (n=13)	0.20 [0.34] (0.22)	15.6 [16.0] (3.4)	5.5 [6.0] (1.9)
Low (n=30)	−0.89 [−0.83] (0.58)	14.7 [15.0] (3.8)	5.3 [5.0] (2.1)

[a] Reported table entries include group means [medians] (standard deviations).
[b] Belief factor scores are reported for each variable used to partition subjects into high, medium and low groups.
[c] The possible (actual) range of multiple-choice scores was 0–25 (5–24).
[d] The possible (actual) range of case scores was 0–8 (0–8).
[e] Students were partitioned into groups using the average of standardized factor scores, representing the overall sophistication of beliefs about the nature of knowledge.
[f] Students were partitioned into groups using standardized factor scores that represent the sophistication of beliefs along each of the three belief dimensions identified in the factor analysis.

high group receiving the highest average and median case scores, followed by students in the medium and low groups. Panel B of table 3 also reports performance scores, where students are classified into groups based on ranked belief scores for each of the three underlying dimensions. Again, multiple-choice performance appears relatively unaffected by students' beliefs about knowledge, and case performance appears to vary systematically with beliefs about the uncertainty of knowledge. However, the other belief dimensions do not appear related to performance on the accounting case.

Regression analyses were conducted to examine systematically the relationship between student performance and beliefs about knowledge and learning. To enhance the power of the tests, the following analyses include only the 60 students classified into the high-and-low belief groups.[8] Because

[8] The sensitivity of this approach was tested by re-running the analyses using a median split, in which the top (bottom) 36 students were classified into the high (low) categories. The results did not change.

ability and effort are likely to influence student performance, GPA was included as a control variable in the regression models.[9] As reported in the second column of table 4, multiple-choice performance was related strongly to GPA (t = 3.96, p = 0.000), but was not related to overall beliefs about knowledge and learning (t = 0.46, p = 0.646).[10]

A similar analysis was run with case performance as the dependent variable. The results, reported in the third column of table 4, indicated that the measure of overall belief sophistication was significant (t = 2.08, p = 0.042), and GPA was not significant (t = 1.57, p = 0.122). In light of the possibility that accounting knowledge itself might be correlated with beliefs about the nature of knowledge, the score on the multiple-choice test was included as a control variable in the case performance regression model.[11] This analysis, reported in the fourth column of table 4, indicates that the aggregate measure of belief sophistication continues to be significant

[9] Prior accounting education research has found consistently that GPA explains a significant proportion of variance in student performance on structured accounting questions. As Jones and Davidson (1995, 172) argue, GPA provides a reasonable control for factors related to ability and effort. More direct measures of ability and effort would be desirable in this study; however, such alternative measures were not collected.

[10] Multiple-choice performance also was regressed on GPA and each of the underlying belief dimensions. Although GPA was significant in these regressions ($p < 0.007$), none of the belief dimensions was significant ($p > 0.240$), revealing a pattern identical to that reported in the second column of table 4.

[11] I am grateful to one of the reviewers for suggesting this analysis as a means of controlling for possibly correlated omitted variables.

TABLE 4
Ordinary Least Squares Regressions of Students' Performance Scores

	Dependent Variable			
	Multiple-Choice	Accounting Case		
Independent Variable	Coefficient (t-statistic)[a]	Coefficient (t-statistic)[a]	Coefficient (t-statistic)[a]	Coefficient (t-statistic)[a]
Intercept	2.30 (0.64)	1.56 (0.87)	1.50 (0.83)	0.56 (0.28)
GPA	**3.73** **(3.96)**	0.74 (1.57)	0.65 (1.21)	0.76 (1.33)
Multiple-Choice			0.02 (0.36)	0.01 (0.14)
Overall Beliefs[b]	0.442 (0.46)	**1.00** **(2.08)**	**0.990** **(2.04)**	
Uncertain Knowledge[c]				**1.42** **(2.79)**
Adjusted R^2	0.192	0.055	0.040	0.086

[a] Significant coefficients and t-statistics (two-tailed $t \geq 1.96$, $p \leq 0.05$) appear in **bold.**

[b] Students were partitioned into groups using the average of standardized factor scores, representing the overall sophistication of beliefs about the nature of knowledge.

[c] Students were partitioned into groups using standardized factor scores that represent the sophistication of beliefs about the uncertainty of knowledge.

(t = 2.04, p = 0.046), even after controlling for knowledge differences.[12] Thus, parallel to the results of prior studies (e.g., Amernic and Beechy 1984; Jones and Davidson 1995), the above analyses suggest that greater cognitive development is associated with greater performance on unstructured, but not structured, accounting tasks. The distinguishing feature of the current study, however, is that the cognitive development involves specific identifiable *beliefs* about knowledge rather than performance on a generic ability-assessment task.

To identify the specific beliefs that contribute to superior performance on the case, regressions were run for each of the underlying belief dimensions.[13] As shown in the final column of table 4, beliefs about *Uncertain Knowledge* were related strongly to case performance (t = 2.79, p = 0.007), after using GPA and multiple-choice scores to control for ability, effort and knowledge. Students who were more likely to believe that "multiple perspectives are possible" and "single 'truths' do not exist" also were more likely to evaluate accurately whether case facts support the decision to capitalize or expense costs in an unstructured, ambiguous setting. Beliefs pertaining to *Committed Effort* and *Abstract/Complex Knowledge* were not related to case performance (p > 0.327).[14] Thus, these results suggest that beliefs about uncertain knowledge are relatively more important in evaluating case facts.

DISCUSSION AND CONCLUSION

This study investigated introductory accounting students' beliefs about the nature of knowledge and learning. A factor analysis of survey responses revealed that students varied in the degree to which they believed knowledge involves: (1) effortful acquisition, (2) uncertainty, and (3) complex abstractions. After controlling for ability, effort and knowledge, regression analyses indicated that overall belief sophistication was positively associated with student performance on cases, but not on multiple-choice exam questions. Specifically, students who possessed more sophisticated beliefs about knowledge were more likely to accurately identify the relevance of case facts. When the belief dimensions were analyzed separately, only the dimension related to knowledge uncertainty was associated with case performance.

These results suggest that students who have developed the view that single correct "answers" rarely exist or that issues can be considered from several perspectives are likely to outperform others on unstructured, ambiguous tasks, such as analyzing accounting cases. This finding is important because the profession has been seeking accounting graduates who are able to cope with uncertainties on a day-to-day basis (*Perspectives* 1989). If students are more likely to accept the possibility that knowledge is uncertain, they may be more likely to succeed early in their careers, as suggested by the Accounting

[12] The multiple-choice knowledge measure was correlated positively with GPA (p = 0.000), but not with any other variables. The only other significant correlation among the variables existed between GPA and overall belief sophistication (p = 0.006). To check for possible multicollinearity among the regression variables, the variance inflation factor (VIF) was computed. The largest VIF was 1.372, which suggests only a very slight presence of multicollinearity (Judge et al. 1988, 869).

[13] The reported analyses include only the top and bottom 30 students along each of the belief dimensions. The median-split procedure yields the same results.

[14] Because variances for the three belief measures do not differ significantly (F < 1.07, p > 0.383), differences in the significance of belief-performance relations are not attributable to differential variability in belief measures.

Education Change Commission (AECC 1990, 310).

The primary purpose of this study was to identify accounting students' beliefs about knowledge and learning, and to test for a possible relationship between these beliefs and performance. Although underlying belief dimensions were identified and a belief-performance relationship was demonstrated, further replication is needed to test whether the results of this study are sensitive to the following limitations. First, the design for this study did not incorporate direct measures of ability that have been investigated previously by Amernic and Beechy (1984) and Jones and Davidson (1995). Second, this study did not measure and test the learning strategies that are presumed to link beliefs with performance. Third, this study measured only one aspect of case performance; the possibility exists that other, more variable performance measures will reveal significant relations between belief dimensions and the other elements of the accounting performance model. Future research is needed to examine these limitations, perhaps by including several direct measures within a single, comprehensive model.

Another direction for future research is to study students' evolving and maturing beliefs about knowledge and learning. Although early development of knowledge appears to occur somewhat independent of the developing beliefs about knowledge (as indicated by the insignificant correlation reported in footnote 12), a point may be reached at which the two constructs develop concurrently and may even facilitate the development of one another. As beliefs about knowledge become more sophisticated, students are more likely to broaden their interpretations of information, thereby creating new knowledge and insight. As knowledge expands and students appreciate the depth with which a topic can be studied, beliefs about knowledge are likely to mature. Research that examines the concurrent development of knowledge and beliefs about knowledge among more experienced students may provide clues for explaining the adage "the more we know, the more we realize we don't know."

Despite the limitations noted, this research provides a basis for speculating what we, as educators, can do to further enhance student education and performance. First, we can strive to adopt instructional methods that encourage students to develop sophisticated beliefs. Friedlan's (1995) research comparing case-oriented and "traditional" methods of instruction indicates that the growing use of accounting cases is a step in the right direction. Second, we must continue to support this movement by creating and disseminating instructional materials that inspire balanced debates of accounting issues. These materials should require students to consider the same concepts from several directions—a recommendation that appears frequently in the educational psychology literature (e.g., Spiro et al. 1992). For example, an auditing case that incorporates management incentives for understating and overstating earnings, such as those examined separately by Hirst (1994), is likely to encourage more sophisticated beliefs to develop. Finally, we must implement emerging technologies that encourage sophisticated belief structures to develop. The introduction of computer-based hypertext systems offers great promise for the future because it visually demonstrates that the same piece of information can be relevant to different problems in different ways, depending on how the problem is approached (Jacobson and Spiro 1993). However, a cautionary note is warranted.

Although sophisticated belief structures can flourish in computer-based hypertext environments, computer-based *drills* are likely to impede their development by reinforcing beliefs that knowledge is certain and acquired through rote learning. Thus, the effectiveness of these technologies is likely to depend ultimately on the complexity of the links that we establish, and encourage our students to establish, within the learning environment.

REFERENCES

Accounting Education Change Commission. 1990. *Objectives of Education for Accountants.* Position statement No. 1. *Issues in Accounting Education* 5 (Fall): 307–312.

Amernic, J. H., and T. H. Beechy. 1984. Accounting students' performance and cognitive complexity: Some empirical evidence. *The Accounting Review* 59 (April): 300–313.

Bonner, S. E., and B. L. Lewis. 1990. Determinants of auditor expertise. *Journal of Accounting Research* 28 (Supplement): 1–20.

Friedlan, J. M. 1995. The effects of different teaching approaches on students' perceptions of the skills needed for success in accounting courses and by practicing accountants. *Issues in Accounting Education* 10 (Spring): 47–63.

Granof, M. H., and P. W. Bell. 1991. *Financial Accounting: Principles and Issues.* Fourth edition. Englewood Cliffs, NJ: Prentice Hall, Inc.

Hackenbrack, K. 1992. Implications of seemingly irrelevant evidence in audit judgment. *Journal of Accounting Research* 30 (Spring): 126–136.

Hirst, D. E. 1994. Auditor sensitivity to earnings management. *Contemporary Accounting Research* 11 (Fall): 405–422.

Inhelder, B., and J. Piaget. 1958. *The Growth of Logical Thinking from Childhood to Adolescence.* New York, NY: Basic Books.

Jacobson, M. J., and R. J. Spiro. 1993. Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. ERIC Document Reproduction Service No. ED355508. Urbana, IL: Center for the Study of Learning, University of Illinois at Urbana–Champaign.

Jones, S. H., and R. A. Davidson. 1995. Relationship between level of formal reasoning and students' performance in accounting examinations. *Contemporary Accounting Research* 12 (Fall): 163–181.

Judge, G. G., R. C. Hill, W. E. Griffiths, H. Lutkepohl, and T. Lee. 1988. *Introduction to the Theory and Practice of Econometrics.* New York, NY: John Wiley & Sons.

Libby, R. 1995. The role of knowledge and memory in audit judgment. In *Judgment and Decision-Making Research in Accounting and Auditing,* edited by R. H. Ashton, and A. H. Ashton. New York, NY: Cambridge University Press.

Perspectives on Education: Capabilities for Success in the Accounting Profession (The White Paper) 1989. Arthur Andersen & Co., Arthur Young, Coopers & Lybrand, Deloitte Haskins & Sells, Ernst & Whinney, Peat Marwick Main & Co., Price Waterhouse, and Touche Ross. New York, NY.

Phillips, F. 1997. Product packaging limited. *Journal of Accounting Case Research* 4 (Summer): 83–88.

Schommer, M. 1990. Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology* 82 (September): 498–504.

———, A. Crouse, and N. Rhodes. 1992. Epistemological beliefs and mathematical text comprehension: Believing it is simple does not make it so. *Journal of Educational Psychology* 84 (December): 435–443.

———. 1993. Epistemological development and academic performance among secondary students. *Journal of Educational Psychology* 85 (September): 406–411.

———, and K. Walker. 1995. Are epistemological beliefs similar across domains? *Journal of Educational Psychology* 87: 424–432.

Shute, G. E. 1979. *Accounting Students and Abstract Reasoning: An Exploratory Study*. Sarasota, FL: American Accounting Association.

Spiro, R. J., P. J. Feltovich, M. J. Jacobson, and R. L. Coulson. 1991. Knowledge representation, content specification, and the development of skill in situation-specific knowledge assembly: Some constructivist issues as they relate to cognitive flexibility theory. *Educational Technology* (September): 22–25.

———, ———, ———, and ———. 1992. Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. In *Constructivism and the Technology of Instruction: A Conversation*, edited by T. M. Duffy, and D. H. Jonassen. Hillsdale, NJ: Lawrence Erlbaum Associates.