International Journal for the Scholarship of Teaching and Learning

Volume 5 | Number 1 Article 13

1-1-2011

Exploring the Variation in First Year Undergraduates' Induction into Their Academic Disciplines

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Keywords
First year undergraduates, Induction, Academic discipline, Qualitative variation

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Introduction

First year students' experience of integration into their disciplinary community and other communities at university impacts greatly on their intellectual, socio-personal growth and success in undergraduate education (Pascarella & Terenzini, 2005). As new members of university, first year students are faced with the tremendous task of adjusting their beliefs, behaviours, habits and abilities according to the requirements of these communities (Feldman & Newcomb, 1969; Krause, Hartley, James, & McInnis, 2005; Tinto, 1993). Studying at university entails first year students unlearning some old study habits and approaches adopted at school and replace them with some new habits and approaches. This may include moving away from reliance on external, authoritative knowledge to independent and critical judgment, learning to see what is being learned from a holistic perspective and many other learning challenges (Prosser & Trigwell, 1999; Ramsden, 2003). For Chinese students coming from secondary school systems such as those in Hong Kong, Mainland China and Taiwan where the competitive examination systems push schools to adopt an examination-oriented approach to teaching and learning, the transition from

school to university is especially challenging given the excessive emphasis on memorised knowledge for academic success in secondary school education (Watkins & Biggs, 2001).

Concerned particularly with first year students' induction into their academic discipline, this study set out to explore the research questions: What are the nature and structure of the variation in students' experiences of being inducted into their academic discipline during the first year at university? What educational implications can we derive from such variation? By focusing on first year students' induction into the academic discipline, we sought to connect two important, but currently discrete, areas of research in higher education: The first year undergraduate experience and student experience in the disciplines.

In exploring the research questions, we focused specifically on students' induction into their discipline in terms of four dimensions: (1) induction into disciplinary knowledge; (2) induction into disciplinary research; (3) integration of learning from different courses in the discipline; and (4) induction into disciplinary skills. These four dimensions were proposed by synthesising existing theories on what students should learn as new members of their disciplinary community. Several curriculum theorists contended that learning in any discipline is organised around the essential curricular elements: the discipline's key concepts and theories, major texts and discourses, criteria of knowledge claims, methods of research, rules and skills of making arguments and other skills for performing well in the discipline (D'Andrea and Gosling, 2005; Ratcliff, 1997; Stark & Lattuca, 1997). Others emphasised the importance of developing students' ability to integrate learning in different courses in the degree programme, given the interrelatedness of the various curriculum elements. For example, Barnett and Coate (2005) argued that learning of disciplinary contents cannot be sustained without the acquisition of relevant skills. Ramsden (2003) also pointed out that students develop a deep understanding of the discipline by integrating their learning, which entails connecting new knowledge to existing knowledge and applying theories to real-world problems. It was based on these ideas that we proposed to investigate students' experiences in terms of the four dimensions as stated above.

This study was part of a research project on first year experience conducted with students from ten faculties at a research and teaching intensive university in Hong Kong. The project included two phases. The first was an in-depth qualitative study, and the second a broad-based quantitative study. In the first phase, ten focus group interviews were conducted with 2006 entrants at the beginning of their second year to identify issues relevant to their experience during the first undergraduate year. In the second stage, a questionnaire was designed on the basis of issues arising from the focus groups and those identified in the literature. The survey was administered to 2007 entrants at the end of their first year to provide a broader picture of first year experience from a larger sample. This paper is based on the outcomes of the in-depth qualitative study conducted in the first phase, which paved the way for further exploration of students' first year experience at the university in the second phase.

First Year Students' Initial Journey into the Academic Discipline

We examine below relevant themes arising from the literature in two areas: (a) student experience during their first year of university and (b) student experience in their academic disciplines. Research in first year experience concerns itself with the first year students' experience of becoming a part of the academic and social communities at university as

they move from school to university (Harvey, Drew, & Smith, 2006). Studies on student experience in the discipline addressed issues arising from undergraduates' experience of being inducted into their academic discipline in relation to learning approaches employed, and learning outcomes achieved (Biggs & Tang, 2007; Prosser & Trigwell, 1999; Ramsden, 2003).

The first year of university is a critical stage of students' transition from school to university (Tinto, 1993). It is also a problematic phase, because a notable proportion of students were identified in existing studies to have had difficulties in integrating into university (Cook & Leckey, 1999; Lam & Kwan, 1999; Hurtado et al., 2007). Recent changes in higher education such as the gradually diversified student body and the wider use of learning technologies have attracted researchers to study variation in first year experience (Kember, Lee, & Li, 2001; Krause et al., 2005). Researchers have called for more attention to variation in student experience in order to facilitate first year students in integrating into their academic and social communities (Harvey et al., 2006). In this paper, we report on the findings obtained by analysing qualitative data from a phenomenographic perspective (see the Methodology Section for a detailed explanation about the rationale for investigating variation). We would argue that understanding of variation in first year students' induction into their discipline would be helpful in pinpointing the gaps in students' initial disciplinary learning experiences at university, thereby assisting educators and institutions in formulating effective strategies to help students become effective learners in their discipline. Such strategies should expose first year students to learning and assessment tasks that emphasise a deep learning approach and foster a desire for integrated understanding of their discipline. These are manifested in inquiry-based first year seminars, disciplinary-based study skills workshops and learning-oriented teaching and assessment approaches that are embedded in everyday teaching and assessment practices (Biggs & Tang, 2007; Brew, 2003; Pitkethly & Prosser, 2001; Ramsden, 2003).

Research into student experience in different disciplines has indicated that student experience differs in terms of the studying approaches adopted and the quality of learning achieved (Entwistle & Trait, 1995). By employing phenomenographic and multivariate quantitative approaches, researchers have established a clear connection between the way students approach their learning/assessment tasks and learning outcomes, and a close relationship between their study approaches and perceptions of the learning environment (Marton and Säljö, 1976a, 1976b; Prosser & Trigwell, 1999; Ramsden, 2003). Students employing the deep approach tend to achieve high-level learning outcomes characterised with integrated/holistic knowledge. Those who adopt the surface approach focus on aggregating bits and pieces of knowledge or information without seeking the internal logic of the atomistic/fragmented knowledge. The deep approach is fostered by student-centred facilitative teaching-assessment approaches, while the surface approach is encouraged by didactic approaches.

Studies utilising taxonomies of educational objectives also confirmed the relationship between quality of student learning and ways of tackling learning tasks. Biggs' structure of learning outcomes (SOLO) taxonomy represents varied levels of sophistication in understanding learning topics (i.e., prestructural, unistructural, multistructural, relational and extended abstract) (Biggs & Tang, 2007). In Bloom's taxonomy, the six categories of cognitive abilities (i.e., knowledge, comprehension, application, analysis, synthesis and evaluation) correspond to different degrees of complexity in thinking (Bloom, 1956). These taxonomies show that higher-order thinking skills and complex ways of understanding are associated with the deep approach to learning.

To reiterate, the literature suggests a need to unpack the complexity of first year experience by exploring the variation in first year students' induction into the academic discipline in the local contexts of institutions, thereby meaningfully linking two areas of research in higher education – student first year experience of induction into the academic and social communities of university, and student experience in the disciplines. Such local knowledge would be helpful in formulating context-relevant strategies for facilitating first year students in indication into their academic discipline as discussed earlier (Pitkethly & Prosser, 2001).

Methodology

The study was guided by the phenomenographic perspective. The objective of phenomenography is to describe the variation in individuals' experiences and understandings of phenomena in the life world (Marton, 1994). A basic assumption of phenomenography is that different individuals may attach different meanings to the same phenomenon in a given situation, and the same individual may experience and understand the same phenomenon differently when the situation varies (Marton, 1994; Prosser & Trigwell, 1999). Variation in individuals' meanings arises from the unique relation between each individual and the phenomenon in the lived situation, in which both the individual and situational factors play a critical part in influencing the meaning that the individual has about the phenomenon. Such relational nature of meaning and understanding is derived from the phenomenological idea of intentionality that individuals' consciousness is always directed toward the particular phenomenon being experienced in a specific situation (Husserl, 1967).

In educational terms, then, investigating variation in individuals' understandings can shed light on how learning situations may be constructed to optimally influence students' understanding of things they learn in their discipline. This gave us the rationale for conducting this study to explore the two research questions: What are the nature and structure of the variation in students' experiences of being inducted into their academic discipline during the first year at university? What educational implications can we derive from such variation?

The phenomenographic researcher seeks to identify individuals' qualitatively different conceptions of the phenomenon being studied, and to describe such conceptions using a set of categories of description (Åkerlind, Bowden, & Green, 2005; Marton, 1994; Trigwell, 2000). Each category describes a way in which individuals discern and focus on certain aspects of the phenomenon; and each is defined in terms of its referential component (What aspects of the phenomenon are discerned and focussed on?) and structural component (How is an explanation given about the aspects?).

Previous research has found that "each phenomenon, concept or principle can be understood in a limited number of qualitatively different ways" (Marton, 1986, p. 30). Moreover, there is a logical relation between these categories of description: the less inclusive categories focus on limited aspects, while the more inclusive categories focus on a more inclusive range of aspects (Marton, 1994; Trigwell, 2000). Such logical relationship between the categories may be represented by a hierarchical structure based on the inclusiveness of each category. Together, this hierarchical structure and the categories of description constitute the 'outcome space'. The outcome space represents the totality of all the meanings that individuals have about the phenomenon in question, i.e. all the qualitatively different ways in which individuals experience, perceive, and understand the phenomenon in the given situation.

Sample and Procedure

Ten focus groups were conducted with a total of 42 students (male = 22, female = 20) from across the disciplines at the beginning of their second-year undergraduate study. They were recruited from respondents of an institutional survey, in which they indicated willingness to participate in further research. Although researchers commonly employ individual interviews in phenomenographic studies (Åkerlind et al., 2005; Trigwell, 2000), some have also conducted interviews in focus groups in recent years (e.g., Franz, Ferreira, & Thambiratam, 1997; Hyrkäs & Paunonen-Ilmonen, 2001; see also Marton, 1994 for a description of other methods of data collection in phenomenographic studies). The focus group approach is found to be effective in accessing multiple participants' perceptions and experiences (Wilkinson, 2004). The small size of each group (4-6 students from the same faculty) was favourable for generating rich conversation (Hydén & Bülow, 2003).

All the participants were ethnic Chinese from Hong Kong (n=32), Mainland China (n=7) and overseas (n=3). Except the five Mainland students who spoke Putonghua (Mandarin), all the other students' mother tongue was Cantonese. Therefore, Cantonese (supplemented with Putonghua) was used in the interviews to help the participants to express their ideas more effectively. The interviews were audio-taped and then fully transcribed into English. To enhance trustworthiness of findings, effort was made to eliminate translation errors, and to verify the accuracy of transcripts against notes of each focus group taken by research assistants who assisted in the focus groups.

Analysis

Phenomenographic analysis was employed in exploring data relevant to three dimensions of students' induction into disciplinary learning: (i) induction into disciplinary knowledge, (ii) induction into disciplinary research, and (iii) integration of learning in the discipline. In each of the three dimensions, a set of categories of description was generated by a procedure that involved the researchers to: (a) compare the similarities and differences in participants' conceptions, (b) tentatively arrange parts of the transcripts into the emerging categories, and (c) constantly check the categories against the transcripts until the categories exhausted all possible conceptions of the phenomenon (Patrick, 2000). The categories were described in detail and compared with one another, and their internally logical relationship represented with a hierarchical structure (Åkerlind et al., 2005).

The categories of description and their hierarchical structure were then represented as the "outcome space". This is presented in the forms of text and tables in the Results Section below. The text gives detailed explanation of the key attributes of each category, which are illustrated with excerpts from students' accounts. Tables 1, 2 and 3 visually summarise the categories and demonstrate the logical relation between them, showing how the students' different ways of understanding the discipline moved 'from limiting to more and more sophisticated' (Trigwell, 2000).

Because the kinds of disciplinary skills that students identified differed considerably, it was considered inappropriate to compare the qualitative differences in students' experiences of being inducted into the fourth dimension of disciplinary learning - disciplinary skills. Content analysis was adopted in dealing with the relevant data (Wilkinson, 2004). The skills students identified were classified into different types and the role of the skills in students' learning in the discipline was explored.

Consistent with the general objective of phenomenographic research, the focus of this study was not on how students in any specific discipline experienced induction into their discipline

differently from students in other disciplines. Although it would be important to understand how students' different ways of being inducted in the discipline might be associated with the nature of their discipline, this was not the purpose of this study. Rather, what we sought to provide was a holistic picture about the totality of the different ways in which students experienced and articulated their induction. Neither were the findings meant to be generalisable to other educational contexts. The description of categories of students' disciplinary learning experiences is supplemented with students' quotes, such that readers would be enabled to make judgment of how the findings might (or might not) be applicable to their specific teaching-learning situation.

Results from Phenomenographic Analysis

We present below the results of phenomenographic analysis relating to students' learning during the first year in terms of their induction into disciplinary knowledge, induction into disciplinary research and integration of learning from different courses in the discipline.

Induction into Disciplinary Knowledge

To explore their understanding of disciplinary knowledge after one year's study, the students were asked to give examples of the theories/concepts learned in their discipline. Four categories were identified from student responses.

Category 1: Understanding of disciplinary knowledge was unstructured or disintegrated.

In this category, the students were either unable to give examples of theories and concepts, or were unaware of the existence of any theories and concepts.

A student majored in Translation was unable to identify any theories learned in her major, and viewed the major to be disintegrated:

> No theories in Translation – actually, I think it is not so systematic. The things we have learned are rather loose […]. I can't remember what theories and concepts I have learned.

Category 2: Disciplinary knowledge was understood in an atomistic manner.

Students in this category typically mistook learning topics or course titles as theories and concepts, and perceived learning topics as unrelated and learning as quantitative aggregation of content.

A student of Food and Nutrition mentioned course titles and viewed her first year courses as belonging to two unrelated fields:

> In Year 1, we learned things about Food. We also learned things such as Functional Biology, which are related to Biology but not related to Food. Things related to Food included Introduction to Nutritional Science, Chemistry and the like.

A student of Biotechnology listed learning topics and perceived learning in his discipline as quantitative accumulation of knowledge:

> What we learned in Year 1 was basically a revision of what we learned in A-level courses with more explanations. [For instance,] how the cell-to-cell communication is like and the deeper things such as signals […].

Category 3: Disciplinary knowledge was understood in a fragmented fashion, with awareness of one or two theories or concepts and their application in practice.

Compared to Category 2, Category 3 represented a more complex way of understanding disciplinary knowledge. In this category, students were able to mention one or two theories or concepts but could not explain their meaning. Unlike students in Category 2 who focused on learning topics or course titles, students in Category 3 focused on theories, concepts and principles. They were also more explicit about the application of disciplinary knowledge, though they mainly focused on its application in academic study.

One example is the comment of a student of Medicine on the application of medical knowledge in clinical practice as part of his degree programme:

> An example of concepts we learned is the Starling's law […] but I can't remember the details […]. The aim of learning these concepts is to make it less difficult for us when it comes to clinical practice […].

Category 4: Disciplinary knowledge was understood in a holistic manner in terms of the meaning of theories, principles and concepts and their application.

Of the four categories relating to induction to disciplinary knowledge, Category 4 was the only one that represented a sophisticated understanding of disciplinary knowledge. In Category 4, the students were not only able to provide examples of principles, theories and concepts learned (Category 3), but also went beyond those in Category 3 by articulating the meaning and application of the principles, theories and concepts mentioned. Also, when commenting on the application of disciplinary knowledge, students in Category 4 focused on application in both academic study and practice.

A quote from a student of Political Science explained the meaning of a key theory and its application in practice and study:

> We've learned realism, rational choice theory and so on. Rational choice theory assumes that a person is rational and s/he does things that are self-maximising […]. Theories may appear to be quite boring, but if you do not learn theories, how do you come to understand the practical situation? They also equip a student with basic knowledge for learning Politics.

Outcome Space of Students' Induction into Disciplinary Knowledge

Table 1 presents the outcome space of students' induction into knowledge in their discipline. The referential component of each category is defined as the aspects of disciplinary knowledge students mentioned. The structural component refers to the way in which students gave explanation of the aspects. The inclusiveness of the referential component and the coherence of the structural component increased gradually across the categories. The categories thus form a hierarchical structure in which the level of sophistication in students' understanding of disciplinary knowledge increased from Category 1 to Category 4.

Table 1. Categories of Description Relating to Students' Induction into Disciplinary Knowledge

Structural	**Referential**			
	No topics, theories or concepts	Topics without theories or concepts	Topics with theories or concepts and application in study	Topics with meaning of theories or concepts and application in practice and study
Unstructured	Category 1			
Atomistic		Category 2		
Fragmented			Category 3	
Holistic				Category 4

Induction into Disciplinary Research

Students' induction into disciplinary research was explored by asking them to give examples of areas of research and methods of inquiry in their major. Four categories of description emerged from the data.

Category 1: Understanding of disciplinary research was minimal.

In this category, students were unable to mention either research areas or methods of inquiry in their discipline and viewed research as irrelevant to their undergraduate studies.

For example, two students of Translation commented on the irrelevance of disciplinary research to their undergraduate studies:

> I have not noticed any research topics in Translation.
>
> Research topics seem to have nothing to do with undergraduate students.

Category 2: Disciplinary research was understood in an atomistic manner, with an awareness of one or two aspects of disciplinary research and how it was related to disciplinary knowledge or professional practice.

Unlike students in Category 1 who could not mention any aspect of disciplinary research, students in Category 2 were able to report certain research areas or certain research methods. They were also aware of the relevance of disciplinary research to practice or disciplinary knowledge.

A student of Dentistry mentioned an area of dental research and commented on how disciplinary research was related to advancement of disciplinary knowledge:

> I know Dentistry explores those areas that are still unknown to us, those not fully investigated or those where criticisms exist. For instance, some diseases […] change constantly, and therefore research needs to focus on that […]. Areas like Periodontosis are specialised fields for research.

Two students of Law commented on the skills and resources for legal research learned in a course and how these might be applied in professional practice:

> The course taught us different [research] methods and the tutors guided us to do research. We were taught some guidelines, such as to use the library and online resources like Westlaw which is a research system.
>
> After we enter the profession, our clients might bring to us cases of which we have no clue. The course Legal Research and Writing presented such cases for us to practice […].

Category 3: Disciplinary research was understood in a fragmented manner, with an awareness of its different aspects and how it was related to disciplinary knowledge and practice.

Unlike students in Category 2 who were commented only on either certain research areas or certain research methods/skills, students in Category 3 identified both research areas and methods of inquiry in their discipline. Similar to students in Category 2, students in Category 3 were aware of the relevance of disciplinary research to knowledge and practice.

A Dental student mentioned research skills used in specific areas of research without giving details:

> We had a PBL problem about case control studies for studying Epidemiology, and we learned there are different methods for sampling […]. If it is about testing saliva, like what we learn in Microbiology, it will involve looking at the microscope in the lab.

A student of Sociology reported the use of philosophical perspectives in examining topics in Sociology. Yet, he mistook these perspectives as 'methods' rather than theoretical frameworks for sociological research.

> In Sociology, we also have methods [of inquiry…]. For instance, structural perspective divides the society into different structures in order to study the society […]. These perspectives were included in a chapter of the course, and it was about how we approach Sociology.

Category 4: Disciplinary research was holistically understood in terms of its different aspects and its relevance to knowledge and practice.

Similar to students in Category 3, students in Category 4 mentioned both certain research areas/topics and research methods/skills in their discipline as well as how disciplinary research was relevant to knowledge and practice. Nevertheless, students in Category 4 went beyond those in Category 3, because they commented on how the methods or skills were employed in investigating specific topics.

A student of Civil Engineering pointed out how research skills were used in investigating a research topic (pollution):

> When taking a tutorial on Environment, we worked with the professor and did things related to research. The tutorial was about the relationship between the pollution of Shenzhen River and its impact on environment. We learned how to measure the pollutants and control their impact […].

A student of Political Science mentioned a research method for exploring topics in political research and elaborated on the relevance of research to practice (policy-making) and knowledge (political science):

> I think that public opinion pools are important for analysing trends of public events, since such analysis is normally used by governments in policy-making […]. And because any significant political events can have impact on the whole world […], political scientists can analyse the impact of an event, say 9.11, on the different aspects of nations in the world.

Outcome Space Relating to Students' Induction Into Disciplinary Research

Table 2 shows the outcome space of students' induction into disciplinary research. The referential component of each category refers to the aspects of disciplinary research students identified. The structural component indicates the way in which students gave explanation of the aspects. Similar to students' induction to disciplinary knowledge, the four categories relating to students' induction to disciplinary research took the shape of a hierarchical structure, in which the level of sophistication of students' understanding of disciplinary research increased gradually from Category 1 to Category 4.

Table 2. Categories of Description Relating to Students' Induction into Disciplinary Research

Structural	**Referential**			
	No research areas/topics or research methods/skills	Either research areas/topics or research methods/skills, and relevance of research to practice or knowledge	Research areas or topics, research methods/skills, and relevance of research to practice or knowledge	Research areas or topics, research methods/skills, relevance of research to practice or knowledge, and an explanation of the use of methods in investigating topics
Unstructured	Category 1			
Atomistic		Category 2		
Fragmented			Category 3	
Holistic				Category 4

Integration of Learning in the Discipline

To explore the extent to which the participants were able to holistically view their learning from different courses in their major area(s) of study, responses were solicited in relation to participants' perception of the relationship between the different courses learned in the major (course-to-course relationship) and the relationship between these courses and their major or profession (course-to-major relationship). Three categories of description were identified. Category 1 that represents unstructured conception was not found in this dimension and is thus not described here.

> **Category 2: Learning from different courses in the discipline was understood in an atomistic manner, with an awareness of how learning in different courses was related to the major / profession.**

Students in this category regarded the courses learned in their major as belonging to two or more unrelated fields and were unable to comment on how learning from different courses might be connected. Some of them were aware of, but could not comment on, the course-to-major relationship in their discipline.

A student majored in English Language Education recognised a general course-major relationship; he was uncertain how learning from different courses might be interrelated.

> I feel the courses belong to separate fields. We learned Phonetics and Phonology, which were about speaking. Then we learned Lexis, which was about vocabulary learning. Now we are learning writing […]. Yes, our courses are related to our major.

For a student of Surveying, some courses were related to one another, but others were not. He appreciated the course-major relationship due to his practice in a part-time job.

> In Surveying […], the Year 2 Law courses are not based on Law courses in Year 1. However, to take Year 2 courses on Construction, we have to have learned those Year 1 courses […]. After taking a part-time job in the summer holiday of Year 1, I realised that what I have learned had practical application in my profession.

Category 3: Learning for different courses in the discipline was understood in a fragmented manner, with some awareness of how learning in different courses was related to the major/profession.

Students' responses in Category 3 showed an awareness of the relationship between the courses they had so far learned, which was absent in Category 2. Two types of course-to-course relationship were identified by students: (1) different courses shared commons or similar elements, and (2) some courses (typically first-year courses) laid foundation for other courses (typically second year courses). Similar to Category 2, some students in Category 3 also expressed an awareness of course-major relation relationship, but generally could not explain how learning in different courses was related to the major.

A student of Civil Engineering identified shared contents in different courses:

> Yes, my courses are related […]. There is an indirect relationship between Year 1 and Year 2 courses. For instance, I found that the experiment I did this morning on soil was related to what we learned in Soil Mechanics in Year 1.

A student of Mathematics explained how learning in some courses was based on learning in other courses. However, he understood learning in the major as quantitative accumulation of content from different courses.

> All courses I have taken are related. Statistics use a lot of mathematic methods […]. After collecting data, we can handle them with algebraic skills […]. Yes, my courses are related to my major. Mathematics has many branches such as Statistics. You have to take three to four courses to learn each branch.

Category 4: Learning in the discipline was understood in a coherent manner with an explicit awareness of how learning in different courses was related to the major/profession.

Category 4 was the most inclusive among the three categories identified in this dimension. Similar to Category 3, students in Category 4 also recognised their courses as relating to one another and learning in different courses as relating to their major. However, students in Category 4 went beyond those in Category 3 in that they were able to recognise the key subject matter as the linkage between different courses and as the centre of the major.

A student of Cognitive Science explained that all of her courses were about the key subject matter in her discipline, which was the human mind:

> Perhaps our programme has been designed around how the mind works. For example, Philosophy is about the human mind, and so is Cognitive Science. Actually, whatever we are learning, it always centres on how human beings think – all courses are about this. Occasionally, certain courses may overlap – not exactly overlap, but are relevant to each other. For example, some contents we learned in Philosophy last year have now appeared again in Cognitive Science […].

Outcome Space of Students' Integration of Learning in the Discipline

The outcome space of students' integration of learning in the discipline is illustrated in Table 3. The referential component of each category refers to the aspects of course-to-course relationship and course-to-major relationship discerned by students. The structural component encompasses the way in which students explained the relationships. Three categories were identified and their relationship is illustrated with a hierarchical structure. In this structure, the level of sophistication of students' understanding of course-to-course and course-to-major relationship increased from Category 2 through Category 3 to Category 4.

Table 3. Categories of Description Relating to Students' Integration of Learning in the Discipline

Structural	**Referential**			
		A general awareness of course-to-major relationship		Major as an integrative whole in which courses were organised around key subject matter
		Courses were separated into unrelated fields	Some courses shared certain contents; or some courses laid foundation for other courses	Relevance of courses to one another due to shared key subject matter
Unstructured	--			
Atomistic		Category 2		
Fragmented			Category 3	
Holistic				Category 4

Results from Content Analysis

Having presented the findings based on phenomenographic analysis, we now turn to results from content analysis relating to students' induction to disciplinary skills.

Induction into Disciplinary Skills

Students' understanding of the disciplinary skills was explored by asking them to identify the skills that were important for learning in their discipline and to explain why such skills

were important. The disciplinary skills identified by students were grouped into three types: cognitive skills, professional skills and study skills.

Cognitive Skills

Cognitive skills identified by students included problem-solving and critical thinking. Problem-solving was mentioned mainly by those majored in the Sciences, Medicine, Dentistry, Law and Engineering. Although their understanding of it varied to some extent, they commonly associated problem-solving with critical thinking and analytical skills.

Students majored in the Sciences mentioned that they solved problems by applying formula or definitions memorised from learning materials. This conception of problem-solving implies a surface approach to problems, which is associated with atomistic understanding of what is being learned. For example, a student of Mathematics commented:

> At university, Mathematics involves a large number of definitions […]. In five courses, there can be as many as 500 definitions to memorise. You have to be very good at analysing problems. When you are given a problem, you need to know what is being asked, and how the solution should be developed.

For the participants majored in Law, problem-solving was to do with analysing concrete legal problems as opposed to broad social issues. Since this conception regards theory (discussion on social issues) and practice (problem-solving) in learning as isolated realms, it reflects a fragmented understanding of the relationship between courses in their major, which is similar to Category 2 in students' integration of learning in the discipline. Below is a quote from one of the Law students:

> Courses like Constitution are more theoretical and related to social issues. In such courses, we would not solve problems but would discuss social issues - we would write essays on how we perceive issues as observers. On the other hand, problems to solve are those related to ourselves, to business disputes, etc.

Those majored in Medicine and Dentistry regarded problem-solving as a process which required students to think critically in order to tackle the problem effectively. This conception reflects the deep approach to learning, which is associated with holistic understanding of the problem. As a Medical student mentioned:

> In PBL sessions, we learned to become critical and to distinguish what is important and what is not. At first, we asked all sorts of questions [about the problems], but the questions were very unhelpful […] Gradually, as we learned bit by bit, the questions asked became more critical and specific, so that learning became more effective as well […].

Students who considered critical thinking as an important disciplinary skill typically associated it with constructing personal meanings and ideas in relation to learning tasks. Such a conception again is associated with holistic understanding of what is being learned. This can be exemplified by an excerpt from a student of Architecture:

> In our major, the most important thing is how to think and how to stick to one's own ideas. Instead of abandoning our ideas when hearing other people's objections, we should think of ways to improve the ideas. Thus, our major places much emphasis on critical thinking.

Professional Skills and Attributes

Professional skills and attributes were mentioned mainly by the participants majored in professional disciplines. Examples of such skills include classroom teaching techniques, skills of drawing and modelling, translation skills, clinical practice, research, and computer skills.

For instance, observation and lesson planning were reported by a student of English Language Education:

> In classroom teaching, we need to observe students and analyse what they have not mastered. Also, we need to plan lessons. These are important skills to learn in our courses.

A student of Civil Engineering mentioned research skills and presentation skills:

> There was a course called Studio. We learned to do presentation and research which involved data analysis. I think these are very useful in our profession, because in the summer when I did my summer internship, I applied all these skills in my work.

Study Skills

Participants identified a range of study skills: self-learning, time management, analytical and logical reasoning, reading, writing, presentation and oral communication, computer skills, and research skills. These skills to some extent overlapped with professional skills.

A student of Civil Engineering explained why writing skills were indispensable for doing well in his major:

> In a course named Construction Materials, we did a lot of writing, and it did not require us to give an absolutely right answer […]. The purpose was to train our ability to convince the professor and, in the future, the clients.

A student of Cognitive Science discussed the importance of time management for dealing with workload while maintaining quality learning:

> An important skill we have learned in Year 1 was time management…We had to take Computer Science in both semesters. We were given one assignment every two weeks and each needed two weeks to complete […]. It was not just about taking time to read, to think and to do the assignment, as we also had to take time to understand the mistakes that we made […].

Discussion and Conclusion

In this study, data from ten focus groups were gathered to explore the variation in first year students' induction into their discipline in four dimensions. The findings provide a rounded picture of the gap between desirable understanding and students' actual conception about the discipline. Such a picture would be important in building constructive learning environments to support first year students' induction into the discipline.

Phenomenographic analysis (Patrick, 2000; Trigwell, 2000) identified four categories of description regarding induction into disciplinary knowledge and disciplinary research, and three categories regarding integration of learning. In each dimension, a comparison of the referential and structural components of the categories revealed a hierarchical relationship between the categories, ranging from less inclusive to more complete and coherent

understandings. Previous research into student learning in the disciplines focused primarily on disciplinary knowledge (Entwistle & Trait, 1995; Marton and Säljö, 1976a, 1976b; Prosser & Trigwell, 1999; Ramsden, 2003). The new findings of this study have extended this research by focusing also on disciplinary research and integration of learning from different courses. The methodology highlighted the need to differentiate students' qualitatively different understandings of these dimensions. While some students identified no aspect of disciplinary research or just one or two isolated aspects, others gave more coherent explanations of key aspects of disciplinary research and how it was applied to practice. Similarly, students' understanding of integration of learning in the discipline ranged from the perception of the courses as representing segregated domains, through the idea that their courses overlapped in some contents, to the understanding that all courses revolved around the core subject matter.

Content analysis showed three types of disciplinary skills to be important to students: cognitive skills, professional skills and study skills. Students in different disciplines mentioned somewhat different skills, even though some of the skills overlapped. One important new finding is the distinction in students' perceptions of problem-solving and critical thinking. While some students held the rigid conception of problem-solving as application of memorised formula or facts, others went beyond such limited conception by linking problem-solving to critical thinking and personal meanings.

The findings caution that by the end of their first year at university, many students may still hold naïve and limited understanding about their academic discipline. This highlights that the initial year of undergraduate study is indeed a critical stage during which students struggle to become effective members in their disciplinary community (Kember et al., 2001; Krause et al., 2005; Pascarella & Terenzini, 2005; Pitkethly & Prosser, 2001; Tinto, 1997; Yorke & Longden, 2007). The findings also provide a rounded picture of the gap between desirable understanding and students' actual conception in terms of the four dimensions of the discipline, which is important for formulating appropriate teaching and assessment strategies that best facilitate first year students' induction into the discipline.

The findings suggest that in order to help first year students develop holistic conceptions about disciplinary knowledge and skills, it is important to assign them learning-oriented tasks, such as essays, projects, case studies, and authentic problem-solving tasks (Biggs & Tang, 2007; Brew, 2003; Carless, Joughin, & Liu, 2006; Ramsden, 2003). Tasks of this kind can nurture deep learning associated with sophisticated understanding, requiring students to focus on the meaning of concepts and exercise higher-order cognitive skills. When performed in groups, such tasks can assist the development of practical skills (e.g., collaboration and communication) that are indispensible for students' future career success. This can be contrasted to traditional standardised tests that tend to reinforce reliance on rote learning and generate limited understanding. Further, to help students recognise the relevance of disciplinary research to their own learning, students may be involved in research and other inquiry-based tasks that require them to investigate discipline problems alongside teachers and peers (Brew, 2003). Assignments such as practical projects, field trips and capstone experiences may also be used to provide opportunities of making connections of what has been learned across their courses (Carless et al., 2006).

Common to all these approaches is the emphasis on nurturing students' capability to engage in self-regulated, independent learning (Boud, 2007), which is essential for students' effective participation in their discipline. In applying the approaches, teachers need to balance attention to all the four dimensions and to take students' level of understanding into consideration.

References

Åkerlind, G., Bowden, J. A., & Green, P. (2005). Learning to do phenomenography: A reflective discussion. In J. A. Bowden & P. Green (Eds.), *Doing developmental phenomenography* (pp. 74-100). Melbourne: RMIT University Press.

Barnett, R., & Coate, K. (2005). *Engaging the curriculum in higher education*. Maidenhead: Society for Research into Higher Education & Open University Press.

Biggs, J., & Tang, C. (2007). *Teaching for quality learning* (3rd ed.). Buckingham: Society for Research into Higher Education and Open University Press.

Bloom, B. S. (1956). *Taxonomy of educational objectives: Handbook 1, Cognitive domain*. New York: Longman.

Boud, D. (2007). Reframing assessment as if learning is important. In D. Boud & N. Falchikov (Eds.), Rethinking assessment in higher education. London: Routledge.

Brew, A. (2003). Teaching and research: New relationships and their implications for inquiry-based teaching and learning in higher education. *Higher Education Research & Development, 22*(1), 3-18

Entwistle, N., & Trait, H. (1995). Approaches to studying and perceptions of the learning environment across disciplines. In N. Hativa & M. Marincovich (Eds.), *Disciplinary differences in teaching and learning: Implications for practice* (pp. 93-104). San Francisco: Jossey-Bass Publications.

Cook, A., & Leckey, J. (1999). Do expectations meet reality? A survey of changes in first-year student opinion. *Journal of Further and Higher Education*, 23(2), 157-171.

Carless, D., Joughin, G., & Liu, N. F. (2006). *How assessment supports learning: Learning-oriented assessment in action* (Eds.). Hong Kong: Hong Kong University Press.

D'Andrea, V., & Gosling, D. (2005). *Improving teaching and learning in higher education: A whole institutional approach*. Buckingham: SRHE and Open University Press.

Feldman, K. A., & Newcomb, T. (1969). *The impact of college on students*. San Francisco, Jossey-Bass.

Franz, J., Ferreira, L., & Thambiratam, D. P. (1997). Using phenomenography to understand student learning in civil engineering. *The International Journal of Engineering Education, 13*(1). Retrieved May 10, 2010, from http://www.ijee.dit.ie/articles/999987/article.htm

Harvey, L., Drew, S., & Smith, M. (2006). *The first year experience: A literature review for the Higher Education Academy.* York: HE Academy. Retrieved Sep 13, 2010, from http://www.heacademy.ac.uk/assets/York/documents/ourwork/archive/first_year_experience_exec_summary.pdf

Hurtado, S., Han, J. C., Sáenz, V. B., Espinosa, L. L., Cabrera, N. L., & Cerna, O. S. (2007). Predicting transition and adjustment to college: Biomedical and behavioural science aspirants' and minority students' first year of college. *Research in Higher Education*, 48(7), 841-887.

Husserl, E. (1967). *Phenomenology and the crisis of philosophy*. Translated with notes and introduction by Quentin Lauer. New York, Harper & Row Publishers.

Hydén, L. C., & Bülow, P. H. (2003). Who's talking: Drawing conclusions from focus groups - Some methodological considerations. *International Journal of Social Research Methodology, 6*(4), 305-321.

Hyrkäs, K., & Paunonen-Ilmonen, M. (2001). The effects of clinical supervision on the quality of care: Examining the results of team supervision. *Journal of Advanced Nursing*, 33(4), 492-502.

Kember, D., Lee, K., & Li, N. (2001). Cultivating a sense of belonging in part-time students. *International Journal of Lifelong Education, 20*(4), 326 - 341.

Krause, K., Hartley, R., James, R., & McInnis, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. Retrieved August 10, 2007, from http://www.griffith.edu.au/centre/gihe/aboutus/klk_publications/FYEReport05.pdf

Lam, B. H., & Kwan, K. P. (1999). Student expectations of university education. In J. Jones & K. P. Kwan (Eds.), *Evaluation of the Student Experience Project* (Vol. 3, pp. 11-20). Hong Kong: Center for the Enhancement of Learning and Teaching, City University of Hong Kong.

Marton, F. and Säljö, R. (1976a). On qualitative differences in learning: I-Outcome and process. *British Journal of Educational Psychology*, 46, 4-11.

Marton, F. and Säljö, R. (1976b). On qualitative differences in learning: II-Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology*, 46, 115-127.

Marton, F. (1986). Phenomenography - A research approach to investigating different understandings of reality. *Journal of Thought, 21*(3), 28-49.

Marton, F. (1994). Phenomenography as a research approach. In T. Husén & T. N. Postlethwaite (Eds.), *The international encyclopedia of education* (2nd ed., Vol. 8, pp. 4424-4429). London: Pergamon Press.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research. Volume 2*. Indianapolis, IN: Jossey-Bass.

Patrick, K. (2000). Exploring conceptions: Phenomonography and the object of study. In J. A. Bowden & E. Walsh (Eds.), *Phenomenography* (pp. 117-136). Melbourne: RMIT University Press.

Pitkethly, A., & Prosser, M. (2001). The first year experience project: A model for university-wide change. *Higher Education Research & Development, 20*(2), 185-198.

Prosser, M., & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education*. Buckingham: The Society for Research into Higher Education & Open University Press.

Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed.). London: RoutledgeFalmer.

Ratcliff, J. L. (1997). What is a curriculum and what should it be? In J. G. Gaff & J. L. Ratcliff (Eds.), *Handbook of the undergraduate curriculum: A comprehensive guide to purposes, structures, practices, and changes* (pp. 5-29). San Francisco: Jossey-Bass.

Stark, J. S., & Lattuca, L. R. (1997). *Shaping the college curriculum*. Needham Heights. MA: Allyn & Bacon.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Trigwell, K. (2000). A phenomenographic interview on phenomonography. In J. A. Bowden & E. Walsh (Eds.), *Phenomenography* (pp. 62-82). Melbourne: RMIT University Press.

Tinto, V. (1997). Classrooms as communities: Exploring the educational character of student persistence. *The Journal of Higher Education*, *68*(6), 599-623.

Yorke, M. and B. Longden (2007). *The first year experience in higher education in the UK*. Heslingon, UK: HE Academy.

Watkins, D., & Biggs, J. (2001). *Teaching the Chinese learner: Psychological and pedagogical perspectives* (Eds.). Hong Kong: University of Hong Kong, Comparative Education Research Centre.

Wilkinson, S. (2004). Focus group research. In D. Silverman (Ed.), *Qualitative research: Theory, method and practice* (pp. 177-199). London: SAGE.