Students' Beliefs about Teaching and Learning and Knowledge Acquisition

TDG PROJECT

Prepared by

Wong, Kit Yi Angel
Cheng, May Hung May
Tang, Yee Fan Sylvia
Cheng, Yan Ni Annie

The Hong Kong Institute of Education
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Table of Contents

List of Tables

List of Figures

Executive Summary

1. Introduction

The current literature identifies the epistemological beliefs of learning as a system of interrelated beliefs, multi-dimensional and hierarchical in nature. The following four beliefs are extracted and validated to form the cornerstone of the present study: innate ability, learning effort and process, authority knowledge, and certainty knowledge. It is interesting to link these beliefs with conceptions about teaching and learning, which can be conveniently captured by the constructivist and traditional approaches to teaching and learning. The four epistemological beliefs together with the two conceptions about teaching and learning, as supplemented by some findings about the influence of field experience (and immersion or exchanges) on teacher education students, forms the basis for the empirical study of this project.

2. Method

This study seeks to examine the BEd students' epistemological beliefs and conceptions about teaching and learning, and their changes as they progress through the four-year programme. A cross-sectional study in 2006-07 and a longitudinal study from 2006-10 were launched to address the above question. The cross-sectional study consists of a survey (N=604) and interviews (N=71) for the year 1 and year 4 students (in the year 2006-07) from the programmes BEd(Primary), BEd(Secondary), BEd(Language), and BEd(Early Childhood Education). The questionnaire for the survey is adapted from some widely adopted instruments in the field, and the interview schedule was revised and tested with pilot interviews. In the longitudinal study, the teacher education students' epistemological beliefs and their conceptions of teaching and learning were studied in four stages, with the first wave being at the same time as the cross-sectional study in 2006-07. The second stage of the survey and interviews was conducted when these first year students progressed to their second year (2007-08), and so forth. Table 1.1 shows the timeframe of the various tasks undertaken for this longitudinal study. It shows that apart from the questionnaire survey and in-depth interviews, there were also observations of the target subjects during their teaching block practices in years 3 and 4.

Table 1.1 Timeframe for various tasks

Tasks	Year/stage 1	Year/stage 2	Year/stage 3	Year/stage 4	Final
Questionnaires	Jan 07	Jan 08	Jan 09	Jan 10	-
Interviews	Jan/Mar 07	May/Jun 08	April/May 09	Nov/Dec 09	Jun 10
Observations			April/May 09	Nov/Dec 09	-

3. Results

3.1 Validation of the instruments

Pilot interviews were carried out to refine the interview schedule, and advice was sought from the team members to revise the schedule. Reliability and validity tests of the items in the questionnaire were conducted, and the results were by and large satisfactory.

3.2 Results of Cross-sectional study in 2006-07

In total, 376 Year 1 students completed and returned the questionnaires; 162, 37, 122 and 55 Year 1 students were in the BEd(Primary), BEd(Secondary), and BEd(Language) and BEd(ECE) programmes, respectively. Among the four epistemological beliefs, the mean score of learning effort and process (3.90) is the highest, followed by innate ability (2.81), authority knowledge (2.76), and certainty knowledge (2.61). Considering that the items were rated on a five-point Likert scale, with a score of 2 indicating disagree, 3 indicating undecided/neutral, and 4 referring to agree, this finding implies that the Year 1 students slightly disagreed with the following three beliefs: the innate ability to learn is fixed, knowledge derives from authority figures, and knowledge remains unchanged and certain. However, they agreed that knowledge can be obtained from hard work and effort through the learning process. Regarding the two conceptions of teaching and learning, the thinking of the Year 1 students was largely in favour of the constructivist approach (mean score=4.20) and they slightly disagreed with the traditional approach (mean score=2.62).

A total of 228 Year 4 students completed the questionnaires: 73, 35, and 120 year 4 students in the BEd(Primary), BEd(Secondary), and BEd(Language) programmes, respectively. Among the 4 epistemological beliefs, the mean score of the learning effort and process (3.95) is the highest, followed by innate ability (2.86), authority

knowledge (2.65), and certainty knowledge (2.54). This finding implies that the year 4 students did not quite support the following three beliefs: the ability to learn is innate and fixed, knowledge derives from authority figures, and knowledge tends to remain unchanged and certain. However, the year 4 students did agree that knowledge can be obtained from hard work and effort through the learning process. The paired sample t-test for these 4 beliefs (for the year 4 students) suggests that they are quite different from each other in terms of the ideas connoted, and in terms of the extent of the agreement on the part of the students. Regarding the two conceptions about teaching and learning, the thinking of the year 4 students was largely in line with the constructivist approach (mean score=4.22), and they did not quite agree with the traditional approach (mean score=2.53). In addition, the year 4 students' espousal of the constructivist approach to teaching and learning was significantly stronger than their views about the traditional approach

3.3 Cross-sectional comparison of the Year 1 and Year 4 students surveyed and interviewed

Efforts were made to make a comparison of the Year 1 and Year 4 students from the survey and the interviews. On the whole, the results from the survey and the interviews were consistent.

According to the survey results, the Year 1 students, as compared to the Year 4 students, were more prone to believe in knowledge passed on to them from authorities such as their teachers. Other than this significant difference, the two groups of students shared similar views in terms of the importance of effort over innate ability in acquiring knowledge, and both considered knowledge as ever-changing. Comparing the Year 4 and Year 1 interview results, there is a major difference between the students' perceptions of the source of knowledge. Over half (N=23 out of 40) of the Year 1 students thought that their knowledge was mainly taught by teachers, while only eight Year 4 students (25.8%) thought so. There were also more Year 4 students who believed that they would learn independently: ten (32.3%) perceived that they had discovered knowledge on their own and seven (22.6%) thought that discovery on their own and being taught by teachers were equally important. Only 11 out of the 40 year 1 students shared this view. The final year students' weaker reliance on teachers as a source of knowledge is similar to the questionnaire results. The responses of Year 4 and Year 1 were quite similar in that learning effort and process was generally regarded as more important than innate ability in the knowledge acquisition process. Regarding the results of certainty knowledge, both groups of students regarded that knowledge would change as a result of new discoveries made

and the passage of time. This is in clear agreement with the questionnaire results.

The survey findings for the conceptions of teaching and learning show that the Year 1 students tended to be more supportive of the traditional conceptions as compared to the final year students. By comparing the answers to the two interview questions: *'Which are the most common strategies that you employed in teaching?'* and *'Which do you think are the best teaching strategies?'*, the results show that both Year 4 and Year 1 students were found to be consistent in their beliefs concerning the best teaching strategy and the most common teaching strategies employed. However, two Year 1 students stated that although their beliefs regarding the best teaching strategy were student-centred, their most common teaching strategies employed were teacher-centred. On the other hand, four and two Year 1 students had no concrete answer to the questions of the best teaching strategies and their most commonly employed teaching strategies, respectively. This shows that they might not have thought clearly about such issues in the first year of the programme.

To explore the relationship between epistemological beliefs and the conceptions of teaching, the research team grouped the student-teachers' epistemological beliefs into two categories, 'sophisticated beliefs' and 'naïve beliefs', with respect to the four dimensions, 'innate (or fixed) ability', 'learning effort and process', 'authority knowledge' and 'certainty knowledge'. One significant difference between the Year 1 and Year 4 students is that the majority of Year 1 students (65%) had mixed epistemological beliefs, whereas over half of the Year 4 students (52%) had uniformly sophisticated epistemological beliefs.

One key research question of this project is to examine what factors have contributed to the changes in students' beliefs and conceptions. The interview data suggested that the Year 1 students perceived more influence from lecturers and peers than did the Year 4 students. Most of the Year 1 students (N=24) regarded that the relationship with lecturers and peers had the strongest influence on them. Eighteen Year 1 students perceived that the lecturers had a positive influence, while five regarded the lecturers as having a negative influence on them. On the other hand, ten Year 1 students perceived that their peers had a positive influence and only one regarded that their peers had a negative influence on them. Nine out of eighteen of the Year 4 students who regarded that the IEd curriculum had a strong influence on them, revealed that the Field Experience component had the greatest impact on them. Four out of eight Year 4 BEd(L) students regarded that immersion had a significant influence on them.

3.4 Results of the Longitudinal Study from 2006-2010

In this section, the findings regarding epistemological beliefs and teaching and learning conceptions of stage 1 to stage 4 are presented before they are compared longitudinally in the next section. The results of the four epistemological dimensions and the two teaching and learning conceptions exhibited a similar pattern across the three stages.

In all stages (N=197), learning effort and process had the highest mean score, followed by innate ability. In stage 1 and stage 2, authority knowledge has a higher mean than certainty knowledge, whereas the reverse holds true for stage 3 and stage 4. Regardless of the year level the students were studying, they consistently considered diligence and learning skills as a crucial means of acquiring knowledge. Personal efforts were seen as more important in the process of learning than the ability and talent one is born with. In addition, the students tended not to view knowledge as coming from external authority and experts; instead personal reasoning and evidence were considered the basis of knowledge generation. This belief is consistent with their emphasis on personal effort in gaining knowledge. Concerning the nature of knowledge, the students did not perceive it as a fixed entity that would not change. They tended to conceptualize knowledge as evolving and changing. The students' support of these four beliefs is clearly differentiated.

For the two main conceptions of teaching and learning as in stage 1, the students clearly preferred the constructivist approach over the traditional approach. These two conceptions are very differently received by the students, which are constantly demonstrated by the result of the paired-sample t-test in which the mean score of constructivist conceptions was found to be significantly higher than that of the traditional approach in all four stages.

A longitudinal comparison of the data collected across the four stages was conducted. Specifically, the relevant responses of each student from each stage were compared with their corresponding responses at other stages by means of the one-way repeated measures ANOVA. Changes in all of the epistemological belief dimensions, but not in teaching and learning conceptions, are statistically significant. However, 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 dimensions. As the students progressed further into the fourth year of their study, the minor changes made were mostly insignificant, with the only exception being in authority knowledge, in 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 the third year.

It has been found that these two constructs are related, with epistemological beliefs exerting predictive influence on teaching and learning conceptions. A SEM model was set up to further examine the relationship between epistemological beliefs and conceptions of teaching and learning for each stage. The relationships ascertained in the four stages share a high degree of similarity. A strong belief in the use of learning effort and learning skills predicts the adoption of the constructivist teaching and learning approach. It is remarkable that the predictive strength of this belief is the strongest among all the predictors in every stage of the evaluation. One change that can be noted in the SEM model of this stage is the influence of certainty knowledge and authority knowledge on constructivist conceptions. Whereas certainty knowledge played a negative role in shaping constructivist conceptions in the first and third stage, its impact faded and became insignificant in stage 4. In this stage, authority knowledge exerted significant negative influence on constructivist conceptions for the first time.

The interview results of Year 2 support the questionnaire findings that the changes in the students' epistemological beliefs appeared between Stage 2 and Stage 3. The findings suggest that General Education stimulated the students to be reflective and this may explain why the authority of knowledge is reconsidered and there is a shift away from it. The students also illustrated that General Education had impacts on this change as it helped them develop their critical thinking. Furthermore, the interview data collected in Year 2 revealed that the exposure to real school life in the School Attachment was the most influential factor in shaping their notion of teaching and learning, which is related to epistemological beliefs. Although the findings for the influence of the School Attachment on epistemological beliefs vary largely depending upon each individual's personal experience, it illustrates that the students' School Attachment experience is critical for the development of their epistemological beliefs.

In stage four, an additional scale was designed to assess the students' perception of the influence of various learning experiences on their epistemological beliefs and teaching and learning conceptions. In all, 18 items of learning experiences were identified and evaluated. This scale was validated by exploratory factor analysis (EFA). Six factors are labelled according to the constituting components as follows: factor 1: "core components in the formal curriculum of the BEd programme (FORM)", factor 2: "field experience (FIELD)", factor 3: "non-local learning experience (N-LOC)", factor 4: "informal and hidden curriculum of the BEd programme (INFORM)", factor 5: "pre-tertiary learning experience (PRE-TER)", and factor 6: "other experience" (OTHER). The Cronbach alphas of these factors, except for that of "other experience", range from acceptable to very good. The low alpha of factor 6 indicates low reliability and so it is not further analyzed.

The mean and standard deviation of these five significant factors illustrate that the students consider "Field Experience" (FIELD) as having exerted the greatest influence on their epistemological beliefs and conceptions of teaching and learning, followed by "Core components in the formal curriculum of the BEd programme" (FORM), "informal and hidden curriculum of the BEd programme" (INFORM), experiences gained from overseas learning (N-LOC), and from their primary and secondary schools (PRE-TER).

Correlation analyses show that four out of five types (except pre-tertiary) of learning experience are significantly correlated with their espousal of constructivist conceptions of teaching and learning. Among their epistemological beliefs, correlations with types of learning experience are generally weak, with the exception of learning effort and process.

3.5 Longitudinal qualitative findings of students' professional development

These qualitative results are consistent with the quantitative results, showing that students from all programmes unanimously chose Field Experience as the most influential type of learning experience in molding their conceptions of teaching and learning. Thirteen and ten participants regarded the learning experience from the 'informal & hidden curriculum of the BEd programme' (including Other Learning Experiences, influences from lecturers, supporting teachers and peers) and 'Core components in the formal curriculum of the BEd programme' as also being influential to their conceptions of teaching and learning. Only two participants thought that their non-local learning experience significantly influenced their conceptions of teaching and learning.

At the end of Year 4, six BEd(Primary) students reflected that there was a lack of practical experience in their minor subject teaching, while one BEd(Secondary) student worried that teaching with only one specialized subject may limit job opportunities and career development.

4. Discussion and conclusion

The quantitative findings in the study reveal that in the course of a four-year period, major changes took place when the students entered the third year of their study. The findings reflect a pattern which suggests that changes in students' beliefs may occur in different directions and that preservice teachers' beliefs may undergo various degrees of change throughout a course. These findings suggest that (1) the subject specific component of the teacher education programme, (2) the General

Education component with an aim to enhancing critical thinking and reflective thinking, and (3) the teaching contexts in schools may contribute to explaining the changes in the students' epistemological beliefs. The findings are also consistent with our previous findings in the cross-sectional part of this study with a different cohort of students (Cheng et al., 2009; Cheng, Cheng, & Tang, 2010). The study of epistemological beliefs is important in teacher education programmes because how the students perceive knowledge may influence how they teach and explain learning to their pupils.

While the three approaches (procedural, adaptive and reflective) (Section 3.5.2.1) to integrating theory and practice can be taken as discrete and separate, they can also be viewed in a developmental sense in which student-teachers should aim to achieve the reflective approach and develop their personal theory or schema about teaching. The findings identify influences from the teacher education programme which are related to the development of a reflective approach. The discussion of the range of teaching pedagogies has to be made in the light of addressing diverse learner needs. The lecturers and institute supervisors play an important role in modeling as well as nurturing the attitudes and skills for reflection among the student-teachers. These findings imply that teacher educators need to maximize the opportunities for the student-teachers to make their thinking and values explicit, and provide stimulation for reflection, for example, by eliciting student-teachers to respond to and/or provide feedback about the knowledge or contents discussed in the modules.

Taking the findings together, the knowledge component and the teaching contexts provide stimulation for the students to reflect on their epistemological beliefs. The knowledge introduced in the campus-based component underpins the reflective approach. The contribution of Higher Education Institutions to teacher education is central as it nurtures student-teachers' understanding of 'discipline-based theories and concepts' in relation to the teaching of the subject. Future studies may look in greater depth into the definition of 'discipline-based theories and concepts' or the nature of knowledge which should be encompassed in teacher education programmes and how these should be taught. Comparison studies may provide evidence of and insights into the pros and cons of different teacher education models.

1. Introduction

The exploration of epistemological beliefs constitutes a fundamental step in our grasp of reality, whether it is regarded as being constructed or being in an existential form. Along this line of inquiry, epistemological beliefs are always conceived in the current literature as a system of beliefs, and are concerned with the two main themes in relation to learning: the nature of knowledge, and the nature of knowing. Situating the study of epistemological beliefs in the context of knowing (Kuhn, Cheney & Weinstock, 2000) and learning (Hofer, 2001; Hofer & Pintrich, 1997) pre-empts the discussion at a metaphysical level (Kuhn & Weinstock, 2002), and consequently would offer some concrete solutions to the problems encountered in the education arena. What follows is a brief introduction of some studies (Schommer-Aikins, 2002) which are most relevant to the project discussed in this report.

At the incipient stage of the exploration of epistemological beliefs about learning, our beliefs about knowledge and knowing were understood as some isolated facets of notions which are unidimensional in nature (Perry, 1968; Ryan, 1984). Following this premise, it was common practice to assume our beliefs of knowledge to be some notions on a continuum (Schommer, 1990). Identification of such beliefs or notions formed the major research questions at the early stage of the study of epistemological beliefs about learning.

Subsequent research analyzed the epistemological beliefs as a system of multidimensional beliefs. A pioneer work in this area is the study by Schommer (1990, 1994a) who proposed a multidimensional framework of epistemological beliefs consisting of five dimensions, viz. omniscient authority, certain knowledge, simple knowledge, quick learning and fixed/innate ability. An empirical study by Schommer (1990) using a 63-item questionnaire to examine the epistemological beliefs of undergraduates in the United States however, could only identify four factors, leaving the omniscient authority dimension unextracted. Further studies in this area suggested that 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. Cano, 2005; Chan, 2003; Schommer, 1993; Schommer, Crouse & Rhodes 1992; Schommer & Easter, 2006)

Chan and Elliott (2002, 2004b) adapted Schommer's scales to study the

epistemological beliefs of a sample of sub-degree teacher education students in Hong Kong, and found four factors or dimensions of epistemological beliefs, namely, innate (or fixed) ability, learning effort and process (replacing quick learning), authority knowledge, and certainty knowledge. The discrepancy in the findings (i.e. the factors identified or the subscales constructed) between Chan and Elliot, and Schommer can be attributed to the differences in the learning cultures in the Chinese and western societies (Chan & Elliott 2004a, 2006).

What is more intriguing is the effort to formulate and establish the relationship between the factors of the epistemological beliefs and the conceptions of teaching and learning. The current literature suggests that there are essentially two major conceptions of teaching and learning: the traditional and the constructivist approaches (Clements & Battista, 1990; Clifford, 1992). The traditional approach believes that the classroom learning context in which the teacher plays the major role in knowledge transmission supports and yields the most efficient and effective learning process and outcomes. It is sometimes regarded as the teacher-centred approach to learning and teaching because the knowledge acquisition is a one-way transmission process from the teacher to the students. The constructivist approach suggests that the knowledge is created from the interaction between the students, or between the students and the teachers. This approach emphasizes that learning is a reflective and interactive process in which the role of the teachers is as a facilitator. This student-centred approach to learning and teaching has gained ascendancy in recent decades ("Constructivism as a paradigm for teaching and learning" retrieved on 20 June 2008). Chan and Elliott (2004b) also offered some findings in this connection. They found that the four factors of epistemological beliefs directly influence the two conceptions of teaching and learning.

However, epistemological beliefs are not static; they develop when individuals have more experience. Starting with Perry's seminal longitudinal work that tracked the development of epistemological beliefs when students progressed through their tertiary study, many other conceptual frameworks have been proposed. While they differ in their key concepts (e.g. Perry, 1970; King & Kitchener, 1994; Kuhn, Cheney, & Weinstock, 2000) and the samples used (e.g. Perry, 1970; Baxter Magolda, 1992), they share the common tenet that an individual's epistemological beliefs will become more sophisticated with increased educational level (Kember, 2001). Does increased educational level bring about development in the epistemological beliefs and teaching and learning conceptions of HKIEd students? What specific elements in their learning experiences would contribute to this development? In this project, we examine

learning experiences related to their regular curriculum, field experience, immersion program and extracurricular activities.

Some studies are worth noting. Cheng (2004), using a cross-sectional design, examined Hong Kong BEd students' views on teaching and learning through interviews. Her findings showed that first and second year primary programme students were more likely to refer to the passing on of knowledge as the major concern in teaching compared to their more senior counterparts who stressed motivation in learning and thinking. Cheng's (2005) small-scale longitudinal interview study examined the effects of field experience on student teachers' professional development, noting that their experiences in schools influenced the ways in which the primary novice teachers thought about themselves as teachers. The effects of field experience were further studied by Tang (2003), this time with students preparing to be secondary school teachers. She reported changes in conceptions after such experiences with one student (of the sample of seven), indicating that she had moved from a teacher-as-policeman perspective to teacher-as-social worker. Another aspect of most teacher education programmes is immersion and exchanges. How do these influence conceptions? Tang and Choi (2004) interviewed four teacher education students after such experiences to find that only one had integrated the overseas teaching and learning experience into the Hong Kong context. Li's (2003) study of kindergarten teachers in Hong Kong also examined conceptions about teaching and learning, not in those training for the profession, but with those who were already teaching. She found that her sample of teachers consistently referred to planning and transmission when discussing teaching and learning (in lessons that had just been observed by the researcher), seemingly ignoring the role of students in the learning process. However, these local studies were relatively small scale in nature, awaiting further exploration with studies of a larger sample size.

In view of the above, the Institute is attempting a larger scale study in students' beliefs in knowledge, knowing and learning. The present study, as supported by TDG funding, builds on the several studies summarized above, especially with regard to the study conducted by Chan and Elliott. The objectives of the present study, by taking advantage of the framework developed by Chan and Elliott, are to investigate the developmental profile of the epistemological beliefs of several programmes of undergraduates at the Hong Kong Institute of Education (who are regarded as teacher education students) and to examine how these beliefs affect their learning, and consequently, their teaching practices. Their previous learning experiences in primary

and secondary schools, and their learning experiences at the Hong Kong Institute of Education were analyzed.

The project group identified the following thematic questions to guide the research:

a. What are the BEd students' epistemological beliefs about and conceptions of teaching and learning?
b. What are these beliefs when they enter the four-year BEd programmes? What are these beliefs attributable to?
c. Are there any changes in these beliefs as the students progress through the four-year BEd programmes?
d. If there are changes, what might such changes be attributable to? What role does the FE experience play in such changes?
e. What are the relationships between the beliefs and the actual teaching practices in the classroom?

2. Method

2.1 Research Design

In order to address the research questions, the project team carried out a cross-sectional study of the first and final year BEd undergraduates' epistemological beliefs about and conceptions of teaching and learning in 2006-07, and then conducted a longitudinal study on the same students as they progressed through their studies from 2006 to 2010. The details of the cross-sectional study and the longitudinal study are described below.

2.2 Cross-sectional study in 2006-07

Both quantitative and qualitative research methods were adopted for carrying out the cross-sectional study.

For the quantitative study, 376 Year 1 and 228 Year 4 students (total = 604) participated in the cross-sectional questionnaire survey. The convenience sampling method was used to draw the samples from these two groups of students.

The questionnaire was administered to these two groups of students in late 2006 and early 2007. The questionnaire was designed by adapting Schommer's 63 item questionnaire on epistemological beliefs (Schommer, 1990) and the Teaching and Learning Conceptions questionnaire (Chan & Elliott, 2004b). The questionnaire aims to measure four dimensions of epistemological beliefs (i.e. innate ability, learning effort and process, authority knowledge, and certainty knowledge), and two conceptions of teaching and learning (i.e. the constructivist and traditional approaches). The reliability and validity tests of the instruments are reported in section 3.1 (Validation of the scales). The students were asked to fill out the questionnaires and to return them during the class. Multivariate analysis was conducted to ascertain the relationship between the epistemological beliefs and the conceptions of learning. Detailed results of the whole sample and each group of students have been reported in the first progress report and will not be repeated here.

Regarding the qualitative study, both Year 1 and Year 4 pre-service teachers were interviewed individually from the four BEd programmes: BEd(Primary), BEd(Secondary), BEd(Language) and BEd(ECE). Specifically, two to three

participants from each major were chosen from the BEd(Primary), BEd(Secondary) and BEd(Language) programmes. As the ECE programme did not have Year 4 students in 2006-2007, only eight Year 1 BEd(ECE) students participated in these interviews. In all, 40 Year 1 students and 31 Year 4 students were interviewed. These students agreed to participate after their lecturers had invited them openly, and they were selected randomly without any consideration of background, sex or academic results.

Semi-structured interview questions were designed to investigate five issues: the students' own beliefs in learning, their beliefs in teaching, influence from past education experience, self as a teacher or motivation to be a teacher, and their experience of the programme at HKIEd. All interviews were conducted by the same interviewer with the same questions so that the respondents might understand the questions in the same way (Silverman, 1993). Each student was interviewed for about 50 minutes. The interview questions were commented on and agreed upon by ten project team members. Two pilot interviews were then conducted to explore any possible missing perspectives and misinterpretations of the questions, and the interview questions were refined accordingly. All interviews were audio-taped in mp3 format and transcribed verbatim. The software NVivo was used to assist in organizing the data emerging from the transcription. The transcriptions were first coded by the sub-headings of the interview questions, and then categorized and analyzed by themes under each sub-heading. After such analysis, the coding of the responses and the categories were cross-checked and audited by the project holder so that reliability would be enhanced (Cohen, Manion & Morrison 2000).

Interview questions used

1. Questions about beliefs in learning

- What are the most common strategies that you employ in learning? What are your reasons or principles for choosing these strategies? What are the differences between your learning strategy in secondary school and your current strategy? When did you change to adopt your current learning strategy?
- What helps students to learn? What stops them learning?
  When you have learnt a subject, what percentage is attributable to your innate ability and to learning effort? Why do you think that?
  Do you believe that perseverance and hard work can overcome difficulties in learning?
- Is your learning mainly a result of teaching by the teacher or discovery on your own?

- Do you think what the teachers teach / what experts say or write is right? Do you question it?
- Do you think knowledge can change, or is it something that cannot change? Why do you think that?

2. Questions about beliefs in teaching

- Which are the most common strategies that you will employ in teaching? What are your reasons or principles for choosing these strategies?
- Which do you think are the best teaching strategies?
- What do you think teaching includes?
  What are the most important things that you think should be taught to the students? Why?
- What role should a teacher play in helping the students to learn better?

3. Questions about past education experience

- Cultural background with reference to the student teacher's schooling
  Describe the primary school(s), secondary school(s) and other educational environments (if applicable) which you attended with reference to the following items: geographical location; religious background / background of the sponsoring body; school premises and facilities; demographic characteristics of the teachers; family background of your classmates and the emphasis of the school.
- Does your experience as a student have any influence on your views about teaching and learning? What are the influences?
- Describe the most positive experience that you have ever had at school. Why do you think it is the most positive?
- Describe the most negative experience that you have ever had at school. Why do you think it is the most negative?

4. Questions about self as a teacher or motivation to become a teacher

- What are the influences on your decision to become a student of teaching/ BEd student in HKIEd? What are the reasons that affected you in choosing your programme?
- Why did you enter into teaching?
- What do you think of the work/job of teaching? What are your present feelings about becoming a teacher?

5. Questions about experiences in the programme at HKIEd

- According to the following three categories: the content of the programme,

lecturer or peer interaction and other activities, which is the most influential factor on your views of learning and teaching. What are the influences?

- Describe any experience you have had at HKIEd that has influenced your views of learning and teaching.
- Apart from your previous school experience, and the experiences in HKIEd, do you have anything to add; are there other influences that affect your views of teaching and learning?

2.3 Longitudinal study from the year 2006-07 to the year 2009-10

Similar to the cross-sectional study, both quantitative and qualitative research methods were utilized to conduct the longitudinal study of the students' epistemological beliefs and conceptions of teaching and learning. The timeframe of the various tasks undertaken for this longitudinal study is as shown in Table 1.1. It shows that apart from the questionnaire survey and in-depth interviews, there were observations of the target subjects during their teaching block practices in years 3 and 4.

Regarding the quantitative study, the longitudinal study (a 4-wave questionnaire survey) firstly focused on the Year 1 students in 2006-07 from the following programs: BEd (Primary); BEd (Secondary); BEd (Chinese Language); BEd (English Language) students; and BEd (ECE). The Chinese Language and English Language programs were combined into BEd (Language) for the sake of convenience in the analysis. This group of Year 1 students was surveyed by the project team again when they were in Year 2 (2007-08), in Year 3 (2008-09), and finally in Year 4 (2009-10).

The questionnaires were distributed to the target students in their programme assembly in four waves. The first wave of the questionnaire survey is actually the survey mentioned in the cross-sectional study above. The same instrument was used to measure the four epistemological beliefs and the two conceptions of teaching and learning in all four waves of the survey in order to examine whether there are any changes in the epistemological beliefs and the conceptions of teaching and learning for the same group of students throughout the 4-year BEd programme. One limitation of this longitudinal study is the attrition of the sample in the course of the study. The number of students who completed the questionnaire in each subsequent wave became increasingly smaller (Table 2.3).[1] The variations in the samples across the four waves of the questionnaire survey could produce bias in assessing the possible

[1] The students were asked to write down their student numbers on the questionnaires. With this, the students' answers to each stage of the questionnaire survey could be traced and merged for the analysis. This also provides information about the students' participation in the four surveys

changes in the epistemological beliefs and the conceptions about teaching and learning. As far as possible, statistical analysis was conducted to find out any systematic bias of the samples in different stages. It is hoped that the results generated from the qualitative analysis could help to rectify this limitation.

Regarding the qualitative portion for the longitudinal study, the same group of Year 1 interviewees had four follow-up interviews over the following three years as shown in Table 2.2. Observation of their teaching practice was also carried out in their block practices during Years 3 and 4. Students who were invited for the interviews and observations were from the same range of programmes as covered in the quantitative part of the study.

2.4 Participants

As in most longitudinal research, the sample decreased in size in each successive stage of the questionnaire survey. One reason for the reduction in the number of participants is related to the conditions in which the data were collected. Students were invited to complete the questionnaire during the programme assembly at the beginning of the second semester in each academic year, and a great deal of work needed to be done during the assembly. When the assembly ran late, many students were no longer prepared to stay behind to complete the survey for which their participation was voluntary. To reduce attrition, students were invited to complete the questionnaire after the programme assembly by e-mail. Some did respond, but they constituted only a small portion of the total sample. In addition, some students did not write down their correct student number on the questionnaire. As a result, their questionnaires in various stages of the longitudinal study could not be matched for analysis. By the last stage, only about half of the initial number of students could be identified as having filled in the questionnaire in all four stages (Table 2.1). In all the stages, female students made up about 80% of the sample. This predominance of female students over male students is commonly found in teacher education programmes.

Table 2.1 Number of students and their programme of study in the four stages of study

Programme	Year 1 sample in stage 1 [N=376]	Year 2 sample in stage 2 [N=281]	Year 3 sample in stage 3 [N=242]	Year 4 sample in stage 4 [N=197]
BEd(P)	162 (43.1%)	99 (35.2%)	72 (29.8%)	59 (29.9%)
BEd(S)	37 (9.8%)	28 (10.0%)	23 (9.5%)	24 (12.2%)
BEd(CL)	48 (12.8%)	44 (15.7%)	44 (18.2%)	37 (18.8%)
BEd(EL)	74 (19.6%)	60 (21.4%)	58 (24%)	43 (21.8%)
BEd(ECE)	55 (14.6%)	50 (17.8%)	45 (18.6%)	34 (17.3%)
BEd(L)*	122 (32.4%)	104 (37.1%)	102 (42.2%)	80 (40.6%)

* *Number of students in the BEd(L) programme is equal to the sum of those from the BEd(EL) and BEd(CL)*

The number of interviewees remained relatively stable over the four-year research period (Table 2.2). This can be explained by the rapport that was established between the interviewer and the interviewees and the flexibility allowed in arranging the interview. The fourth round of interviews, carried out in the period between Nov 2009 and Jan 2010, was after the observation interviews. Due to the sensitivity issues of the kindergartens, the BEd(ECE) students did not participate in this round of observations and interviews.

Table 2.2 Number of students participating in the interviews over the four years

Period of interviews	Jan to Mar 2007	Jan to Mar 2007	Apr to Jun 2008	Apr to Sept 2009	Nov 2009 to Jan 2010	Jun to Aug 2010
Programme	2003-2006 cohort BEd Student at Year 4	2006-2007 cohort BEd Student				
BEd(P)	13	13	13	13	11	12
BEd(S)	10	10	10	10	10	10
BEd(L)*	8	9	9	8	8	7
BEd(ECE)	NA	8	8	8	NA	6

* *The number of students in the BEd(L) programme is equal to the sum of those from the BEd(EL) and BEd(CL)*

2.5 Instrument

The questionnaire consists of the epistemological beliefs scale and the scale measuring conceptions about teaching and learning. Four dimensions of epistemological beliefs are included in the epistemological beliefs scale. They are innate ability (sample item:"There isn't much you can do to make yourself smarter as your ability is fixed at birth"), learning effort/process (sample items: "Knowing how to learn is more important than the acquired facts"; "Getting ahead takes a lot of work"), authority knowledge" (sample items:"I still believe in what the experts say even though it differs from what I know), and certainty knowledge (sample item: "Scientific knowledge is certain and does not change"). The two conceptions of teaching and learning are constructivist and traditional. An example of the former is "Learning means students have ample opportunities to explore, discuss and express their ideas" and the latter is represented by the item "A teacher's major task is to give students knowledge, assign them drill and practice, and test their recall" (The complete questionnaire can be found in the appendix).

Both scales consist of 30 items which are rated on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The higher the score, the stronger the support of the notion expressed in that particular sentence. Both scales were developed and validated by confirmatory factor analysis and had satisfactory psychometric properties (Chan & Elliott, 2004b). Validation of the scales for the students in the present study was conducted again, and satisfactory goodness of fit indexes and reliability alphas were obtained (see Results section).

3. Results

3.1 Validation of the scales

Confirmatory factor analysis (CFA) was applied to validate the measurement model composed of both the epistemological belief and teaching and learning conception scales for the sampled BEd students. The CFA result reported satisfactory goodness of fit indexes for the model situation of larger sample size with a large number of variables (Hair, Black, Babin, Anderson, & Tatham, 2006)[1]: Chi-sq=1351.81, *df*=614, $p<$ .001; CFI= .95; NNFI= .95; RMSEA= .047; SRMS= .056. This provides a basis for further assessing the validity of the structural model. The reliability Cronbach alphas for innate ability, learning effort and process, authority knowledge, and certainty knowledge were .71, .70, .57, and .63 respectively, and those for the constructivist approach and the traditional approach were .88, and .82 respectively. Whereas the alphas for authority knowledge and certainty knowledge are a bit low, those for the remaining latent variables are satisfactory. The alphas of the epistemological beliefs subscales are close to and slightly above the reported values of the epistemological beliefs scales developed by Schommer and other researchers who modified Schommer's questionnaire, such as Jehng, Johnson and Anderson (1993), Kardash and Wood (2000), and Schraw, Bendixen and Dunkle (2002). In these instruments, the Cronbach alpha for each belief ranges from.54 to.76 (see Schommer, 1994b).

3.2 Results of the Cross-sectional study in 2006-07

3.2.1 Statistical analysis of Year 1 students (N=376) in stage 1 (2006-07)

3.2.1.1 Findings on the epistemological beliefs

A total of 376 year 1 students completed and returned the questionnaires. Of these, 162, 37, 122 and 55 were in the BEd(Primary), BEd(Secondary), and BEd(Language) and BEd(ECE) programmes, respectively. Of these 376 students, around 53% were in the age range 20 to 24, and 43 % were aged 19 and below. 22% were male and 75% were female.

Among the four epistemological beliefs, the mean score of learning effort and process (3.91) is the highest, followed by innate ability (2.79), authority knowledge (2.78), and certainty knowledge (2.57). Considering the items were rated on a five-point Likert scale, with a score of 2 indicating disagree, 3 indicating undecided/neutral, and 4 referring to agree, this finding implies that the Year 1 students slightly disagreed with the following three beliefs: the innate ability to learn is fixed, knowledge derives from authority figures, and knowledge remains unchanged and certain. However, they agreed that knowledge can be obtained from hard work and effort through the learning process.

3.2.1.2 Findings on the conceptions of teaching and learning

Regarding the two conceptions of teaching and learning, the thinking of the Year 1 students was largely in favour of the constructivist approach (mean score=4.22) and they slightly disagreed with the traditional approach (mean score=2.62).

3.2.2 Statistical analysis of Year 4 students (N=228) in stage 1 (2006-07)

3.2.2.1 Findings on epistemological beliefs

In total, 228 year 4 students completed the questionnaires: 73, 35, and 120 year 4 students in the BEd(Primary), BEd(Secondary), and BEd(Language) programmes respectively. Around 89% of them were in the age range 20 to 24 and 18% in the age range 25 to 29. Similar to their Year 1 counterparts, about 22% were male and 73% were female. About 5% of the students did not report their sex.

Among the 4 epistemological beliefs, the mean score of the learning effort and process (3.95) is the highest, followed by innate ability (2.86), authority knowledge (2.65), and certainty knowledge (2.54). This finding implies that the year 4 students did not really support the following three beliefs: the ability to learn is innate and fixed, knowledge derives from authority figures, and knowledge tends to remain unchanged and certain. However, the year 4 students did agree that knowledge can be obtained from hard work and effort through the learning process. The paired sample t-test for these 4 beliefs (for the year 4 students) suggests that they are quite different from each other in terms of the ideas connoted, and in terms of the extent of the agreement on the part of the students.

3.2.2.2 Findings on the conceptions of teaching and learning

Regarding the two conceptions of teaching and learning, the thinking of the year 4 students was largely in line with the constructivist approach (mean score=4.22) and they did not really agree with the traditional approach (mean score=2.53). In addition, the year 4 students' espousal of the constructivist approach to teaching and learning is significantly stronger than their view of the traditional approach, as indicated by the significant difference from the paired sample t-test.

3.3 Cross-sectional Comparison of the Year 1 and Year 4 students surveyed and interviewed

The results from the survey and the interviews are presented in sequence under epistemological beliefs and conceptions about teaching and learning. Comparing the questionnaire data offers an overall picture of whether the two groups of students differ in their epistemological beliefs and teaching and learning conceptions. The interview findings provide a microscopic view of the survey results in the sense that they go beyond the macro results shown by the quantitative results, and dig deeper into the subjective views and conceptions of the students. For instance, the interview findings can shed light on the rationales and the reasons for adhering to these beliefs and conceptions. The past learning and field experiences of the students are also examined so as to offer additional perspectives to make sense of the wide spectrum of findings.

3.3.1 Findings on epistemological beliefs

Analysis of survey results

Multivariate analysis followed by ANOVA and a t-test were conducted to determine whether the four beliefs significantly vary across the groups differing in year of study. MANOVA showed that significant differences existed across the two groups in their epistemological beliefs (Wilk's lambda = 0.973, $F(4, 599) = 4.145$, $p = 0.003$). Follow-up univariate analysis with Bonferroni-type adjustment of alpha at the 0.0125 level for the four epistemological beliefs indicated that only the dimension Authority Knowledge was significant with respect to year level, $F(1, 602) = 7.324$, $p = 0.007$. The mean score for Authority Knowledge for the Year 1 students is significantly higher than that for the Year 4 students. An independent t-test shows a

significant difference between year groups (year 1: N = 376, mean = 2.76, SD = 0.493; Year 4: N = 228, mean = 2.653, SD = 0.435, t (602) =2.706, p =0.007). This finding implies that the Year 1 students, as compared to the Year 4 students, are more prone to believe in knowledge passed on to them from authorities such as their teachers. This result is not unexpected because after several years of undergraduate education, Year 4 students are likely to have become more self-reliant in knowledge seeking. Other than this significant difference, the two groups of students shared similar views in terms of the importance of effort over innate ability in acquiring knowledge, and both considered knowledge as ever-changing.

Analysis of the interview results

The interview results correspond closely to the quantitative data, but provide more insights that could not have been known by the questionnaire findings alone. This is particularly evident with regards to authority knowledge, which differentiates the students in the different years of study.

3.3.1.1 Source of knowledge (Authority knowledge)

A comparison of the Year 1 and Year 4 participants' responses regarding source of knowledge is shown in Table 3.1.

Table 3.1 A comparison of the Year 1 and Year 4 participants' responses regarding the source of knowledge acquisition

Response	**Year 4 students (N=31)**	**Year 1 students (N=40)**
Mainly discovered on my own	10(32.3%)	7 (17.5%)
Mainly taught by the teachers	8 (25.8%)	23 (57.5%)
Equally from discovery on my own and taught by teachers	7(22.6%)	4 (10%)
Source of knowledge is dependent on the subject	6 (19.4%)	6 (15%)
Total	31	40

Comparing the Year 4 and Year 1 students, there is a major difference between their perceptions of the source of knowledge. Over half (N=23 out of 40) of the Year 1 students thought that their knowledge was mainly taught by teachers, while only eight Year 4 students (25.8%) thought so. There were also more Year 4 students who believed that they would learn independently: ten (32.3%) perceived that they have discovered knowledge on their own and seven (22.6%) thought that discovery on their

own and being taught by teachers were equally important. Only 11 out of the 40 Year 1 students shared this view. The final year students' weaker reliance on teachers as a source of knowledge is similar to the questionnaire results.

A comparison of the Year 1 and Year 4 participants' responses regarding questioning authority (Table 3.2) showed some intriguing results.

Table 3.2 A comparison of the Year 1 and Year 4 participants' responses regarding questioning authority

Response	**Year 4 students (N=31)**	**Year 1 students (N=40)**
Would question teachers/experts	20 (64.5%)	35 (87.5%)
Tend to trust teachers/experts first, but may question	9 (14%)	5 (12.5%)
Would question teachers more than experts	2 (6.5%)	0
Total	31	40

Although the Year 1 students showed a stronger preference for being taught by teachers, interestingly, more of them (87.5%) would question the teachers or experts than their Year 4 counterparts (64.5%); and they were also a little less likely to trust the teachers or experts first (12.5%) compared to the Year 4 students (14%). So, although the Year 1 students were prone to see teachers as knowledge deliverers, they were also more ready to question them. This apparent contradiction may reflect the transitional stage in the development of the epistemological beliefs of the Year 1 students. They are not yet used to the independent learning required in tertiary education (cf. analysis of Conception of Learning below), but the diverse, at times even contradictory, perspectives they have been exposed to in their learning may have driven them to another extreme where they would begin to doubt over-proportionally. This fine-grained differentiation between the source of knowledge and the trust in the source adds to our understanding of the complex picture relating to this belief that cannot be revealed by the quantitative findings.

3.3.1.2 Innate ability and Learning effort

The comparison of the Year 1 and Year 4 participants' responses regarding innate ability and learning effort is shown in Table 3.3.

3.3.2 Conceptions of learning and teaching

Analysis of survey results

Questions related to the constructivist conceptions gained a higher mean score (means of both groups were over 4.20), and the mean score of the traditional conceptions was less than 3. Though the mean scores of the traditional conceptions of both groups were between 2.5 and 2.75, the mean score for the Year 1 students was significantly higher than that for the Year 4 students (Year 1 : N = 376, mean = 2.62, SD = 0.501; Year 4 : N = 228, mean = 2.53, SD = 0.495; $t(602) = 2.047$, $p = 0.041$). This means that the freshmen tended to be more supportive of the traditional conceptions as compared to the final year students. Several years of undergraduate education could have helped the Year 4 students develop a more progressive view of teaching and learning, and consequently, they would be less supportive of the traditional approach to teaching and learning.

Analysis of interview results

While the distinction between 'traditional' and 'constructivist', or 'teacher-centred' and student-centred' approaches serves as a useful analytical tool for our understanding of classroom practices at the conceptual level, it is acknowledged that intermingling of the conceptions, 'traditional' and 'constructivist', or 'teacher-centred' and 'student-centred' exists in classroom practices (Chan & Elliott, 2004b). As teacher educators, we are interested in finding out if graduates of our programmes are likely to adopt 'teacher-centred' or 'constructivist' teaching strategies. In order to identify the inclination of the student-teachers, these categorizations were adopted in the process of data analysis in our study.

Twelve Year 1 students (30%) showed that they adopted teacher-centred learning, while fourteen of them (35%) adopted student-centred learning strategies. The percentages for their final year peers in these two aspects are 16% and 65% respectively. It is clear that the Year 1 students had a stronger preference for using teacher-centred learning strategies compared to the Year 4 students, while the final year students were more student-centred in going about their learning. The clearer tendency for year 4 students to use the self as resource in acquiring knowledge as indicated in their responses to questions about teachers as a source of knowledge is cemented here. A comparison of the Year 1 and Year 4 participants' learning approaches in each of the categories is shown in Table 3.5.

Table 3.3 The comparison of the Year 1 and Year 4 participants' responses regarding innate ability and learning effort

Response	Year 4 students (N=31)	Year 1 students (N=40)
Learning effort is more important.	17 (54.8%)	20 (50%)
Learning effort is more important, but innate ability is essential.	6 (19.4%)	3 (7.5%)
Innate ability and learning effort are equally important in proportion.	6 (19.4%)	6 (15%)
Innate ability is more important.	2 (6.5%)	6 (15%)
Dependent on subjects.	0	5 (12.5%)
Total	31	40

The responses of Year 4 and Year 1 were quite similar in that learning effort and process was generally regarded by the students as more important than innate ability in the knowledge acquisition process. This is in clear agreement with the questionnaire results.

3.3.1.3 Certainty knowledge

All those interviewed in Year 1 and Year 4 believed that knowledge would change due to various reasons as listed in Table 3.4.

Table 3.4 A comparison of the Year 1 and Year 4 participants' responses regarding certainty knowledge

Response	Year 4 students (N=31)	Year 1 students (N=40)
Knowledge would change because of new discoveries made	17	20
Knowledge would change following the changes of the world and era	13	18
Certain aspects of the nature of knowledge would change	8	9

Note: All students could mention more than one type of teaching strategy

Both groups of students regarded that knowledge would change as a result of new discoveries made and the passage of time.

Table 3.5 A comparison of the Year 1 and Year 4 participants' learning approaches in each of the categories

Response	**Year 4 students (N=31)**	**Year 1 students (N=40)**
Student-centred Learning	20(65%)	14(35%)
Teacher-centred Learning	5(16%)	12(30%)
Student-centred Learning (subject specific)	4(13%)	2(5%)
Teacher-centred Learning (subject specific)	2(6%)	0
Both Student-centred and Teacher-centred learning	0	3(8%)
Total	31	40

To reach an in-depth understanding of student-teachers' conceptions of teaching, the interview data were further analyzed. By comparing the answers to the two interview questions: *'Which are the most common strategies that you employed in teaching?'* and *'Which do you think are the best teaching strategies?'*, we found inconsistencies between their choices of best teaching strategies and the most commonly adopted strategies. The participants were also asked to reflect on how and which components of the programme influenced their conceptions of teaching. The view of the best teaching strategies and the most common teaching strategies expected to be employed by the Year 1 and those employed by the Year 4 students were compared and are shown in Table 3.6.

Basically, most of the Year 4 (N=23) and Year 1 (N=30) students were found to be consistent in their beliefs regarding the best teaching strategy and the most commonly employed teaching strategies. However, two Year 1 students commented that although they believed that the best teaching strategies were student-centred, the most commonly employed teaching strategies they would expect themselves to employ were teacher-centred. Such a clear-cut contrast between the ideal and actual teaching strategies was not noted by the Year 4 students. The inconsistency found in the Year 4 students' responses revolved around the discrepancy between the number of teaching strategies that were considered the best and the number of strategies actually used in teaching. They evaluated one as the best possible strategy but employed another in reality. It is possible that the teaching practices these students experienced in Years 3 and 4 prompted them to deliberate more deeply about the gap between ideal and reality and to hold a more complex view.

Interestingly, four and two Year 1 students had no concrete answer to the questions of the best teaching strategies and their most commonly employed teaching strategies, respectively, whereas no Year 4 students gave this type of response. This shows that they might not have thought clearly about such issues in the first year of the programme.

> *Actually, I don't know yet (which teaching strategy can arouse students' interest) because I don't know whether I can control the situation when facing thirty or forty students. I must try it, at least once, before I know what to do. (Sonia, year 1)*

Table 3.6 Comparison between the best teaching strategies and the most commonly employed teaching strategies of the Year 4 and Year 1 students

Conceptions of teaching		**Year 4 students (N=31)**	**Year 1 students (N=40)**	**Consistency**
Best teaching strategies	**Most commonly employed teaching strategies**			
Student-centred	Student-centred	23	30	Consistent
Both teacher-centred & student-centred	Both teacher-centred & student-centred	0	1	Consistent
Student-centred	Both teacher-centred & student-centred	4	0	*Inconsistent*
Both teacher-centred & student-centred	Student-centred	4	1	*Inconsistent*
Student-centred	Teacher-centred	0	2	*Inconsistent*
No answer	Student-centred	0	4	NA
Student-centred	No answer	0	2	NA
Total		31	40	

In all, the interview data signify that the final year students were more reflective and showed more coherence in their epistemological beliefs and conceptions of teaching and learning. With regard to the way of knowing, their weaker dependence on their teachers goes along with their more infrequent doubt of their teachers. The freshmen, on the other hand, preferred to have knowledge transmitted by their

teachers but were more doubtful of their credibility at the same time. With respect to teaching and learning conceptions, the thinking and practice of Year 1 students are at odds with each other, regarding one approach as the ideal but using the other in actual teaching. The inconsistency of the Year 4 students, however, is more a matter of the weight attributed to each type of teaching strategy. They opined that one approach was the ideal but used the other in teaching, and vice versa. It is thus a mild form of inconsistency rather than being contradictory in nature.

Another way to investigate the coherence of their belief system is by relating their epistemological beliefs and conceptions of teaching and learning. Rich information can be generated by the analysis of the interview data.

To explore the relationship between epistemological beliefs and the conceptions of teaching, the research team grouped the student-teachers' epistemological beliefs into two categories, 'sophisticated beliefs' and 'naïve beliefs', with respect to the four dimensions, 'innate (or fixed) ability', 'learning effort and process', 'authority knowledge' and 'certainty knowledge'. Describing a person as having sophisticated beliefs means that they believe that ability is neither inborn nor fixed but is acquired and growing, learning is a process that requires effort, the source of knowledge is mainly self-construction, and knowledge is tentative and changing. On the contrary, an individual holding naïve beliefs thinks that ability is inborn and fixed, learning is quick and effort does not change the results, the source of knowledge is mainly authority or expert figures, and knowledge is certain and remains unchanged. Categories of the epistemological beliefs in terms of the four dimensions are shown in Table 3.7. However, some student-teachers hold both sophisticated and naïve beliefs in different dimensions and so are classified as having 'mixed' epistemological beliefs. For example, one with 'mixed' beliefs would consider that 'learning is a process that requires effort' but that 'the source of knowledge is mainly authority or expert figures'.

Table 3.7 Categories of the epistemological beliefs in terms of the four dimensions

Dimension(s)	Categories of epistemological beliefs	
	Sophisticated	**Naïve**
Innate /fixed ability	Ability is not inborn and fixed but acquired and growing	Ability is inborn and fixed
Learning effort and process	Learning is a process that requires effort	Learning is either quick or not at all, and effort does not change the results
Authority/expert knowledge	Source of knowledge is mainly from self-construction	Source of knowledge is mainly from authority or expert figures
Certainty knowledge	Knowledge is tentative and changing	Knowledge is certain and remains unchanged

Since holding sophisticated epistemological beliefs is regarded as supporting flexible thinking, and the ability to take in new ideas or change old ideas (Schommer-Aikins, 2002) is an essential element for constructing new understanding in the process of learning, it is expected that consistency should be found among individuals; those with sophisticated beliefs are likely to be constructivists in terms of their conceptions of teaching, or those with mixed epistemological beliefs will tend to possess mixed conceptions of teaching. Table 3.8 provides a summary of the comparison of epistemological beliefs and conceptions of teaching. When comparing their epistemological beliefs with their conceptions of teaching, twelve Year 4 student-teachers were categorized as being consistent in possessing sophisticated epistemological beliefs and constructivist conceptions of teaching (Type A). Another four student-teachers were also considered as being consistent in having mixed (both sophisticated and naïve) epistemological beliefs and employing mixed (both constructivist and traditional) conceptions of teaching (Type B). However, inconsistencies among individual student-teachers were found in two ways: (1) student-teachers having sophisticated epistemological beliefs held a combination of both constructivist and traditional conceptions of teaching (Type C); (2) student-teachers espousing mixed epistemological beliefs (meaning that they held both sophisticated and naïve beliefs) could also, interestingly, be described as constructivists in terms of their conceptions of teaching (Type D).

Table 3.8 Comparison of the epistemological beliefs, conceptions of teaching and the Year 4 and Year 1 students

Type	Epistemological beliefs	Conceptions of teaching	Consistency	Year 4 students (N=31)	Year 1 students (N=40)
A	Sophisticated	Constructivist	Consistent	12 (39%)	12 (30%)
B	Mixed (Sophisticated & Naïve)	Mixed (Constructivist & Traditional)	Consistent	4 (13%)	2 (5%)
C	Sophisticated	Mixed (Constructivist & Traditional)	Inconsistent	4 (13%)	2 (5%)
D	Mixed (Sophisticated & Naïve)	Constructivist	Inconsistent	11 (35%)	24 (60%)

One significant difference between the Year 1 and Year 4 students is that the majority of Year 1 students (65%) had mixed epistemological beliefs, whereas over half of the Year 4 students (52%) had uniformly sophisticated epistemological beliefs. Not only did the Year 1 students show more intra-individual variation in the degree of sophistication in their epistemological beliefs, but more inconsistency could be noted when their epistemological beliefs were related to their teaching and learning conceptions (65% vs. 48 % for Year 4 students). Taken as a whole, whether the beliefs are examined separately or are linked together, those with more educational experience tend to show increased interrelations between their beliefs. Their beliefs have become more coherent compared to those of the freshmen. Similar results have been reported by Alexander, Jetton, and Kulikowich (1995) and Vermetten, Vermunt, and Lodewijks (1999). As students progress in their study, the various elements in their thinking show stronger relations. Vermetten et al. (1997) attributed the more diffuse thinking pattern of the first year students to "a period of 'friction': a period in which students find that their ideas of knowledge and how to go about learning are no longer adequate…[t]he adaptation to a new learning environment may cause temporal diffuse patterns of relations" (p.237) between different beliefs. This explanation can be applied to our findings.

3.3.3 Impact of the BEd programme

One key research question of this project is to examine what factors have contributed to the changes in the students' beliefs and conceptions. The interview data indicated that the major sources of influence on the students' conceptions of teaching and learning relating to the IEd BEd programmes included the courses the students took and their relationships with lecturers and peers. Table 3.9 lists the stated sources of influence of the Year 1 and Year 4 students. For over half (18 out of 31) of the final year students, learning through curriculum subjects/modules was more instrumental in shaping their conceptions. For their more junior counterparts, relationships with peers and lecturers played the key role.

Table 3.9 Comparison of the most influential factors of the IEd programme of the year 1 and year 4 students

Most influential factors	Year 4	Year 1
Curriculum	18	18
Lecturer, Peer relationships	13	24
Other activities in IEd	0	1

Note: All students could mention more than one factor

For more in-depth investigation, Table 3.10 illustrates a comparison of the most influential components of the identified factors for the Year 1 and Year 4 students. The participants could mention more than one component. In the following, quotations from the interviews of both the Year 1 and Year 4 students are used to illustrate more clearly the students' perceptions of what led to the changes in their thinking.

Table 3.10 Comparison of the most influential components of the IEd programme

Factor	Component	Year 4 (N=31)	Year 1(N=40)
Curriculum	Field Experience	9	1
	School Attachment	0	5
	Modules related to pedagogy	8	2
	Modules in formal curriculum	5	11
	Immersion	3	0
	Subject knowledge	2	0
	School system and arrangement	2	2
	Exchange program	1	0
Lecturer, Peer relationships	Lecturers' positive influence	12	18
	Peers' positive influence	8	10
	Lecturers' negative influence	1	5
	Peers' negative influence	1	1

Note: All students could mention more than one response

Curriculum

The curriculum was a more important factor for the Year 4 students that affected their conceptions of teaching and learning.

Field Experience

Among the eighteen Year 4 students who regarded that the IEd curriculum had the most influence on them, nine revealed that their Field Experience had the greatest impact.

> *'Field experience provided me with an opportunity to experience how the school works. There is such a difference between being a student and a teacher.' (Angela)*

The only Year 1 student who regarded that Field Experience would have the greatest impact imagined that,

> *'You can only know what teaching is in the field experience because it is the battlefield.' (Polly)*

School Attachment

BEd(ECE) was the only BEd program with a School Attachment component; from the eight Year 1 ECE students who were interviewed, five thought the School Attachment had the most influence on them.

> *'If there wasn't school attachment, I wouldn't have the chance to try out such teaching strategies. I have learnt things that I could never learn in lectures, for example, how teachers taught, how the school operated, (so) I got to learn about this profession much better. It is so different to visit a real kindergarten; it makes me like this job more.' (Katie)*

It is clear that for students who have had the opportunity to engage in some form of frontline teaching, this component is valued as a molding agent of their teaching conceptions.

Modules related to pedagogy

More Year 4 students appreciated the curriculum that gave them exposure to different pedagogies.

> *'I think the course curriculum influenced me the most because it introduced me to a lot of different teaching and learning theories. Even for those pedagogies which I had never heard of, I would*

make every opportunity to try them out to see whether they would help the students the most and suit my own style or not....In the programme, I needed to unlearn something (previous schooling experiences) and to learn some effective teaching strategies.' (Ella)

This makes sense when their need to do actual teaching in the Field Experience is taken into account. This requirement would make pedagogical knowledge more important and urgent than it is for the Year 1 students for whom assessment of teaching practice would take place only in their third year.

Modules in formal curriculum

With teaching practice a less immediate prospect, the Year 1 students attached more importance to the learning of conceptual knowledge. Eleven Year 1 students and five Year 4 students identified certain modules such as those in professional studies, language enhancement, general education or their major as having the greatest influence on them. For example, one Year 1 student stated that,

'It is because the curriculum can really teach you how to teach. For example, you learn how to dance first, and then you learn how to teach your students to dance and how to make them learn better. In fact, the curriculum talks a lot about it, for modules like "teaching and learning" and "human development" really taught me a lot.' (Seline)

Immersion

Three out of eight of the Year 4 BEd(L) students regarded immersion as having a significant influence on them.

'Immersion is very impressive...It included the whole framework structure of the program...I feel so blessed to be studying in IEd compared with other universities because I can transfer all my credits from immersion.' (Edwin)

Lecturer & Peer relationships

The Year 1 students had a stronger tendency than the Year 4 students to believe that lecturers and peers exerted more influence on them. Many of the Year 1 students, twenty four out of forty, regarded the relationship with lecturers and peers as being the most influential on them.

As the teacher is the major guide, the teacher's method is very important. Besides, you need some peers to exchange ideas with. I

can discuss with my course mates about our learning process, it can help our study. (Linette)

Peers' positive influence

Peers were regarded as an essential source of support for students. Eight Year 4 students agreed to this and one expressed that,

'Peers are so important because we could discuss a lot of things together. Many issues seem to be contradictory. We bring them to discussion when we have questions and it would then become clearer afterwards. There are a lot of things which I need my course mates to help and support me with; we all need to overcome things together.' (Ava)

At times, peers might be seen as potential teachers. One Year 4 student stated that,

'Peers would tell me about their own experiences. It has a similar function to a lecturer. You can learn something from someone else's previous experience.' (Perry)

Similarly, ten Year 1 students valued the influence of peers as the most important. One stated that she improved her learning through the group discussion learning approach,

'We have a lot of group discussions or study groups. We, as peers, have more initiative to learn. Not waiting for the teacher to teach, we already knew how to seek the problems to discuss. It helps so much in learning.' (Linda)

Lecturers' positive influence

Students always look up to the teachers as role models. One Year 1 student expressed that,

'Knowledge, you can learn it yourself. Yet, a lot of teaching strategies, you can only learn through the teachers themselves. For example, what kind of methods they used to get your attention or what kind of strategies they used to make us learn? It all defines how well a teacher can teach.' (Sharon)

Another Year 4 student explained the importance of the lecturers in affecting his conception of teaching,

'I think the lecturers would be developing their own perspectives about teaching continuously. They will tell you how to look at teaching and what it is all about. Although you might not agree with them, it gives you another perspective to think about. Then you can

decide how to look at teaching yourself.' (Clarence)

A lecturer's passion can influence students' attitudes towards being a teacher and inspire them to follow in the footsteps of the lecturer. One Year 1 student stated that,

> *'I really appreciate the teachers who have great passion in teaching. They have motivated me, someone who did not want to become a teacher, to start thinking that although being a teacher would be tough, it would be interesting at the same time. In addition, they have touched me so deeply that it makes me think if I could be as good as them one day, it would be such a great comfort to me and I would be so happy.' (Lizzy)*

Lecturers' negative influence

However, lecturers can also have a negative influence on students. Five Year 1 students had such negative influences. One said,

> *'I encountered a lecturer who did not teach the subject matter accurately. I think a teacher needs to be well prepared and to know the subject matter adequately; otherwise you may mislead the students you teach. I could never image that it would happen in Tertiary Education.' (Scott)*

A Year 4 student made a comment that,

> *'It is because IEd is the place where teachers are taught. IEd teachers should know better about different varieties of teaching strategies. Certainly, not all IEd teachers could teach well. They are like role models. You would know what teaching is about through them. Some positive and some negative standards would then be revealed.' (Chloe)*

Whether the lecturers had a positive or negative influence on the students, the students looked up to them as role models and had high expectations of them. How they teach speaks volumes. Good teachers not only demonstrate how to teach, but also exemplify what makes a good teacher who can enthuse students to be more committed in the teaching profession. In contrast, peers are important as supporters in learning. Through exchange of ideas and experience, the students were encouraged to be more independent learners.

3.4 Results of Longitudinal Study from 2006-2010

3.4.1 Statistical analysis of students' epistemological beliefs and conceptions of teaching and learning in stage 2 (2007-08), stage 3 (2008-09) and stage 4 (2009-10)

When quantitative data were collected in the respective programme assemblies in stage 2, stage 3 and stage 4, sample attrition was noted. One reason, as already explained in section 2.4, has to do with the very limited time granted for completing the questionnaire in the programme assembly. Another factor for the reduced number of the sample is the problem encountered in matching the questionnaire. To enable longitudinal comparison, only those questionnaires that can be matched with those of the previous stage(s) provide suitable data for this purpose. For example, the stage 2 data stemmed from the questionnaires that could be traced by means of student number and hence be merged for comparison. When the students did not take part in the stage 2 data collection or when they did not provide their student numbers properly in one of the questionnaires, their data could not be used to make longitudinal comparisons. As the research advanced into the third and fourth stage, it became increasingly difficult to match the questionnaires, and so the number of students with a full data set for statistical analysis decreased in number. More details of the samples can be found in Table 2.1.

In this section, the findings on epistemological beliefs and teaching and learning conceptions of stages 1 to 4 are presented before they are compared longitudinally in the next section. For the sake of completeness, the results of stage 1 are presented again. The results of the four epistemological dimensions and the two teaching and learning conceptions exhibited a similar pattern across the four stages and are discussed together to avoid repetition when needed.

In all stages (Table 3.11), learning effort and process had the highest mean score (stage 1: 3.91; stage 2: 3.86; stage 3: 3.95; stage 4: 3.92), followed by innate ability (stage 1: 2.79; stage 2: 2.84; stage 3: 2.92; stage s: 2.96). In stages 1 and 2, authority knowledge has a higher mean (stage 1:2.78; stage 2: 2.74) than certainty knowledge (stage 1: 2.57; stage 2: 2.55), whereas the reverse holds true for stages 3 and 4, (stage 3: certainty knowledge=2.71; authority knowledge=2.66; stage 4: certainty knowledge=2.78; authority knowledge=2.56), that is to say, certainty knowledge has a higher mean than authority knowledge. The rank ordering of the four epistemological beliefs in stage 1 and stage 2 (learning effort > innate ability > authority knowledge > certainty knowledge) could be substantiated, as paired sample t-tests indicated that each of the preceding belief dimensions has a significantly higher mean score than the next. For stages 3 and 4, the rank ordering of learning effort > innate ability > authority knowledge and certainty knowledge was confirmed by paired-sample t-tests. No significant difference was found between authority knowledge and certainty knowledge, but the relative importance of learning effort and innate ability over these two beliefs was substantiated.

Regardless of the year level the students were studying, they consistently considered diligence and learning skills as a crucial means of acquiring knowledge. Personal efforts were seen as more important in the process of learning than the ability and talent one is born with. In addition, the students tended not to view knowledge as coming from external authority and experts; instead personal reasoning and evidence were considered the basis of knowledge generation. This belief is consistent with their emphasis on personal effort in gaining knowledge. Concerning the nature of knowledge, the students did not perceive knowledge as a fixed entity that would not change. They tended to conceptualize knowledge as evolving and changing. Students' support of these four beliefs is clearly differentiated.

For the two main conceptions of teaching and learning, as in stage 1, the students clearly preferred the constructivist approach (mean for stage 2:4.15; stage 3: 4.22; stage 4: 4.21) over the traditional approach (mean for stage 2: 2.65, stage 3: 2.63;

stage 4: 2.67). Taking the use of 5-point Likert scales (4=agree, 5=strongly agree) into consideration, a mean score of over 4 represents a very positive espousal of the learning and teaching approach that assigns learners an active role in learning. Their acceptance of the teacher-centred traditional approach is more moderate. That these two conceptions are very differently received by the students is constantly demonstrated by the result of paired-sample t-tests in which the mean score of constructivist conceptions was always significantly higher than that of the traditional approach in stages 1 to 4.

Table 3.11 Changes in epistemological beliefs and conceptions of teaching and learning from stage 1 to stage 4 (N=197)

Epistemological beliefs and conceptions of teaching and learning	**Stage 1** **Mean (SD)**	**Stage 2** **Mean (SD)**	**Stage 3** **Mean (SD)**	**Stage 4** **Mean (SD)**	***F*** value	***p*** 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**
Constructivist conceptions	4.22 (.50)	4.15 (.39)	4.22 (.36)	4.21 (.38)	1.70	>.05
Traditional conceptions	2.62 (.51)	2.65 (.49)	2.63 (.51)	2.67 (.58)	1.84	>.05

$^{+}$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)

3.4.2 Longitudinal comparison of epistemological beliefs and conceptions of teaching and learning of students who participated in all four stages of this project (N=197)

The analysis above presents a general picture of the students' epistemological beliefs about and conceptions of teaching and learning in the four stages of the research. While the overall change pattern of the sample could be revealed, the magnitude of their development of the students across the four research stages could not be ascertained. In order to assess whether the changes are statistically strong enough and at which stage(s) changes are most pronounced, a longitudinal comparison of the data collected across the four stages was conducted. Specifically, the relevant responses of each student from each stage were compared with their corresponding responses at other stages by means of the one-way repeated measures

ANOVA. With this intra-individual comparison, the researcher can trace changes in the students' conceptions and beliefs over time, and obtain direct and specific information on the development of epistemological beliefs and conceptions of teaching and learning.

The results of the one-way repeated measures ANOVA for the dimensions of epistemological beliefs and conceptions of teaching and learning are presented in Table 3.11. Changes in all of the epistemological belief dimensions, but not in teaching or learning conceptions, are statistically significant. A schematic representation of these changes is depicted in Figures 3.11(i) and 3.11(ii). Significant differences between stages are shown by the thickened arrows.

Figure 3.11(i) Changes in epistemological beliefs from stage 1 to stage 4 (N=197)

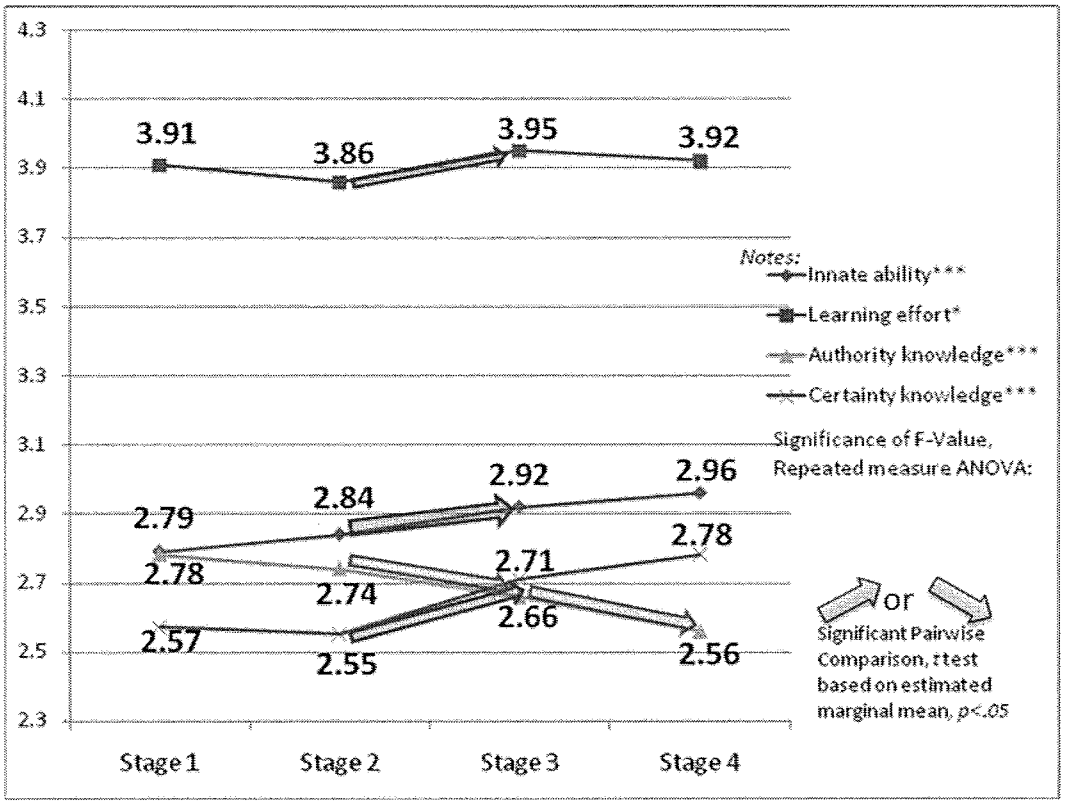
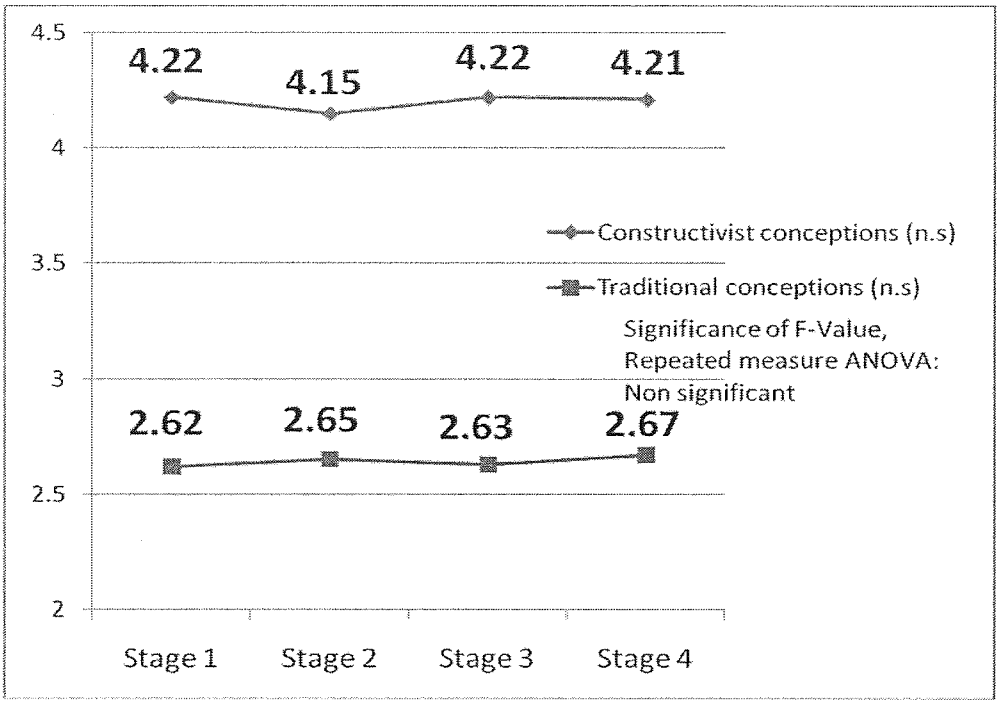


Figure 3.11(ii) Changes in conceptions from stage 1 to stage 4 (N=197)



By following up students for 4 years and collecting data systematically each year, the time and the extent of changes can be more clearly shown. It is noteworthy that no changes in epistemological dimensions 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 dimensions. 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 in the third year.

The lower mean score of authority knowledge in stage 4 than in stages 1, 2, and 3 (stage 1: mean= 2.78, SD= .50; stage 2: mean= 2.74, SD= .52; stage 3: mean= 2.66, SD= .57; stage 4: mean= 2.56, SD= .54; F (2.87, 561.56)= 16.80, $p< .001$) indicates a change towards more skepticism in the belief concerning source of knowledge. If their trust in expert knowledge was already relatively weak in stage 1, it diminished further in each year of their further study. 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 other epistemological belief that became more sophisticated with time is learning effort. The significant change of its mean score also started in stage 3. 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 (stage 2: mean= 3.86, SD= .38; stage 3: mean= 3.95, SD= .38; *t* test for pairwise comparison based on estimated marginal mean, $p<.05$). The one-way repeated measures ANOVA result confirmed significant changes across the four stages, F (2.73, 534.03)= 2.96 $p<$ .05. The students were more certain of the instrumental role of effort exertion in knowing in stage 3, 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 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 (stage 1: mean= 2.79, SD= .58; stage 2: mean= 2.84, SD= .47; stage 3: mean= 2.92, SD=.52; stage 4: mean=2.96, SD= .53; 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 (stage 1: mean= 2.57, SD= .59; stage 2: mean= 2.55, SD= .55; stage 3: mean= 2.71, SD= .62, stage 4: mean= 2.78, SD= .61; 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). The coexistence of progression and regression in the epistemological beliefs of the students will be further discussed in section 4.

The availability of data from the same students at regular one-year intervals for four years makes it possible to unearth intriguing results that would not otherwise be uncovered. If only data at the beginning and the end of the research period (Stage 1 and Stage 4) were available from the identical sample for comparison, what would be found is the reduced reliance on teachers as authority of knowledge, and a stronger conviction that knowledge is stable and inherent capability is indispensible for gaining knowledge (significant difference between stage 1 and 4, *t* test for pairwise comparison based on estimated marginal mean, $p<.05$). While these results agree with

the four-fold comparison made above on the whole, it fails to reveal the time when changes take place within the students and, more interestingly, the synchronization of these changes in all the knowledge-related beliefs studied. Also, no development in students' beliefs regarding effort would have been identified in the Stage 1 vs. Stage 4 comparison.

If we pit the results of the longitudinal comparison between Stage 1 and Stage 4 against the results of the Year 1 vs. Year 4 cross-sectional comparisons (section 3.3.1 and 3.3.2), differences in the findings of the two types of analysis are clear. Whereas changes are found in epistemological beliefs only in the longitudinal comparison, the Year 1 and Year 4 cohorts in 2006-07 differ in how much they embraced authority knowledge and traditional teaching and learning conceptions. According to the cross-sectional results, it seems that the freshmen were more conformist in their outlook – they were more naïve in the trust they accorded to expert knowledge and more conservative in the approach they would adopt in teaching and learning. This portrait of the Year 1 students would not be supported by the longitudinal results. Surely they were not as sophisticated in their perception of authority knowledge as when they were in Year 4 of their study. But they were actually more advanced in their perspective on the tentative nature of knowledge and to what extent learning is a matter of innate ability. The resulting picture of the developmental pattern as revealed by longitudinal assessment is richer and more complex than that which could be offered from the cross-sectional data.

3.4.3 Relationship between epistemological beliefs & conceptions of learning and teaching: Longitudinal comparison of the path model in stage 1 and stage 4

Epistemological beliefs and conceptions of teaching and learning have been analyzed separately so far. It has been found that these two constructs are related, with epistemological beliefs exerting predictive influence on teaching and learning conceptions (Chan & Elliott, 2004b; Wong, Chan, & Lai, 2009). To explore whether similar relationships are present in this sample and whether the relationships would vary across the four stages, the CFA model with the four epistemological beliefs and two conceptions as latent variables was tested by LISREL 8.54 in each of the stages. The overall goodness of fit is satisfactory in all of these analyses. Based on the respective model specification, a SEM model was set up to further examine the relationship between epistemological beliefs and conceptions of teaching and learning for each stage. The overall goodness of fit for the resulting four SEM models is also satisfactory (Table 3.12). In each model, as in other studies, the traditional and

constructivist conceptions of teaching and learning are each predicted by some epistemological beliefs. Table 3.12 summarizes the predictors of each conception.

Table 3.12 Goodness of fit indices and predictors of traditional and constructivist conceptions of teaching and learning of the SEM models in stage 1 to stage 4

	Goodness of fit indices of the SEM model	**Predictors of constructivist teaching and learning conceptions**	**Predictors of traditional teaching and learning conceptions**
Stage 1	NNFI=.94 RMSEA=.056 SRMR=.073	Learning effort (.69) Certainty knowledge (-.34)	Innate ability (.46) Learning effort (-.11) Authority knowledge (.13) Certainty knowledge (.38)
Stage 2	NNFI=.92 RMSEA=.07 SRMR= .082	Learning effort (.69)	Innate ability (.32) Authority knowledge (.24) Certainty knowledge (.19)
Stage 3	NNFI= .90 RMSEA= .059 SRMR= .085	Learning effort (.54) Certainty knowledge (-.25)	Innate ability (.47) Authority knowledge (.30) Certainty knowledge (.21)
Stage 4	NNFI= .90 RMSEA= .054 SRMR= .092	Learning effort (.63) Authority knowledge (-.22)	Innate ability (.26) Authority knowledge (.40) Certainty knowledge (.22)

Numbers in bracket are the standardized estimates

The relationships ascertained in the four stages share a high degree of similarity. A strong belief in the use of learning effort and learning skills predicts the adoption of the constructivist teaching and learning approach. It is remarkable that the predictive strength of this belief is the strongest among all the predictors in every stage of the evaluation. On the other hand, if one attributes greater weight to inborn talent and knowledge from experts as ways of knowing, and perceives knowledge as fixed, the teaching and learning approach that will be chosen is the traditional one. Among these three beliefs, the one related to innate ability predicts traditional conceptions most strongly in the first three stages, but its place was taken by authority knowledge in the last stage. Actually the standardized coefficient of authority knowledge increased from stage to stage till it finally overtook innate ability as the strongest predictor of traditional conceptions shortly before the students graduated.

One change that can be noted in the SEM model of this stage is the influence of certainty knowledge and authority knowledge on constructivist conceptions. Whereas certainty knowledge played a negative role in shaping constructivist conceptions in the first and third stage, its impact faded and became insignificant in stage 4. In this stage, authority knowledge exerted significant negative influence on constructivist conceptions for the first time. While it was the perceived static nature of knowledge that deterred students from accepting the constructivist conceptions previously, their stance that knowledge stems from experts weakened their adherence to constructivist conceptions of teaching and learning when they advanced to the last year of their study. It is possible that the teaching experience from the two Field Experience blocks sharpened their reflection on the role of teachers in students' knowledge acquisition. They began to appreciate more that the implementation of student-centred ways of teaching and learning demanded the teachers to let go of their dominance as knowledge transmitters in the classroom to pave the way for students to take up more responsibility in constructing their own knowledge. Actually, as aforementioned, authority knowledge exerted the most influence on traditional teaching and learning conceptions at this stage too. In other words, the students developed a highly polarized view of authority knowledge. If they are ready to assign students the role of their own source of knowledge and believe effort helps in this process, they will turn to constructivist conceptions. If, on the other hand, they are more convinced that teachers are to deliver knowledge to students, together with a belief that knowledge does not change much and one's learning depends on inherent ability, the choice of a teacher-centred approach is obvious. The fact that final year students are least in favor of this epistemological belief with time in both the longitudinal and cross-sectional comparisons (section 3.4.2) raises the hope that their commitment to the constructivist teaching and learning conceptions would be strong.

3.4.4 Sources of changes in epistemological beliefs: Insights from the interview data

Since the quantitative findings show that the changes of students' epistemological beliefs mainly appeared between Stage 2 and Stage 3, we examined the results of the Year 2 interviews, which were conducted between collecting the Stage 2 and Stage 3 survey, to see whether the interviews could explain those changes.

The interview results of Year 2 support the questionnaire findings that the

students started to realize that their source of knowledge was less reliant on the teachers in Year 2.

> *Since I have been studying in the institute, my perspectives have widened. I found that what had been taught (by the teacher) might be disputable. (Lizzy, year 2)*

This change is accounted for with several reasons. Firstly, the students found that it was not enough to acquire knowledge directly from the teachers, but it was important to reflect on their own learning through the self-discovery process. For example,

> *I think knowledge does not mainly come from teachers. Teachers merely provide you with a direction. As teachers cannot continuously teach you all the knowledge within a 3-hour lecture, I believe that I can learn so much more by self-learning or self-discovery than being taught in the lectures. Nevertheless, teachers certainly provide me with a direction. (Leona, year 2)*

Secondly, the students might start to doubt the teachers after comparing knowledge from different authorities or sources.

> *I used to believe whatever the teachers said. But I gradually realized that what they said was not always right after comparing the views from the knowledge I gained through reading books by myself. (Seline, year 2)*

Thirdly, the students' regard for authority knowledge decreased when they thought they had attained adequate knowledge to challenge their teachers

> *For the subjects such as Chinese, our native language, students would think that they have adequate knowledge and are more likely to dare to challenge their teachers (Leo, year 2).*

As the students' perspectives had been widened in the institute, their epistemological beliefs may have changed. In the second-year interviews, the students revealed two main undergraduate programme components: General Education and School Attachment as contributing to changes in their epistemological beliefs. The General Education modules are designed to enrich the students' intellectual nutrition with a balanced diet of modules from different academic disciplines other than their teaching profession, which relate to the life of the students as a highly educated and cultured citizen. In the students' second year, a period of 'School Attachment', usually one day per week for ten weeks, gives students the opportunity to be involved in the day-to-day life of a school as an interactive observer and they may also have some teaching experience.

Regarding the decreasing score of authority knowledge, the students were influenced by the course design that required them to develop critical thinking.

> *In fact, we need to have critical thinking in lectures. Teachers allow us to listen to other opinions during discussion. We have to consider those opinions and express our own comments. Therefore I think this form of teaching strategy can stimulate our thinking. (Kitty, year 2)*

Influence from General Education

The students illustrated that General Education had impacts on this change as '*the thinking model of the general education module is very different' (Phoebe).* This helped them develop their critical thinking.

> *I think General Education modules help train our critical thinking through exploring a lot of case studies. (Katie, year 2)*

In addition, the students regarded that the General Education modules helped them enhance their professional learning.

> *The General Education modules stimulated us to think from a critical perspective. I will apply this thinking style to my professional learning to examine whether different approaches or theories are correct. (Kitty, year 2)*

The General Education modules also assisted them in learning reflective thinking skills by encouraging them to read more and to reflect on different issues.

> *One General Education module, "Myth of love", required us to read a lot. I started to pay more attention to things happening in society. Since then, it has changed me in that I not only read lots of newspapers and magazines to learn about different knowledge, but I also keep reflecting on different issues. (Kim, year 2)*

Realizing the importance of critical thinking and reflective thinking, it explains the changes which occurred that made students more likely to doubt authority starting in their second year.

Influence from School Attachment

The school or classroom teaching context is found to be an influential factor in the development of epistemological beliefs and conceptions of learning and teaching among student-teachers (Cochran-Smith, 1991; Tanase & Wang, 2010). The interview data collected in Year 2 revealed that the exposure to real school life in the School Attachment was the most influential factor in shaping their notion of teaching and learning which is related to epistemological beliefs (Wong et al., 2009).

The campus-based influences

Taught modules

The findings show that the teacher education programme provided the student-teachers with the theoretical basis through exposing them to different knowledge inputs and stimulation in the subjects. These inputs mainly occur in the form of modules of different nature.

Although Scott did not agree with some of the classroom management methods, he took those methods as a starting point to practice his teaching (refer to the quote in last section, p.70). Furthermore, he applied other theories he learnt from the counseling module that teachers need to care for their students and the students will be able to feel this.

> *COUNSELLING is very good. I took this module just before the teaching practice, but there is one strategy which I do not agree with i.e. the strategy of not handling students' problems on the spot. However, I learnt an important point: with all the strategies, we need to be aware of our own teaching style and the teaching context; there is no right answer. He taught us a range of different strategies; this is true, we learnt a lot and have to really care for our students; they will feel it, this is important....A lot has been covered by that lecturer and the feeling is very strong. The module on Counselling is very good. (Scott)*

The modules in the teacher education programmes stimulated the student-teachers to consider alternative teaching strategies and motivate them to try out various teaching approaches in the practicum. Sharon identified some new teaching strategies which she would aim to try out in the field experience,

> *(My aspiration for the practicum is that)I can further develop my teaching skills and try out some new teaching strategies e.g. the experimental approach. I would also like to develop a better understanding of the students. (Sharon)*

It is important that the modules offer the student-teachers a range of different teaching strategies and that the application of the strategies is to address the diverse needs of the learners.

The visiting scholars did play a role in widening the exposure of the student-teachers and gained learning experiences which may not have been available to them.

epistemological beliefs vary largely depending upon each individual's personal experience. It illustrates that the students' School Attachment experience is critical for the development of their epistemological beliefs.

3. 4.5 Findings on the perceived influence of learning experience

In stage four, an additional scale was designed to assess students' perceptions of the influence of various learning experiences on their epistemological beliefs and teaching and learning conceptions. A total of 18 learning experiences identified from the BEd programme structure and from responses which emerged in the previous interviews were included. It was reckoned that this evaluation is most appropriately done in Year 4 after the students had sufficient exposure to all the major curriculum components in their BEd programme. They were also asked to use a 6-point Likert scale (from 6: very large influence to 1: no influence) to evaluate the influence of the eighteen items of learning experience on their beliefs and conceptions after rating the epistemological beliefs and teaching and learning conceptions.

This scale is validated by exploratory factor analysis (EFA) with SPSS version 17. Principal axis extraction and oblimin rotation were used to extract factors. Using a minimum eigenvalue of 1 as the criterion, the eighteen items of the scale can be factorized into six factors that account for 69.57% of the total variance. This percentage is commonly considered to be a satisfactory solution in the social sciences (Hair et al., 2006). All the item loadings are over or very close to .40, which can be considered significant for the current sample size (Table 3.13). The factors are labelled according to the constituting components as follows: factor 1: "core components in the formal curriculum of the BEd programme (FORM)", factor 2: "field experience (FIELD)", factor 3: "non-local learning experience (N-LOC)", factor 4: "informal and hidden curriculum of the BEd programme (INFORM)", factor 5: "pre-tertiary learning experience (PRE-TER)", and factor 6: "other experience" (OTHER). The Cronbach alphas of these factors, except that of "other experience", range from acceptable (.54) to very good (.91) (See Table 3.14). The low alpha of factor 6 (.34) indicates low reliability and so is not analyzed further.

Table 3.13 Pattern matrix reported by exploratory factor analysis for perceived influence of learning experience of BEd students (n=197)

	Factor					
	1	**2**	**3**	**4**	**5**	**6**
Professional Studies	.91					
Complementary Studies	.77					
Major: Pedagogy	.62					
Major: Academic Subject	.44					
Improving Teaching with Learning Studies	.39					
Classroom Discipline in Field Experience		- .92				
Learning Ability of Students in Field Experience		- .82				
Field Experience		- .48				
Immersion			.99			
Overseas / Mainland Exchange			.73			
Teachers in HKIEd				- .66		
Supporting Teachers in Field Experience				- .63		
Learning Experience in HKIEd				- .52		
Extra Curricular Activities				- .51		
Learning Experience in Primary School					.65	
Learning Experience in Secondary School					.55	
School Attachment						.42
General Education						.40

The mean and standard deviation of these five significant factors are reported in Table 3.14. The students considered "Field Experience" (FIELD) (mean= 5.09, SD= .67) as having exerted the greatest influence on their epistemological beliefs and conceptions of teaching and learning. "Core components in the formal curriculum of the BEd programme" (FORM) (mean= 4.55, SD= .74) and "informal and hidden curriculum of the BEd programme" (INFORM) (mean= 4.47, SD= .80) follow as the second and third most influential types of experience perceived by students, but their difference is not statistically significant as revealed by a paired sample t-test (t=1.43, df=196, n.s.). The importance of the other two kinds of learning - experiences gained from overseas learning (N-LOC) (mean= 4.19, SD= 1.33) and from their primary and secondary schools (PRE-TER) (mean= 4.06, SD= 1.10) are significantly lower in comparison (e.g., N-LOC & INFORM: t=2.96, df=196, p< .01; PRE-TER & INFORM: t=4.78, df=196, p< .001), though their absolute values (both above 4) are still quite high. It should be noted that their standard deviations are quite high (1.33 for N-LOC and 1.10 for PRE-TER) which reflects a larger difference in students' opinion concerning the role of overseas and pre-tertiary learning in their beliefs and conceptions.

Table 3.14 Means, standard deviations (S.D.) and Cronbach's alphas (α) of perceived influence of learning experience (N=197)

Perceived influence of types of learning experience	mean	S.D.	α
1. FIELD	5.09	.67	.79
2. FORM	4.55	.74	.81
3. INFORM	4.47	.80	.75
4. N-LOC	4.19	1.33	.81
5. PRE-TER	4.06	1.10	.54

Note. FORM= core components in the formal curriculum of the BEd programme; FIELD=field experience; N-LOC=non-local learning experience; INFORM= informal and hidden curriculum of the BEd programme; PRE-TER=pre-tertiary learning experience

Both the high mean scores and low standard deviations of the key BEd curriculum components – field practice and course work, imply the students' shared agreement on their importance in shaping their epistemological beliefs and teaching and learning conceptions. The learning they went through in the BEd programme is more essential than their secondary and primary experience in developing their beliefs and conceptions. While what they learned in the many courses in the formal curriculum is important, the influence of theoretical knowledge faded in comparison to the first-hand practical experience in front-line teaching. The confrontation with the reality of actual school teaching plays a more decisive role in molding different knowledge-related beliefs and teaching conceptions. For the informal curriculum, the human factor stands out as an obvious source of influence. The teachers they interacted with in the Institute and in their teaching-practice schools have also inspired them in the ways they think about knowledge, teaching and learning. Qualitative findings can illustrate more clearly how these types of learning experience have influenced the students.

3. 4.6 Relationship between epistemological beliefs and conceptions of teaching and learning and perceived influence of learning experiences

Correlation analyses were conducted to determine the relationship among four epistemological beliefs and perceived influence of different types of learning experience (Table 3.15).

Table 3.15 The Pearson correlation coefficients between perceived influence of teaching and learning experience with epistemological beliefs and conceptions of teaching and learning (N=197)

Perceived influence of types of learning experience	INA	LEP	AUK	CEK	CONS	TRAD
1.FORM	.04	.25**	.13*	.10	.35**	.01
2.FIELD	.08	.09	.04	- .09	.15*	.07
3.N-LOC	.03	.07	- .02	- .01	.14*	- .03
4.INFORM	.01	.21**	.05	.02	.25**	- .03
5.PRE-TER	- .03	.15*	- .02	.01	.07	.09

Note. INA= Innate ability; LEP= Learning effort/process; AUK=Authority in knowledge; CEK= Certain knowledge; CONS= Constructivist conception of teaching and learning; TRAD= Traditional conception of teaching and learning; FORM= core components in the formal curriculum of the BEd programme; FIELD=field experience; N-LOC=non-local learning experience; INFORM= informal and hidden curriculum of the BEd programme; PRE-TER=pre-tertiary learning experience

*significance of correlations *p< .05, **p< .01,

It is found that four out of five types of learning experience are significantly correlated with their espousal of constructivist conceptions of teaching and learning. Both the formal and the informal curriculum of the BEd programme, the field experience that students went through, and the experience that they gained in their overseas learning are all positively related to their support of constructivist conceptions of teaching and learning. The prime role played by the teacher education programme in shaping these conceptions is also indirectly indicated by the insignificant correlation of the constructivist conceptions with their pre-tertiary educational experience. On the contrary, the way these pre-service teachers thought about traditional ways of teaching and learning is related to neither the educational experience in the teacher education programme nor their earlier schooling.

Among the epistemological beliefs, correlations with types of learning experience are generally weak, with the exception of learning effort and process. When students believe that effort is needed to acquire knowledge, they ascribe a role to both their tertiary and pre-tertiary learning experiences. But it is the "regular" learning experience, be it the learning of knowledge in the formal curriculum or the teachers associated with such learning in the informal curriculum, that counted. Practical experience in learning to teach in schools and immersion or exchange experience are not associated with this belief. The belief in teachers as authority of knowledge shows a significant positive, though a slightly weaker, relationship with

the formal curriculum. It seems that students still regard their teachers as an authority figure in their learning of academic content.

3.5 Longitudinal qualitative findings of students' professional development

A summary of the number of students who participated in the interviews and observations of the four-year longitudinal study is listed in Table 3.16.

Table 3.16 Summary of the number of students who participated in the interviews and observations of the four-year longitudinal study

Tasks for the longitudinal study	Period of data collection	2006-2007 cohort BEd Student participants (person)
Interviews	Jan to Mar 2007	40
	Apr to Jun 2008	40
	Apr to Sept 2009	39
	Nov 2009 to Jan 2010	29
	Jun to Aug 2010	35
Observations for Year-3 teaching block practice	Apr to Jun 2009	33
Observations for Year-4 teaching block practice	Nov 2009 to Jan 2010	31

The following analysis presents a general picture of the students' professional development in terms of conceptions of teaching. The participants were asked to reflect on 'which factors or components of the programme influenced their conceptions of teaching and learning' at the end of the BEd programme, and the results are shown in section 3.5.1. Section 3.5.2 illustrates the analysis that examines the professional development of students in terms of practicalizing theoretical knowledge

Factors which may enhance student-teachers' professional development are also identified in this section.

3.5.1 Students' perceived influence of learning experience on their conceptions of teaching and learning

In the final round of interviews, we categorize the responses of the factors or components of the programme which influenced the participants' conceptions of

teaching and learning according to the categories of our final-stage questionnaires (refer to section 3.4.5). The summary of the components of the programme that influenced the participants' conceptions of teaching and learning is shown in Table 3.17. Participants might mention more than one type of component.

Table 3.17 Frequency of the constituting components of the programme that influenced the participants' conceptions of teaching and learning (N=35)

Factors	**Constituting components of the programme that influenced the participants' conceptions of teaching and learning**	**Frequency of response**
Core components in the formal curriculum of the BEd programme **(FORM)**	• Professional Studies	4
	• Complementary Studies	0
	• Major: Pedagogy	5
	• Major: Academic Subject	4
	• Improving Teaching with Learning Studies	0
Field experience **(FIELD)**	• Classroom Discipline in Field Experience	1
	• Learning Ability of Students in Field Experience	3
	• Field Experience	21
Non-local learning experience **(N-LOC)**	• Immersion	2
	• Overseas / Mainland Exchange	0
Informal and hidden curriculum of the BEd programme **(INFORM)**	• Teachers in HKIEd	10
	• Supporting Teachers in Field Experience	1
	• Learning Experience in HKIEd	2
	• Extra Curricular Activities	3
	• Peers	1
	• School Attachment	0
	• General Education	0

Note: All students could mention more than one response

According to factor analysis of the constituting components of the quantitative results (refer to section 3.4.5), these components can be summarized into four types, namely "core components in the formal curriculum of the BEd programme (FORM)", "field experience (FIELD)", "non-local learning experience (N-LOC)", and "informal and hidden curriculum of the BEd programme (INFORM)". Table 3.18 shows the frequency of the types of learning experience that were perceived by the students as affecting their conceptions of teaching and learning. Note that ss the same student could mention more than one component within the same type of learning influence,

the frequencies in Tables 3.17 and 3.18 do not add up. Table 3.17 reflects the more detailed analysis in terms of the constituting components whereas Table 3.18 shows analysis in terms of the types of influences.

Table 3.18 Frequency of the types of learning experience of the programme that influenced the participants' conceptions of teaching and learning (N=35)

Perceived influence of the types of learning experience	**Frequency of response**
Field Experience	24
Informal & hidden curriculum of the BEd programme	13
Core components in the formal curriculum of the BEd programme	10
Non-local learning experience	2

These qualitative results are consistent with the quantitative results, showing that students from all programmes unanimously chose field experience as the most influential type of learning experience in molding their conceptions of teaching and learning. Thirteen and ten participants regarded that the learning experience from 'informal & hidden curriculum of the BEd programme' and 'Core components in the formal curriculum of the BEd programme' were also influential to their conceptions of teaching and learning. Only two participants thought that their non-local learning experience significantly influenced their conceptions of teaching and learning.

In order to examine the students' HKIEd learning experiences and how they make sense of the various types of learning experience of the BEd programme, the qualitative findings across four years will be reported in the following three sections: formal curriculum of the BEd programme, informal and hidden curriculum of the BEd programme and the Field Experience.

3.5.1.1 Formal curriculum of the BEd programme

According to the programme structure, the formal curriculum includes 'Professional Studies', 'Complementary Studies', 'Major: Pedagogy', 'Major: Academic Subject', 'General Education' and 'Immersion' for BEd(Language) students.

The students regarded that developing understanding of the subject knowledge and then pedagogy influenced their conceptions of teaching and learning. For example,

> *'It is because the curriculum can really teach one how to teach. For example, one learns how to dance first, and then one learns how to teach your students to dance and how to make them learn*

better. In fact, the curriculum talks a lot about it, for modules like "Teaching and Learning" and "Human Development" really taught me a lot.' (Seline, BEd(S), Year 1)

Another student reflected that the course had stimulated his learning interest.

'I think it's my major subjects and the course that influenced me the most. I already had a great interest in and certain knowledge about music. This course has deepened my knowledge and made me want to explore and learn more about this subject.' (Paco, BEd(P), Year 1)

The following student emphasized that the subject's pedagogical modules not only changed her view about the subject, but also influenced her attitudes towards teaching.

'Two modules influenced me the most. The first one is 'Methods of Teaching Mathematics' (數學教學法) and the second one is 'Methods of Teaching General Studies' (常識教學法). I used to think that General Studies was a rote-learning subject which mainly focused on knowledge transfer. Yet, the 'Methods of Teaching General Studies' module reminded me that skills and attitudes are very important in nurturing students' character and growth. This is far more important than the subject content knowledge.' (Paula, BEd(P), Year 3)

Some students reflected that those modules which exposed them to different approaches to learning and teaching influenced them a lot. For example,

'A teaching and learning module of my major subject influenced me a lot. It is because the lecturer taught this subject really well. She not only taught us basic teaching methods, but she also taught us how to conduct social enquiry with our students. She was aware of The New Senior Secondary Curriculum and emphasized that students needed to search for information themselves instead of being taught directly by the teachers. By demonstrating experimental teaching approaches, she showed us how to improve our teaching and change the traditional teaching conceptions which we had experienced.' (Sharon, BEd(P), Year 3)

Modules that introduce educational theories underpinning pedagogy also helped to prepare students for teaching.

> *'Different modules, particularly those related to child development and language development, introduced different teaching skills, pedagogies and theories to support my teaching and activities planning. I find them very useful for classroom management and for teaching children languages.' (Karen, BEd(ECE), Year 3)*

Counselling skills to support student development are important for students.

> *'Just before the teaching practicum, I took a 'Counselling' module which was really good. The lecturer taught us a lot of methods to help students. I feel so strongly about the necessity of putting our whole heart into our students in counselling because the lecturer has given us a lot of examples.' (Scott, BEd(S), Year 4)*

General Education also plays an important role for students to develop their critical thinking and arouse their interest in being concerned about current affairs.

> *'GE subjects are livelier. It could be artistic or focusing on current affairs. It is very different from my discipline subjects. For example, one lecturer uses a critical perspective to stimulate our thinking. I can also apply this kind of thinking to learn my discipline subjects.' (Kitty, BEd(ECE), Year 2)*

> *'It (GE) is more interesting. It gave me more room to think and to develop my thoughts, in particular, to think about current affairs and society. In learning a GE module, we need to read a lot and to keep an eye on current affairs. I found that we actually need to know a lot more current affairs for learning in general. I have started to read more newspapers and magazines and keep thinking about those issues.' (Kim, BEd(ECE), Year 2)*

For BEd(Language) students, non-local learning experience, that is immersion, was particularly useful for them to learn the language.

> *'Immersion was very useful to us because it helped us to apply the subject knowledge that we had learnt from IEd. I could really practice the language (English) and understand the English culture during the immersion. It helped me to increase my confidence in*

speaking English.' (Linette, BEd(L), Year 3)

3.5.1.2 Informal and hidden curriculum of the BEd programme

The informal and hidden curriculum of the BEd programme refers to both learning experiences in HKIEd and other learning experiences provided by HKIEd. Learning experience in HKIEd includes influences from lecturers, supporting teaching in the teaching practicum, the FE supervisor from HKIEd and peers.

Other learning experiences

SAO serves the role of providing various learning opportunities for students.

> *'Other learning experiences in IEd have broadened my horizons. I believe that a teacher does not only need to teach the subject content, but also needs to help students develop in other areas such as their leadership. I think SAO has provided a lot of opportunities for us to enrich our experiences.' (Paula, BEd(P), Year 4)*

Learning experience in HKIEd

The following student reflected that her learning experience in IEd influenced her view of the teacher's role as a facilitator.

> *'My view is to change our teaching from the didactic teaching which we experienced in our previous school years. My experience in IEd has been influencing me a lot. This is a place that allows students to learn freely and the lecturers served as facilitators. ... Now, I would encourage students to try to express their views first before I gave comments and guided them to learn. That's the way I learn from this Institute.' (Penelop, BEd(P), Year 4)*

A student experienced that a visiting scholar had widened his perspectives.

> *'The programme is good. For example, we have a very good visiting scholar this semester. This scholar makes the whole music department filled with an explorative attitude. Besides, he helped us connect with some external professionals by arranging some seminars or providing some exchange opportunities for us. It was really good because these activities help us explore different types of music.' (Stanley, BEd(S), Year 4)*

Influence from lecturers

The lecturers at IEd are role models; other characteristics such as personal attitudes, being innovative, and commitment to continuous development are inspiring for the student-teachers.

> *'I really appreciate the teachers who have great passion in teaching. They have motivated me, who did not want to become a teacher, to start thinking that although being a teacher would be tough, it would be interesting at the same time.' (Lizzy, BEd(L), Year 1)*

> *'My lecturer is an upright person. I really appreciate his personality and character. This makes me accept his teaching very naturally. ...He gave us a lot of pedagogy examples as well as many personal examples. Now, my students love to attend my classes as much as we love to attend my lecturer's lectures....I would both adopt my lecturer's pedagogy and innovate my own teaching methods.' (Leo, BEd(L), Year 3)*

The following student mentioned in two successive years about the importance of the quality of the lecturers.

> *'I think the quality of the lecturers is very important because they are teaching the future teachers. Their teaching would stimulate me to think how to teach better. They should be our role models. However, their quality varied. It alerts me to the importance of being a role model to my students.' (Pheobe, BEd(P), Year 3)*

> *'I still think that the lecturer being a role model is very important. Some lecturers didn't obtain a very high academic achievement, but they really put their hearts into their students in designing the courses and arranging resources. Their feedback is spontaneous and their teaching contents are updated. For this kind of lecturer, students would admire them and be easily convinced by them. On the contrary, students would not like those lecturers who 'tramp on' (look down on) students even though they have obtained higher academic achievement.' (Pheobe, BEd(P), Year 4)*

Influence from supporting teachers in placement schools

The supporting teachers in the placement schools set a good example and gave valuable advice to the student-teachers.

> *'It (school attachment) is beyond my expectation...The school teacher gave me a lot of advice in marking the students' work. I have learnt that the purpose of marking is not only about giving marks, but also to find out about the students' common mistakes so that we can enhance our teaching accordingly. I think it's very useful.' (Lilian, BEd(L), Year 2)*

> *'My supporting teacher is very supportive. He is very efficient. He often pin-pointed the most things that I need to improve. Then he would discuss with me and gave me constructive comments. Moreover, my supporting teacher did a very good job in his classroom management. Thus, classroom management was not an issue to me in my teaching practicum. He is very well organized. His students know his rules and his plans for the lessons, so they will be clear what to do in class. He influences the students a lot and he told them to respect pre-service teachers. That made our lives easier in the teaching practicum.' (Lilian, BEd(L), Year 4)*

> *'The mentor for this teaching practicum is really great. She expects the student-teacher to have the same performance as her. In the beginning, I was trying so hard to meet her expectation of writing scripts for instructions in the lessons. Since then, I have been writing scripts for every lesson. I think it's important and it helps me a lot.' (Sharon, BEd(S), Year 4)*

Influence of the FE supervisors from HKIEd

Students can learn from an FE supervisor who sets a good example.

> *'The FE supervisor is really good. ...She does things so thoroughly. I have learnt a lot from my supervisor while some course mates didn't learn much from theirs. It all depends on which supervisor one has.' (Seline, BEd(S), Year 4)*

Influence from Peers

Peers are important for students to learn from each other.

> *'We have a lot of group discussions or study groups. We, as peers,*

have more initiative to learn. Not waiting for the teacher to teach, we already knew how to seek the problems to discuss. It helps so much in learning.' (Linda, BEd(L), Year 1)

'Every course mate is a unique individual. Each of us has our own teaching philosophy. Some tend to be more traditional. Then, I will ask myself do I want to be like that? No matter what, our course mates would have influenced us in some ways because we chat from time to time.' (Lilian, BEd(L), Year 4)

3.5.1.3 Field Experience

The interview data indicated that the major sources of influence on the view of the students' conceptions of teaching and learning from the types of learning experience are largely from their field experience.

In Year 2, School Attachment might provide students with the first teaching opportunity and the chance to perform other duties in school.

'I experienced what a lesson or the students were like when I tried out my teaching during the school attachment. I also learnt to examine the students' levels of ability while marking the students' work or designing test papers. I wouldn't take notice of this kind of thing without the school attachment.' (Sandy, BEd(S), Year 2)

As Field Experience provides opportunities to develop relationships with students in school, thus motivating student-teachers' interest in teaching, it could change the students a lot.

This field experience has changed me a lot. Before this teaching practicum, I had never taught or encountered students. I thought being a teacher was merely a teaching 'job' with a fairly good salary. But now, I think teaching is fun. Different things happen every day. The students are very interesting and they often say something innocent. (Seline, BEd(S), Year 3)

One of the most common benefits of the Field Experience mentioned by the students is that it provides them with an opportunity to apply theories learnt in practice and to understand the school context.

This one-and-a-month teaching practicum let me experience a real teacher's life at work. It made me reflect on my own teaching philosophy and methods which I had learnt from the institute. To be able to put those into practice is really important. If I started teaching straight away without this teaching practicum, I would feel a great sense of failure. But now, I am certain that this teaching practicum has helped prepare me to teach in the future. (Lizzy, BEd(L), Year 3)

Furthermore, Field Experience complements the pedagogical component of the programme and immersion.

Three main components of the programme have influenced me the most. They are the modules of pedagogy, TP and immersion. Modules of pedagogy and TP can be seen as a process. I was observing and learning the trend of pedagogies while I was attending those pedagogical lectures. In addition, I could practice and test the effectiveness of what I believe to be the best pedagogy in TP. Furthermore, I could learn different pedagogies in different cultures during the immersion which inspired me. That is a really good learning process. (Peggy, BEd(P), Year 4)

During the Field Experience, students could develop confidence and teaching beliefs.

During TP, I could try to apply what I had learnt from IEd. I could test whether those theories work or not. Finally, I believe those theories are useful for children's learning and they work. This increases my confidence in teaching and enhances my beliefs about teaching and learning. (Kiki, BEd(ECE), Year 4)

Above all, students could develop their personal repertoire in teaching and adapt theories learnt to school and personal contexts.

I still believe that the teaching practicum influenced me the most. Even though we have learnt a lot of theories from the Institute, we still need to learn how to make adjustments in practicing the "ideal" theories in real classrooms to suit students' needs. The most difficult thing about teaching is to transform theories into teaching approaches that suit me and my students. (Pierre, BEd(P), Year 4)

3.5.2 Integrating professional learning in the campus-based component and the field experience

After four rounds of interviews, we followed up the discussion by looking into how the design of teacher education programmes may enhance professional leanring among the student-teachers.

These data reported focus on the detailed analysis of four cases, who were studying in BEd(Secondary), after their two blocks of Field Experience. The analysis looks into how these student-teachers integrated their learning from the campus-based component into their Field Experience. The participants were also asked to reflect on how and which factors or components of the programme influenced their professional learning in the programme. Table 3.19 shows the summary of characteristics of the four student-teacher cases.

Table 3.19 Summary of characteristics of the four student-teacher cases

Case	BEd (Secondary) Major	Experiences	Characteristics
Stanley	Music	Previous work and orchestra experiences are influential on teaching beliefs.	• Able to name musical knowledge, application to daily life, musical feeling, and framework advocated in teacher education programme. Ideas implemented in practice. Always reflective and emphasis on lifelong learning.
Seline	Physical Education	Some success in the tryout of approach learnt in the teacher education programme	• Willing to try out different topics covered in the teacher education programme
Sharon	Home Economics	Felt more challenged in her 2nd TP experience	• Different teaching strategies tested out in practice • Willing to take supervisor and supporting teacher's advice.
Scott	Business Studies	Tried out teaching strategies that didn't work in 1st TP experience.	• Emphasis on experiential learning and teacher-student relationship

3.5.2.1 Typology of different ways of practicalizing theoretical knowledge

The data suggest a typology of different ways of practicalizing theoretical knowledge which reflect different understandings of teaching pedagogies as well as ways of making sense of them in the school context. The following four cases show increasing sophistication of personal interpretations of theoretical knowledge in different degrees that accompanies the approach in try-out and experimentation.

1. Procedural approach *(Scott)*

Students adopt a procedural approach, driven by their experience of the effectiveness of applying theory in a specific situation.

According to Hobson (2003), proceduralist apprentices adhere to given procedures and strategies with little interest in the 'theoretical' work. Eraut (1994), and Leinhardt, Young and Merriman (1995) suggest generalizations and practical principles as a form of theoretical/ propositional knowledge. Scott is testing out the principles learnt in the module on classroom management and categorises them as 'workable' or not.

> *'The institute taught us to never handle incidents spontaneously when something suddenly happens in the classroom because it may influence other students. I tried to use it in my last teaching practicum, but it didn't work. Since then, I believe that classroom management method is not practical. So, I tried to use my own method in this current teaching practicum. Once, a student did something inappropriate in class; then I talked to him immediately. It worked and I think it's good.' (Scott)*

2. Adaptive approach *(Seline, Sharon)*

Adaptive already carries the meaning that there are changes in practices in relation or reaction to certain situations, be it classroom or pupils or school context. The adaptive differs from the reflective in that it emphasizes more the changes made in response to context, while the latter places more emphasis on the generation of theory or schema as a result of practice. The former will continue to try and fine tune practice while the latter also fine tunes practice, but there is a further attempt to make sense of the process, reflect on the underpinning principles and attempt to explain the process, and make generalisations or try to arrange the experience into a schema or 'theory'.

Theory is an essential part of the teacher education programme and it provides starting points for experimentation. Seline emphasizes trying out teaching methods to test out effectiveness.

> *'There was a module named 'Physical Education Pedagogy' that I learnt from the institute and which is really good. I started to apply those theories from my first teaching practicum in year 3. My lecturer always promoted 'Teaching Games for Understanding Method' (領會教學法). I didn't know how good it was, so I tried it.' (Seline)*

Professional knowledge is further refined as shown in the following feedback.

> *'It would be difficult to practice 'Teaching Games for Understanding Method' (領會教學法) if the students were not enthusiastic enough to take part in the game. If this happened, I would try to guide them better by questioning. For students of lower grades, I would focus on teaching them more foundation knowledge and skills before I apply the 'Teaching Games for Understanding Method'' (Seline)*

3. Reflective approach *(Stanley)*

Discipline-based theories and concepts played an important role in this case. They stimulated his reflection, the development of his schema, resulting in the development of his personal theory about music teaching.

> *'My supervisor commented that I should teach the students more details of singing as teaching for choir. Generally, Hong Kong students don't like singing in class very much. In fact, singing is to let them be happy, express themselves and as they cannot chat in the lesson, they may as well let go of their emotions. Singing in class is only a way for them to relieve or express themselves. I think teaching them about performance is more useful to them. It is hard to change the classroom environment, even if I make the changes they are still not attentive.... it may need to take a lot of effort to construct an ideal environment for them to learn in these traditional schools.' (Stanley)*

This finding is consistent with Korthagen's (2010) suggestion of the development to a 'theory' level, the re-construction of professional knowledge leads to logical ordering within his schema. There is an attempt to develop students' musical sense, culture and style, but Stanley realizes that this takes time.

> *'In fact, we need to teach students some knowledge about music, especially aural training and musical sense, it is not only about whether you like or do not like a piece of music. Students need to understand what makes a piece good or not, it is not something complicated, we can just train their musical sense. For example, in the haunted house activity, they can apply what they have learnt in the lesson. I have taught them what is happy or not, and they can find some songs to match the activity. But I think the students are not yet ready, this takes time.' (Stanley)*

Stanley makes evaluative judgments of the knowledge learnt in the teacher education programme

> *'Teaching students with different abilities made me understand their difficulties more ...It is like taking medicine. It takes time. Or else, it may not work for some people. Therefore, we may try different ways such as learning from my mentor. In this teaching practicum, I learnt from my mentor how to build up relationships with students.' (Stanley)*

Stanley has a very strong sense of self as a teacher. He was committed to continuous improvement and lifelong learning and was very reflective in facilitating student learning.

> *'Certainly, I will reflect on or evaluate my teaching skills, for example, whether my expression was too direct or loose. I often reflect on those questions.' (Stanley)*

> *'I think it's important to train myself to read more books or learn new knowledge to remind myself to raise my academic level.' (Stanley)*

3.5.2.2 Influences on students' professional learning

The influences on the professional learning of the students are classified into two main categories, campus-based and school-based influences.

The campus-based influences

Taught modules

The findings show that the teacher education programme provided the student-teachers with the theoretical basis through exposing them to different knowledge inputs and stimulation in the subjects. These inputs mainly occur in the form of modules of different nature.

Although Scott did not agree with some of the classroom management methods, he took those methods as a starting point to practice his teaching (refer to the quote in last section, p.70). Furthermore, he applied other theories he learnt from the counseling module that teachers need to care for their students and the students will be able to feel this.

> *COUNSELLING is very good. I took this module just before the teaching practice, but there is one strategy which I do not agree with i.e. the strategy of not handling students' problems on the spot. However, I learnt an important point: with all the strategies, we need to be aware of our own teaching style and the teaching context; there is no right answer. He taught us a range of different strategies; this is true, we learnt a lot and have to really care for our students; they will feel it, this is important....A lot has been covered by that lecturer and the feeling is very strong. The module on Counselling is very good. (Scott)*

The modules in the teacher education programmes stimulated the student-teachers to consider alternative teaching strategies and motivate them to try out various teaching approaches in the practicum. Sharon identified some new teaching strategies which she would aim to try out in the field experience,

> *(My aspiration for the practicum is that)I can further develop my teaching skills and try out some new teaching strategies e.g. the experimental approach. I would also like to develop a better understanding of the students. (Sharon)*

It is important that the modules offer the student-teachers a range of different teaching strategies and that the application of the strategies is to address the diverse needs of the learners.

The visiting scholars did play a role in widening the exposure of the student-teachers and gained learning experiences which may not have been available to them.

Stanley related a few incidents during which the visiting scholar made some impact on his conceptions.

> *'The programme is good. For example, we have a very good visiting scholar this semester. This scholar makes the whole music department filled with explorative attitude. Besides, he helped us connect with some external professionals by arranging some seminars or providing some exchange opportunities for us. It was really good because these activities help us explore different types of music.'* (Stanley)

Stanley achieved relating different teaching strategies with the learning needs of the students,

> *'I have considered how to teach before, but now I'm aware of more alternatives and know that different methods can be applied for different children. A teacher may use Method A today and method B tomorrow, (whichever method) can help them learn in lessons. I learnt all this in the module 'teaching and learning'.* (Stanley)

It is important that the teacher education programme provide a range of modules which introduce the student-teachers to a range of teaching pedagogies, classroom management strategies, and different perspectives in the discussion of teaching and subject content. Moreover, the relationship between teaching and addressing the diverse student needs will play a significant role in helping the student-teachers to develop a reflective approach.

The faculty in the university

While the curriculum and the impact of the teacher education programme are planned, the influence from the faculty also needs to be recognized. The findings reveal that the lecturers affect student-teachers both in the university-based component of the programme and in the practicum. Sharon was impressed by one of the lecturers who stimulated her to conduct social enquiry, promote independent learning and demonstrated to her ways to improve her teaching,

> *'A teaching and learning module of my major subject influenced me a lot. It is because the lecturer taught this subject really well. She not only taught us basic teaching methods, but she also taught us how to conduct social enquiry with our students. She was aware of the New Senior Secondary Curriculum and emphasized that students need to search for*

information themselves instead of being taught directly by the teachers. By demonstrating the experimental teaching approach, she showed us how to improve our teaching and change the traditional teaching conceptions which we had experienced.' (Sharon)

Again, Seline appreciated the discipline-based theories that she gained from the teacher education programme and was enthusiastic about learning *'Teaching games for understanding method'* from one of the lecturers who was an expert in the field. Based on the discussion in the module, she was enthusiastic about trying out the approach.

'I think that the PE subject (modules) are very good. The module on teaching pedagogy is excellent, and the teaching was of high quality. I could use them immediately when I was in year 3. The main influence is the lecturer; he is very professional and so I chose this module on 'Teaching games for understanding method'. As the lecturer suggested that this is a very good approach, I would really want to try this out and find out the benefits.' (Seline)

Lecturers who are experts in the field are influential for the learning of the student-teachers. Their influence persists during the field experience as the student-teachers regarded that the lecturers greatly emphasized the trying out of different teaching approaches. This was reflected by Seline as she sensed the pressure from her supervisor from the institute who expected her to try out different teaching strategies. She held an attitude of experimenting and further trying out different methods such as self evaluation and peer evaluation.

'I did not try the 'Teaching games for understanding method' last year; in fact, I did not have the courage to do so. It is because of the supervision visit that I was forced to try this. My supervisor asked me to use other teaching methods, and I chose this as it is the simplest. After the try out, it was quite good. When the students were engaged in the competition, I did not need to worry too much about them. I did not need to invent a lot of activities and they were happy and could learn. Thus, I think that this is a good way to teach ball games. I will help them with the exams next week, and there will be self and peer assessment; I think these are good for them. However, I can only tell the impact after the trying out. The students may not pay a lot of attention to the assessment and give very

high marks.' (Seline)

Advice from supervisors from the institute during the Field Experience is crucial for students.

> *'My supervisor gave me a lot of advice. She helped me to improve a lot.' (Sharon)*

Sharon was grateful that her IEd supervisor gave her a lot of advice during TP.

> *'The FE supervisor is really good. ...She does things so thoroughly. I have learnt a lot from my supervisor while some course mates didn't learn much from their supervisors. It all depends on which supervisor one has.' (Seline)*

The willingness of the lecturers to discuss with the student-teachers, engaging them in critical analysis of the subject, stimulated Stanley to take on a reflective approach in his own learning.

> *'I think some lecturers may not be very good at lecturing, but they can answer a lot of interesting questions if you approach them individually. I will go to ask them if they mention some interesting points. I think we need to be critical as learners and do not just believe in what we are told. I have always learnt in this way.'* (Stanley)

The provision of feedback from the lectures and acknowledging student answers was appreciated and seen to be conducive to learning, as suggested by Stanley.

> *'Sometimes I think feedback (is important)....I will adopt this attitude when I become a teacher. When students provide really good answers, I think we need to provide them with some reward. It is not about handing out candies, it is just to write their answers on the blackboard, showing that I am adopting their answers. I think feedback is not only about whether you have done well or not, but it has to be in-depth. Feedback is common in the adult world (or in society); you will always get some feedback after the completion of a project.'* (Stanley)

The feedback provided should be of quality and in detail. The lecturer also needs to be explicit in his demands or expectations about student performance. Stanley elaborated on how the quality of feedback provided by a lecturer helped him learn,

'*My saxophone teacher is better, he is very serious but he can identify quite a lot of 'points' (problems) easily, and you'll know that he is very demanding. Therefore, I will ask him, he can point out a lot of my weaknesses, very much to the point and in great detail. I think this is the teacher-student relationship and because of this he is very good to me. I am good to him and I continue to ask while he will address my questions.*' (Stanley)

The last part of the above quotation suggests that the influence on the student-teacher works beyond the information provided in the feedback. It is the teacher-student relationship which matters and creates a longer term impact.

The lecturers introduced to the student-teachers a range of teaching pedagogies, the importance of critical analysis, and provided feedback on their performance. The ability to reflect and critically analyze is crucial to the development of a reflective approach. The building up of teacher-student relationships is also seen to be important, as it affects the development of the student-teachers. This later becomes one of the concerns in Stanley's reflection about student learning.

Influences from the school context

With the teaching practice being an important component of the teacher education programme, the school context plays a significant role in influencing the process of practicalising theoretical knowledge among the student-teachers. The school-based contexts cover a range of dimensions such as the classroom or school situation, the supporting teachers, and the peers placed in the same school.

The challenges of practice situations embedded at classroom and school levels

Building good teacher-student relationships is a challenge for the student-teachers. This is an area which influences the student-teachers in making decisions related to the design of their lessons.

'I think student and teacher relationships are particularly important. If you really open your heart to the students, they will definitely feel it. I like to learn about what the students think and open up to them about what I really think. Then, I would discuss with them how to reach an agreement together.' (Scott)

Other challenges are related to building good relationships with the students. I have tried to make my teaching relevant to their daily life experiences, to build good relationships with them. If they find my teaching relevant, they will participate in the lessons. If not, they go to sleep. (Scott)

Scott reckoned this is one of the challenges in his teaching practicum. It is because this relationship would influence classroom management, recognizing students' ability, and how to establish a working relationship with the students.

Stanley tailor-made his teaching to suit the students' ability and learning habit, by adjusting his expectations of the students and thinking of ways to help the students to be involved in the lessons and increase their willingness to learn.

'The institute expected us to include three elements in each lesson: listening, performance and composing. Different from my previous teaching practicum, the students in this school did not expect to contribute in lessons...Although I could not include all the three elements; I would include at least one in each lesson. As you might notice in my lesson, I gave them pens to write with. It was because they did not prepare for this lesson. So, I would prepare for them. If they (the students) liked the teacher, they would be willing to participate in class.' (Stanley)

Limited resources and time were often regarded as factors that hindered the students from practicing and trying out different teaching strategies. Seline regarded that the time constraint was an obstacle during her Field Experience.

'Because of the limited time available, it is not possible to be successful. I put this down in my lesson plans.' (Seline)

However, these limitations could sometimes provide the students with more opportunities to explore those teaching strategies they would not have planned for. Seline mentioned limited resources such as the shortage of a suitable venue which made her change her teaching plan. Yet, she found that she gained some benefits from it.

'I think this has to do with the venue...I forced myself to use the covered playground or other places. I forced myself to teach other contents,

something new, such as Aerobic dance. These are what I gained; I have tried alternative teaching strategies which I would not have planned for. Having tried them out, it turned out to be easier to teach dance and I do not need to teach this under the sun which makes life much easier.'(Seline)

Peer support and interaction

Peer support and interaction to discuss problems encountered in school can enhance the students' evaluation of their teaching. Seline demonstrated the benefit of peer observations of teaching that provided them with opportunities to try out different teaching strategies, share the experiences of the trials and their attitudes to value different teaching strategies.

'My peer in the teaching practicum would point out my problems in teaching. I would give him advice too. Whenever we co-teach, we would figure out how to solve the problems together.' (Seline)

The supporting teachers

The supporting teachers being a role model as well as a source of contextual information and advice is generally regarded as having an important influence on the learning of the student-teachers.

The mentor for this teaching practicum is really great. She expects the student-teacher to have the same performance as her. In the beginning, I was trying so hard to meet her expectation of writing scripts for the instructions in the lessons. Since then, I have been writing scripts for every lesson. I think it's important and it helps me a lot. (Sharon)

Sharon admired her supporting teacher and took her advice seriously. Seline also acknowledged the support from the supporting teacher as she said,

The supporting teacher has helped a lot. He sometimes observes my lessons and gives me some feedback. I can then take time to improve. I have tried a lot of different things and am not as anxious as before. (Seline)

Stanley reflected on how he has learnt from his mentor,

'Therefore, we may try different ways such as learning from my mentor. In this teaching practicum, I learnt from my mentor how to build up relationships with students.' (Stanley)

3.5.3 Main challenges or barriers in practicing teaching and career development

At the end of Year 4, the students reflected on the main challenges or barriers in practicing their teaching and career development.

Six out of thirteen BEd(Primary) students reflected that there was a lack of practical experience in their minor subject teaching.

'Since we would not practice our minor subject teaching until Year 4, I feel that my minor subject teaching is quite weak. There were only a few lessons in one semester and the supporting teacher didn't give much advice on my teaching. Therefore, I suggest starting teaching minor subjects in Year 3.' (Philip, BEd(P), Year 4)

The following students experienced that teaching their major and minor subjects is very different.

'I did not know how to manage a classroom. This is the first time I entered a classroom in Year 4 since I didn't practice my minor teaching subject in Year 3 TP. Teaching General Studies is very different from teaching PE. How to deal with classroom management and deliver knowledge to students are very different from teaching PE. These skills and knowledge require more practical experience.' (Patrick, BEd(P), Year 4)

'My major, Music and my minor, General Studies, are two very different categories. There is less discussion in Music lessons which emphasises individual development more. For General Studies, we need to encourage the students to practice and learn from more discussion.' (Paco, BEd(P), Year 4)

'There was insufficient teaching practice and pedagogies for my minor subject. My minor is PE, for example, the instructor would teach us how to swim but did not teach us how to teach students swimming.'(Pheobe, BEd(P), Year 4)

One BEd(Secondary) student worried that teaching with only one specialized subject may limit her job opportunities and career development.

> *'Since the Specialised Teaching policy has been executed, the institute focuses on developing a specialised Home Economics teacher. However, in reality, a Home Economics teacher needs to teach other subjects in school. So, we who only study Home Economics would be disadvantaged because we don't know how to teach other minor subjects. It makes me so worried because I don't know whether we could adapt to new changes if we don't have a minor subject to teach.' (Sonia, BEd(S), Year 4)*

4 Discussion and Conclusion

4.1 Implications of the changes in Epistemological Beliefs

The quantitative findings in the study reveal that in the course of a four-year period, major changes took place when the students entered the third year of their study. No epistemological belief underwent any significant change in the mean score between the first and the second year. After the transformation in the third year, these beliefs stabilized in the fourth year. The only exception is the belief concerning Authority Knowledge in which the students demonstrated a continuous and growing scepticism in considering authority as a source of knowledge. Together with an increase in the dependence on one's own efforts to gain knowledge, the students' epistemological beliefs in the later stage of their study can be regarded as more sophisticated. However, the mean scores for innate ability and certain knowledge have become significantly higher. These together can be described as a regression towards less complex beliefs. The two contrasting patterns demonstrate a fluctuation or instability in the development of the students' epistemological beliefs. This may suggest that certain beliefs may be more easily changed than others. Another possibility is that changes in some epistemological beliefs may require more than three years to consolidate and become established, whereas some changes may come to an end if there is a lack of continual support. While Exley, Walker and Brownlee (2008) argued that the first year in university should be an opportunity to help students to reconstruct their views about learning and knowledge, the findings in this study suggest that a sustained and continual effort to enhance such changes is essential.

The coexistence of more and less mature epistemological beliefs can also be interpreted as having an internal logic. If students gradually realize that knowledge is not that relative after all, they may assume more responsibility in acquiring the more stable knowledge than when they perceive knowledge as being in constant flux. Although their doubt in authority has grown, they also understand that things are less liable to subjective interpretation than they previously thought. A substantial body of knowledge has already been established. How much access they have to the accumulated knowledge is a matter of how much they utilize their personal resources, be it in the form of diligence or inborn talent. Seen in this way, the sophisticated and

less sophisticated epistemological dimensions stand in meaningful relationship with one another.

The findings reflect a pattern which suggests that changes in students' beliefs may occur in different directions, echoing the findings of Tanase and Wang (2010) that preservice teachers' beliefs may undergo various degrees of change throughout a course. In order to plan for or facilitate stable development in the students' epistemological beliefs, teacher educators should not conceptualize their beliefs as consistent and one dimensional (Tanase & Wang, 2010; Schommer-Aikins, 2002). Moreover, Kagan's (1992) idea of influencing preservice teachers' conceptual changes through personalized and contextualized ways is relevant.

The findings suggest that (1) the subject specific component of the teacher education programme, (2) the General Education component with an aim to enhancing critical thinking and reflective thinking, and (3) the teaching contexts in schools may contribute to explaining the changes in the students' epistemological beliefs. The findings are also consistent with our previous findings in the cross-sectional part of this study with a different cohort of students (Cheng et al., 2009; Cheng, Cheng, & Tang, 2010).

The study of epistemological beliefs is important in teacher education programmes because how the students perceive knowledge may influence how they teach and explain learning to their pupils. In particular, a decrease in mean scores for Authority Knowledge and an increase in mean scores for Innate Ability may mean that these students hold a view that some knowledge comes from authority and that pupils' learning is better explained by innate ability. This view has implications for teaching. When epistemological beliefs were related to conceptions of teaching and learning, it was found that how much Year 4 students endorsed experts as a source of knowledge affected whether traditional or constructivist teaching and learning conceptions would be followed. Before then, the faith in the innate ability to learn was the strongest predictor of the traditional teaching and learning approach. To encourage student teachers to accept constructivist ways of teaching and learning or to turn away from the teacher-centred ways of instruction, designing a curriculum that facilitates the revision of these two beliefs would catalyze acceptance of related teaching approaches. Hofer (2004) maintained that teacher education programmes should discuss these views in the context of both content knowledge and how students learn. The qualitative findings reinforce this notion as the students clearly pointed out that the examination of knowledge, especially through the course design in General

Education courses in which analytical and critical thinking was called for, and its application to actual teaching did stimulate them to reconsider or reflect on Authority Knowledge.

The importance of the field based components of a teacher education programme has been emphasized by researchers since the 1980s and this emphasis has been maintained to the present (Stones, 1981; Tillema, 2000). The teaching context provides an opportunity for students to construct their personal knowledge, which may extend or reshape their knowledge learnt from books (Kessels & Korthagen, 1996). It is, therefore, not surprising to find that the students in this study recount their school attachment experience as an opportunity to reconstruct their understanding about teaching, reflect on theories, and try out different approaches to teaching. This process has allowed them to reposition their epistemological beliefs. Researchers (Orland-Barak & Yinon, 2007; Schon, 1987) have advocated for the importance of the development of reflective practice in teacher education programmes. In order for the students to benefit from the subject specific component or school attachment period in the programme, the ability to reflect on and reconstruct their understanding is crucial. It is this ability to reflect which may explain the changes in their epistemological beliefs. Though there is no direct relationship between the General Education component and classroom teaching, the GE did succeed in nurturing critical thinking ability among the students.

4.2 Integrating theory and practice

While the three approaches (procedural, adaptive and reflective) (Section 3.5.2.1) to integrate theory and practice can be taken as discrete and separate, they can also be viewed in a developmental sense in which student-teachers should aim to achieve the reflective approach and develop their personal theory or schema about teaching. The starting point can be taken as a procedural approach. With some reflection and practice, the student-teachers should not only be able to categorize teaching strategies but also to refine and adapt them. The focus of attention should shift from concerns about teachers teaching to students learning. Student-teachers adopting a reflective approach demonstrate the ability to analyze the classroom situations and their practice with an emphasis on student learning.

The findings identify influences from the teacher education programme which are related to the development of a reflective approach. The discussion of the range of

teaching pedagogies has to be made in the light of addressing diverse learner needs. The lecturers are crucial in facilitating the development of a reflective approach as they engage with the student-teachers in critical analysis of the subject, and provide detailed and quality feedback on the performance of the student-teachers. Both the ability and the personal attitude to engage in critical analysis are directly related to the adoption of a reflective approach. The feedback from lecturers stimulates the student-teachers to reflect on their performance and actively nurtures the ability to reflect. Moreover, the development of lecturer-student relationships has a long term impact on how student-teachers approach their own learning and teaching as well as developing a reflective attitude.

The lecturers and institute supervisors play an important role in modeling as well as nurturing the attitudes and skills for reflection among the student-teachers. The impact of modeling by the lecturers in the campus-based programme, and quality supervision during field experience as consistent with other research (Beck & Kosnik, 2002; Cheng et al., 2010) cannot be ignored. These findings imply that teacher educators need to maximize the opportunities for the student-teachers to make their thinking and values explicit and provide the stimulations for reflection, for example, by eliciting student-teachers to respond to and/or provide feedback about the knowledge or contents discussed in the modules.

4.3 Conclusion

Taking the findings together, the knowledge component and the teaching contexts provide stimulation for the students to reflect on their epistemological beliefs. The GE component enhances their ability to think critically and engage in reflection. These conditions in the programme should appear in a spiral manner such that the students are exposed to such opportunities continuously, and that continual changes in the form of sustained development in epistemological beliefs can be effected. For example, students may be placed in different teaching contexts, be exposed to different teaching pedagogies, theories of learning and teaching, subject content of different levels of complexity, and overseas learning experience in the teacher education programme. Although it is important that critical thinking or reflection occurs at an individual level, opportunities to engage in group work or interactions with other teachers or researchers, or others who may offer different perspectives will be conducive to the development of reflective thinking ability. Finally, teacher educators may consider including reflective thinking as one of the assessment criteria throughout the programme in an attempt to induce sustained changes in

epistemological beliefs.

The knowledge introduced in the campus-based component underpins the reflective approach. The contribution of Higher Education Institutions to teacher education is central as it nurtures student-teachers to understand 'discipline-based theories and concepts' in relation to the teaching of the subject. This is consistent with Darling-Hammond's (2010) call for figuring out what teachers should have the opportunity to learn and how they should learn it such that the notion that teaching as a profession can move forward. She compared teacher education programmes with the professionalization of medicine. In her discussion, the universities are in the best position to incorporate advances in the profession into their curricula, and that didactic and clinical training should be strong. These suggestions are in line with the findings in this paper, and universities organizing teacher education programmes do need to define 'discipline-based theories and concepts' for the subject(s) the student-teachers are prepared to teach, and advocate strongly that such theories and concepts form an indispensable component of teacher education programmes.

Future studies may look into greater depth at the definition of 'discipline-based theories and concepts' or the nature of knowledge which should be encompassed in teacher education programmes and how these should be taught. While the present study looks into professional learning for student-teachers engaged in an undergraduate four-year teacher education programme, it will be interesting to find out whether or how the findings for postgraduate teacher education programmes differ. Finally, comparisons of professional learning among student-teachers in different teacher education programmes will be interesting. Comparison studies may provide evidence and insights into the pros and cons of different teacher education models.

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