

Students' Epistemological Beliefs and Approaches to Learning

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Abstract

This research attempts to examine the relationship between epistemological beliefs and study approaches of teacher education students. Pearson correlation coefficients analysis indicated there were significant relations among four dimensions of epistemological beliefs and three study approaches, including the associated motive and strategy components. Implications were drawn for class teaching and learning as well as future research in this area.

Introduction

Students' motives and strategies to learn are always one of the focused areas of research. Educators have proposed various models to account for the process of students' learning. One common model in teaching and learning often cited in literature is the 3P-model of classroom learning, first outlined by Dunkin & Biddle in 1974 (Biggs & Watkins, 1993) which relates the main components in classroom learning in terms of the 3P: Presage (student characteristics and teaching context), Process (task processing and Product (nature of outcome). Among the students' characteristics, students' motivation and their approaches or strategies to learn are very important elements of students' learning and have been much researched.

Making use of the 3P-model, Biggs (1985, 1987, 1992, 1993) has researched extensively in the study approaches of students and has generated two questionnaires for use at different levels: the study approach questionnaire (SPQ) for the tertiary level and the learning approach questionnaire (LPQ) for the secondary school level. The questionnaires were built on his theoretical framework which assumed there are two study approaches: surface and deep approaches, each study approach is composed of a motive and strategy component. His conceptual framework was supported by factor analysis studies of over thousands of college/university students in Australia and Hong Kong with the identification of two factors: the surface and the deep approaches. Later studies by Biggs (1985, 1987, 1992, 1993) extracted a third factor in the factor structure, implying the existence of another approach among students in addition to the "surface" and "deep" approaches. Biggs termed the third factor or approach the "achieving" approach. The "achieving" approach is based on the ego-enhancement aiming at the achievement of high grades. The strategy is to organize time, workplace, and syllabus coverage cost effectively, with much use of cue-seeking, systematic use of study skills, planning ahead, allocating time according to task importance. These researches of study approaches have given rise to many implications on students' learning, for example, teachers beliefs and the assessment mode may influence the study approaches or strategies adopted by the students (Biggs, 1987, 1992; Biggs & Watkins, 1993). Students' beliefs may also affect students' motivation to learn and their study strategies. However, there are only few studies about the influence of beliefs on the motives and study strategies of students, the latter has been demonstrated to affect students'

academic performance in research (see Paulsen & Feldman, 1999). Such a relationship, if identified, should help understand students' learning.

Recently, research has suggested that beliefs have indirect effects on students' use of learning and self-regulatory strategies, which in turn affect academic performance (Paulsen & Gentry, 1995; Pintrich & Schrauben, 1992). Of the belief studies conducted, one which has received increased attention recently is the beliefs about the nature of knowledge and knowing, known as epistemological beliefs. Research by Schommer (1990, 1994a, 1994b) and others has suggested that beliefs about the nature of knowledge and learning (known as epistemological beliefs) are related to meta-cognitive activities. For example, studies have established that epistemological beliefs influence performance on several different kinds of learning tasks in predictable ways such as mathematics problem solving (Schoenfeld, 1983, 1985), persistence in the face of a difficult task (Dweck & Leggett, 1988; Qian & Alvermann, 1995), reading comprehension, comprehension monitoring, and interpretation of information (Ryan, 1984; Schommer, 1990). Students' epistemological beliefs are considered to affect their motivational beliefs, cognitive strategies and learning outcomes (Hofer & Pintrich, 1997; Schommer, 1990).

Recent study by Paulsen and Feldman (1999) indicated that three of the four dimensions of epistemological beliefs (as identified by Schommer, 1990) were found to be significantly related to four or more of the motivational constructs (as included in the MSLQ questionnaire developed by Pintrich, see Pintrich et al., 1993). In Paulsen and Feldman (1999) study, students with the naïve belief that the structure of knowledge is simple were less likely to have an intrinsic goal orientation, to appreciate the value of learning tasks, to perceive an internal control over learning, and to feel efficacious about their capacity to learn. Students with the naïve belief in simple knowledge were also more likely to have an extrinsic goal orientation and to experience higher levels of test anxiety than were students with more sophisticated beliefs. Students with the naïve belief that learning takes place quickly, compared to students with the more sophisticated belief that learning takes place gradually were less likely to have an intrinsic goal orientation, to appreciate the value of learning tasks, and to perceive an internal control over learning. Students with a naïve belief in quick learning were also more likely than other students to have an extrinsic goal orientation toward learning. Students with the naïve belief that ability to learn is fixed were less likely to have an intrinsic goal orientation, to appreciate the value of learning tasks, to perceive an internal control over learning, and to feel efficacious about their capacity to learn than were students with the more sophisticated belief that the ability to learn can be improved (and therefore controlled) over time. In addition, whether students believed that knowledge is absolute and certain or tentative and evolving was not found to be related to the motivational constructs.

Purpose of Study

Based on the previous research findings on epistemological beliefs and meta-cognitive activities of students, it is likely that some kind of relationship exist between epistemological beliefs and study approaches, i.e. study motives and strategies of students. Identification of such a relationship would help understand students' learning and provide implications to classroom teaching. However, studies in exemplifying the relationship of epistemological beliefs and study approaches (motives and strategies) are still scarce and lacking in the non-western cultural contexts resulting in a great demand of such studies. Subsequently, this study attempts to examine the relation between epistemological beliefs and study approaches adopted by the students in a Hong Kong institute of teacher education.

Method

Materials

Two questionnaires were used in this study, one for measuring epistemological beliefs and the other study approaches of students. The first one was a 30-item questionnaire on a 5-point Likert scale (5 = strongly agree, 1 = strongly disagree) developed by the author to measure epistemological beliefs of students. The questionnaire was adapted from Schommer's 63-item epistemological beliefs questionnaire. Four dimensions or subscales were identified for the Hong Kong cultural context, viz. Innate/Fixed Ability, Learning Effort/Process, Authority/Expert Knowledge and Certainty Knowledge. These four dimensions/subscales were in some way similar and different to that identified by Schommer for the North American college students: Innate/Fixed Ability, Certainty Knowledge, Simple Knowledge and Quick Learning (see Schommer, 1990, 1994). The author's 30-item epistemological beliefs questionnaire has been validated with a sample of 385 Hong Kong teacher education students by means of confirmatory factor analysis using LISREL8 ($gfi = 0.93$). Reliabilities of the four subscales were satisfactory (Cronbach alpha of the four subscales ranged from 0.6 to 0.7) (see Chan, 2000).

The second one was Biggs 42-item SPQ questionnaire which has been designed for the tertiary level students. The SPQ contains six subscales of seven items each: three subscales measure students' study motives (Surface, Deep and Achieving), and the other three measure corresponding learning strategies utilised by students (Surface, Deep, Achieving). The corresponding subscales for motive and strategy can be combined to produce a score representing approaches to learning - Surface, Deep and Achieving. A 5-point Likert scale (5 = always or almost true of me, 1 = never or only rarely true of me) was used for students' rating.

Participants

The participants consisted of 292 teacher education students of the Hong Kong Institute of Education, enrolled in the Certificate in Education Course. The Certificate in Education (CE) is a full-time two year sub-degree course for training of non-graduate teachers, whose admission requirement is similar to that of university undergraduates in Hong Kong. The age of the participants ranged from 18 to 30, mostly around 19 to 22 (altogether about 86%). Of those who indicated their gender in the demographic column of the questionnaire, 90 were male (32%) and 190 (68%) were female students. The ratio of the male to female students in the sample was similar to that of Institute's population.

Data Analysis

The author's developed epistemological beliefs and Biggs' Study Process (SPQ) questionnaires were administered to a sample of 292 teacher education students of the Hong Kong Institute of Education for rating on a 5-point Likert scale. Subscale scores were computed from the response data for the four dimensions of epistemological beliefs, six motives and strategies and three study approaches. Pearson Correlation analysis was applied to study the relation of the identified subscales/dimensions of epistemological belief with study approaches and motives and strategies respectively.

Results

The subscale scores (mean and standard deviation) of the four dimensions of epistemological beliefs, three study approaches, six study motives and corresponding strategies are listed in Table 1.

**Table 1 The Mean and Standard Deviation of Epistemological Belief,
Study Approach, Motive and Strategy Dimensions**

Dimensions	Cases	Mean	Std Dev
Innate/Fixed Ability	284	2.76	.50
Learning Effort/Process	281	3.81	.47
Authority/Expert Knowledge	283	2.63	.47
Certainty Knowledge	284	2.78	.59
Surface Approach	284	2.91	.48
Deep Approach	284	3.15	.49
Achieving Approach	283	2.93	.51
Surface Motive	286	3.03	.57
Surface Strategy	285	2.78	.52
Deep Motive	286	3.11	.54
Deep Strategy	285	3.20	.56
Achieving Motive	285	3.03	.61
Achieving Strategy	285	2.81	.62

For epistemological beliefs, except the dimension on learning effort and process, all the mean subscale scores were below 3, the mid-point of the five-point Likert scale, suggesting students' beliefs in Innate/Fixed Ability, Authority/Expert Knowledge and Certainty Knowledge tended to lie in the lower end of the five-point scale. In other words, the teacher education students seemed not to believe in that ability is fixed and innate, that knowledge is handed down by authority or experts and that knowledge is certain and permanent. The relatively high subscale score of the dimension learning effort/process suggests that the students tended to believe that learning requires effort and process of learning including understanding.

The subscale scores of the three study approaches were close to each other, particularly the surface (mean 2.91) and achieving approach (mean 2.93). The subscale score of the deep approach (3.15) was slightly higher than the other two and was just above 3, the mid-point of the five-point scale suggesting a relatively even use of the three approaches by the students, with some more students favouring the deep approach for their study. Similar to

the trend of the study approaches, the subscale scores of the motives and strategies in Table 1 shows the students' motive and strategies were mostly of the deep category, followed by achieving and surface type with little differences amongst the three.

Pearson correlation coefficients and their levels of significance are reported in Tables 2 and 3 respectively.

Table 2 Correlations Between Epistemological Beliefs and Study Approach

Dimensions	
Dimensions of Epistemological Beliefs	
Innate/Fixed Learning Authority/Expert Certainty	
Dimensions of Ability Effort/ Knowledge Knowledge	
Study Approach Process	
Surface Approach	.21** .01 .19** .18**
Deep Approach	.004 .22** -.17** .05
Achieving Approach	.02 .13* .04 .16**

* significant at .05 level (2-tailed)

** significant at .01 level (2-tailed)

Table 2 shows the Pearson correlation coefficients of each possible pairing of one of the three study approach constructs and one of the four dimensions of epistemological beliefs. The four dimensions of epistemological beliefs were found to be significantly related to the three study approaches at the 0.05 and 0.01 level. Taking a significance level of 0.01, the dimension Innate/Fixed Ability was found to be positively related to Surface Approach; Learning Effort/Process was positively related to Deep Approach; Authority/Expert Knowledge, while positively related to Surface Approach, was found negatively related to Deep Approach; Certainty Knowledge was positively related to both Surface Approach and Achieving Approach. In other words, students with the sophisticated belief that ability is fixed and innate tended to use a surface approach in their study. Students who believed in that learning requires effort and process of learning were likely to adopt a deep approach. Students who believed in authority or expert knowledge would try a surface approach instead of a deep approach in their study (as reflected by the respective significant positive and negative correlation coefficients). The study approached used by students who believed that knowledge is certain and unchanged would be surface and achieving.

Table 3 Correlations Between Epistemological Belief, Study Motive and Strategy Dimensions

Dimensions of Epistemological Beliefs

Dimensions of Innate/Fixed Learning Authority/Expert Certainty

Study Motive and Ability Effort/ Knowledge Knowledge

Strategy Process

Surface Motive	.12*	.08	.15*	.14*				
Surface Strategy	.25**	-.06	.19**	.17**	Deep Motive	.02	.22**	-.14* .08
Deep Strategy	-.01	.17**	-.17**	.01	Achieving Motive	.06	.12	.03 .10
	.10	.03	.18**		Achieving Strategy	-.03		

* significant at .05 level (2-tailed)

** significant at .01 level (2-tailed)

Table 3 shows the Pearson Correlation Coefficients of the six study motives and strategies constructs with the four dimensions of epistemological beliefs. The results were in line with relation of the study approaches with epistemological beliefs. The breakdown of the study approaches into the motive and strategy components and their relations with epistemological beliefs can be reviewed by the Pearson Correlation Coefficients of the possible pairing shown in Table 3. There were eleven significant correlations at both 0.05 and 0.01 level between the dimensions of epistemological beliefs and the motive and strategy constructs. The epistemological belief dimension on Innate/Fixed Ability was found positively related to Surface Strategy (0.01 level) and Surface Motive (0.05 level); Learning Effort/Process was positively related to both Deep Motive and Deep Strategy at 0.01 level; while Authority/Expert Knowledge was positively related to Surface Strategy (0.01 level) and Surface Motive (0.05 level), it was negatively related to Deep Strategy(0.01 level) and Deep Motive (0.05 level); Certainty Knowledge was not only positively related to Surface Strategy (0.01 level) and Surface motive (0.05 level) but also positively related to Achieving Strategy (0.01 level). That is, students who believed in that ability is fixed and innate were likely to be surface motivated and utilize a surface strategy in their study. On the other hand, students who believed in the learning effort and process would be deep motivated and adopt a deep strategy in study. Students who believed in authority/expert knowledge were surface motivated and used a surface strategy instead of being deep motivated and utilized deep strategy in their study. Students who believed in the certainty nature of knowledge would be surface motivated and utilized surface strategy as well as achieving strategy in their study.

Discussion and Implications

The subscale scores of the study approaches and the motive and strategy components of the Hong Kong teacher education students in this study (shown in Table 1) is contradictory to some of the beliefs and conceptions of western scholars that Asian students rely on rote learning and surface study approach. The result indicates that Hong Kong Chinese students tended to be deep and achieving orientated in their learning approaches (also motives and strategies). This study also gives support to Biggs' argument of the misperception of western scholars on the study approach of Chinese students (Watkins & Biggs, 1996).

This study provides evidence that epistemological beliefs are related to meta-cognitive activities such as learning approaches, motives and strategies. The results also gave support to the findings of researchers such as Hofer (1994), Schultz, Pintrich and Young (1993) Paulsen and Feldman (1999) regarding the significant relationship between the epistemological beliefs of students and their motivation to learn in a particular course of study. In addition to the motivation aspect, this study also elaborates the significant relationship of epistemological beliefs with students' utilized strategies and hence their study approaches. For example, students who believed in that learning requires effort and process of learning would probably try to learn with a motive and strategy to understand instead of relying on rote, accounting for a deep approach adopted instead of a surface one. Students who believed in that knowledge is hand down by authority or expert would not both to much in questioning or understanding the learning materials which would be put into memory by the surface strategy. The same thing could have happened when students believed that ability is innate and fixed, and that knowledge is certain and unchanged, hence things or knowledge are there and would not change, so learning would be a simple task of memorization and students would adhere to a surface approach of study.

The relationship exemplified/identified gives valuable implications to teaching and learning. Through uncovering the epistemological beliefs held by the students, it enables the teacher and students themselves to understand their approaches, motives and strategies utilized in learning. It follows that one of the possible means in changing the study approaches, motives and strategies utilized by students in their learning would be to alter the epistemological beliefs held by the students, which are influenced by the students previous experiences and learning contexts.

Caution must be noted that this is a correlational study and there is no causal effect relationship shown by the analysis. For future research, structural equation modelling of the causal effect relationship of epistemological beliefs, study approaches, motives and strategies could be a potential and valuable area of study to further understand the nature of the relationship.

Conclusion

The Hong Kong teacher education students in this study was found to adopt mostly a deep approach (include motive and strategy) in their study, followed by achieving and surface approaches. However, there were little differences amongst the three approaches with respect to the calculated means.

For the Hong Kong students under study, the four dimensions of epistemological beliefs (Innate/Fixed Ability, Learning Effort/Process, Authority/Expert Knowledge and Certainty Knowledge) were found significantly related to the three study approach constructs (Deep, Surface and Achieving), including the six motive and strategy components. The relationship identified is understandable in terms of the nature of the epistemological beliefs and study approach constructs and provides useful implications to class teaching and learning. Such

relation gives support to earlier research suggestion that epistemological beliefs are related to meta-cognitive activities, clarify the misperception of western scholars on the study approaches adopted by the Chinese students and gave implications to classroom teaching and learning as well as future direction of research in this area.

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