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Changes in epistemological beliefs among undergraduate students: programme components and learning experiences

Research strand - Exploring learning, teaching and student experience development in:

- Changing student experiences of higher education and evolving identities of students

Abstract

With an aim to map out the development and the learning process for undergraduate students enrolled in a 4-year teacher education programme, a longitudinal study investigating changes in the students' epistemological beliefs conducted. The study involved 197 undergraduate students. Both quantitative and qualitative methods were employed to examine the students' epistemological beliefs and influences from the undergraduate teacher education programme that are related to these changes. Questionnaire data across the four-year period were analyzed to tap possible changes in the epistemological beliefs of students. The analysis of qualitative data from interview identified critical elements of the undergraduate programme which contribute to these changes. Implications for the design of undergraduate professional programmes are drawn based on the findings.

Objective

The aim of the study is to capture the changes of the undergraduate students' epistemological beliefs and examine the elements of the undergraduate programme that contribute to the changes of epistemological beliefs.

Perspective

Epistemological beliefs refer to the beliefs about the nature of knowledge and knowledge acquisition (knowing) (Schommer, 1994; Schommer-Aikins, 2004) and Schommer has developed a scale to study this construct empirically (1990). Further studies in this area suggested that the epistemological beliefs are related to the meta-cognitive variables of student learning, such as reading comprehension, learning strategies, and problem solving in mathematics, etc. (e.g. Schommer, 1993, Schommer, Crouse & Rhodes 1992). Chan and Elliott (2002, 2004) adapted Schommer's scales to study the epistemological beliefs of sub-degree teacher education students in Hong Kong and found four factors of epistemological beliefs namely, 'innate (or fixed) ability', 'learning effort and process', 'authority knowledge', and 'certainty knowledge'.

The epistemological beliefs could be classified as 'naive' and 'sophisticated' (Schommer, 1994). Sophisticated learners may believe that a vast amount of knowledge is evolving, and acquisition of knowledge depends more

on one's effort than inborn ability. Authority does not play a main role in the construction of knowledge. . On the contrary, naive learners may believe that most information is certain and is passed on to them by authority. How much they learn is related more to innate ability than the effort made,. Sophisticated epistemological beliefs are identified as elements that support flexible thinking, yet underlying that ability to take in new ideas or changing old ideas, will be a steadfastness of core concept (Schommer-Aikins, 2002). This paper attempts to chart the changes of different components of epistemological beliefs among undergraduate students in a teacher education programme across a four-year period (by which we name year 1 as stage 1, year 2 as stage 2 and so on below). The pattern of change across the four year period will inform us as programme designers whether there is a clear systematic trend of development or if the undergraduates are following a more non-linear path.

Context

The study involves four streams of Bachelor of Education (BEd) students: BEd(Early Childhood Education), BEd(Primary), BEd(Secondary) and BEd(Language) programmes in an Education Institution. The four-year BEd programme consists of the core components: Professional Studies, General Education, Complementary Studies of English Language Proficiency, and Field Experience, accompanied by specialist components that meet the particular professional needs of different groups of student-teachers.

Method and data source

This paper reports on a study involving 197 preservice teachers in the final year of a 4-year BEd programme in Hong Kong. It consists of a quantitative and a qualitative component. The questionnaire developed by Chan and Elliot (2002 and 2004) was administered to the students at the middle of each academic year. Reliability and validity tests of the items in the questionnaire were conducted, and the results were by and large satisfactory. Interviews were conducted at the end of each academic year and a total of 30 students participated as interviewees.

Results

One-way repeated measures ANOVA of the questionnaire across the four stages revealed that no changes in epistemological beliefs from stage 1 to stage 2 attained the level of significance. It was only when students' responses in stage 3 were compared with those in stage 2 that statistically meaningful changes emerged in all the epistemological beliefs. As students progressed further into the fourth year of their study, the minor changes made were mostly insignificant, with the only exception being for Authority Knowledge for which the downward move continued to attain a remarkable level. For the other 3 epistemological beliefs, what they thought in the final year differed markedly from their viewpoint in the second year, but not from that in the third year (Table 1).

Table 1 Changes in epistemological beliefs from stage 1 to stage 4 (N=197)

Epistemo-logical	Stage 1	Stage 2	Stage 3	Stage 4	

beliefs	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F	p
					value	value
Innate ability	2.79 ^{+a,b} (.58)	2.84 ^{+c,d} (.47)	2.92 ^{+a,c} (.52)	2.96 ^{+b,d} (.53)	8.77	<.001
Learning effort	3.91 (.46)	3.86 ^{+ab} (.38)	3.95 ^{+a} (.38)	3.92 ^{+b} (.37)	2.96	<.05
Authority knowledge	2.78 ^{+a,b} (.50)	2.74 ^{+c,d} (.52)	2.66 ^{+a,c,e} (.57)	2.56 ^{+b,d,e} (.54)	16.80	<.001
Certainty knowledge	2.57 ^{+a,b} (.59)	2.55 ^{+c,d} (.55)	2.71 ^{+a,c} (.62)	2.78 ^{+b,d} (.61)	11.73	<.001

⁺Pairwise Comparison, t-test based on estimated marginal mean, $p < .05$ (where "a", "b", "c", "d", and "e" specifically indicate which pairs are significantly different)

The lower mean score of authority knowledge in stage 4 than in stages 1, 2, and 3 ($F(2.87, 561.56) = 16.80, p < .001$) indicates a change towards more skepticism in the belief concerning source of knowledge. This increased doubt of expert views is usually interpreted as a sign of growing sophistication in the beliefs concerning knowledge acquisition (Hofer & Pintrich, 1997; Kember, 2001; Schommer, 1998).

The mean score of learning effort remained unchanged from stages 1 to 2, but this stable trend did not continue from stages 2 to 3. Its mean score in stage 3 indicates a significant increase (t test for pairwise comparison of the mean of stage 2 and stage 3 based on estimated marginal mean, $p < .05$) and they maintained this belief in the last stage (non-significant difference between stages 3 and 4, t test for pairwise comparison based on estimated marginal mean, $p > .05$). The students were more certain of the instrumental role of effort exertion in knowing in stage 3. The rise in awareness of personal responsibility in the form of hard work to build up knowledge is another indicator of maturity in personal epistemology.

Unlike learning effort and authority knowledge, what the students thought about innate ability and certainty knowledge did not change towards maturity. A significant increase in the mean score of innate ability after stage 2 is found ($F(2.89, 565.39) = 8.77, p < .001$). Pairwise comparison t-tests indicated significant change from stage 2 to stage 3 and stage 4. Similarly, a significant rise in the mean score of certainty knowledge is shown ($F(3, 588) = 11.73, p < .001$) and the mean scores of stages 3 and 4 are substantially higher than that of stage 2. Starting from stage 3 and persisting into stage 4, the students believed more strongly in the importance of inborn ability in learning and in the stability of knowledge. These changes are conceptualized as

a shift towards more naïve beliefs according to the related literature (Hofer & Pintrich, 1997; Knight & Mattick, 2006). There is a coexistence of progression and regression in the epistemological beliefs of the students.

Implications

Drawing on these findings, the students are seen to have undergone a non-linear path in their development across the four years. The interview findings are thus analysed to provide further information about the relationship between the changes in epistemological beliefs and the programme components. For example, the adherence to authority knowledge is found to be related to both the content of the programme and the learning process experienced by the students.

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