

**Group Dynamics in Problem-Based Learning (PBL): A Case Study of
Architectural Students in a Hong Kong University**

Thesis Submitted for the Degree of

Doctor of Education

University of Leicester

by

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2011

DECLARATION

This thesis is my own work and no part of it has been submitted to a degree at this, or any other, University.

A handwritten signature in black ink, appearing to read 'Wong Joseph Francis', with a long horizontal stroke extending to the right.

WONG Joseph Francis

ABSTRACT

This thesis investigates the individual and group behaviour of students in Hong Kong who are experiencing a Problem-Based Learning (PBL) curriculum for the first time. The research examines how they cope with problems arising from small group collaborative learning and factors influencing their group dynamics in a PBL setting. The central research question is, “How does a group of university students in a Hong Kong cope with the group dynamics, both inside and outside the classroom, when experiencing a PBL situation in their programme?” Following an interpretivist paradigm, this study aims to develop a substantive theory of the interaction among university students in a PBL tutorial environment and associated phenomena. This research has employed the qualitative approach of grounded theory research methods to collect and analyse data from twelve first year students studying in the Associate of Science in Architectural Studies programme at the City University of Hong Kong. Data collected from semi-structured interviews, non-participant video-taped observations, and documents were triangulated to enhance the rigour of the study. The Theory of Adaptive Formation that has emerged from this study explains the interactive processes that determine student behaviour and group dynamics in the PBL small group collaborative learning setting and describes the phenomenon of constant *formation* and *re-formation* adopted by the students and tutorial groups to adapt to different situations arising from the PBL process under the influence of four key factors: *Group members*, *Problem brief*, *Tutor influence* and *Group collaboration*. The theory also explains the relationship between the four student types – *Drivers*, *Adventurers*, *Workers* and *Riders* – and the key factors. Although the emergent theory remains predominantly substantive in nature, this study illuminates important implications for the stakeholders as well as highlights critical recommendations for practitioners and researchers of PBL.

DEDICATIONS

I wish to dedicate this thesis to,

My Mother, for her eternal kindness and showing me at a very young age the virtues of
education and educating;

My Sons, Jerome and Jeremy, for bringing me laughter and excitement in their own
special ways amidst the tedium of going through heaps of data;

My lovely Wife, Cecilia, for her endless love and unconditional support;

and My Late Father.

ACKNOWLEDGEMENTS

I would like to acknowledge with the deepest gratitude to my supervisor, Professor Clive Dimmock, who has painstakingly guided me through every stage of this study and every page of the thesis. His patience, insights and profound knowledge were especially valuable during difficult periods in my doctoral studies.

I am grateful to the students who have participated in the research, especially to the twelve who have participated in the interviews. Their enthusiasm and contributions have enriched this study in many ways.

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CHAPTER 1:

THE RESEARCH PROBLEM

1.0 Introduction

This thesis investigates the individual and group behaviour of students in the sub-degree architectural studies programme at the City University of Hong Kong (CityU) who are experiencing a Problem-Based Learning (PBL) curriculum for the first time. The research examines how they cope with issues arising from small group collaborative learning and factors influencing their group dynamics in a PBL setting. Grounded theory research methods are adopted to analyse primary data collected from interviews and observations to formulate a substantive theory on student and group behaviour in a PBL setting.

As the focus shifts from “teaching” (teacher-centred) to “learning” (student-centred) in the development of modern educational approaches, the interrelationship has also changed from a more singular one-to-many to a pluralistic many-to-many. The *learning paradigm* involves not only two-way dialogues between the teacher and the students but also active inquiry and discussions among the students themselves. Thus, the teacher is no longer the only source of knowledge: students are not only taught by one but learning from many. Similarly, with the teacher’s role shifted in learning-centred approaches in education, the

students all become active agents in determining *what* and *how* they want to learn – i.e. what kind of knowledge is needed and how can that knowledge be developed.

In Hong Kong, one of the student-centred methods gaining acceptance among different disciplines is Problem-Based Learning (PBL), which was first developed for medical education in North America in the 1970s. At present, PBL is adopted at varying degrees in a broad range of subjects in Hong Kong, including medicine, education, language, speech therapy, architecture, and so on. The aim of this study is to develop a theory of the learning experience of new students in a PBL context and how they cope with problems arising from small group collaborative learning setting. The participants in this research are first year students in an architectural studies sub-degree programme that has incorporated PBL as an integral part of the curriculum.

This chapter presents an overview of the thesis. First, it introduces the background and context of the problem. This includes an overview of the PBL pedagogical approach, an examination of the traditional focus of architectural education – design studio education, the relationship between problem-based and project-based approaches, and issues relating to adjustment to PBL. Second, the research aims and proposed significance of this study are discussed. Finally, the various limitations of this study are explained. A brief overview of the thesis is also presented at the end of the chapter.

1.1 Background and Context of the Problem

The teaching and learning approaches in universities in Hong Kong are largely driven by policies of the University Grants Committee (UGC), which is the non-statutory body that oversees the funding and development of higher education in Hong Kong. Since 2005, the UGC has been advocating Outcomes-based Approaches (OBA) and has encouraged all UGC-funded institutions to adopt OBA in their programmes (Hong Kong University Grants Committee, 2006, 2010). As a result, various teaching and learning approaches have been taken up by teaching teams in Hong Kong universities to achieve this UGC initiative.

Some programmes have turned to adopting PBL to meet the objectives of OBA, or Outcomes-based Teaching and Learning (OBTL), as it is known in some institutions. Predominantly educated in a teacher-centred system utilising almost entirely lecture-based approaches to achieve its objectives, students coming into a PBL curriculum or course will face a variety of adjustment problems. This study thus focuses on how students cope with these problems and the factors influencing their behaviour when experiencing PBL for the first time.

1.1.1 PROBLEM-BASED LEARNING (PBL)

Formally structured in medical training in the 1970s, PBL is an educational approach that is gaining wide acceptance in programs from kindergarten to higher education which focus on student-centred learning and the training of processing skills. With a similar focus, a

new re-designed curriculum of the two-year Associate of Science in Architectural Studies (AScAS) programme at the CityU based on problem-based learning approaches was implemented in 2003 by combining the traditional architectural education based on design studio projects and the widely replicated McMaster Medical School PBL model. One of the major components of the McMaster PBL model is the use of small groups of five to six students in a tutored cooperative learning format. This research is a study on the behaviour of students in the small group learning setting and their feedback to this new learning experience.

PBL is a generic term encompassing many forms of education, which include research, case studies, design studio projects, etc. Taking many forms, its approaches can range from individual research under faculty guidance to the small group method (5 to 9 students) favoured by the McMaster Medical School model to large group approaches such as the famed case studies method employed at Harvard Business School, involving over a hundred students at the same time. The new AScAS program follows an innovative curriculum that combines traditional architectural education based on design studio projects and the widely replicated McMaster PBL model, utilizing small groups of five to six students. This unique coupling of the divergent problem-based and convergent project-based approaches facilitates the maximisation of student learning as each approach compensates what is lacking in the other.

1.1.2 DESIGN STUDIO EDUCATION IN ARCHITECTURAL STUDIES

Traditionally, architectural education revolves around the design studio, in which students work on building projects of progressively increasing scale and complexity as their knowledge base grows. Architectural education has experienced various attempts of transformation to keep up with the increasingly complex task of designing for the present day built environment. To do so, it must transform by “broadening its horizons beyond its traditionally perceived limits,” (Leach, 1995, p.28) and move beyond the confines of studio teaching.

Despite a fair amount of group activities, e.g. pin-ups, reviews, presentations, etc., the traditional studio concentrates almost exclusively on individual work and learning. In his study of architecture design studios, Schön (1985) referred to the traditional studio as an exemplary example of a setting for “learning-by-doing”. He termed it a “reflective practicum”, which “would organize itself around projects of simulated practice and would ask students to plunge into these before they know what they need to be doing or learning” (Schön, 1985, p.89). Typically, at the beginning of the term the studio instructor would give all students a “design brief” (a set of requirements) for a building type and information on the site on which the project would hypothetically be located. Students would then commence on working on the design of the project based on his background knowledge, knowledge gained formally from subject courses and informally through books and other sources. The student is thus acquiring explicit knowledge and transforming them into tacit knowledge through applying them *in action* on the design project. In this case,

knowledge is transferred through *internalization* in the Nonaka and Takeuchi's (1995) model of knowledge transfer.

Even the most experienced designers would find themselves having difficulty trying to express in words the precise knowledge behind the actions leading to the design. When designers are *in the action of designing*, however, they are obviously guided by some kind of subjective and experience based knowledge that informs them on their decision-making. This body of knowledge manifests itself only *in action* and is therefore context specific. This knowledge is termed *tacit knowledge* by Polanyi (1966), who observed that people can know more than what they can declare explicitly.

Although many architects seem to agree to the *tacitness*, or *implicitness*, of the knowledge in their own domain of expertise, there must evidently be some kind of sharing of this set of knowledge among architects in order to build a professional knowledge base upon which architectural education is structured (Habraken, 1997). As opposed to *explicit knowledge*, i.e. knowledge that can be codified, the notion of tacit knowledge encompasses the full range of unarticulated and tacitly accepted conventions and social practices on which all articulated knowledge is based. The transfer processes for tacit and explicit knowledge form the backbone of learning whenever experiential knowledge is generated from the activities of individuals who belong to a larger group. The success of each of the knowledge transfer processes in the model can therefore also be used as a measure of how effective knowledge is leveraged within a group of individuals.

The backbone of the design studio consists of periodic individual reviews known as “desk-crits” during which instructor and student interact on a one-on-one basis. These are sometimes replaced by group reviews in the form of pin-ups or mid-reviews and culminate in the final review when students present the full results of their designs to a panel of design critics commonly including external reviewers from other studios, other universities, practices and professional institutes. During desk-crits students will show the progress of their designs to the studio master, who will comment on each individual project and start to build up a dialogue with the student. For a student to defend his design against the studio master’s comments, he must first try to comprehend the comments’ meaning and implications before he can construct his response. To do this, he must reflect critically his own design in relation to the studio master’s comments and in broader architectural terms while simultaneously working on improving the design.

On the other hand, the studio master would give new comments based on the student’s immediate design revisions and a reflection of the student’s response to the previous comments, thereby kicking off a new round of review followed by revision. In this process, there is a reflection part and an action part for both the student and the studio master. The student reflects on the comments received and designs accordingly while the studio master reflects on the designs and comments accordingly. But upon reflecting on one another’s actions, both the student and the studio master must also reflect on and during their own actions before completing the action. Schön calls this process *reflection-in-action*:

Through reflection, [the practitioner] can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice, and can make new sense of the situations of uncertainty or uniqueness which he may allow himself to experience.

(Schön, 1995, p.86)

1.1.3 PROJECT-BASED AND PROBLEM-BASED APPROACHES

In theory, two kinds of knowledge are communicated and shared during the process: the students' own tacit knowledge from past experiences and explicit knowledge acquired when researching for materials for solving the problem case. Each student must learn how to describe their own knowledge-in-action by codifying them into communicable information in order to allow the other students to receive them. Furthermore, the discussion promulgates explicit knowledge contributed by each group member, which will be further analyzed to determine whether the shared knowledge is helpful to solving the problem. This is where students combine the newly acquired explicit knowledge from various sources and assimilate them to make them more useful for the task at hand.

The major difference between the design project and problem case discussion is that the former is convergent in nature while the latter is divergent. A design project begins with a general building type (e.g. a house or a kindergarten) and basic parameters (e.g. site, space requirements, social background, etc.). Students will develop each of their unique design solutions based on this set of general information. On the contrary, the problem case discussion begins with a very particular problem scenario and through dissecting the

problem into a multitude of interrelated issues students acquire knowledge from various topics concerning these issues. The traditional experienced-based studio teaching and learning in architectural education, though widely adopted, has basic pedagogical issues that are not resolved: namely, the articulation of general design methodological principles and its ineffectiveness in the transfer and creation of design knowledge (Oxman, 1999). In PBL, students generally work in groups in order to engage with the scenario presented and to determine what information they need to acquire so that propositions can be made as to how the problem might be addressed (Savin-Baden, 2000).

The success of problem-based learning (PBL) hinges upon two important factors: the use of real-life-like problems as the learning vehicle and working in small group team settings as the learning environment. The second of these factors is of particular interest because of its wider application to education in various disciplines and levels. It is often said that working in teams creates results that individuals can never achieve alone and “seems to contribute to greater creativity, productivity, commitment and participation in a diversity of small and large operations” (Partington & Harris, 1999, p.699). The success of problem-based learning relates closely to the same attributes of success in teamwork in the real world as PBL is inevitably a team process. The major difference lies in the main objectives in that while solving the problem at hand is the main objective for teams in the corporate world, PBL teams focus on solving the problem *and* learning at the same time. It is therefore imperative for PBL programs “to be aware of practicalities as well as the theories of teamwork; using this knowledge as the catalyst for maximising the students’ learning potential by enabling them to experience and reflect on the realities of team-

working for themselves” (Watkins & Gibon-Sweet, 1997, p.110). One of the essential, but little researched, areas of teamwork in PBL settings is a *team role model* and its impact on the team process.

1.1.4 ADJUSTING TO PROBLEM-BASED LEARNING

In their study of first-year undergraduate occupational therapy students in Hong Kong, Chung and Chow (2004, p.166) concluded that “[Problem-based learning] may work well for those students who have prior experience of independent learning. However, it can become an unpleasant learning experience for those students who have limited experience and study skills to support their engagement in an independent and active learning mode.” Furthermore, in a study of Year 1 and 2 students at the University of Sydney medical program Hendry, Ryan and Harris (2003, p.613) has found that “students perceived that their learning was hindered the most when their group's tutorial process was disorganised or haphazard, and/or engagement with the case was shallow.” They concluded that we need further research “that clarifies causal mechanisms, and specifies and evaluates the most effective strategies for helping students to form and maintain effective groups. In particular, there is a need for evidence on which to base guidelines for tutors and students to manage group problems” (Hendry et al, 2003, p.615).

Failure to cope with the new group learning processes and the need for active participation may lead students to develop negative views of PBL and small group learning as Miller, Trimbur and Wilkes (1994, p.43) remark: “Collaborative learning requires student to participate actively and perform cognitive and social tasks that are new and often

difficult... The harder the tasks look on the outset, the greater may be their discomfort.”

To avoid students developing strong opposition against what is to them a foreign concept of learning that is almost antagonistic to the traditional teacher-centred system, measures to alleviate their anxieties and deficiencies in handling a team approach is critical, especially at the beginning when students have no experience in team learning.

Students in Hong Kong go through the matriculation of Hong Kong Advanced Levels examinations before they enter university degree programmes or sub-degree programmes to continue their education at the tertiary level. Their educational experience consists predominantly of teacher-centred lecture-based lessons culminating in almost one hundred percent summative assessment mostly in the form of an examination paper. Students are used to a hierarchical relationship in the classroom and follow the teacher’s lead in their learning experiences (Pearson et al, 2007, p.619) and may find the lack of direct teacher instruction in the team learning setting and the reliance on group dynamics difficult to adapt to.

Group dynamics is a one of the factors that the success of PBL tutorial small group learning process relies significantly on (Mpofu et al, 1998, p.421). Unfortunately, there also seems to be a general lack of studies on actual practical issues regarding the implementation and management of appropriate PBL group dynamics. Pearson et al further emphasize the role of the facilitator in upholding the effectiveness of group dynamics of the small group learning process and that “being able to help group members’ function as a learning group is axiomatic to a successful outcome” (2007, p.617). They

also go on to assert that to achieve this function “often requires changes in thinking from both students and PBL tutors” (Pearson et al, 2007, p.617). One of the first aspects of knowledge that PBL tutors / facilitators must acquire therefore is an understanding of the group dynamics in a small group learning environment.

1.2 Researcher Involvement and Positioning

The researcher is an Assistant Professor at CityU who has been serving as the Programme Leader since 2007 for the AScAS degree that has formed the context for this research. Teaching in the programme since 1998, he was one of the main proponents for adopting PBL about a decade ago and was the key designer of the PBL curriculum for the AScAS programme, which was implemented in 2003. Through this experience, the researcher has developed an interest in PBL and has given talks as well as presented papers at international conferences on the PBL approach. This research is an opportunity for the researcher to conduct more in-depth and rigorous study on student behaviour in a PBL setting.

The researcher’s position as an *insider* in the research context has both advantages and disadvantages. Major concerns are the confusion caused by the researcher’s dual roles (Glesne, 1999) and any preconceived ideas about the research area and setting (Eriksson & Kovalainen, 2008). Measures have been taken in the research design to minimise these problems. Moreover, according to Gray (2004), one advantage is that the insider knowledge can help the researcher to interpret the data because of his knowledge of the

culture and background of the participants. Another advantage is the researcher's ability to gain rapport in the field (Eriksson & Kovalainen, 2008) as well as to blend into the setting (Hockey, 1993) as an insider. Furthermore, it is more likely that real changes would result from researches conducted by educators themselves (Charles & Mertler, 2002). (See Section 3.7 for a more detailed discussion on the implications of the researcher as an insider researcher.)

1.3 Aims and Purposes of the Research

This research examines how a group of new students in the AScAS programme at CityU cope with the PBL curriculum and working in a small group learning setting to gain a better understanding of the in-class and out-of-class group dynamics. With primary data collected from interviews and observations, grounded theory research methods are used to analyse the data to generate a theoretical framework for understanding student and group behaviour in a PBL setting. The main aim of this research is to investigate how students newly admitted to university adapt to an unfamiliar learning environment. The key objectives of this research are to:

- Study the individual and group behaviour of these students in a PBL tutorial small group setting and identify any key patterns and characteristics;
- Investigate the major categories of factors influencing the group dynamics of the collaborative learning groups and their performance;

- Formulate a typology of key student types working together in a learning group situation; and
- Examine the strategies these students use to respond to problematic situations that they encounter in the small group collaborative learning mode.

1.4 Research Questions

There are many sources for the generation of research questions. According to Strauss and Corbin (1998, p.37-38), the sources for research questions can be: 1) suggested or assigned, 2) technical and nontechnical literature, 3) personal and professional experience, and 4) the research itself. The research questions adopted in this study originated from the professional experience of this researcher and further refined through the review of key technical literature. Although the research questions are generated through the literature review, which is presented in the next chapter, they are listed here to give a more complete overview of the research in this introductory chapter.

To fulfil the objectives listed in the previous section, this research focuses on the main research question of:

How does a group of architectural studies students in a Hong Kong University cope with the group dynamics, both inside and outside the classroom, when experiencing a PBL situation in their programme?

Specific research questions formulated to support the main research question in this study are as follows:

1. How do students manage the process of learning and the team roles in a PBL tutorial small group setting?
2. Do recognisable team roles develop in the PBL tutorial small groups, with or without formal assignment? Are these team roles consistently assumed by students, or do students assume different team roles at different times?
3. What group activities do the students conduct outside the PBL tutorials to manage the PBL learning and group dynamics?
4. How, if at all, do students change their behaviour to improve their performance – their own and the group's – in the PBL small group learning setting? What actions, if any, do they take to cope with problems they encounter in the PBL process?

1.5 Significance and Outcomes of the Research

There are six justifications to support the significance of the outcomes of this research: 1) lack of previous studies, 2) qualitative methodology, 3) students' perspective, 4) factors influencing group dynamics, and 5) reference for tutors and PBL coordinators. Each justification is elaborated below:

1.5.1 LACK OF PREVIOUS STUDIES

The majority of prominent previous studies have resulted in the description of “ideal” models of PBL, such as Barrows (1988), Barrows and Wee (2007), Bridges and Hallinger (1992, 1995), Woods (1994), and so on. However, very little research has focused on the problems students face in PBL and how they resolve such problems, especially in the context of Hong Kong. The findings of this study can thus enrich existing literature by providing an understanding of the difficulties experienced by PBL students.

1.5.2 QUALITATIVE METHODOLOGY

There have been a relatively high proportion of studies on student behaviour in small group learning settings using quantitative methods. While providing a clear overview of student behaviour in statistical terms, such studies fail to produce in depth explanations of their behaviour. By adopting a qualitative approach using grounded theory methods, this research can gain a deeper understanding of the students’ actions in PBL tutorials and provide insights for guiding future responses to different situations (Strauss & Corbin, 1998).

1.5.3 STUDENTS’ PERSPECTIVE

Besides enhancing the rigour of this study through triangulation of data, this research has collected data from multiple sources to ensure that the findings are grounded in the students’ perspective. It is the explicit intention of the researcher to ensure that the data collected reflect the students’ “natural” behaviour as much as possible through corroborating various types of data - semi-structured and open-ended interviewing, non-

participant video-taped observations and documentary analysis of the students' reflective journals.

1.5.4 FACTORS INFLUENCING GROUP DYNAMICS

One of the outcomes of this research is the identification of the main categories of factors influencing the dynamics of PBL tutorial groups. Furthermore, the research discovered a series of sub-categories for each of the main categories and the different stages of the problem process that these sub-categories affect. The discovery of these factors is significant because they have emerged from data originating entirely from the participating students.

1.5.5 REFERENCE FOR TUTORS AND PBL COORDINATORS

One of the major attributes of an effective facilitator in small group collaborative learning is the skill to maintain positive group dynamics among the members of the learning group. The typology of students and main categories of factors that have emerged from this research serve as important references for the tutors to enhance group interaction and promote synergy among group members. Besides, the student typology provides critical information for PBL coordinators to optimise group composition with a healthy balance of different student types.

1.6 Limitations of the Research

The data in this study were collected from twelve local students studying in an architectural studies sub-degree (associate degree) programme in a university in Hong Kong. There are a number of limitations in this research, which are listed below:

1.6.1 VARIETY OF PBL APPROACHES

Despite efforts to unify PBL by classifying what is and what is not PBL, such as Barrows and Wee's (2007) "Authentic Problem-Based Learning" (aPBL), PBL remains implemented in diverse approaches across various disciplines (Hmelo & Evensen, 2000; Savin-Baden, 2003). The findings from this research thus cannot be directly applied to other PBL settings, which exhibit wide-ranging differences in the degree of structure. To help researchers and practitioners to determine the transferability of the findings, a detailed description of the PBL approach is provided in Appendix C4.

1.6.2 SMALL SAMPLE SIZE

Due to the adoption of the grounded theory methods for a more in depth study, the sample size of twelve students is relatively small, especially when compared to quantitative studies. The scope for direct application and generalisation of the findings to other PBL settings is limited.

1.6.3 COLLECTION OF DATA

The primary source of data has come from interviews, which relied heavily on the participants' willingness to share information about their own behaviour. Despite the triangulation of data, the observation data cannot cover the outside class student activities and the reflective journals are subjected to the same limitations regarding truthfulness.

1.6.4 LANGUAGE

Both the interviews and the observed group discussions have been conducted in Cantonese and subsequently translated to English by the researcher. Although the translated English transcriptions have been verified with the participants to ensure accuracy, the findings are dependent on the researcher's interviewing and translation skills.

1.6.5 TECHNICAL LIMITATIONS

Despite help from the studio staff to set-up and test the video camera before the actual recordings, some technical limitations remained. Although the set-up can record the dialogues in the group discussions clearly, the recordings could not capture all the non-verbal actions of the group members not participating in the on-going deliberations.

The strategies to counter some of these limitations are discussed in detail in Chapter 3 on the Research Methodology.

1.7 Outline of the Thesis

This thesis comprises seven chapters. Chapter 1 provides an outline of the thesis, including the background as well as the aims and purposes of the research. Chapter 2 reviews the key literature relevant to the study leading to the formulation of the research questions. The research methodology is then discussed in detail in Chapter 3. Chapters 4 through 6 present the overview of the Theory of Adaptive Formation, the main categories of the theory and the typology of participants respectively. Finally, Chapter 7 ends the thesis with a summary and conclusion of the study.

CHAPTER 2:

LITERATURE REVIEW

2.0 Introduction

The objective of this research is to investigate how students cope with the new experiences of working in a small group setting under a PBL curriculum and the associated group dynamics in the PBL collaborative learning environment. This chapter critically reviews the literature from three key subject areas to establish the theoretical foundation for this study on group dynamics in PBL collaborative learning tutorials. First, various texts on PBL are reviewed to establish the background – theoretical foundation, development history, actual practices and processes, special features, and so on – for this study. Second, previous studies on PBL in higher education are examined to identify areas worthy of investigation or further study. Finally, writings on group dynamics in non-educational collaborative settings are appraised to “stimulate theoretical sensitivity” (Strauss & Corbin, 2008, p.43). The review of literature contributes directly to the construction of the research questions that are listed at the end of this chapter.

Researchers conduct literature reviews usually to summarize and synthesize the research literature that informs a study in order to make clear what is already known about the substantive area of study (Gall, Gall & Borg, 2003). It is not uncommon in most research

enterprises that one of the first steps in the research process is a literature review and is typically completed even before the research methodology is finalized when the hypothesis is still in its formation stage. Unlike other research methodologies, it is not essential to carry out a comprehensive literature review at the early stages of a grounded theory research because the research should preferably begin without a “predefined theoretical framework” (Strauss & Corbin, 2008, p.39).

According to Glaser (1992), to ensure that the theory thus generated is grounded in the data as much as possible, researchers should not draw directly on pre-established theoretical frameworks from much quoted references to avoid forcing of any kind. In fact, Glaser (1992) champions delaying the first real move into the professional literature related to the topic until categories grounded in the data have been identified. There are two main reasons why it is advantageous to avoid carrying out the major part of the literature review prior to the collection and analysis of data: Firstly, theories espoused in existing literature may unduly influence the emergence of the theory from the data as they would limit the development of the emerging theory. Secondly, theoretical focus/foci emerging from the data collection and analysis stages would necessitate further literature review to develop theoretical sensitivity during the later stages of the study.

The literature covered in this chapter has not only been reviewed at the beginning of the study but also over the course of the research. As a result, there are two major stages of literature review conducted in this study. In the first part of literature review conducted at the beginning of the research, literature relating to problem-based learning as social

learning, and previous studies on the implementation of problem-based learning in higher education, are reviewed to ascertain the extent of previous knowledge and to provide a context for formulating the research questions (Strauss and Corbin, 2008). The purpose of this initial review is to increase awareness of the existing knowledge base and to identify gaps where there is little extant knowledge on the topic of group dynamics of a small group in a PBL learning environment.

The second major part of the literature review was carried out during the first round of data collection and analysis. The main purpose of this was to reinforce the analytical process by enhancing theoretical sensitivity and stimulating questions (Strauss & Corbin, 2008) during the coding stages. This phase of the literature review concentrates on issues that emerge from the data and relates primarily to the social interaction between the collaborative learning team members as well as reviews of group dynamics in non-educational settings. As guided by the relevant concepts derived from the data, studies on group dynamics and team roles in non-educational settings are reviewed to help build up the theoretical framework to “complement, extend and verify the findings” (Strauss & Corbin, 2008, p.39). Both parts of the literature review have contributed to the formation of the research questions, which are listed at the end of this chapter.

2.1 Problem Based Learning (PBL)

This section begins with an introduction to PBL, which is followed with an examination of a number of fundamental characteristics of PBL that distinguish it from other modes of

learning. The major areas reviewed in this section are: learning as a social activity, team dynamics and PBL small group learning, and the role of the teacher as facilitator in PBL tutorials. Findings from this literature review primarily inform the formulation of some of the questions in the interview schedule for the initial round of interviews and observations as well as provide a source of concepts for drawing comparisons during the coding stages (Strauss & Corbin, 2008).

2.1.1 WHAT IS PBL?

PBL emerges from the critique that traditional lecture-based education may not be adequate for developing functional knowledge required in the modern workplace. First developed in 1970s, the formulation of PBL has been based on “constructivist pedagogical designs that are based on the assumption that learning is the product of both cognitive and social interaction in problem-centred environments” (Hmelo & Evensen 2000, p1). Its inception as an innovative educational approach in a new medical school at McMaster University in Canada in the 1970s have since inspired many similar approaches focusing on problem cases first in medical schools and then in other disciplines (Barrows & Wee, 2007). In PBL, small group learning in a problem situation replaces large class lectures. Learning is achieved as a knowledge discovery process in a problem-centred context rather than a knowledge transmission process as in traditional classrooms.

As a contextualised approach to teaching and learning (Hmelo & Evensen 2000), PBL can assume many different forms. In general, students work in groups in PBL in order to engage with the scenarios presented and to determine the information they need to acquire

so that propositions can be made as to how the problem might be addressed (Savin-Baden, 2000). Working in small groups, problem cases based on “real” situations are utilised to initiate student learning activities, drawing closer the relationship between learning theory and practice. PBL encompasses many forms of learning activities, which include research, case studies, group discussions, etc. Taking many forms, its approaches can range from a highly structured model with considerable tutor input, such as *Authentic Problem-based Learning (aPBL)* (Barrows & Wee, 2007), to relatively unstructured approaches where the tutors’ influence is much diminished.

Although differing widely in terms of design and delivery, the different forms of PBL share three major common goals: 1) acquisition of fundamental content knowledge, 2) development of functional knowledge and skills, and 3) development of problem-solving skills (Barrows & Wee, 2007; Savin-Baden, 2000). Bridges & Hallinger (1992) differentiate two types of PBL – *student-centred* and *problem-stimulated* – according to the degree of structure that is imposed on the problem case. In a student-centred PBL project, the student groups are only given the problem scenario, specification of the deliverables and deadline(s). The students must therefore take the initiative to identify their own learning issues and formulate the learning process to achieve the objectives. As a result, the emphasis lies not only on the acquisition of knowledge but also the development of the requisite skills for life-long learning. On the other hand, PBL groups working on a project-stimulated PBL project are issued other guidelines in addition to those given in the student-centred type, such as course plan, learning objectives, list of references, guiding questions, and so on. Hence, with the aims and a timetable of learning

activities clearly spelt out for them, the students are directed to focus on gaining content and functional knowledge instead of learning skills.

The distinction between a student-centred PBL and a project-stimulated one is however not that clear-cut. The amount of prescribed information and directions given by the instructor in the latter type can vary significantly among different practices. The semi-structured problem cases assigned in the architectural studies programme examined in this research provide the students no more than four to five key concepts, a handful of references, the format of the submission and, the dates for the interim and final presentations, which all fit together with the problem statement onto a single side of a sheet of paper (Appendix B1). At the other end of the spectrum lies Barrows' aPBL, in which not only are the outcome objectives, educational process, and evaluation criteria, provided, but even what the tutor should do to start off a class is prescribed in detail: "The tutor takes a minute or two to share his background, work and interests with the group and asks the group if they have any questions about his background" (Barrows & Wee, 2007, p.19).

Contrary to Barrow's highly prescriptive approach, Savin-Baden (2000) takes an opposite position and stresses that it is problematic to limit PBL to that which is precisely definable. Instead, she argues that the specific characteristics of a PBL course should "stem from the discipline or professional knowledge base into which it is introduced" (Savin-Baden, 2000, p.16). For example, Bridges and Hallinger (1995) contrast the case of a PBL programme in medical education to their approach to PBL in leadership education. Although both PBL programmes feature students working in collaborative learning groups to solve

assigned problems, there are two fundamentally different characteristics between them. Tutors in the medical PBL mentioned by the authors take on a much more active role in facilitating the learning process. This contrasts directly with PBL leadership education according to Bridges and Hallinger, in which students work in the absence of a facilitator and manage their own learning throughout the process. In addition, their PBL model focuses more on implementing of problem-solving strategies than the medical PBL, where the emphasis is placed on the understanding of content knowledge and its application.

Summing it all up, Woods (1994) instead composes a simple map to situate the different methods of learning along two key dimensions (Figure 2.1). The first dimension relates to who takes the initiative in directing the learning. In the *teacher-directed* traditional classrooms, the teacher takes charge of the teaching and learning activities, which mostly take the form of lecture-based knowledge transfer. Conversely, when the students are given the responsibility of making decisions on the learning activities, the learning becomes *student-directed*. The second dimension is associated with whether the knowledge to be learnt is determined before the learning activity or identified during the resolution of the given problem case. While the material the students need to know in *subject-based* learning is decided beforehand, students in a *problem-based* learning situation discover what they need to know during the learning process. Moreover, Woods concludes that, “Regardless of who owns the responsibility, the key for PBL is that the focus is to use a problem situation to drive the learning activities on a need to know basis” (Woods, 1994, p.2-2).

Figure 2.1

Woods' map of learning methods

(Reproduced from Woods, D. R. (1994). *Problem-based learning: how to gain the most from PBL*. Waterdown: Donald R. Woods, p.2-3)

	Teacher-directed	Teacher-guided	Student-directed
Subject-based	Lecture	PSI	Self-study
			Homework
			Peer Teach
			SDL Contract
	Discussion		Co-op Learn
	Workshop		
	Games		Role Play
	Simulations		
Problem-based	Case Studies	"Guided Design"	SDL, PBL
			Research

2.1.2 LEARNING AS A SOCIAL ACTIVITY

At the centre of PBL instruction is a small group learning unit known as the *PBL tutorial*, which usually consists of 5-8 students under the guidance of a facilitator. In this learning environment, students work together to solve real-life-like problems and learn collaboratively through a series of tasks, such as formulating the problem, researching for

background information, deliberating solutions, and so on. According to Bridges and Hallinger, the majority of the learning in a PBL context takes place during the small-group tutorials instead of the large-class lectures and the students “assume a major responsibility for their own instruction and learning” (Bridges & Hallinger, 1992, p.6) both as individuals and members of a collaborating group. Moreover, the tutorial is not unique to PBL and is commonly adopted as a teaching and learning activity in educational situations primarily to achieve a lower student-to-tutor ratio, thereby resulting in more attention on individual students. In PBL, however, the purpose of utilising small-group tutorial comes not from gaining tutor contact. Instead, the main objective is to create an environment to facilitate collaborative learning among students (Lee & Tan, 2004).

In problem case discussions, group members work cooperatively to a set of structured learning activities and work out a course of action in solving the given problem. The structured activities follow loosely the eight stages of the PBL process described by Woods (1994) and can be generalised into eight tasks spanning two- to three-week cycles (Table 2.1). The instructor, who is known as a *facilitator* in the problem case set-up, only gives guidance and advice while generally refraining from imposing too much control over the students’ learning as in lecture situations. Facilitators should be asking leading and open-ended questions to help students explore the complexity of real world problems and to help them develop their critical thinking. The problem case discussions are intense sessions where students actively share views and knowledge with their group members in solving the given problems.

Table 2.1

The 8 tasks of the problem-based learning cycle

(Based on Woods, D. R. (1994). *Problem-based learning: How to gain the most from PBL*.

Waterdown: Donald R. Woods, p.2-2)

Task	Student activity
1	Explore the problem. Create hypotheses. Identify issues. Elaborate.
2	Try to solve the problem with what you currently know.
3	Identify what you do not know.
4	As a group, prioritise the learning needs, set learning goals and objectives, allocate resources and identify tasks for each member.
5	Individual self-study and preparation.
6	Return to the group. Share the new knowledge effectively so that the entire group learns the information.
7	Apply knowledge to solve the problem.
8	Assess the new knowledge, the problem solution and the effectiveness of the process used. Reflect on your own work and that of the group.

According to Barrows (1988), knowledge and skills are acquired in the PBL learning environment through the interactions of the students with the other group members within the small group learning context. Through collaborating on the various tasks in the PBL tutorial process – understanding the problem case, identifying missing information, collection of information, deliberation of concepts, generation of solutions, and so on – learning is achieved by the ability of the individual to construct meaning by selecting and structuring materials generated from the PBL process. The operation of the PBL learning

group illustrates a social constructivist model of the construction and development of knowledge and conceptual understanding through collaborative activities (Askill-Williams, Murra-Harveu & Lawson, 2007).

In this model, the basic premise is that the students as individual learners must actively engage in building knowledge and skills (Bruner, 1990) from various stimuli present in the learning context. Through their participation in the formulation of learning issues, identification of knowledge deficiencies, researching for information, problem-solving process, and so on, every member of the learning team should find that “learning is transformed into an active process where participants are mutually engaged in dialogue, often fuelled by questions and a meaningful sharing of roles and responsibilities” (Lee and Tan, 2004, p.141). Each member of the PBL tutorial group brings to the learning environment his/her own unique prior experience and understanding of the concepts required to solve the assigned problems. Individual knowledge evolve through interaction with the respective knowledge other group members inject into the mediation while in turn contribute to the development of the knowledge of the others. The group social dynamics are therefore critical to the development of each student’s individual understanding of key concepts as well as to the construction of new knowledge. Lee and Tan (2004) compare PBL to conventional knowledge-transfer-based teaching: “In contrast to didactic instruction, in collaborative learning everyone contributes in order to *create* something together” (p.135).

This shift of the onus for learning from the teacher to the student does not diminish the significance of the tutors' role and Barrows (1988) argues that their actions switch from directly instructing to guiding in the PBL tutorial. Consequently, the PBL tutors should behave in a manner that is "more facilitatory and less didactic" (Koschmann, Glenn & Conlee, 2000). Through various means – the formulation of the problem cases, the setting up of the collaborative learning teams, the control of the amount of direct instruction given, and so on – the PBL tutor focuses on the objective of creating "a range of learning environments [] capable of generating multiple perspectives and different value orientations" (Dimmock & Edwards, 1996, p.309) to facilitate learning. The balance between facilitation and direction depends on the specific design of the PBL curriculum, ranging from more facilitation in the student-centred learning type to more direction in the project-stimulated type.

Furthermore, central to this group creative process is the constant dialogue among the group members to elaborate on prior knowledge and deliberate on new information. Fellow members in the groups become the primary mechanism for testing their own understanding – old ones and new ones – of the knowledge and skills prompted by the problem solving exercise. Dialogue in the PBL process releases the students from the limitations of their confined and unrefined knowledge and skills base (Savin-Baden, 2000). As an established platform for exchanging ideas and perspectives, the PBL tutorial allows the students to review their own understanding of key learning issues in light of those of the others in the small group. Therefore, they construct their own knowledge both individually and collectively. This also means that in the group learning process, there

may be types of behaviour that contribute separately to individual and collective knowledge construction.

2.1.3 TEAM DYNAMICS AND PBL SMALL GROUP LEARNING

As a group activity, PBL tutorials share many issues concerning teams and team processes in general. Similar to teams in the corporate world, students are often grouped together and expected to perform effectively and help each other complete given tasks and learn in a “synergetic” manner. However, studies on small group learning have indicated otherwise. According to Miller, Trimbur and Wilkes (1994, p.35), “the performance, harmony, and satisfaction that collaborative learning seeks to foster are, of course, rarely achieved through a smooth and unimpeded process” and “group work can be a messy and uneven business.” Research has shown that simply grouping students together and instructing them to work in teams does not automatically promote higher achievement (Johnson & Johnson, 1990). The lack of training in teamwork results in an aversion against team-based activities for the students when they leave school and join the work force (Dyer, 1995, p.90). Adding to the importance of the understanding of team work in PBL small group learning, Mpofu et al (1998, p.426) also observe that “individuals’ communication contributions may be hindered by unfamiliarity not only with tutors, but with group members and group tasks.”

The effectiveness of learning as a team is often undermined by problems arising from poorly structured learning teams resulting in poor team effectiveness, as Peterson (1997) pointed out: “Observers of student group interaction often find that students don’t work

productively, waste time, repeat old information, or become confrontational. Regardless of the problem posed to a group of students, learning is proportional to the ability of that group to work effectively together.” (p.1). Furthermore, PBL teams with students who failed to establish their own identity and sense of belonging to a team produced less satisfactory results as Palmer and Major (2004) observed: “our lower functioning teams viewed themselves as individuals who happened to be trapped together in a particular space for a period of time” (p.130).

Peterson (1997) has found that in a PBL curriculum, the effectiveness of the tutor in managing the group learning as a facilitator is a more crucial factor than the effectiveness of the small group process, especially at the beginning of the PBL program. Holen (2000) also agrees with the significance of facilitators and their mastery of the team process in a PBL curriculum – “The quality of the group dynamic decides the learning environment of PBL groups. In this context, the skills of the facilitator in group dynamics are important” (p.488). However, as most PBL programmes are run with both facilitated and un-facilitated tutorial sessions, the critical question is: what is the corresponding factor crucial to the success of the small group process in the absence of a facilitator?

2.1.4 SELF-DIRECTED LEARNING

Unlike traditional teacher-centred education, where learning is mainly achieved inside the classroom through lecture-based instruction controlled by the tutor, acquisition of knowledge and skills in PBL takes place both inside and outside the classroom. Students in PBL “assume major responsibility for the acquisition of information and knowledge”

(Tan, 2004, p.9) and accomplish much of their learning in the absence of the tutor.

Besides the small-group PBL tutorial discussions facilitated by tutors, students spend considerable time in unfacilitated collaborated learning sessions during tutorials when the tutor rotates to the other groups. Furthermore, members of the team typically have to afford additional time outside of the classroom to conduct *self-directed learning*, both individually and with one or more team members, to complete the requisite tasks to solve the assigned problem cases. The closer the PBL curriculum is designed to be near the student-centred end of the spectrum, the more motivation there is for self-directed learning (Hmelo & Lin, 2000).

Highlighting the impact of self-directed learning in PBL, Barrows and Wee (2007) observe that “much of the important interactions among the group members and much of their learning occur in these spontaneous, collaborative sessions during self-directed learning” (p.33). Working together as a team or smaller denominations of the group in twos or threes outside of scheduled class time strengthens the PBL groups’ learning and decision-making process. Apart from working together as a group in the absence of the tutor, students also undertake individual self-directed learning, which consists mainly of independent research following division of learning issues and research topics (Hmelo & Lin, 2000). The students are therefore prompted to take a more proactive role in their own learning as they realise that their learning improves with the amount of time and effort spent on self-directed learning.

Based on a review of previous research on learning processes in PBL medical programmes, Blumberg (2000) identifies four key component skills for students in self-directed learning. First, students need to be able to identify what needs to be learned. The ability to define the learning issues and use them to direct the subsequent activities to achieve learning is an indispensable self-direction skill. Second, they should be able to devise a plan to learn, especially the time management skills to complete the self-learning tasks efficiently. Third, self-directed learners should possess the capacity to utilise resources properly, which includes where to look for resources, how to evaluate the appropriateness of resources, the strategies to use the resources effectively, and so on. Finally, they need to constantly reflect on their own self-directed learning skills and seek to continually improve themselves as self-directed learners. Blumberg (2000) further asserts that “since the research evidence shows that most of the students completed the PBL programme studied, it is a reasonable hypothesis that graduates of PBL curricula will become effective lifelong learners” (p.222).

Out of the above component skills, the one that relates most to professional practice is the ability to critically evaluate the accuracy of various information resources and to adopt them properly to solve the problems at hand. Hmelo and Lin (2000) point out that one of the most important factors in the development of self-directed learning skills in PBL is the independent research for information following the division of topics from group deliberations. After being assigned a subject to research, individual students work independently to identify appropriate new resources as well as to draw from previous resources to extract information for the group’s use. It is thus essential to include the

critique of the students' resource evaluation skills as an integral part of the PBL process. According to Barrows and Wee (2007), instead of directly including the results from the self-directed learning into their problem solutions after regrouping, the group should critique the learning resources each member used. By going over the resources each had planned to use, new resources that had emerged and the ones they have ended up using, the students develop the capacity to evaluate resources and select the most appropriate ones.

As a central component of PBL, self-directed learning can become a major source of problems when it is not properly considered. Some problems arise from the "complex nature of self-direction" that is "evident in the strikingly different approaches adopted" by different students (Evenson, 2000, p.294). This may cause conflicts among team members during unfacilitated group activities. In addition, according to Savin-Baden (2000), individual students come into the course "at different stages of readiness for self-directed learning" (p.29), giving rise to further opportunities for disagreements over various aspects in their learning, such as agreeing on learning issues, time management, resources used, and so on. Thus, students should not be expected to perform immediately when placed in self-directed learning situations. Instead, curriculum designers should ensure that students are given ample preparation for self-directed learning to minimise possible conflicts as "self-directed learning needs to be nurtured" (Evensen, 2000, p.295).

Due to "issues of power and control between tutors and students" (Savin-Baden, 2000, p.94), another potentially problematic area in curricula emphasising self-directed learning is that of assessment. It becomes especially frustrating for students in PBL programmes

when actual practices contradict the explicit claims promoting self-directed learning that are often made by tutors during course introductions. In particular, major problems result when modes of assessment fail to support, or even challenge, these claims. When assessment methods are not suitably aligned with self-direction, students would adopt learning behaviour that ensures good marks rather than individual and group learning approaches that develops their self-learning skills (Savin-Baden, 2000). Different attitudes towards the importance of self-directed learning therefore emerge among the members in a PBL group in relation to the different degree of focus on assessment outcomes and other reasons. It would be of great value to investigate how the collaborative learning group cope with such misalignment of emphasis on self-directed learning between individual members within the group.

2.1.5 THE ROLE OF THE TEACHER AS FACILITATOR IN PBL TUTORIALS

According to Senge (2006, p.229) one of the most important function of the facilitator for the team is to act as a “process facilitator”, whose main job is to help the team “maintain ownership of its processes and outcomes.” This view is supported by McChesney (1995), who used the term “process consultant” to describe the facilitator: “The facilitator’s objective is to help teams find solutions to their tasks with a maximum amount of team participation and as little interference from the facilitator as possible. The team is supported by the facilitator as a process consultant, a teacher, and a coach. As the process consultant you must maintain a balance between the task and the process, apply a minimum amount of power and authority, know and when to use group process tools, and

nurture individuals as well as team dynamics.” (p.9). The facilitator is not put in place to solve the problem for the team. Instead, he/she generates and sustains the context that allows the team members to perform effectively in both their team roles and functional required to complete the given task and, at the same time, stimulates the team members to participate constructively as a team. In this sense, the focus of the facilitator is on the process and not the task. He/she must be familiar with the respective roles each one of the team members assumes and how these different roles interrelate with each other. This is also the reason why process knowledge and understanding of team roles is more critical than content knowledge for the effectiveness of the facilitator and, hence, the success of the team.

To the surprise of educators, research cannot find a direct relationship between the facilitator’s content expertise and the performance of the PBL team (Davis, Nairn, Paine, Anderson & Oh, 1994; Schmidt, 1994). McChesney (1995) emphasised “a facilitator need not be an expert who could solve the problem the team faces” (p.6). More and more studies have found that it is more important for the facilitator to be able to develop and manage group dynamics, and co-ordinate the diverse working and thinking styles of the participants (McFadzean, 2002; Wilkerson, 1996). Azer (2005) also agrees with the relative importance of process knowledge over content knowledge for effective facilitation: “Facilitation is not about detailed content or what the group works on...The aim of facilitation in problem-based learning tutorials is to make the process easier and more convenient rather than answer questions or provide a lecture. The facilitator keeps the group focused on their tasks and guides them to achieve their goals.” (p.676).

Similar to teams in the corporate world, learning teams in educational environments also serve two fundamental functions: to accomplish a task, and to develop and maintain the team: “The role of the tutor is to facilitate the proceedings (helping the chair to maintain group dynamics and moving the group through the task) and to ensure that the group achieves appropriate learning objectives in line with those set by the curriculum design team” (Wood, 2003, p.329). Jung, Tryssenaar and Wilkins (2005, p.606) asserted that “the ability of the tutor to facilitate an effective learning environment within the small-group process is the major determinant of the quality and the success of problem-based learning” and named “knowledge of group dynamics” as one of these essential abilities. This illustrates the significance of the need to understand the behaviour of the PBL small group and how the group members interact with each other in order to maximise the effectiveness of the PBL process.

2.2 Previous Studies on PBL in Higher Education

Since the inception of PBL at McMaster University in the 1970s, there have been numerous studies on various aspects of the PBL approach, an approach that was developed as an alternative to lecture-based / teacher-centred methods in professional education. To gain a more in-depth understanding of the students’ behaviour in the PBL team-learning context, this section looks at previous research on three aspects of PBL: 1) dynamics and roles in PBL teams, 2) PBL small group learning in Chinese culture, and 3) taking

ownership of learning. This review also helps identify areas not adequately covered in existing studies that are therefore appropriate for further examination.

2.2.1 DYNAMICS AND ROLES IN PBL TEAMS

The importance of team harmony in a PBL setting has been pointed out by many, such as Katsuragi (2005), who points out that “group harmony and interaction is absolutely imperative for a PBL tutorial” (p.80). It has also been widely discussed that all PBL teams have two fundamental functions: “to accomplish a task, and to develop and maintain the team” (Peterson, 1997, p.4). Peterson (1997) points out that “To be a learning team, the learners need to have the interpersonal skills that will help them become an effective team” (p.2). The kind of essential skills required are not any interpersonal skills, but those that contribute to the team members working effectively together as a team. This includes an understanding of one’s team role within a team and how to assume that role in a constructive manner in the team.

Despite the importance writers put on the role of the team members in a PBL setting, a review of the literature shows that there is a lack of studies on the team roles of the PBL team. Holen (2000) observes that researchers interested in PBL are currently focusing on a number of issues other than team dynamics: how information technology can enhance the PBL process, especially in medicine education; enhancement of assessment and curriculum strategies; and criteria for student selection. As a result, not enough study has taken place in the area of the dynamics of the team process within PBL tutorial groups. Mpofu et al (1998) also agree in their study on PBL in medical education that, “What is lacking is

studies on actual practicalities related to developing and dealing with appropriate PBL group behaviors” (p.421).

Duek’s (2000) review of past studies shows small group learning almost always produced better results than learning individually, “if and only if, there was positive interdependence evidenced within the group” (p.77). Attaining positive interdependence requires that all members of the group not only constructively participate but such participation must also be recognised by the rest of the group. PBL administrators and facilitators often focus on the first part of this condition and seek active participation from every member in the PBL team to enhance group dynamics but overlooked the second part of the condition – not only must all members actively participate, their participation must be constructive and recognised as such by the rest of the team – for the team to function effectively. For this to happen, the team members must understand their own role(s) and the respective roles of the other team members. In practice, the facilitator must help construct this condition (Faidley et al, 2000). Tan (2004) asserts that “this calls for staff to be (1) equipped with competencies of process skills (handling group dynamics, questioning skills, facilitating metacognition and so on) and (2) able to identify, articulate and assess these skills” (p.179). Among other attributes, Pearson et al (2007, p.617-619) highlighted “understanding of group dynamics and development” and “skills in handling a small group” as “significant assets” that are “crucial” to the success of any PBL course or programme.

As mentioned in Section 2.1.4 on self-directed learning, the students come into the PBL learning environment with different levels of process skills and understandings of their

roles in collaborative learning. According to a study by Taylor and Burgess (1995) on orientation programmes in problem-based learning, one of the main areas that students prefer to be covered before they start PBL is the said skills necessary for learning in groups. They concluded that to properly prepare students for PBL, more attention should be paid to the integration of process skills training in curriculum design. Besides taking up the above role prior to the beginning of the PBL process, the tutor also plays an important role in the students' development of process skills during facilitation. Bridges and Hallinger (1995) name "process observer" (p.82) as one of the key roles of the PBL tutor. When tutors detect difficulties in any groups' ability to work effectively as a learning team, they should take appropriate intervention. However, sometimes the best intervention is no intervention at all at the time of the process difficulties and the most appropriate action is to allow the group to overcome the problems themselves while learning from the incident. Bridges and Hallinger (1995) advocate recording the problem in these situations and the need to reflect on it *after* the completion of the problem case.

2.2.2 PBL SMALL GROUP LEARNING IN CHINESE CULTURE

An interesting study by Walker, Bridges and Chan (1996) on students of a master's level course in educational administration at the Chinese University of Hong Kong raised the question of cultural background as a factor in PBL small group learning where they ask the question of "Would PBL produce a similar learning process and outcomes in a non-Western culture as reported in the West?" (p.12). Although Walker et al (1996) cannot find concrete evidence that Chinese students react differently to PBL than Western students due to their cultural background differences, a number of dissimilar behaviours

can be identified. One of their first propositions for the study is that, “since PBL places emphasis on group dynamics, Chinese students may have difficulty in this regard due to cultural factors” (p.23). They attribute this difficulty to the perception of a preference for harmony in the Chinese culture: “The root of this need for harmony and the outward appearance of calmness in groups may relate to the recognized primary desire across Chinese societies for harmonious relationships... In group contexts, the Chinese have generally been found to place greater emphasis than their Western counterparts on group solidarity through socio-emotional activities as a goal in itself, rather than on the outcome of the task.” (Walker et al, 1996, p.23) The study finds, however, that sustaining a congruent atmosphere in the small group may come at a cost of the discussions being not vigorous enough to produce the desired learning effects.

Another major finding in the Walker et al (1996) study runs contrary to Western PBL experiences relates to hierarchical dynamics. They found that “younger and lower status members” in the groups studied often concede control to “older members” or members of “privileged positions” – for example, group members who are principals – during tutorial discussions. Even when the younger members cannot agree with the ideas of more senior members, they tended to argue with reduced intensity and favoured compromise. The participation of the group members, especially regarding how strongly they push their own ideas, appeared to be directly influenced by their respective hierarchical position. This behaviour mirrors the strongly hierarchical nature of traditional Chinese social structures that is still customary in current practices in the Chinese culture. Furthermore, at least in one incident, a female group member had given up her own ideas without much debate

after failing to gain support from a dominating male senior member of her group. Walker et al think that the above observations suggest hierarchical dynamics influenced by gender and job position feature in group learning in Chinese cultures. However, the influence of position status would not be a factor in this research as all subjects are students in the same cohort who had graduated from secondary school one year before the study.

While identifying many attributes of Asian students that may make PBL a suitable learning approach for them, Khoo (2003) also finds that Asian students in general, not only Chinese, may have cultural backgrounds that lead to discomfort in group situations: “Asian students, who are enculturated from a young age not to be outspoken in front of any authoritative figures, would therefore tend to feel extreme discomfort at any perception of confrontation with the authority figure of the teacher as they fear loss of ‘face’ and violation of their community rules on propriety. They would also not be comfortable with debating issues within their tutorial groups.” (p.402). This puts further burden on the facilitators in managing the group process for Asian/Chinese students, especially when the level of discussion in the PBL tutorial is not as “vigorous” as desired, as Lam (2004) concludes in her study of implementing a PBL course at the tertiary level in Hong Kong, “Tutors who use the PBL mode of instruction bear a lot of responsibilities. They facilitate the group’s learning process and provide stimulation as necessary” (p.383).

2.2.3 TAKING OWNERSHIP OF LEARNING

In a PBL learning environment, students are encouraged to take responsibility of their own learning (Barrows, 1988; Savin-Baden, 2000; Woods, 2004) through active participation in

the group learning process. Students are thus given the opportunity to take ownership of their learning experiences. However, this may not always be positive from the students' perspective despite being given more control over their own learning. In a study of the use of PBL in an undergraduate social programme in a Hong Kong university, Lam (2004, p.381) discovered that some students found it "stressful" to "assume primary responsibility for their learning" under the self-directed learning principle of the PBL curriculum.

From a research study on PBL in engineering schools in Brazil, Ribeiro (2008) observed that one of the key difficulties associated with implementation of PBL is the shifting of ownership, and hence responsibility, of learning from the instructor to the student. Parallel to the assumption of different roles from those in a conventional teacher-centred learning environment is a significant perceived shift of responsibility assumed by the students in their own learning. Ribeiro (2008) further pointed out that, "Whereas it may be true that students are ultimately responsible for their learning and that no teacher can force them to learn regardless of the instructional method adopted, students are explicitly empowered in PBL. They are told from the beginning that they will have to perform the aforementioned tasks on their own and that knowledge construction will depend on their willingness to investigate problems in depth" (p.154). According to his findings, some students failed to accept the additional responsibility and prefer to have more direct instruction from the teachers.

One of the main sources of stress students experience when faced with taking ownership of their own learning comes from the expectation of success. PBL diverts from the students'

accustomed practice of passive learning and requires students to understand that they must undertake a more proactive learning effort in order to experience success (Bridges and Hallinger, 1992). In a traditional lecture-based learning environment, a feeling of likely success in learning comes from the perception of an explicit learning structure composed of lecture topics, assigned readings, coursework, examination, and so on. Although aligned with equal rigour, such structure is deliberately made implicit in a PBL learning environment to allow students to explore the problem cases and knowledge domain. One way to mediate this problem is the provision of *scaffolding* by the facilitator through a good set of guiding questions during the PBL tutorial discussions (Tan, 2004). A critical question therefore is how students take ownership of their own learning in the absence of the scaffolding provided by the facilitator in an un-facilitated PBL tutorial session.

2.3 Group Dynamics in Non-educational Collaborative Settings

This final section of the literature review moves outside the field of education and evaluates some of the works on group dynamics from non-educational disciplines. Most of the research works on group dynamics reviewed comes from management studies. In business corporations of any size, people spend the majority of their time working in teams of one kind or another. Thus, there is an extensive body of studies on group dynamics in work settings conducted for the purpose of improving teamwork, and thus productivity and effectiveness. The following sub-sections delve into relevant areas in the said studies to enhance the general understanding of group dynamics in a small group context.

2.3.1 TEAMWORK IN SMALL GROUPS

As much as it is widely accepted that a team can yield far superior results than the same individuals can achieve by working independently, success is hardly guaranteed by grouping people together and expect escalating productivity. In their research on small groups as complex systems, Arrow, McGrath & Berdahl (2000) reviewed a body of work on the development of the use of teams in work organisations and found that these studies “show both that teams can be very effective units of the work organisation and that teams can fail to provide high performance effectiveness” (p.21). Similarly, Woodcock (1979) observed that “a team can accomplish much more than the sum of the individual members and yet frequently groups of people are seen to achieve less than could have been accomplished by the individual members working alone” (p.3). Teams are often created without the requisite planning, training, coaching and support for a team to function properly. McChesney (1995, p.6) asserts that “teamwork is not easy for most of us” and that an “objective third party acting as a facilitator can help maximise the productivity of a team.” To him, “the facilitator plays a significant role when individuals battle to become and remain effective as a team in the continuous improvement process.”

McFadzean (2002) of the Henley Management College identifies social interaction between team members and facilitation as the two dominant factors in his research in small group problem solving, where researchers seek to understand the facilitators’ impact on team productivity. While members of a team concentrate on applying their respective skills and knowledge on the “content of the decision”, a facilitator focuses on “constructively aiding the group’s decision process” (Wheeler & Valacich, 1996, p.481).

In this setting-up of the small group problem solving process, there are again two different types of team actions taking place. On the one hand, there are actions relating to the content of the problem itself that require competence in subject matter – architectural, management, computing, etc. – and are disciplinary-based. Thus, this type of actions varies among teams in different fields. For example, a team in an architectural firm would need skills and knowledge in areas such as statutory procedures, building regulations, construction technology, and architectural design, while a team in a computing company would require expertise in computer architecture, programming, circuitry, information systems, and so on. Teams are likely to be formed to ensure each of the required competencies is adequately covered by at least one of the team members. This type of action performed primarily by the members of the team is equivalent to what Belbin termed “functional roles” or “the mechanics of the problem solving process.”

On the other hand, team members must also simultaneously take on the “team roles” in the absence of a facilitator and keep the “dynamics of the team process” under control for the team to perform effectively. Belbin (1993) thinks that this “running-in” phase takes time as “the establishment of roles within a team where the assumption of duties and responsibilities depends on a measure of self-discovery combined with a perception of the needs of the team as a whole” (p.1).

Secondary school education in Hong Kong mainly follows a teacher-centred and lecture-based approach. Unlike individuals in working environments, who inevitably operate in team settings, the vast majority of the students coming into the PBL learning environment

have little or no experience in working in collaborative teams. This lack of team work experience would significantly affect the students' adaptation and subsequent performance in the team-based learning environment of the PBL process. The distinction of functional roles and team roles provides an additional basis for comparison during the coding process, especially for "comparing [] two conceptually similar but different situations" (Strauss and Corbin, 2008, p.37). These concepts are particular useful for comparative purposes while coding the recorded PBL tutorial sessions.

2.3.2 BELBIN'S STUDY ON TEAM ROLES

One of the most frequently cited and utilised studies on teams and the roles of the team members is the body of work by Belbin (1981, 1993), who in the study of management teams claims that "advanced teamwork is one of the most efficient ways we know of accomplishing complex tasks and missions" (1993, p.1). Belbin's work on teams carried out at the Henley Management College appears in a large element of the literature on the subject reviewed for the purpose of this paper and was described as "extensively used as a counselling and team development tool for organizations and management consultancies" (Prichard & Stanton, 1999, p.652), "most widely-used management development instruments / ubiquitously popular in team working training courses" (Partington & Harris, 1999, p.699), and "a model that many managers and consultants find immensely practical in helping them to think through the dynamics of their teams" (West, 2004, p.33).

Central to Belbin's theory is the sharp distinction between a person's "team role" and "functional role" when working as a member of a team. We normally understand the

“role” of a team member as the tasks he/she performs in contributing their share of work towards completing the assignment given to the team as a whole. Belbin (1993) defines respectively, “team role” as “a tendency to behave, contribute and interrelate with others at work in certain distinctive ways,” and “functional role” as “the job demands that a person has been engaged to meet by supplying the requisite technical skills and operational knowledge” (p.24). Prichard and Stanton (1999, p.652) distinguish the two by elaborating functional roles as “task-oriented behaviour,” which “concentrate on getting things done” and team roles as “team maintenance behaviour,” which are “social/emotional-oriented behaviour [to] maintain team processes.”

For this discussion, we can distinguish “team roles” as associated with the “dynamics of the team process” and “functional roles” with the “mechanics of the problem solving process” (Belbin, 1993). A study on UK managers by Fisher, Hunter and Macrosson (1998) concurs with Belbin’s (1981) observation that “competent managers seem to be able to perform well both in a primary and secondary team role” (p.115), though the former discovered that certain conditions may apply and that only certain types of team roles can be compatibly “multi-roled”. Despite the apparent “popularity” it enjoyed with a number of exponents, especially in the nineties, and being “both simple and appealing” (McCrimmon, 1995, p.35), however, Belbin’s team role theory also has its share of doubters and opposition. West (2004) finds that “there is little evidence to support [the team role] predictions and the instruments developed to measure the team role types do not appear to have good psychometric properties” (p.33).

Nevertheless, the team role theory developed by Belbin and the resulting team roles identified can serve as the foundation upon which other studies on team processes can be built. Prichard & Stanton (1999) suggest that Belbin's theory may facilitate "the transference of teamworking skills from the training environment into working practice" (p.658) and can provide a framework for people to "become aware of the skills necessary for successful teamwork, come to recognise that they may be better suited to performing some of these skills than others, learn to recognise skills which are absent in teams which they meet, and recognise the impact of this one performance, and through practice, override any natural tendency to behave in ways not conducive to successful teamworking" (p,658).

2.3.3 TEAM BALANCE

Another tenet central to Belbin's team role theory is the direct relationship between team role balance and team performance, that is, a higher team balance will result in better team performance. Belbin (1993) claims that "teams of able people would not necessarily produce favourable results since the balance might be wrong" because "particular individuals took on particular roles with the pattern of role balance exercising a crucial effect on the outcome" (p.20). To facilitate the assurance of team balance, Belbin (1981) has developed the Team Role Self-Perception Inventory (SPI) to assist in assessing team role tendencies prior to team formation. The SPI can, theoretically, help to identify the "natural roles" of prospective team members and guide higher management in forming teams and selecting candidates for "the crunch question in the long run is not, therefore, what specialist skills are possessed: what matters most, given a fair field of adequately

qualified candidates, is how the chosen person is going to behave [in the team]” (Belbin, 1993, p.19).

Opinions are divided among researchers on the over-riding emphasis Belbin puts on identifying and balancing team roles to ensure performance. Some support the idea that “identifying and understanding team roles in advance is critical to the success of workgroup interactions” (LoBue, 2002, p.294), while others find the need for team balance useful because “it is aimed at using individual strengths to strengthen the team” and “it takes extra energy to force people who are choosing team members to scan the mix of people already there and fill the gaps, instead of selecting more of the same so ‘everyone will get on well together’” (Foy, 1999, p.160). There are others who question its “universal relevance”, such as Partington and Harris (1999), who state that “the concept of team role balance and its link with performance may be impossible to generalise, and in the case of SPI – as with any other conceivable team role categorisations – may be entirely the wrong approach to universal relevant theory” (p.699) and “find no significant relationship between team role balance and team significance” (p.694). Another criticism against high diversity in groups, as highlighted by West (2004), is that “when diversity reduces group members’ agreement about team objectives, teams will fail ... Where the group is heterogeneous there will be pressures to manage (via group processes) the centrifugal forces of diversity that could lead to the disintegration of the group and could also threaten individual members (e.g., others’ differing perspectives threatening one’s own beliefs).” (p.43).

Besides the above two views, there is a third position. People holding this view agree with Belbin that team role balance constitutes one of the factors that influences team success is not always positively related, that is, low team balance may be more beneficial to team performance in some situations. In their study to investigate the impact of team composition on team performance taking into account the additional variable of task complexity, Higgs, Plewnia and Ploch (2005) found that “there is a clear relationship [] that the more complex the task and the more diverse the team composition – the better, and for less complex tasks highly diverse teams are detrimental to performance” (p.239) and that “in certain conditions low diversity may be beneficial for team performance” (p.243). Dunn and Wills (1999, p.274) suggested that task urgency and the environment of the team are other factors that may complicate the effect of team roles on team performance. These studies represent a collection of works which suggests that while the effect of team balance on team performance is confirmed, whether the impact is positive or negative is dependent upon other factors.

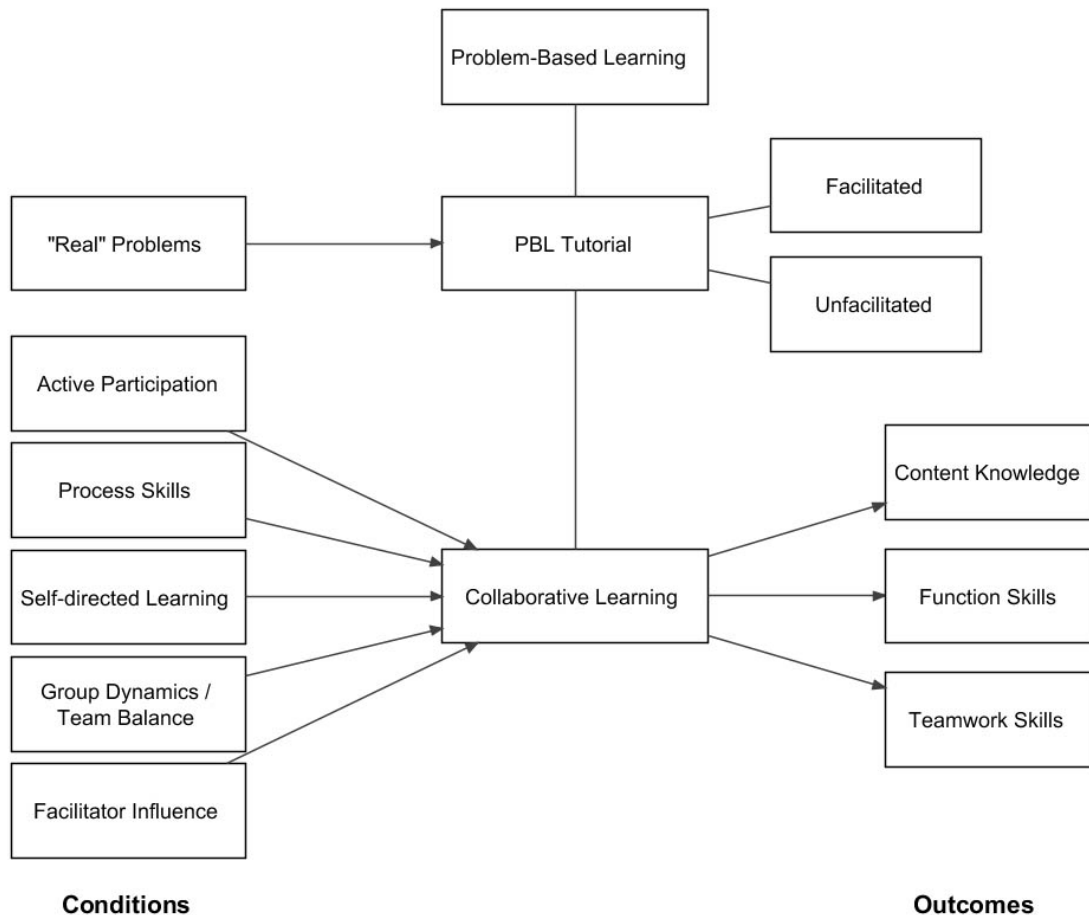
One of the early findings from the data collected for this research suggests that students are very concerned with team composition. As groupings are assigned randomly at the beginning of the semester, there is no guarantee on the balance of team composition. Hence, the majority of the students prefer to be given the opportunity to reorganise themselves into new groupings between problem cases. This is mostly done for two reasons: 1) to group together with classmates they are friendly with, or 2) to get team-mates with high abilities. However, the reorganisation of groupings would still result in

groups of varying degrees of team balance. It is therefore important to examine how students cope with the issues associated with team balance in the PBL process.

2.4 Summary Findings of the Literature Review

Figure 2.2

Summary of the conditions and outcomes of PBL



The key findings of the literature review are summarised in Figure 2.2 above. All authors agree that the focus of PBL is the presentation of real-life-like problem cases and the PBL tutorials (Barrows & Wee, 2007; Bridges & Hallinger, 1992; Woods, 1994), where the problem cases are deliberated in both facilitated and unfacilitated sessions. When implemented properly, the PBL setting stimulates collaborative learning and encourages students to take responsibility for their own learning (Bridges & Hallinger, 1992, Lee & Tan, 2004). Through the collaborative learning activities, students not only acquire content knowledge as in traditional curricula, but also develop function skills – critical thinking, evaluation, problem-solving– and teamwork skills (Barrows, 1988; Savin-Baden, 2000; Woods, 2004).

The review of previous studies shows that there are a number of key conditions to enable collaborative learning in PBL. One of the critical conditions for small group learning to produce better results than learning individually is positive dynamics within the group (Dyer, 1995; Johnson & Johnson, 1990; Miller et al, 1994; Peterson, 1997). Attaining positive interdependence requires that all members of the group not only constructively participate but such participation must also be recognised by the rest of the group. PBL administrators and facilitators often focus on the first part of this condition and seek active participation from every member in the PBL team to enhance group dynamics but overlook the second part of the condition – not only must all members actively participate, their participation must be constructive and recognised as such by the rest of the team – for the team to function effectively. For this to happen, the team members must understand the

process skills – their own role(s) and the respective roles of the other team members – in order to maintain team balance.

In the setting-up of the small group problem-solving process that lies at the centre of the present study, there are two different types of team actions taking place. On the one hand, there are actions relating to the content of the problem itself that requires competence in subject matter – architectural, management, computing, etc. – and are discipline-based. These types of actions – the *functional roles* (Belbin, 1993, p.24) – vary among teams in different fields. On the other hand, there are actions performed to maintain the group dynamics of the team that are independent of the functional roles – such as, leading the discussion, providing support, communication, and so on. While more experienced teams with teams members successfully working together for a long time may be able to assume necessary team roles as the team process begins, even members who have worked in team situations before may take a bit of time to establish their own role(s) in the team. Members with limited or no exposure to team situations may find it even harder to identify their own respective team roles and perform them effectively. The composition of the small group learning teams therefore has significant impact on the performance and dynamics of the collaborating students.

There is wide recognition that both functional roles and team roles are critical to the success of group dynamics in small group settings (Belbin, 1993; McChesney, 1995; Prichard and Stanton, 1999). Despite the importance writers put on the role of the team members in a PBL setting, the above review of the existing literature shows that there is a

lack of studies on the team roles of the PBL team. Instead, most of the current PBL research focuses on issues besides team dynamics, such as, “how information technology can enhance the PBL process?” As a result, not enough study has taken place in the area of the dynamics of the team process and the requisite skills within PBL tutorial groups. The kind of essential skills required are not any interpersonal skills, but those that contribute to the team members working effectively together as a team. This includes an understanding of one’s team role within a team and how to assume that role in a constructive manner in the team.

In all, the available literature clearly shows that PBL students face many challenges in their quest for quality education in the host countries. However, as mentioned earlier, very little else is known about how they cope with their many challenges, except that they seem to put in more effort in their self-directed learning to overcome their problems during lessons. However, self-directed learning in the PBL context is no longer limited to individual studies done independently but instead involves intensive group work conducted without tutor guidance. Those who could not acclimatise themselves to the new social and cultural environment mostly go into self-isolation and remain aloof from other students. The key question is therefore not only how individual students react to learning problems arising from their first encounters with PBL but also how the learning group as a whole responds to difficulties during the small group collaborative learning process.

2.5 The Research Questions

The facilitators hold what Pearson et al (2007) calls “the key [to] the creation of a safe, non-critical and accepting atmosphere in which students can practice this new way of learning and behaving” (p.619). There is however a lack of study on the problems the PBL students face in small group learning. For example, Lam (2004, p.381) finds from feedback collected from students of a PBL course in a Hong Kong university that “the students found time management and the workload challenging” and that students also found it “stressful” to “assume primary responsibility for their learning” under the self-directed learning principle of the PBL curriculum. The tasks of “managing” one’s own learning process and progress in a PBL course represent a whole new set of fundamentally different experiences for the students, who are previously educated under a very structured and regimented curriculum closely monitoring by the school and teachers.

Already faced with the very foreign experiences of transition to university life, the additional burden undoubtedly asserts tremendous pressure on new students encountering a PBL course. Easing this pressure would be critical to enhancing their experiences and outcomes from the PBL approach. The agents in the best position to achieve this are the PBL tutorial group facilitators because they are not only the ones most frequently in close contact with the students in the course of the latter’s learning but also the people the students look up to for guidance when confronting problems. However, although most PBL facilitators are well-trained in the theory and operation of the PBL approach, they often lack an understanding of the problems the students are experiencing in their

adjustment to the new teaching and learning methodology. From their study, Mpofu et al (1998) observe that “In many situations such as group dynamics, faculty members have their own preconceived ideas about what is really important, and the students may have a totally different view as indicated in the results.” (p.425). Hence, it is important to find out what the students’ views are.

In a PBL setting, the tasks of “managing” one’s own learning process and progress represent a whole new set of fundamentally different experiences for the students, especially for students who are previously educated under a very structured and regimented curriculum closely monitored by the school and teachers. The main aims of this research into the group dynamics of small group learning in an architectural studies sub-degree programme in Hong Kong is two-fold. First, this research aims to examine the team roles assumed by students in the PBL tutorial learning group to give educators a better understanding of the group dynamics within the small group learning setting. Second, this study aims to investigate the problems associated with experiencing small group learning that are encountered by the students probably for the first time.

For all stakeholders in the PBL process – such as, students, facilitators, curriculum designers, programme administrators, and so on – a better understanding of the small group dynamics within the PBL tutorial group is imperative to the effectiveness of the PBL curriculum. Hence, it is important to find out how students new to a PBL curriculum cope with the group dynamics. For the facilitators of PBL tutorials to better control the small group learning environment and maintain the health of the group dynamics, they must

acquire in-depth knowledge of how students actually behave in relation to the PBL process both inside and outside the classroom. Consequently, this research focuses on the main research question of:

How does a group of architectural studies students in a Hong Kong University cope with the group dynamics, both inside and outside the classroom, when experiencing a PBL situation in their programme?

Specific or guiding research questions to be studied include the following:

1. How do students manage the process of learning and the team roles in a PBL tutorial small group setting?
2. Do recognisable team roles develop in the PBL tutorial small groups, with or without formal assignment? Are these team roles consistently assumed by students, or do students assume different team roles at different times?
3. What group activities do the students conduct outside the PBL tutorials to manage the PBL learning and group dynamics?
4. How, if at all, do students change their behaviour to improve their performance – their own and the group’s – in the PBL small group learning setting? What actions, if any, do they take to cope with problems they encounter in the PBL process?

Although the above questions are listed here at the end of the literature review chapter, it must be noted they are not “frozen” at this stage. Emerging from the issues identified

through the review of key literature on the research topic, these research questions are continuously refined over the subsequent stages of the research. After their first formulation, the questions have gained direction and become more focused as the data collection and analysis process provides a better understanding of the phenomenon being studied.

CHAPTER 3:

RESEARCH METHODOLOGY – GROUNDED THEORY

3.0 Introduction

Despite the wealth of literature on group processes in the classroom, there has been little previous research directly related to the extensive use of small group cooperative learning in a design studio setting, especially as used in conjunction with architectural project teaching in design education. The aims of this study are to develop a theory of the group dynamics among Hong Kong university students in a PBL tutorial environment and associated phenomena. This research has employed a qualitative approach to examine the ways students coped with experiencing small group collaborative learning for the first time. This chapter describes the research design based on grounded theory methods used to investigate the behavioural pattern of the students engaged in PBL group learning as well as the factors influencing their behaviour.

The first section introduces the research paradigms, *positivism* and *interpretivism*, and provides justifications that the latter is more appropriate for this research. The emergence of the qualitative research methodology of grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1998) is presented together with a discussion of its theoretical foundation and salient features. The emphasis is on how the various features of grounded theory have been adopted in this research and their relationship to the specific research

questions of this study because this method “cannot be used in a formulaic way” (Morse, 2009, p.14) and requires modification to the particular needs of this investigation into small group learning in PBL situations.

In the following sections, the three sources for data collection – interviewing, observation and documents – are discussed and how they are related to one another in this research design to achieve triangulation is explained. The adaptation of the grounded theory data analysis stages of open coding, axial coding and selective coding to the context of this study is presented next. Finally, questions regarding the issues of ethics and trustworthiness in this study are raised in the last section and the strategies taken in response to these issues are elaborated.

3.1 The Research Paradigms and Approaches

3.1.1 POSITIVISM AND INTERPRETIVISM

At the time of the development of grounded theory, the dominant view of scientific research was the *positivist paradigm*. Research of the positivist view is based on the “assumption that features of the social environment constitute an independent reality and are relatively constant across time and settings (Gall et al, 2003, p.28).” The positivist paradigm therefore defines theory as being external to the actual social environment and that any statement about reality can become meaningful only when it can be verified empirically within the social environment. This is known as the *verifiability principle*, a central element of the philosophy of *logical positivism* (Friedman, 1999).

Disagreeing with the basic beliefs on matters of reality and knowing in the positivist paradigm are the proponents of the *interpretivist paradigm*, who share the objective of understanding the complexity of the real world from the view of those who experienced it (Schwandt, 1994). According to the interpretivist paradigm, the positivist scientific study of social reality is impossible because all social activities involve beliefs, values, intentions, and goals that are invested in activities to give them meanings. But to understand the meanings assigned to activities requires that the meanings be placed within a social context.

The interpretivist ontological view opposes the notion of an external reality of the positivist view and is predicated on the of a foundation of contextually bound reality – a reality, or rather relativistic realities, that are local and specific in nature (Guba & Lincoln, 1994). Researchers can only provide meaningful findings and *interpretations* of reality that are bound to particular subjects, settings and context. Epistemologically, the interpretivist perspective therefore views the observer as interactively connected to the observed in that the researchers play an active role in constructing the meaning and processes of the participants in the study (Schwandt, 1994). Methodologically, there are no pre-formed hypotheses to test but rather a set of general problems and a theoretical framework in which to collect and analyse data.

Building on the research paradigms the researcher can follow one of two approaches– the *quantitative methods approach* and/or the *qualitative methods approach* – or even adopt a combination of the two approaches when conducting the research – which informs the

researcher *what* should be done and *how* to do it. The major differences between the quantitative approach and the qualitative approach in social research lie in their almost opposing epistemological views on the researcher and the knowledge/theory of reality, which give rise to obvious technical disparity. The qualitative researcher thus maintains a far closer relationship to the people and situation under study than the quantitative researcher through methods such as interviewing, ethnography, case study and participant observation to study not only isolated events, but how these events are related to each other as a process of change.

3.1.2 JUSTIFICATIONS FOR ADOPTING INTERPRETIVISM

In this research, the starting point is to investigate an educational situation based on a specific learning approach – small group collaborative learning in PBL tutorials – in a specific setting – a case university in Hong Kong – where there is a lack of established research work. Due to this lack of previous research, there is no “testable, pre-determined hypothesis” to be verified, a condition for positivist research. As discussed in the previous chapter, students in Hong Kong coming through the local secondary school system bring into their first encounters a unique set of learning attitudes and experiences. The initiative for research is not to understand the universal reality of small group learning or verify a hypothesis of such a reality but to interpret through approaches that are sensitive to the learners and their thoughts – the focus is how to conduct research, not on people, but with people (Morrison, 2002).

Furthermore, there is a general lack of established theory, or a set of established theoretical foundations, available for positivist verification. Most research in PBL has been conducted relatively recently compared to other educational research. Researchers are only starting to construct an understanding of the processes and meanings relating to the individual learner and their interactions with the learning group in a PBL environment (Schmidt & Moust, 2000). Hmelo and Evensen (2000) point out that most of the earlier research focused on the aspects relating to knowledge acquisition and problem-solving skills in PBL. Since the growth of PBL research in the late 1980s, the key questions of how the members within a group interact and how the individuals cope with the new experiences of self-directed learning – have not been adequately studied. As a result, “theories remain vague about how these interactions are practiced or which aspects of the interactions differentially affect learning” (Hmelo & Evensen, 2000, p.4).

With the main objective of gaining an understanding of the interactions and individual actions of PBL students in Hong Kong, “qualitative methods can be used to obtain the intricate details about phenomenon such as feelings, thought processes, and emotions that are difficult to extract or learn about through more conventional research methods” (Strauss & Corbin, 1998, p.11). Rather than treating the learners as subjects of research, they are considered active “informants,” who are not only actively participating in the learning process but, more importantly, actively shaping it as well. Saven-Baden (2000) argues that, “The consideration of personal experience in learning is something that is noticeably lacking in literature about learning in general and problem-based learning in particular, yet for many, personal experience is that which makes learning both possible

and meaningful. New definitions and new meanings of learning often emerge when interaction of ideas and experience collide with one another.” (p.6)

The purpose of this research is to examine small group collaborative learning from the perspective of the Hong Kong students participating in the PBL tutorials. In PBL, the students play a much more important role in shaping the learning process than in traditional learning methods (Barrows, 2000; Woods, 1994). Therefore, the meanings of their activities are intrinsically linked with the social constructions they bring to the learning context. Consequently, for researchers to understand these meanings, they must make a “studied commitment to actively enter into the worlds of interacting individuals” (Denzin, 1978, p.8) and engage the social processes actively. This clearly opposes the positivist stand of displacing the observer from the observed and detaching the educational researcher from the learning environment and participants studied.

One of the fundamental concepts of interpretivism is that all human interactions are social in nature and are meaning-making experiences. Hence, any comprehensive research into human activities aims to understand those experiences, and furthermore, any adopted research methods to study such phenomena must reflect the nature of the studied experiences. Blumberg (2000) argues that, “[r]esearchers need to develop approaches that reflect the dynamic, constantly changing nature of learning endeavors” (p.224), and in this respect naturalistic and interpretive research approaches become more appropriate for this research than positivist ones. For the above reasons, this research has adopted the qualitative method of grounded theory.

3.2 Grounded Theory

During 1960's, there were growing questions among social scientists about the suitability of applying what is essentially a natural science model of research to the social sciences.

Bryman (1988) attributed this challenge to the acceptance and influence of phenomenology at that time, which put great emphasis on reality as experienced from the first-person point of view. One of the major qualitative methods of research resulting from this challenge is the method of *grounded theory* developed in the field of medical sociology (Glaser & Strauss, 1967).

3.2.1 DEVELOPMENT OF GROUNDED THEORY

First formulated comprehensively by sociologists Barney Glaser and Anselm Strauss (Glaser & Strauss, 1967), grounded theory is a research methodology for generation of theory, which derived its name from the practice of generating theory from research which is "grounded" in data. Instead of conducting research for the purpose of testing or verification of theory or hypotheses formulated from the integration of previous research, grounded theory research generates theoretical propositions of a substantive area from the data collected from a specific situation. According to Strauss and Corbin (1998), by "grounding analysis in data" (p.13), grounded theories "are likely to offer insight, enhance understanding, and provide a meaningful guide to action" (p.12), as well as "maintain[] a certain degree of rigor" (p.13).

The grounded theory approach has emerged as an alternative research methodology since its introduction to more traditional approaches to scientific inquiry of hypothesis testing and verification, which relied heavily on quantitative techniques in analysis of the collected data, and is extensively used today in researches in various disciplines.

Grounded theory is itself an emergent methodology. Glaser and Strauss (1967) have explicitly stated that their research methodology “puts a high emphasis on *theory as process*; that is, theory as an ever-developing entity, not as a perfected product” (p.32).

They believe that the notion of “theory as process” denotes a more accurate representation of the reality of social behaviour and interactions.

3.2.2 USING GROUNDED THEORY IN THIS RESEARCH

For the substantive area of this research, there is limited previous research to formulate established theory as hypotheses for verification or testing. As a result, this is an interpretive study aiming at the generation of theory for a less-studied area in education research instead of verification of pre-established theory on group-teaching in education. To achieve this objective, a research methodology based on *grounded theory* is adopted to look into the behaviour of architectural studies students in the small group learning setting.

Intrinsically bound to the *interpretivist paradigm*, grounded theory is a qualitative research methodology developed for studying human behaviour from the perspective that social behaviour and interactions are themselves a process that is ever-changing over time and place. Denzin and Lincoln (1994) believe that grounded theory may currently be the most popular interpretive research strategy applied in the social sciences. Problem-based

learning (PBL) and its small-group based teaching approaches are new to Hong Kong, especially to architectural education, which is dominated by design studio project teaching. Faced with such a new research problem area, grounded theory seems a particularly suitable research methodology because of several points:

- It is widely accepted that the strength of grounded theory methodology lies in its emphasis on theory development (Bryman, 1988; Dey, 1999; Goulding, 2002; Punch, 1998). Working with a problem area that has little previous research, it is critical that the methodology employed has been designed to tackle research problems where there are limited theory developed (Goulding, 2002). Grounded theory is also well fitted to the kind of research questions listed at the end of Chapter 2, which would be deemed too broad and unstructured for a quantitative research approach (Strauss & Corbin, 1998).
- Due to the long and established traditions of project-learning in architectural education, there is much preconception about the advantages of project-learning over other types of teaching method, such as PBL. It is therefore imperative that the research methodology begins by avoiding as many preconceived ideas as possible. Grounded theory is appropriate because it “breaks through both verification and preconceived conceptual schemes to provide us with very interesting and important theory” (Glaser & Strauss, 1967, p.185).

- Dimmock (2002) has cited the apparent preference of the quantitative approach over the qualitative in Hong Kong to illustrate the impact of cultural differences on the selection of research methodology, though the observed preference seems to be subsiding in more recent times. This research calls for a qualitative research methodology that can allow the researcher to be most “culture sensitive.” Grounded theory is thus deemed most suitable because despite its rigour provided by a coordinated and system approach it is still flexible enough (Punch, 1998) to be adjusted to the emerging cultural influences of the subjects through built-in mechanisms such as theoretical sampling.
- As opposed to generating “grand theory”, the kind Mills denounced as parasitic to social science (1959), this research is immediately directed at development of theory at the substantive level. Although grounded theory is appropriate for the generation of formal theory as well as substantive theory (Glaser & Strauss, 1967), most research using this methodology has concentrated on the latter (Strauss & Corbin, 1994). This provides a substantial body of precedents to draw on as references to research specifically focusing on the development of substantive theory.

For the above reasons, a grounded theory methodology is adopted for this research. It has been selected because it is a research method that “offers a comprehensive and systematic framework for inductively building theory” (Punch, 1998, p.103), which makes it suitable for the little researched subject of team roles in small group learning. Goulding (2002), also describes grounded theory as a research methodology best suited for researchers

whose main goal “is to build their theory from the ground” (p.55), which applies especially to the case of un-facilitated small group tutorials because existing research on PBL concentrate almost entirely on conventional facilitator-guided small group tutorials.

3.2.3 KEY FEATURES OF GROUNDED THEORY IN RELATION TO THIS STUDY

Despite the later development of disagreements between Glaser’s and the late Strauss’ version of grounded theory methodology, there are a number of major themes that run common in the versions developed by both Glaser and Strauss: *source of data*, *the constant comparative method*, and *theoretical sampling*. This section will examine the proposed problem area and research questions in relation to each of these themes.

3.2.3.1 Sources of Data

To understand the complex phenomenon group dynamics in PBL teams, no single data collection method is adequate to capture all the subtleties of the interaction between students and how they behave as a team. Denzin and Lincoln (1994) maintain that “qualitative research is multimethod in its focus, involving an interpretive, naturalistic approach to its subject matter” (p.2) and this means that “qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring to them” (p.2).

In agreement with this view, a multitude of data sources is required for this research because different data focus on different levels of analysis. This study had made use of

both kinds of main qualitative data mentioned by Glaser and Strauss (1967), namely *field* data and *documentary* data. To ensure the validity and reliability of this research, data were triangulated through the use of different collection methods. Field data are collected through both observation of the students' behaviour in the small group tutorials and semi-structured interview of individual students, while the documentary data is collected from the reflective journals that students have submitted as a standard part of their assessment tasks.

3.2.3.2 *The Constant Comparative Method – The Coding Process*

One of the most important issues regarding coding in grounded theory is not to force preconceived concepts and categories onto the data, ones that are not natural to the empirically observed behaviour. Grounded theory research facilitates this process with another of its fundamental features – the implementation of the *constant comparative method*. As the coding progresses, it is important that each new coding is compared with previously coded concepts and incidents to lead towards the development of more general conceptual categories for multiple happenings or fragments of data.

This constant comparison is particularly critical to this study because most of the data collected are descriptions of the actions taking place in the small group learning process from different sources – the students' own verbal and written descriptions as well as the researcher's observations. Looking at both the similarities and differences between data incidents, and the corresponding conceptual categories, will help to clarify that the associations between data and the emerging concepts are consistent (Locke, 2001). There

is therefore constant movement between concept categories and data incidents in the part of the researcher during the coding process.

3.2.3.3 *Theoretical Sampling*

The total number of students to be studied cannot be determined at the beginning of this research because of the emergent nature of grounded theory research (Glaser & Strauss, 1967; Strauss & Corbin, 1998). Locke (2001) attributes the logic of theoretical sampling to the commitment of grounded theory research to theory development for a substantive topic: “the practice of actively searching for and ‘sampling’ data in order to provide the best possible information for theorizing a substantive topic area is one of the foundational operations of this research style” (p.55). This commitment precludes the possibility of identifying the most appropriate group of subject students, or PBL tutorial group, before the theory begins to emerge, that is, before the first set of data is collected and analysed. The key question of where to collect data *next* is controlled by the emerging theory (Glaser & Strauss, 1967). More detailed description of the sampling approach is given in section 3.3.4.

3.2.4 GROUNDED THEORY AND GROUP DYNAMICS

Group activities in PBL tutorials can be understood as individuals doing things collectively and undergoing “micro level processes.” Locke (2001) claims that, “Grounded theory as originally conceived is very much oriented towards micro level processes reflected in action and interaction” (p.41). Glaser and Strauss (1967) argued that the methodology is especially suited to generating theories of social process. This focus on process is

illustrated by them in their own studies on dying, in which there is clearly an emphasis on process over the individual actors.

Furthermore, another important aspect of this study is to understand the way in which students in PBL tutorial groups manage and maintain the team process. Punch (1998) stresses that “grounded theory methodology specifically includes the analysis of process” (p.103). In their studies on researches in management, both Goulding (2002) and Locke (2001) supported the use of grounded theory methodology for research on group behaviour of small group teams in business corporations that are similar in size and dynamics to the PBL tutorial groups under study in the proposed research.

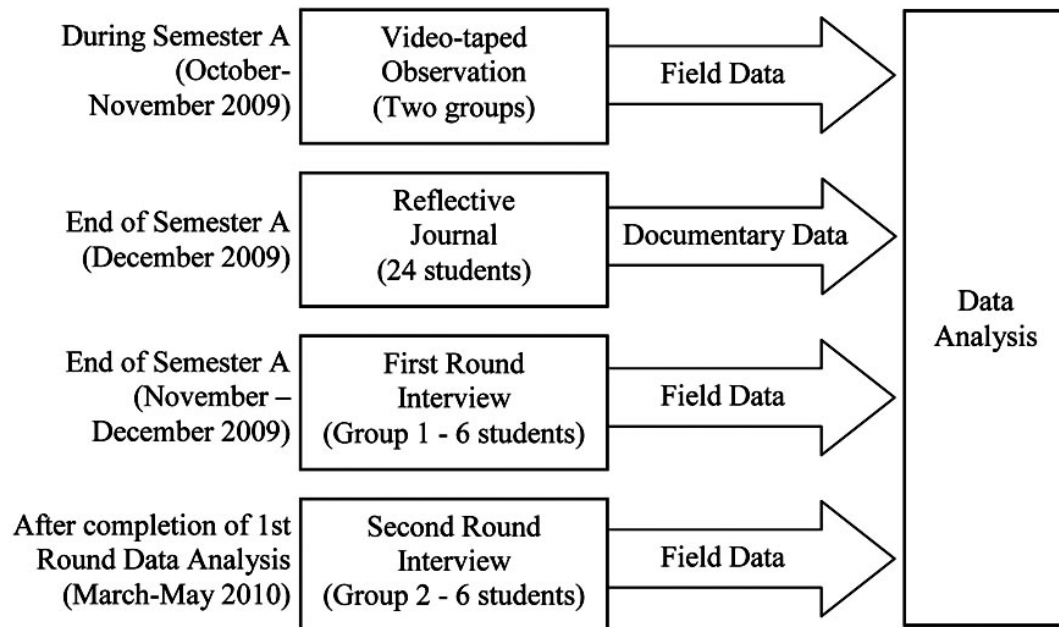
Locke (2001) points out a number of important reasons behind the suitability of grounded theory for management research. Firstly, grounded theory is an effective method for studying the situated processes inherent to the substantive topics in management and organisational studies such as problem-solving, socialisation and issues associated with individual and group behaviour. This makes grounded theory well suited for the proposed research on PBL tutorial small group dynamics as well. Secondly, groups dynamics in both business and educational settings involve complex actions and issues, and “the grounded theory approach is well suited to the study of complex entities because of its ability to produce a multifaceted account of organisational action in context” (Locke, 2001, p.95).

3.3 Data Collection

One feature that distinguishes grounded theory methodology from other qualitative research methodologies that emphasize only one source of data is that grounded theory research acknowledges data collection from both single and multiple sources (Goulding, 1992). Strauss (1987) encourages the use of additional data as they often become necessary in the course of theory-guided data collection inherent to grounded theory. He thinks that supplementing with what he termed different “slices of data” is essential because “different kinds of data give different views or vantage points, allowing for further coding, including the discovery of relationships among the various categories that are entering into the emergent theory” (p.27).

Figure 3.1

The time-line for the collection of different sources of data



The following sections will discuss the three main sources of data and collection method to be used in this study: *interviewing*, *observation* and *documentary sources*. Figure 3.1 shows the time when the different sources of data were collected. It should be noted that although the video-taped observations had been the first data collected, the observation data for the second group were not analysed until the group was identified through theoretical sampling.

3.3.1 INTERVIEWING

The primary data collection method in this research was by interviews with students taking part in the PBL tutorials. This was supplemented by secondary analysis through observation of video-recorded PBL tutorial sections of the interviewed groups and analysis of reflective journals submitted by the students. Adler and Adler (1994) think that while observation overcomes the biases and limitations of the participants, it is in turn subjected to the biases and limitations of those observing and coding the behaviour under study. To overcome this short-coming, interviews were conducted in this study to counter-balance potential observer biases with accounts from the participants themselves.

Burns (2000) pointed out a number of advantages of interviewing as a data collection method, of which three are of importance to this research: *flexibility*, *probing*, and *suitability to complex topics*. Interviewing provides great flexibility that allows the interviewer to respond to the situation by repeating questions or elaborating meanings in case the subjects misunderstood them. The interviewer also has the opportunity to use

probing questions to solicit more complete responses when ones given by the respondents seem incomplete or irrelevant. Furthermore, interviewing proves to be particularly useful “when extensive data is required on a small number of complex topics” (Burns, 2000, p.583) as is the case for this research to understand PBL small group tutorials.

To allow the respondents to use their own natural language and to avoid the problem of the perspective of the researcher being imposed through the interview language in a structured interview, semi-structured interviews were adopted for this study. Unstructured, or open-ended, interviews were not used because although this approach can focus on the respondent’s own perception of the phenomenon being studied and their own experiences, the researcher becomes too vulnerable to the whims and personal interpretation of the respondent, which may in turn lead to problems of validity (Burns, 2000).

A more flexible interview guide with no predetermined wording or order of questions has been developed in this research for the semi-structured interview to give it direction. Two rounds of pilot interviews with two of the PBL students were conducted to refine the interview questions. According to Gall et al (2003), pilot-testing interviews are important, especially for the novice researcher, to “ensure that [the interviews] will yield reasonably unbiased data” (p.246). The pilot interview questions followed the research questions formulated from the literature review to answer the research questions that are listed at the end of chapter 2:

This initial set of questions was subsequently modified based on the responses and insights gathered from the pilots. Some of the wordings of the original questions were revised to make them clearer to the interviewees, while others were eliminated altogether and replaced by new questions.

For example, based on the experience gained from the pilot interviews, it was decided that instead of simply asking the respondents at the beginning of the interview, “What are your general views of experiencing PBL for the first time?”, the question had been expanded to include “Did you encounter any problems?” This revision was made to help “open up” the respondents in the interviews as both participants in the pilot had come more enthusiastic in their responses once they had begun to talk about problems that they had encountered.

Another finding from the pilot interviews was that following the order too rigidly might have interrupted the respondents’ narration of their experiences in the PBL group process. Instead, it has been decided that after the first question, the researcher would determine which one out of questions 2 to 5 to ask next depending on the direction of the respondents’ answers. So essentially, each interview had followed a different sequence of questions. The final questions adopted for the interview schedule of the first round of interviews were as follows:

1. How do you find the process of learning in a PBL tutorial small group setting?
How was it different from your previous learning experiences? Did you encounter any problems?

2. What actions did you take to cope with the problems you had encountered in the PBL process?
3. How did you change your behaviour to improve your performance – your own and the group's – in the PBL small group learning setting?
4. *What group activities did you and your group members conduct outside the PBL tutorials to manage the PBL learning and group dynamics?*
5. Did recognisable team roles develop in the PBL tutorial small groups, with or without formal assignment? Were these team roles consistently assumed by group members, or do members assume different team roles at different times?
6. Any other things you would like to share about your PBL experience?

After the first round of interviews, the researcher noticed that question number 4 (highlighted in italics) was mostly answered in the respondents' reply to questions number 1 through 3. Hence, that particular question was dropped in the second round of interviews because it was simply replicating areas already covered by the previous questions. When students did not provide information on outside class activities upon answering the first three questions, a prompt question was asked on the topic. More significantly, a new question (question 5 highlighted in italics below) relating to the emerging theory of "formation" was added to the interview schedule. The revised interview questions for the second round of interviews are as follows:

1. How do you find the process of learning in a PBL tutorial small group setting?
How was it different from your previous learning experiences? Did you encounter any problems?
2. What actions did you take to cope with the problems you had encountered in the PBL process?
3. How did you change your behaviour to improve your performance – your own and the group's – in the PBL small group learning setting?
4. Did recognisable team roles develop in the PBL tutorial small groups, with or without formal assignment? Were these team roles consistently assumed by group members, or do members assume different team roles at different times?
5. *When the distribution and/or load of tasks changed within the group, what were the main reasons? When did such changes occur during the problem process?*
6. Any other things you would like to share about your PBL experience?

A group of six students was selected as the initial sample for the first round of interviews. Arrangements were made to interview each of the students in the sample individually in tape-recorded sessions. The interviews were loosely structured to gather data about the broadest possible range of events associated with team roles and team process in PBL tutorials. The research questions stated in Section 2 and pilot interview sessions were used to compose an interview guide for the data-gathering process in the interviews. The interview guide maintains focus on the crucial issues by giving directions to the interview through a collection of questions that have no fixed wording or order (Burns, 2000).

Theoretical sampling was used to guide the selection of subsequent round of interviews until theoretical saturation is reached.

The interviews were conducted in the participants' native language of Cantonese to allow the students to express their opinions and describe their actions more clearly. These were then translated back to English upon transcription by the researcher. As common with most Hong Kong students, the respondents answered the questions in a combination of Cantonese with English terms mixed in. To ensure accuracy, the transcriptions were shown to the interviewed students to check for any misinterpretations. The interviews, each lasting around 25 to 35 minutes, were conducted in an enclosed conference room away from the design studio and the participants' fellow classmates.

Multiple interviews were conducted to corroborate the results as Gerson and Horowitz (2002) pointed out "no single interview, however revealing, can offer more than limited insight into general social forces and processes" and that "only by comparing a series of interviews can the significance of any one of them be fully understood" (p.211). Data collected from interviews is information given by the participants outside the natural setting and happening of the event itself. According to Fontana and Frey (1994), this causes the information to be "limited by participants' knowledge, memory, and ability to convey information clearly and accurately and, also, by how they wish to be perceived by outsiders such as researchers" (p.367). To counteract this problem, observation was conducted as another means of data collection for corroboration.

3.3.2 OBSERVATION

In social science research, observation as a data collection method involves systematically watching and recording the behaviour of people in detail (Mays & Pope, 1995). The major advantage of observation over other methods is that it is a type of “naturalistic research”, that is, it takes place in natural settings instead of experimental settings. Including observation in this research on the PBL group process would provide a more complete account of the studied behaviour of small group learning than would be possible by relying solely on data collected from interview or documentary evidence. Although covert observation provides the potential of obtaining the most realistic and unbiased data on the activities being studied, Gay and Airasian (1992) caution that researchers should avoid such practices due to “ethical issues regarding participants’ lack of awareness” (p. 198).

Despite “the advantages of participant observation including the ability to gain insights and develop relationships with participants that cannot be obtained in any other way” providing “both breadth and depth of information about participants and setting” (Gay & Airasian, 1992, p.198), this method is not be employed in this research. The PBL small group interaction that forms the focus of this research is best observed as it takes place naturally without any outside disturbance. It belongs to the type of behaviour which Gay and Airasian (1992, p.205) mandate as naturalistic observation, where the “observer purposely does not control or manipulate the setting being observed” and “the intent is to record and study behaviour as it normally occurs.” In fact, it is essential for this research that the impact of the observation process on the PBL small groups be minimised by all means to gain valuable insights to this relatively new subject area. To serve this purpose, non-

participant observation facilitated by video-taping is adopted as the data collection method for this research.

Capturing the PBL small group interaction on video tape also has additional advantages over the use of observers:

1. The production of a permanent record allow for repeated observations.
2. Video recording serves the role of an unbiased record (Leinhardt, 1988, p.494).
3. Coding of videotape is far easier than in-class live coding as repeated viewing can take place (Leinhardt, 1988, p.494).

On the one hand, video-taped observation improves the ability of the observers to accurately record the details of the observed behaviour, especially when the small group further breaks up into smaller groups during the tutorial, which makes it difficult for the observer to follow all the activities taking place at the same time. On the other hand, video-taping allows repeated observations of the complex and fairly rapid happenings of the student interactions in the PBL tutorial. This would be particularly helpful towards the end of the problem-solving process when the students are more familiar with the problem subject and gain more confidence in contributing to the discussion.

One of the key issues in observational research concerns the way the presence of the observer in the natural setting affects the behaviour being observed (McMillian & Schumacher, 1993). Although the use of an actual observer to code events as they happen

in the natural setting may be easier for the observer to appreciate the shared meaning between the team members than using mechanical means of recording (Galtron, 1988), video-recording of the activities was adopted in this research. It should be noted that videotaping is also intrusive – though its actual effect is little researched – therefore care must be taken in the introduction of the mechanical device into the natural setting of a PBL tutorial to minimise its impact on the participants’ behaviour.

Figure 3.2

The setting for video-taping the PBL tutorials

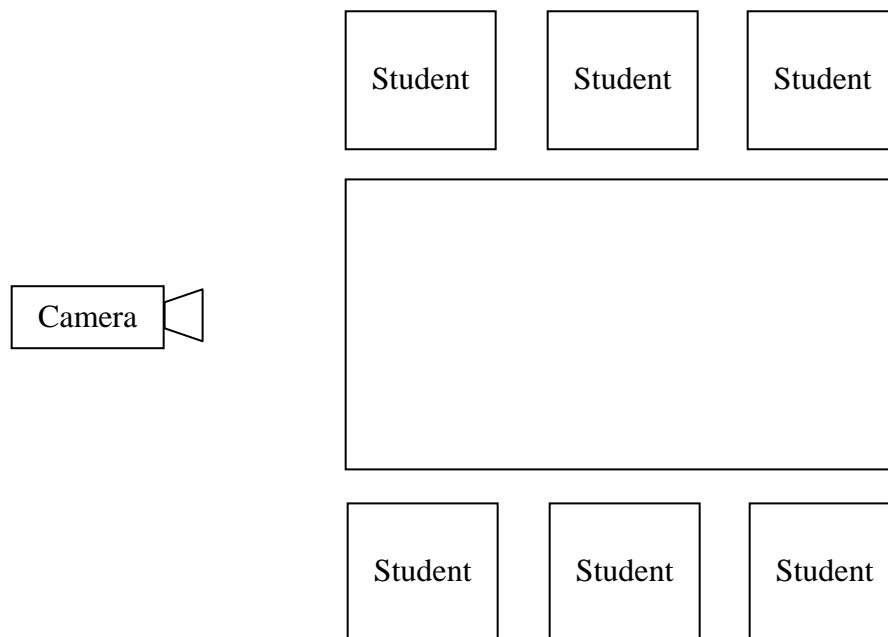


Figure 3.2 shows the setting of the video-taped observations. In each observed PBL tutorial group, six students sat around a rectangular table to discuss the problem case, just as they would during a normal session. A digital video camera has been set up on a tripod at the short end of the table to capture the face of all the participants so that it would be possible to determine who was talking at any given time. The device records in DVDs that are playable in any normal DVD players. Only one camera has been used in the video-taping to minimise intrusion to the student discussions. A directional microphone was fitted on the video camera to enhance sound recording. Two trial recordings were conducted to fine-tune details, such as the distance between the camera and the table, the height of the camera, the focal length, etc. Each video-recorded session lasted between 25 to 30 minutes.

3.3.3 DOCUMENTARY EVIDENCE

The third source of data for this study is the reflective journals submitted by students at the conclusion of each semester to reflect on their experiences in the problem case discussions and what they have learnt. Documents – written communication and other textual materials – are commonly used by researchers as a source of data in qualitative researches (Strauss & Corbin, 1998) and have a long tradition in research (Cortazzi, 2002). Since the non-participant observation conducted in this study inevitably affected the behaviour of the PBL small groups to some degree because of the presence of the video recorder, therefore the students' reflective journals form an important additional source of data in this research. Such documentary evidence provides a “rich source of data for social research” (Punch,

1998, p.190). In addition, the reflective journals record activities taking place off site that cannot be captured by field observation.

The documents used in this research, student journals written as part of course requirements, are of the type that Cortazzi (2002) describes as “already exist independently of the researcher” and “can be used as they are found” (p.201). In the reflective journals, students were requested to review their contribution to the team process as well as what they had learned from the problem case. Contained in these journals are therefore valuable information on how the students behaved in a small group setting, the kind of roles they assumed in the team process, and their own interpretation of their own respective roles in the team structure. This represents the most “natural” data to be collected for this research as the reflective journals are submitted as a normal part of the curriculum and therefore precludes biases that may result from the knowledge that one is being studied in a research. A sample of a reflective journal is shown in Appendix C1. The journals have followed an open format with some guide questions:

Please give a reflective account of your own experience with the Problem Case component in this semester in a statement of around 500 words. The Reflective Journal accounts for 5% of your final grade.

The following are questions that you may want to consider when composing your Reflective Journal:

- How would you assess your own performance in the PBL tutorials?
- What have you gained in terms of attitude, generic skills and architectural / building knowledge?
- What do you consider your talents or strengths in the PBL process?
- In what areas could you improve further?
- How did you apply what you have learned from the Problem Cases in your Studio Project?
- How did the small group learning process contribute to your learning?
- What are your plan(s) to further your development in this programme?

The text in a document is given new meaning each time it is being read and interpreted (Hodder, 1994). Nevertheless, researchers must realise it is critical to understand the context in which the document being studied is produced when they interpret the meaning of the said text (Gall et al, 2003). As the designer of the format of the reflective journals and their assessor for a number of years, the researcher in this study understands the purpose and the context of the documents very well. Potential problems arising from the researcher's position as an *insider*, such as preconceived biased views, are addressed in section 3.7.

3.3.4 SAMPLING METHODS

3.3.4.1 Theoretical Sampling

Strauss explains that the relationship between the data collection and data analysis processes in grounded theory research methodology differs from other research

methodologies through the concept of “theoretical sampling”, which he describes as a mechanism “whereby the analyst decides *on analytical grounds* what data to collect next and where to find them” (Strauss, 1987, p.38-39). The researcher follows the emerging theory and seeks the next group of subjects or activities to collect the next set of data for specific theoretical purposes grounded in the emerging theory.

Theoretical sampling is diametrically different from the form of sampling known as “selective sampling”. Common in qualitative research, selective sampling involves deciding beforehand the data collection sample based on some preconceived ideas and intention. The use of predetermined samples is in direct conflict with the principle of theoretically grounding the sampling and data collection in the theory emerging from the analysed data. The central idea of theoretical sampling in grounded theory is that “subsequent data collection should be guided by theoretical developments that emerge in the analysis” (Punch, 1998, p.167).

Locke (2001) attributes the logic of theoretical sampling to the commitment of grounded theory research to theory development for a substantive topic: “the practice of actively searching for and ‘sampling’ data in order to provide the best possible information for theorizing a substantive topic area is one of the foundational operations of this research style” (p.55). This commitment precludes the possibility of identifying the most appropriate group of subjects before the theory begins to emerge, i.e. before the first set of data is collected and analysed. The practice of theoretical sampling is critical to the rigour of the developing theory as Locke (2001) further explains, “theoretical sampling, then,

identifies those comparison groups that are useful to refine as well as increase the robustness of the emerging substantive theoretical framework” (p.57).

Goulding (2002) asserts that theoretical sampling operates as a “happy marriage of induction and deduction” (p.68). While inductive analysis help generate the codes from the data, deductive processes help guide the research towards the next sample in association with the emerging theory. Through this induction-deduction process, the grounded theory research is guided by theoretical sampling to move from the absence of a theory to its emergence, and in turn to the more central issues of the developing theory. In a grounded theory research “researchers enter into data collection with the supposition that it will be an open ended and flexible process” (Locke, 2001, p.55) that will inevitably be modified over the duration of the research as the researchers pursue the clarification, development and refinement of the process of conceptual abstraction and the resulting categories in the conceptual scheme.

3.3.4.2 Context – The City University of Hong Kong

The City University of Hong Kong (CityU) is a relatively young university in Hong Kong. Incorporated as the City Polytechnic of Hong Kong in 1984, it was granted full university status in 1994. CityU focuses on professional education through its three colleges – Business, Humanities and Social Sciences, and Science and Engineering – and four schools – Creative Media, Energy and Environment, Law, and Graduate Studies. In the the school year 2009-2010, there were a total of 12,760 undergraduate students and 5,798 graduate / post-graduate students enrolled in various programmes under twenty academic

departments. CityU is ranked 129th among the world's top universities according to *The Times Higher Education Supplement* (THES) 2010 survey and 15th among the top Asian universities in the 2010 Asian University Rankings published by QS (Quacquarelli Symonds) on 13 May 2010.

Students taking part in this research are first year students in the 2-year Associate of Science in Architectural Studies (AScAS) programme in the Division of Building Science and Technology of the College of Science and Engineering. Graduates from this programme are normally accepted for further studies into the second year of a 3-year bachelors degree in Hong Kong and United Kingdom universities, and the final year of programmes in Australian universities.

The majority of the students in the AScAS have taken the public Hong Kong Advanced Levels (HKAL) examinations and are admitted through the Joint University Programmes Admissions System (JUPAS). About 5-10% of the students are admitted through the non-JUPAS route, which means that they have not taken the HKAL examinations and have qualified for admissions through alternative means, such as the International Baccalaureate or a recognised diploma course from a technical college. Only one out of the twelve student participants in the interviews and observation was admitted through the non-JUPAS route.

3.3.4.3 *Sampling Procedures in this Research*

Each cohort of students in the case programme is divided into sixteen groups of five to six students in their first year for the operation of the PBL curriculum. In order to ensure that students with different academic abilities are evenly distributed among the groups, they are not formed by randomly putting students together. Instead, academic performance is used as a reference to form groups so that each group contains students of mixed ability and none of the groups is predominantly composed of stronger or weaker students in academic terms. A PBL group is therefore an appropriate unit for each round of data collection for two reasons. First, the students from each group would represent students of different levels of academic performance. Second, as this is a study on group dynamics, it would be most suitable to study all students from a group to understand the way the group functions as a whole.

To avoid bias, groups containing students who have been taught or advised by the researcher are excluded from the study. This leaves seven out of the sixteen groups from the studied cohort eligible for collecting interview and observation data. As there is no way to predict the sample size for theoretical saturation to occur at the beginning of the study, the data collection begins with one randomly selected group from the cohort and uses theoretical sampling to guide the selection of groups for additional data collection until theoretical saturation is reached (Strauss & Corbin, 1998). All seven qualified groups were video-taped during the semester.

Each round of data collection and analysis covered one of the seven subject groups, coupling the observation of the group in action and individual interviews with each of the six group-members. After the first round of data collection and analysis, additional groups of students were targeted through theoretical sampling according to the emerging theoretical questions and the emphasis gradually shifts to issues at the core of the developing theory. In the study, the second group of students has been selected using theoretical sampling to further investigate an emerging typology of students. As a result, the group exhibiting the highest diversity in behaviour among the group members according to the video-taped observations is chosen for the second round of interviews. For a doctoral thesis, the manageability of the volume of data to collect and analyse is an important consideration when determining sample size. In the end, two student groups, containing a total of twelve students, were interviewed and observed.

The second group was selected to further develop two emerging themes from the first round of data collection and analysis. First, to elaborate and refine the category (Charmaz, 2006) of “tutor influence”, it was decided that the next group of students should be one that is facilitated by a different tutor from the first group. Turning to the small group learning experience of a group under another tutor helped the researcher to better investigate the properties and other factors of this category. Two out of the remaining six groups were in the same tutor group as the first group and were therefore not considered for the second round of data collection and analysis.

Second, the group with the widest range of group member performances among the remaining groups was chosen for the next round of data processing. From the experience of the researcher, this would most likely result in redistribution of tasks and work load, another key factor of the emerging theory resulting from the analysis of data collected from the first group. The performance of the group members was determined by their final marks for the course and the group with the largest deviation of marks was selected. The researcher also reviewed the video-recordings of all four remaining groups to confirm the suitability of the selection.

For the third source of data, reflective journals of twenty-four students were analysed in the documentary analysis for corroboration purposes. They came from one student group from each of the four tutor groups to capture the full picture of tutor influences. The two groups that had gone through the comprehensive analysis of observation and interview were both included in the documentary analysis.

3.4 Data Analysis

One of the key features of data analysis in grounded theory is the intention of “getting above the empirical level in analysing data, and on working towards a condensed, abstract and emerging interpretation of what is central in the data” (Punch, 1998, p.218). The main objective of grounded theory is not a simple interpretation of the collected data but to push beyond the data onto an abstract level. The initial stage of the coding process in grounded theory therefore focuses not only on the identification of similar events but on the

conceptualisation of the collected data through grouping similar events into higher level conceptual categories – the emphasis is on the generation of emerging conceptually abstract categories. Although these conceptual categories do not actually form part of the collected data, they emerge from the data and are therefore grounded in the data.

One of the most important issues regarding coding in grounded theory is not to force preconceived concepts and categories onto the data, ones that are not natural to the empirically observed behaviour. Locke (2001) cautions that, “We should deliberately hold in abeyance existing ways of thinking about the substantive area we are investigating so as to preclude their prematurely giving form to data” (p.46). Grounded theory research facilitates this process with another of its fundamental features – the implementation of the *constant comparative method*.

3.4.1 OPEN CODING

In the first stage, open coding elevates the analysis from the description of data to the conceptualization of the relationship between and across social phenomena contained in the data (Goulding, 2002). As the coding continues, it is important that each new coding is being compared with previously coded concepts and incidents to lead towards the development of more general conceptual categories for multiple happenings or fragments of data. Furthermore, it serves to “sharpen and clarify” our readings and interpretations of our data. Looking at both the similarities and differences between data incidents, and the corresponding conceptual categories, will help to clarify that the associations between data and the emerging concepts are consistent (Locke, 2001). There is therefore constant

movement between concept categories and data incidents in the part of the researcher during the coding process.

Figure 3.3

Sample of line-by-line coding of the interview transcriptions

Interview Transcript	Open Coding
<p>J: Did you encounter any other problems? Arguments?</p> <p>C: Some group-mates might have a lot of suggestions (ideas) and did not always try to compromise. Not really arguments, but there were disagreements. Although the rest of the group might have reached a consensus and divided up the tasks accordingly, he/she might still come back without much work done because he/she still disagreed with the group's decision.</p> <p>J: What did you do if the group still failed to convince the disagreeing group-mate?</p> <p>C: Sometimes we continued arguing but to a point when you realised you were not getting anything done without any sort of consensus. Then we tried to compromise and incorporate some of his/her ideas.</p>	<p>Disagreeing group-mates</p> <p>Many suggestions⁶⁹</p> <p>No compromise</p> <p>Disagreement</p> <p>Group consensus</p> <p>Division of tasks⁷⁰</p> <p>Do not follow group decision</p> <p>Failure to complete tasks⁷¹</p> <p>Argument</p> <p>Realisation</p> <p>Group consensus</p> <p>Compromise</p> <p>Incorporate others' ideas⁷²</p>

This research followed a line-by-line coding approach (Figure 3.3). According to Charmaz (2006), line-by-line coding “works particularly well with detailed data about fundamental empirical problems or processes whether these data consist of interviews, observations, documents” (p.50). The unit of data was further broken into smaller parts where necessary. Since the interviews were originally conducted in Cantonese, with some English phrases mixed in, the researcher constantly referred back to the interview recordings to ensure that

the English transcriptions conveyed the students' meanings and train-of-thoughts. The numbers after the codes are memo numbers. The relationship between memos and the categorising process will be discussed in the next section and the process of memoing itself will be discussed in detail in section 3.4.5.

Coding develops and assigns abstract meanings to activities or incidents observed by conceptualizing what is taking place or what is happening in a particular fragment of data. In this sense, data in grounded theory research are put through a kind of deconstructive analysis where data are being fragmented – deconstructed – and opened up to multiple readings in a “brainstorming of possible interpretations [that] pushes us to think broadly about the possible meaning of the incident [being coded]” (Locke, 2001, p.47).

3.4.2 CATEGORISING

The early stage of open coding has rapidly resulted in many concepts from intensive coding of the data. To avoid any emerging theoretical implications being clouded by a flood of concepts, the analysis in this research has switched over to categorising mode whenever it appeared that some of the coded concepts could be “grouped under a more abstract higher order concept” (Strauss & Corbin, 1998, p.113). Instead of building up the theory with only the data itself, categories have been conceived to represent “concepts indicated by the data” (Glaser & Strauss, 1967, p.36) to allow the theory to develop into a higher level of conceptual abstraction. Following Punch (1998), the categorising process is “about successively integrating the data” (p.214) into more concise subsets.

Figure 3.4

Sample of memos

Memo No.	Associated Concepts from Open Coding	Memo Notes
69	Disagreeing group-mates Many suggestions No compromise Disagreement	“Many suggestions” is a property of “disagreeing group-mates”. “Disagreeing” was previously identified as a property of the key phenomenon “group-mates.” “Disagreement” is an action taken by group-mates, with “no compromise” as one of its causes. One of the properties of “disagreement” is its “constructiveness”, that is, whether the suggestions are provided given for the benefit of the group discussion or just for argument sake. The former is therefore “positive” (dimension) in terms of “constructiveness” and the latter “negative”. It is however not that clear yet whether this dimension of “disagreement” is continuous (having different degrees of positivity and negativity and ranges from very positive to neutral to very negative) or distinct (either positive or negative). In this case, the “disagreement” referred to by this student is clearly more on the “negative” side. Other properties of disagreement are: “players”, which involves the number of group-mates on each side of the disagreement (one against many, many against many, half-of-the-group against half-of-the-group, etc.) and the number of disagreeing sides (minimum two), and “duration” (in-session, cross-session, etc.).
70	Disagreement Group consensus Division of tasks	The student mentioned two areas in which “disagreement” occurs. Individual group-mate may disagree with the “group consensus” reached by the remaining member of the group or the “division of tasks” These are thus subcategories of “disagreement”. What are the other areas (i.e. subcategories) of “disagreement” that can be identified? Another interpretation is that “group consensus” incorporates many different types of disagreements over different aspects of the group discussion – process, tasks, content, etc. (See memo no. 29) Furthermore, “disagreement”, “team work”, “individual ideas” are all similar concepts/categories that can be in turn incorporated under the larger category of “collaboration problems”.

In this research, the categorisation has been mainly informed by the memos written during the open coding of the data into concepts. These memos have been used to record insights that had emerged in the coding process and indicated relationships between the coded concepts and concepts that have appeared previously. The memos therefore contain

important information that guided the formation of categories. Figure 3.4 shows some of the memos for the open coding excerpt shown in Figure 3.3 in the previous section. The memo notes show certain conceptual ideas about the characteristics of the concepts and their relationships to other concepts. For example, memo note number 70 has first elaborated the relationship between the concepts “group consensus” and “disagreement”. The latter concept has in turn been connected to “team work” and “individual ideas”, which were both concepts coded earlier.

After reviewing the memos of “team work” and “individual ideas”, it was decided that they share enough similar properties with “disagreement” that they could all be subsumed under the same higher level category. The category name “collaboration problems” has been chosen because it not only helped classify these three concepts, it has also explained the concepts (Strauss & Corbin, 1998) – that these concepts constituted problems in the PBL group process. Later on in the open coding process, more concepts have been classified under this category.

3.4.3 AXIAL CODING

The second stage – *axial coding* – shifts its emphasis from the data and our interpretation to the conceptual categories created and instead concentrates on developing and organising the conceptual categories generated from open coding. This stage focuses on one conceptual category as the *axis* of analysis at a time and results in “cumulative knowledge about relationships between that category and other categories and subcategories” (Strauss, 1987, p.32). Furthermore, a set of propositions was generated when these categories were

interconnected with each other (Punch, 1998). As Strauss and Corbin (1998) put it, “axial coding is the act of relating categories to subcategories along the lines of their properties and dimensions” (p.124).

Using relational diagrams, or *bubble diagrams*, the resulting concepts from the open coding stage were related to one another. The researcher chose to adopt diagramming as the main method to analyse the relationships among the concepts because he is highly trained in graphic thinking. A qualified architect, he is experienced in visualising information and the relationship between them using diagrams. Therefore, although Strauss and Corbin’s coding paradigm (1998) was used to help organise the data in the axial coding stage, the codes were analysed graphically with diagrams first before being mapped to the components of the paradigm. Figure 3.5 shows how the samples of coding shown in Figure 3.3 were organised into an initial relational diagram. The original diagrams were all hand-drawn in notebooks. Samples of pages from the notebooks are shown in Appendix C2.

This diagramming process took on the form of a largely iterative process, where each code became something like a piece of a jigsaw puzzle that was fitted into the diagram almost by trial and error initially (Strauss & Corbin, 1998). After constructing the initial relational diagram, the researcher then referred back to the whole phrase or sentence in the interview transcript to look for clues to confirm or review the relationships established in the initial diagram. In addition, previous occurrences of the concepts in question were also

checked again to gain further insights on how to refine the categories in the diagram and their properties.

Figure 3.5

The initial relational diagram of codes in the axial coding stage

Concepts from Open Coding Stage		
Disagreeing group-mates Many suggestions No compromise Disagreement Group consensus	Division of tasks Do not follow group decision Failure to complete tasks Argument	Realisation Group consensus Compromise Incorporate others' ideas

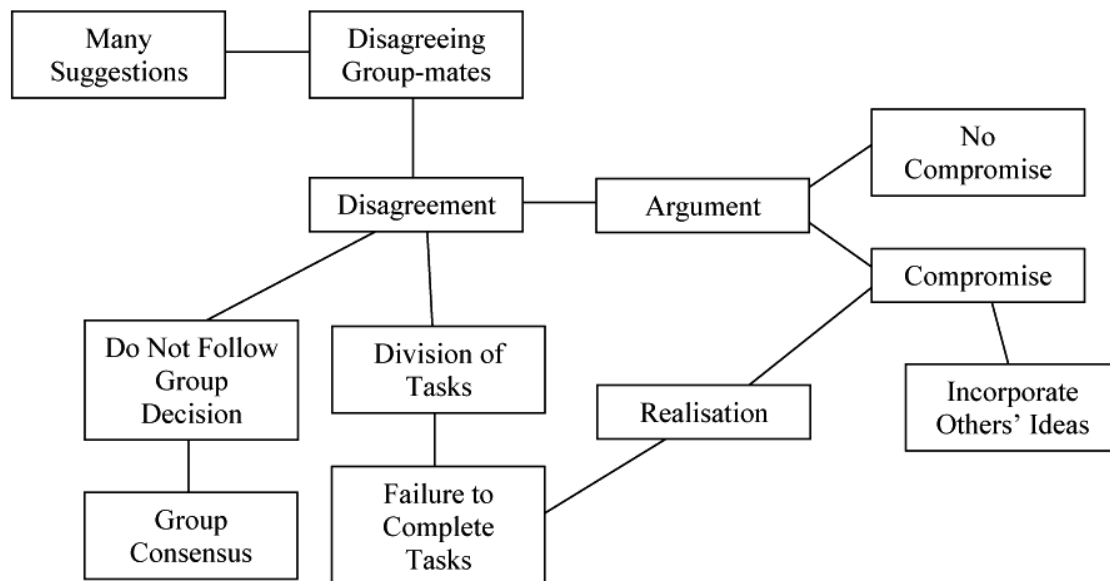
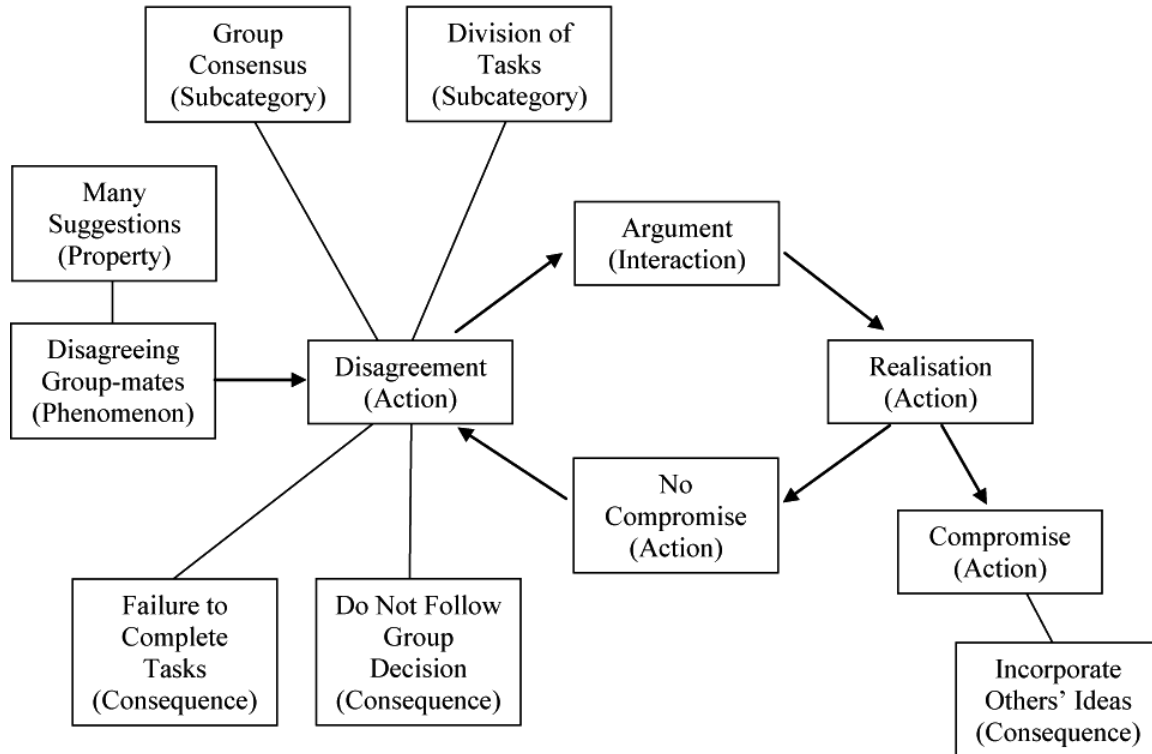


Figure 3.6

The refined relational diagram of codes in the axial coding stage



For example, after repeated comparisons, the diagram in Figure 3.5 was revised to illustrate a cycle of activities initiated by disagreeing group-mates (Figure 3.6). After checking with some of the previous diagrams, it was discovered that some of the concepts had appeared before. The key links between some of the concepts from the earlier analyses of these concepts were added in to form the revised relational diagram.

Throughout the diagramming process, theoretical notes were recorded in hand-written form (Appendix C3). It was in this process of constantly moving the building blocks of the diagrams around and writing of theoretical notes that the nature of the concepts emerged

and mapped to the components of the coding diagram. This in turn helped the researcher to further refine the relationships between the concepts.

3.4.4 SELECTIVE CODING

Strauss and Corbin define “selective coding” as: “the process of integrating and refining categories” (1998, p.143). In this final stage of coding the emphasis further shifts onto coding around the core category: “The other codes become subservient to the key code under focus. To code selectively, then, means that the analyst delimits coding only those codes that relate to the core codes in sufficiently significant ways as to be used in a parsimonious theory” (Strauss, 1987, p.32). The core code from selective coding gives direction to the developing theory and points to next area for theoretical sampling for further data collection.

To formulate the emerging theory, the key categories from axial coding need to be incorporated and refined to generate a larger theoretical scheme (Strauss and Corbin, 1998). While other researchers may rely on textual coding and theoretical notes to inform this integration process, the present researcher relied mainly on his graphic thinking training and used diagrams as the main tool for integrating the categories that had emerged from the axial coding stage. In the beginning of this stage, all the “clusters” of concepts from the axial coding stage were linked together to form the master relational diagram that incorporates all the concepts discovered in the previous coding stages (Figure 3.7).

The next step was to identify the *central category*, or the *core category*, which could integrate all other main categories (Strauss & Corbin, 1998). Following the criteria for selecting a central category listed by Strauss (1987), the category of “formation” was determined to be the central category. The master relational diagram in Figure 3.7 was thus realigned with the concept “formation” as the centre of analysis (Figure 3.8).

Categories that relate to it were arranged around “formation” to illustrate their relationship with it and their position in the developing theoretical scheme. At the same time, the emerging theory was further refined through “trimming”, in which excess data that do not form an integral part of the theory got trimmed off (Strauss & Corbin, 1998). Figure 3.9 shows the summary relational diagram with all the lower level concepts, that is, those on the outer ring of Figure 3.8, taken away for a clearer view of the main factors.

3.4.5 MEMOING

Apart from the conceptualizing of data to develop categories, another central part of grounded theory research methodology is the use of memos throughout the process. As Goulding (2002, p.65) explains, “Memos can be used with observational data, or with any form of data. These memos are vital as they provide a bank of ideas which can be revisited. They help map out the emerging theory, and are used to identify concepts and their properties. Essentially memos are ideas which have been noted during the data collection process and which help to reorient the researcher at a later date.” Glaser (1978) suggests that memoing is a core aspect of the grounded theory and the process is indispensable in the research method.

The master relational diagram incorporating all the concepts from the open coding stage



Figure 3.8

Realigned category relational diagram with “formation” as the core category

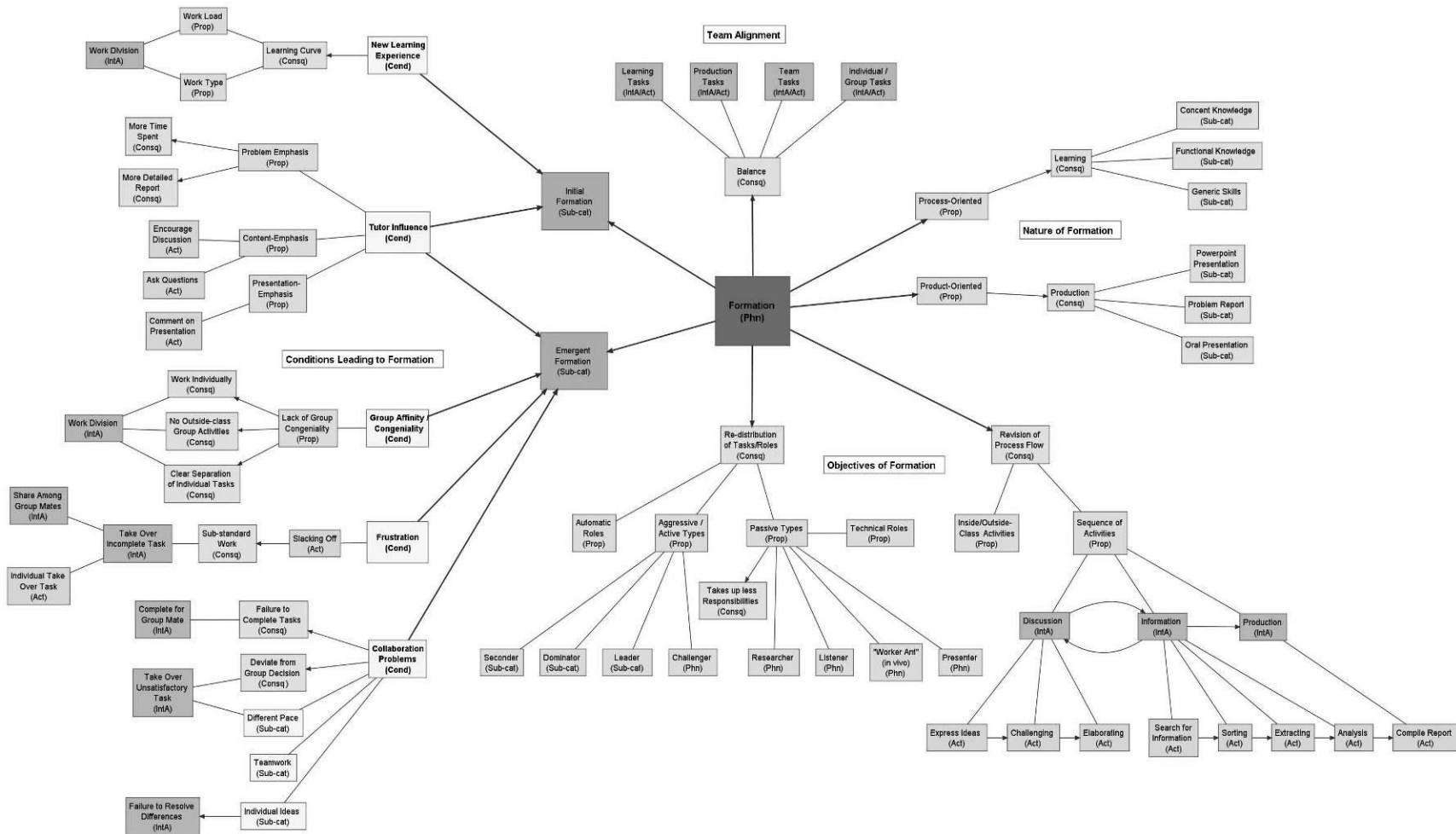
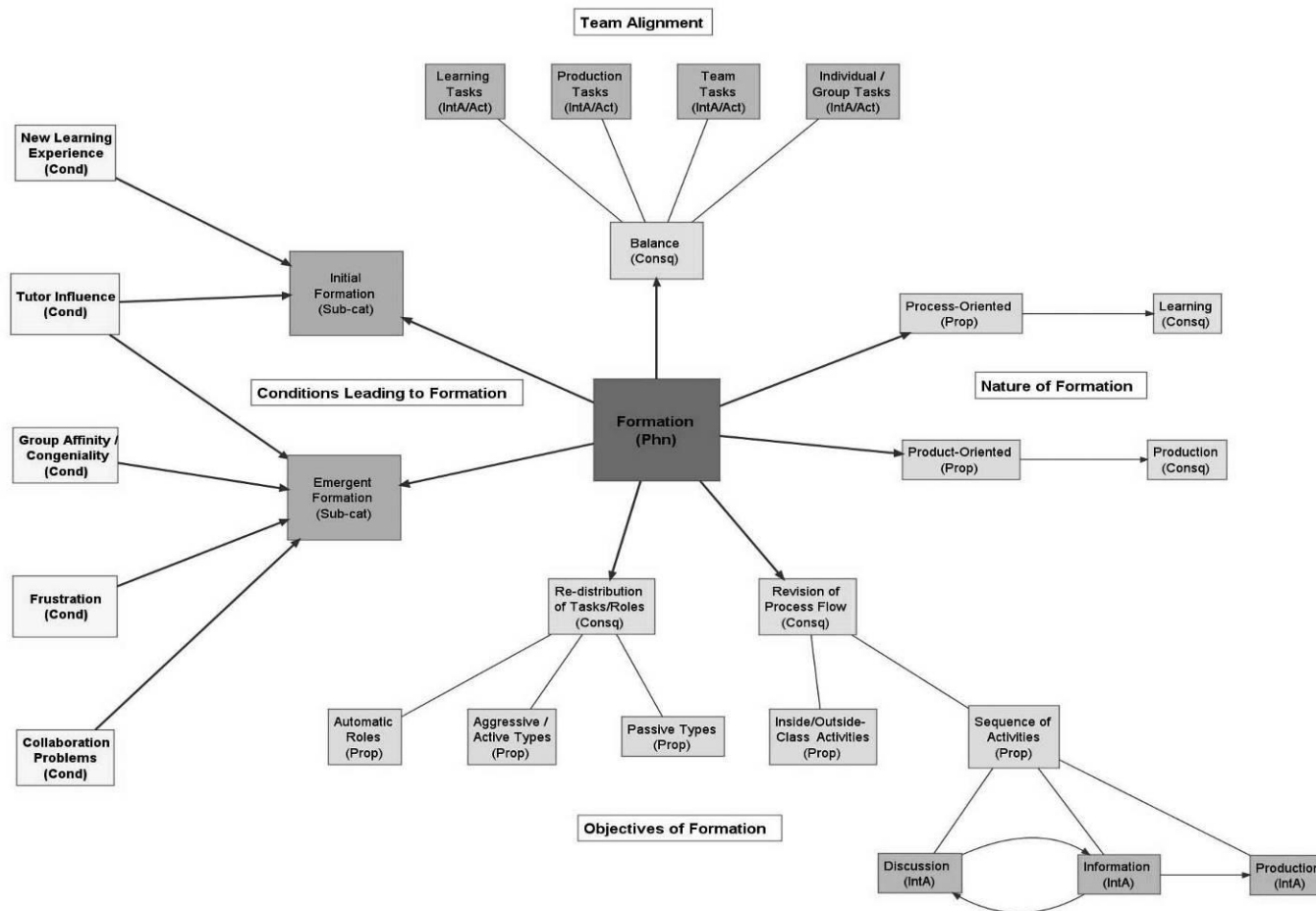


Figure 3.9

Summary diagram with “formation” as the core category



In grounded theory data analysis, memoing operates in parallel with coding; they are not sequential operations. Many ideas emerge during all levels of the coding process. When this occurs, the coding process should be suspended and the ideas recorded down as soon as they come up. Glaser (1978) defines a memo as “the theorizing write-up of ideas about codes and their relationships as they strike the analyst while coding ... it exhausts the analyst’s momentary ideation based on data with perhaps a little conceptual elaboration” (p.83-84). In this research, memoing was used more for recording ideas during the open coding stage, where the data remained predominantly in text format. These memos pointed to important linkages among and about concepts, and became the “glue” during the later data analysis stages when the concepts were connected to form relational diagrams. In the later stages, memoing gradually gave way to diagramming as the tool for recording ideas. Punch (1998) provides an illuminating distinction between the essence of coding and memoing linking them to the need to balance discipline and creativity in qualitative research: “We can think of coding as the systematic and disciplined part of the analysis (though creativity and insight also are needed to see patterns and connections), whereas memoing is the more creative-speculative part of the developing analysis” (p.207). Initiated from the data, memos however begin to move beyond a simple direct descriptive analysis of the data and introduce conceptual content. Memos thus act as the connector between the empirical level and the conceptual level during the data analysis process. Memoing should be an “open” process where emerging ideas associating with the data and their codes can be freely developed. Consequently, there is no limitation on the form of memos - they can consist of a sentence, a paragraph or even a few pages long.

3.5 Trustworthiness

The ontological, epistemological and methodological differences between the interpretivist and positivist research paradigms demand that a separate set of criteria be used to judge the quality of research within them (Lincoln & Guba, 1986). Lincoln and Guba (1986) created the “parallel criteria of trustworthiness” (p.76-77) for interpretivist / naturalistic research as a more appropriate measure of research quality to replace the conventional criteria to test rigour in positivist / scientific researches. In relation to the four criteria of rigour in the positivist paradigm – *internal validity*, *external validity*, *reliability* and *objectivity* – they proposed the parallel criteria of *credibility*, *transferability*, *dependability* and *confirmability* respectively (Lincoln & Guba, 1986).

3.5.1 CREDIBILITY

The criterion of credibility in this research was addressed through the use of *triangulation* and *member checking* (Lincoln & Guba, 1986) with some of the participants. Triangulation – the practice of corroborating data collected from different sources and/or different methods (Bryman, 1988; Denzin, 1970) – has been employed as a means to check for credibility of the interpretation of the collected data through comparing and cross-checking with different data (Bryman, 1988). Out of the four main types of triangulation (Denzin, 1988, p.512) – data triangulation, investigator triangulation, theory triangulation, and methodological triangulation – both data triangulation and methodological triangulation were adopted for this study.

In this research, data triangulation was achieved by collecting and analysing both documentary data and field data. Documentary data were extracted from the reflective journals students submit at the end of each semester as part of their normal programme requirements. Data collected from the journals would serve as a valuable source of corroboration data free from the *Hawthorne effect* (Gall et al, 2003), the situation in which individuals participating in the research alter their behaviour because they are aware that they are being observed. The field data were collected through two means: observation and interview. All three types of data were codified using the same procedure as described in section 3.4.

For methodological triangulation, two methods were used to collect the field data: *individual interviews* and *non-participant observation*. Non-participant observation of the PBL discussion sessions of students was conducted to collect data with an unstructured observational strategy. Although observation is a very direct and powerful form of data collection it nonetheless has its drawbacks because the collected data has been somewhat filtered through the researcher's eyes, who might have emphasised certain behaviours as influenced by his background and position in relation to the curriculum. For the above reasons, data collection was further supplemented by accounts given in interviews. While the video-taped observation could give a clearer picture of what has been actually happening during the PBL discussion, interviews could better reveal the subjects' thinking and reasoning behind their actions.

3.5.2 TRANSFERABILITY

Following the recommendations of Punch (1998) on qualitative studies, this research has emphasised the concept of *transferability* – the question of “Are the conclusions transferable to other settings and contexts?” (p.261) – over *generalisability*, which is defined as the degree to which the findings can be generalized from the study sample to the entire population (Polit & Hungler, 1991). The main objective of this research on small group learning in a Hong Kong associate degree programme was therefore not to develop a *formal theory* that is transferable to explain the group dynamics of all small learning teams. Instead, its value comes from the more in-depth understanding of a particular phenomenon that can potentially contribute valuable knowledge to a substantive area – in this case, group dynamics problems encountered in small group learning by students whose previous education was conducted predominantly in teacher-centred methods.

The main strategy adopted in this research to achieve transferability was focused on producing *thick descriptions* (Geertz, 1973; Glesne, 1999). Thick description is “a verbalized interpretation that is able to crystallize the reasons behind the rich and multifaceted details of the case” (Eriksson & Kovalainen, 2008, p.120). It comprises richly described data that provide the reader with enough information to judge the transferability of the findings of this research to other group learning situations.

The setting and procedures in this research have been described in adequate detail to provide a context to facilitate the understanding of the findings and their discussion. In addition to the account of the CityU and the AScAS programme given in section 3.3.4.2, which includes

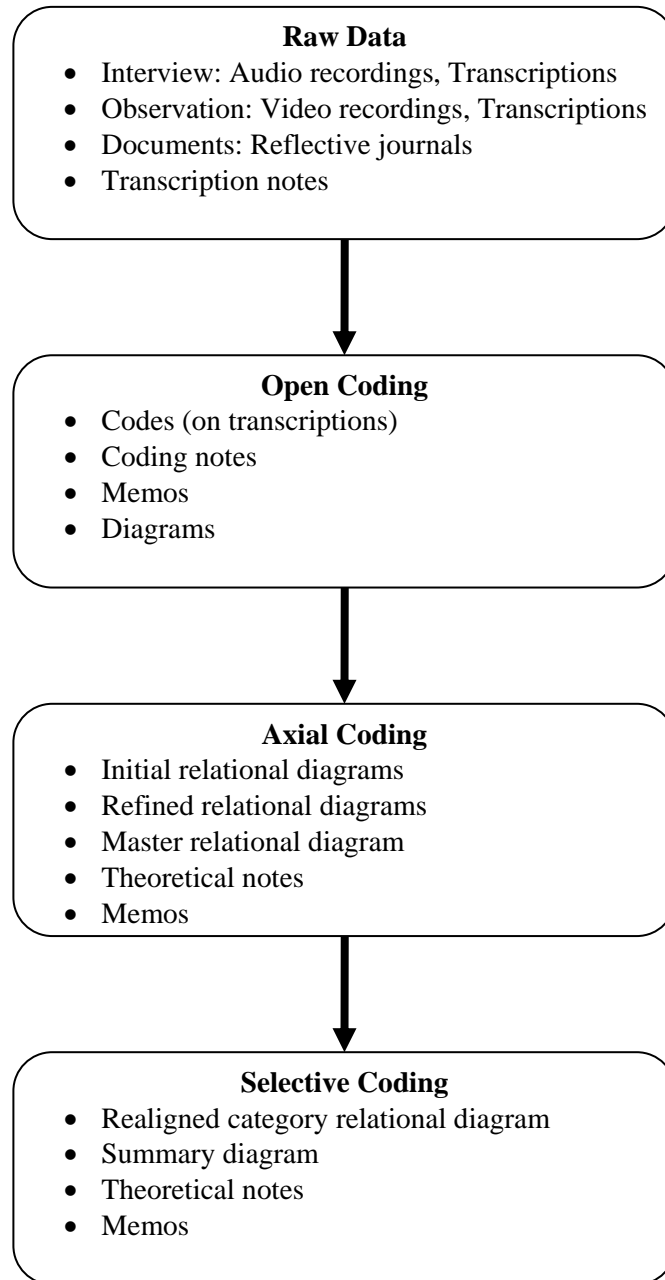
description of the physical environment, demographics, international standing, structure, general student profile, and so on, further information on the programme is given in Appendix C4. Regarding the procedures employed in this research, the previous sections on data collection and analysis have elaborated thoroughly key information, such as the development of the interview schedule, the setting of the interviews and video-recorded observations, their duration and recording procedures, the content of the reflective journals, etc., to enhance comprehension of the researcher's interpretation of the findings.

3.5.3 DEPENDABILITY AND CONFIRMABILITY

Finally, to address dependability and confirmability, a comprehensive audit trail was established in this study to track the accuracy at each stage proceeding through data, transcription, analysis and findings. The audit trail allows the course of development of the theory on small group learning to be documented and provides an account of all research activities throughout the research (Lincoln & Guba, 1985). Besides establishing a physical audit trail that permits readers and other researchers to access the methodological and analytical decisions to enable confirmation of the results, by carefully keeping track of the different phases of the research, an intellectual audit trail has also been set up to assist the researcher in reflecting on the emergence of the theory (Carcary, 2009).

Figure 3.10

The elements of the audit trail



This research has followed broadly the array of information suggested by Lincoln and Guba (1985) to build up the audit trail from raw data to the development of theory. Figure 3.10

shows the trail of information that has been collected to inform the audit process. Each of the notes, memos and diagrams has been numbered systematically throughout the process, so that they can be traced back stage by stage.

3.6 Ethical Issues

The procedures of this research have followed the “Revised Ethical Guidelines for Educational Research” of the British Educational Research Association (BERA) (2004). Furthermore, the research methodology of this research was elaborated in detail in the Thesis Proposal that was approved by the Doctor of Education Programme Board of the University of Leicester. Three of the more important ethical issues in this research – *informed consent*, *protection of subjects from harm* and *anonymity / confidentiality* – are discussed in more detail in the following sub-sections:

3.6.1 INFORMED CONSENT

Before the proposed research, all prospective participants have been issued a letter (Appendix C5) describing the research written in plain English, which is a language understandable to all of them. The letter described to the participants the details and features of the research, including its purpose, objectives, methodology and the requirements of their participation. All prospective participants were given a minimum of one week to read the letter before making their decisions to participate in the study or not. The content of the said letter was revised once to reflect changes in the conditions of the subjects’ participation when the interview questions were amended between the first and second round of

interviews. The researcher has also repeated the above information to the participants in Cantonese before each interview and observation session to ensure that they had thoroughly understood the details of this research before the procedures began. A corresponding letter has also been sent to the Head of the Division of BST to request for permission to conduct this research.

3.6.2 PROTECTION OF SUBJECTS FROM HARM

Educational research traditionally employs relatively harmless research methods “that imposes either minimal or no risk to the participants” and has therefore been afforded exempt status from human research subject protection codes when “conducted in established or commonly accepted educational settings involving normal educational practices” (Johnson & Christensen, 2004, p.111). With the proposed research equipments in this study – interview, observation and documentary analysis – there were minimal, if any at all, conceivable physical risk to the participants.

Although there had been no foreseeable physical harm to the participants in this research, the experience of this researcher alerted him that students may become agitated and/or upset when talking about their problems encountered in small group learning, especially for students who had found it difficult to adapt to the new PBL learning environment. During the research, the interviewer had paid attention to any exhibition of mental discomfort by the participant in the course of an interview and was prepared to stop the interview when necessary and remind the participant of his/her freedom to withdraw from participation in

the study at any time when such signs of distress appears. Moreover, none of the above situations ever happened over the course of the interviews and observations.

3.6.3 ANONYMITY AND CONFIDENTIALITY

Sometimes mixed up, *anonymity* and *confidentiality* are two of the ways in which researchers protect the human participants and data in a study (Johnson & Christensen, 2004). Confidentiality means that the researcher knows the identity of the participant but protects it from being revealed to any person other himself or herself and his or her research staff. In the proposed research, it was difficult to maintain absolute anonymity because of the use of face-to-face interviews and observation as the primary data collection method. Anonymity regarding documentary analysis was achieved by removing all names from the reflective journals prior to collection and coding to ascertain that there was no means to identify the source of the data. A number of other measures have been taken to ensure overall confidentiality.

First, all participants were only identified by code-name at both the collection and transcription of data. For the interviews of individual students, code-names “Student A”, “Student B”, and so on, were used; and for the observation of tutorial groups, code-names “Student 1A”, “Student 1B”, and so on were used. These code-names were also used to name the video and audio computer files for the observations and interviews respectively, as well as for the transcriptions. Second, the transcription and coding of the data had all been undertaken by this researcher only and no third party was allowed access to the data. Finally, all datasets from which participants can be identified, including personal identifiers such as

names and contact information, were destroyed immediately after the conclusions of this research project.

To further protect the privacy of the participants, the storage of data in this research has followed strictly the provisions of the Personal Data (Privacy) Ordinance (Cap. 486) of the Hong Kong (HKSAR, 1996), which includes expression of opinion as a form of personal data.

3.7 Positioning of the Researcher

The researcher is the Programme Leader as well as the key designer of the PBL curriculum for the AScAS programme that has formed the context for this research. Conducting educational research as an *insider* is a double-edge sword that has both advantages and disadvantages. The insider researcher possesses an “intimate knowledge of the organisation being studied” (Gray, 2004, p.375) and, in this research, has helped his interpretation of the actions within the group because he knows the culture, the jargon, the subject matter, and so on. Besides, Hockey (1993) maintains that insiders are able “to blend into situations, making them less likely to alter the research setting” (p.204).

Furthermore, the researcher’s position in the programme has not only given him privileged access to the participants but also facilitated his gaining rapport (Eriksson & Kovalainen, 2008, p.58), or field relations, with the students being interviewed for the research and has helped to “open[] more doors to more informed research” (Fontana and Frey, 1994, p.367).

Finally, it is becoming more and more accepted for educators to conduct classroom research instead of research specialists, because it has a higher probability of bringing actual changes to educational practices (Charles & Mertler, 2002). This matches with one of the key objectives of this research to improve the facilitators' understanding of group dynamics in small group learning.

As Glesne (1999) recounts, one drawback of the dual-role of the educator researcher is that participants may become confused regarding the shifting of roles between an educator and a researcher, and respond inappropriately as a result (p.26). To avoid this problem, the method of non-participant observation using video-recordings was adopted in this research so that the researcher would not come into direct contact with the student subjects during the PBL tutorial group, where role confusion was a possibility. The only time the researcher had come into direct contact with the participants was during the interviews when his role as a researcher has been very clear. Furthermore, only students who had not been taught by the researcher were included in the sample for observation and interviewing.

The other major concern with insider research is the potential *insider bias* that the researcher may hold due to his or her in depth knowledge of the setting under investigation. The closeness between the researcher and the research setting or the participants may lead to a mix up of knowledge grounded in the research evidence and knowledge that the researcher already has (Eriksson & Kovalainen, 2008, p.58). Moreover, the focus of this research is on group dynamics in the PBL tutorials – how the students behave in a small group learning environment – not the effectiveness of the curriculum. Therefore, any underlying biases or

preconceived ideas the researcher has on the curriculum itself should not have major impact on this insider research. In fact, the major reason that prompted this research is the researcher's *lack* of understanding of the group dynamics in the PBL tutorials that he regularly facilitates.

To further address possible insider bias in this research, additional measures have been taken. First, semi-structured interviews have been adopted in favour of a more structured one to prevent imposing the researcher's preconceptions on the informants' responses. Second, as mentioned in the previous section on ethics, an audit trail has been established to ensure that the emergent theoretical framework can be traced back to the data and that it had not been tainted by any presumptions. Finally, the triangulation of data from multiple sources has also helped to assure that the findings are grounded in the data.

3.8 Conclusion

This chapter has explained the justification for adopting the interpretivist paradigm and using a grounded theory approach to research methodology for the study of student behaviour pertaining to small group collaborative learning under a PBL context. Combining field data with documentary data, this research relies on the triangulation of multiple sources of data to enhance the rigour of the study. Main features of the research design – theoretical sampling, data collection methods, coding procedures, etc. – have also been presented in detail in different sections to contribute to a thick description of the methodological aspects of this study.

With the methods outlined by Strauss and Corbin (1998) as the foundation, key concepts on how students had coped with the new learning experience in the PBL curriculum have been generated from the data and formed into categories during the open coding stage, while relationships between these categories have been elaborated during the subsequent axial coding stage. Throughout the data analysis process, the use of the graphic thinking skill of diagramming has become a major tool to supplement the grounded theory coding process. In the final stage of the coding process, selective coding, the core category of Formation has been developed to focus the analysis. An outline of the core category Formation and its many factors is provided in the next chapter to provide a theoretical framework for comprehending the student behaviour in a small group collaborative learning environment in a university in Hong Kong.

CHAPTER 4:

THE THEORY OF “ADAPTIVE FORMATION”

4.0 Introduction

The objective of this investigation is to examine the behaviour of university students in coping for the first time with small group learning as a regular learning activity. This chapter presents an overview of the theory of “Adaptive Formation” that has emerged from this qualitative grounded theory study of 12 first-year architectural students in a problem-based learning curriculum. A summary is provided here to locate the various components of the theory within the overall framework to allow the reader better comprehension of the theory and its conceptual and theoretical development in subsequent chapters.

The research questions guiding this investigation are:

1. How do students manage the process of learning and the team roles in a PBL tutorial small group setting?
2. Do recognisable team roles develop in the PBL tutorial small groups, with or without formal assignments? Are these team roles consistently assumed by students, or do students assume different team roles at different times?

3. What group activities do the students conduct outside the PBL tutorials to manage the PBL learning and group dynamics?
4. How, if at all, do students change their behaviour to improve their performance – their own and the group’s – in the PBL small group learning setting? What actions, if any, do they take to cope with problems they encounter in the PBL process?

This chapter is divided into six main sections: 1) the concept of formation, 2) an overview of the theory of Adaptive Formation, 3) the stages of formation, 4) the factors affecting formation, 5) the outcomes of formation and 6) the typology of participants.

4.1 The Concept of Formation

In football, “formation” refers to the arrangement of specific positions and division of responsibilities (forwards, midfielders, defenders, goal-keeper, etc.) among the different team members. The actual formation adopted depends on the objective of the team – attacking or defensive formation – as well as the strengths or deficits of the available players. Similarly, the PBL learning groups need to decide on the most appropriate ways to solve a given problem and divide the tasks among the team members throughout the PBL problem cycle. This study has found that the *formation* of the PBL collaborative teams governs three main aspects: 1) *task division*, 2) *task distribution*, and 3) *process flow*.

Moreover, although football teams would like to keep their chosen formation as much as possible, the mix of tasks inevitably varies over the course of a match due to various

situations, for example, to counter the opposing side's own formation or to shift more players forward to try to score an equalising goal. Likewise, this study discovers that the student groups also change their formation over the learning process due to various reasons. More importantly, they constantly adapt their formation to overcome emerging issues and resolve different situations in a way that enables the new PBL students to cope with experiencing small group learning for the first time.

4.1.1 ROLES AND TASKS

Before describing “formation” in more detail, it is necessary to distinguish the differences between, as well as the different types of, roles and tasks in PBL small group learning. As part of the standard procedures in PBL tutorials, one of the first actions of the group is to decide who will become the chairperson, secretary, time-keeper, presenter, and so on. These are *functional roles* that maintain effective functioning of the group. Besides these *functional roles*, students also tend to take up *team roles*, which are described by Belbin (1993) as “a tendency to behave, contribute and interrelate with others [] in certain distinctive ways” (p.24). This study has identified a typology of participants featuring four main *team roles*: *driver*, *adventurer*, *worker* and *rider*. The categories and concepts regarding *team roles* are discussed in more detail in section 4.6.

While *functional roles* are either assigned by the tutor or nominated by group-mates, the students naturally assume different *team roles* within the PBL tutorial group, with each role entailing certain kinds of behaviour. For example, a student assigned the *functional role* of *time-keeper* by the group may also assume the *team role* of *challenger*, a concept under the

category of *adventurers*. Besides the actions associated with these roles, such as *monitoring time* and *questioning* respectively, each student is also delegated *tasks* directly relating to the solving of the problem case. From the data, there are generally two major categories of *tasks* that students undertake in the PBL process: *learning tasks* and *production tasks* (Table 4.1).

Table 4.1

The categories and concepts of tasks

Category	Concepts	Activities
Learning tasks	Identify learning issues	Activities that contribute to the acquisition of content and functional knowledge associated with the topic in question.
	Researching for information	
	Evaluating information	
	Discussion	
Production tasks	Processing digital images	Activities for completing the deliverables, namely the presentation PowerPoint and problem report. Although these activities do not contribute to the acquisition of content and functional knowledge, they facilitate the acquisition of generic skills.
	Drawing diagrams and charts	
	Compiling the PowerPoint	
	Type-setting	
	Laying out the report	
	Printing and binding	

4.2 An Overview of the Theory of Adaptive Formation

The theory of Adaptive Formation has emerged as the core theme that conceptualises how students cope with the problems of experiencing small group learning for the first time. In a PBL curriculum, the unit of learning is no longer individual-based but group-based.

Working hard individually is no longer adequate to guarantee good results. Students must

maximise their group's performance to achieve the learning outcomes. To do so, each learning group must ensure that they put their resources to their best use and work together efficiently and effectively by dividing up and distributing the requisite tasks among the group's members. They must also devise a framework for organising the information they find in order to present it in a comprehensive manner.

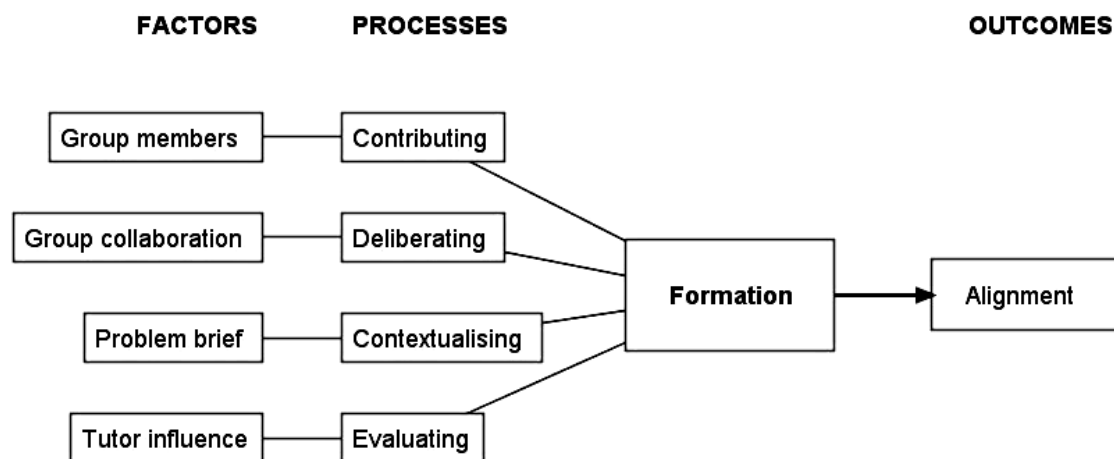
Each problem case lasts two weeks with two tutor-facilitated meetings per week. There are only four class meetings so the only chances that the whole group gets to meet face to face are quite few. It is therefore very critical that the group optimises the *formation* process to maximise performance and output. The group and its members take many factors into consideration to ensure that prudent decisions are made during their first PBL tutorial meeting. However, with so many uncertainties – new group members, lack of group experience, unknowns in the problem brief, and disagreements over standards – it is impossible to get the formation right at the beginning of the problem cycle. As a result, the group must constantly respond to the current situation and adapt their formation accordingly to resolve various group issues. This forms the foundation of the theory of “Adaptive Formation”.

Figure 4.1 illustrates the relationship between the various components of the theory of Adaptive Formation. To the left in the diagram are the four categories of key factors: 1) group members, 2) group collaboration, 3) problem brief, and 4) tutor influence. Each of these factors corresponds to one of the four interrelated processes in small group learning: 1) contributing, 2) deliberating, 3) contextualising, and 4) evaluating. Sitting on the right side

of the diagram is the main outcome of formation: alignment. The categories of key factors and outcomes, and their respective concepts, are elaborated in more detail in sections 4.4 and 4.5 below.

Figure 4.1

Summary of the Theory of Adaptive Formation



4.3 The Stages of Formation

In the PBL learning process, the small groups commence the problem case with mostly *learning tasks*. As there are weekly mini-presentations to the tutor and mid-cycle interim presentations, there are *production tasks* throughout the process. During the course of the problem cycle, the amount of time spent on *learning tasks* decreases while those spent on *production tasks* increases (Figure 4.2).

Figure 4.2

Relationship between learning tasks and production tasks

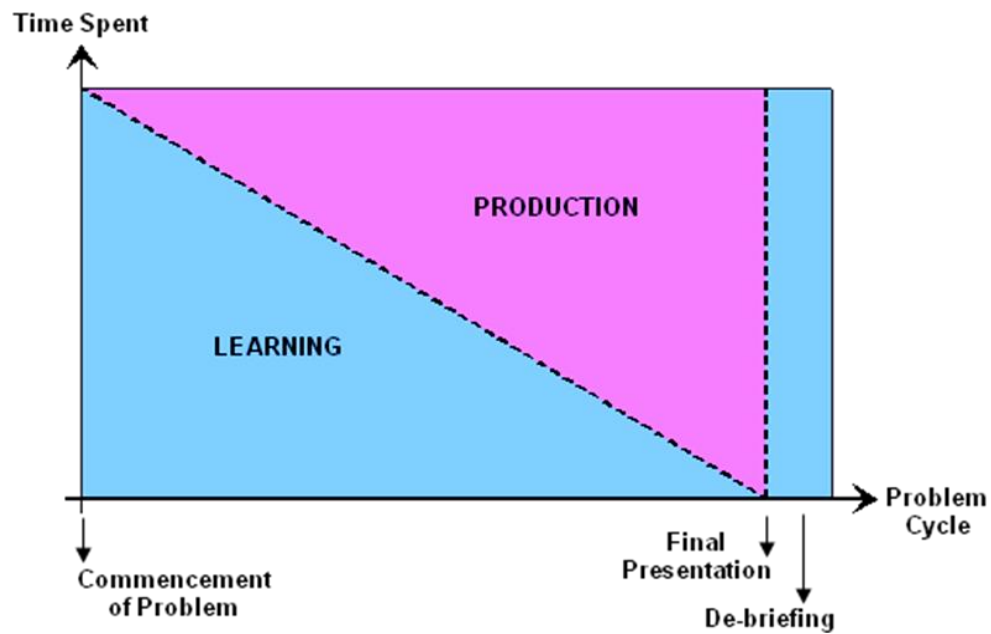
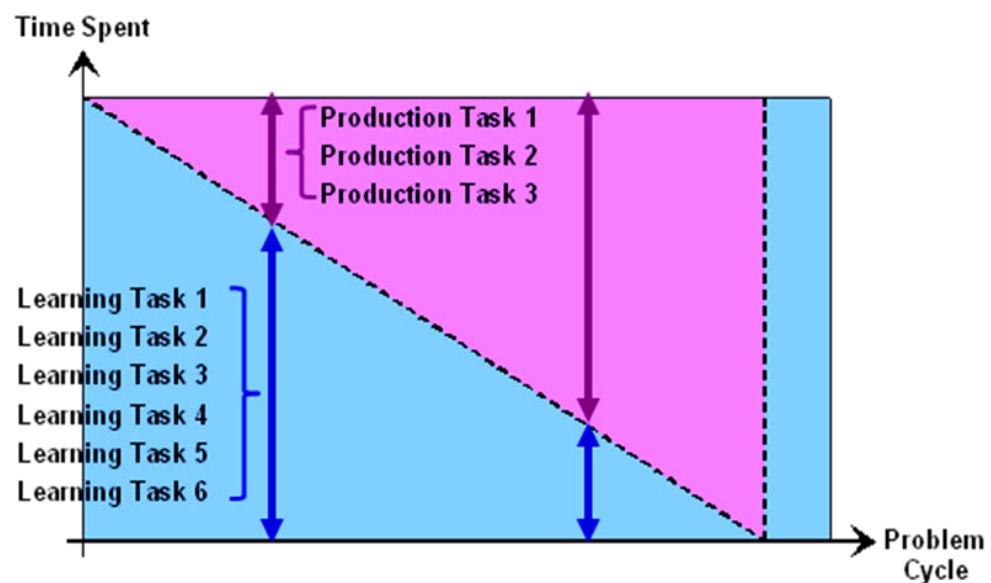


Figure 4.3

The mix of learning tasks and production tasks



The jump back to 100 percent *learning tasks* at the end of the cycle represents the debriefing session after the final presentation. At any time over the problem cycle, the group members agree on the *Formation* of their group, that is, number of *learning tasks* and *production tasks* that needs to be completed (Figure 4.3) – the *task division* – and, the delegation of each of the tasks to specific group members – the *task distribution*. This also reflects the group's intended organisation of their *process flow*, which represents the framework for the development of the problem solution.

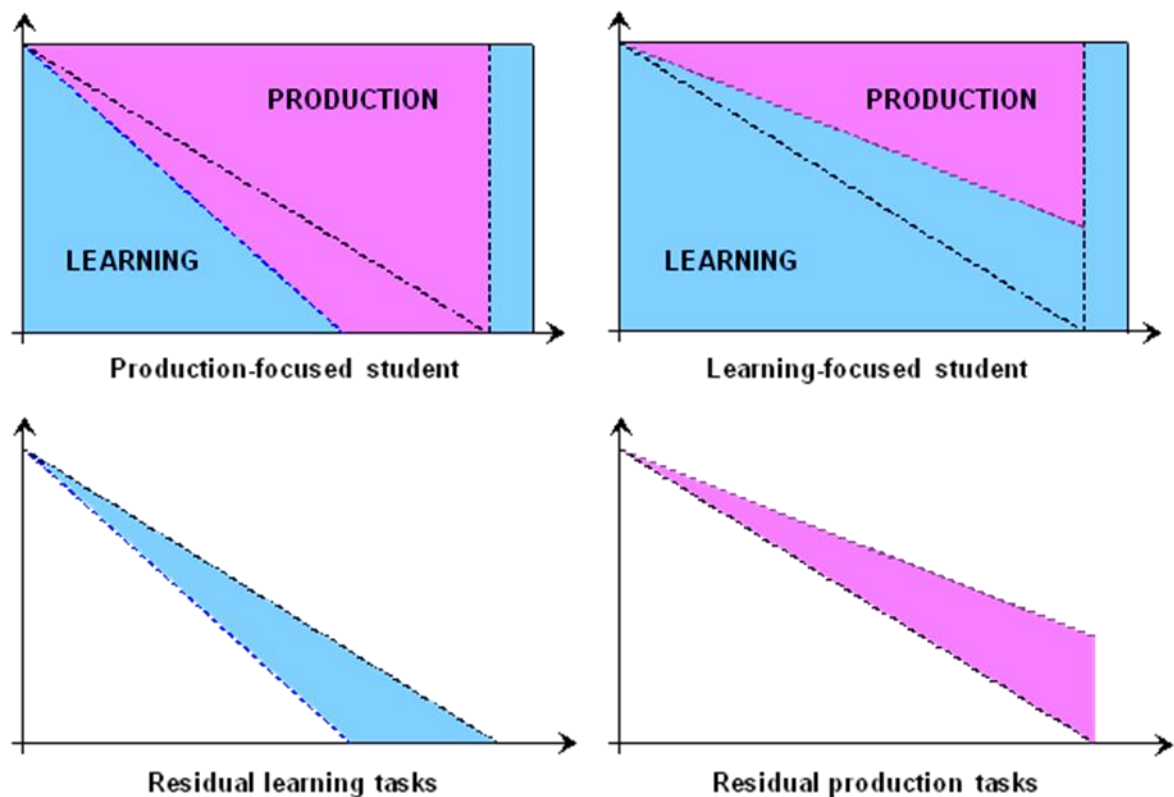
Data show that teams often have to deviate from the *initial formation*, that is, the agreed *Formation* after the first group meeting. According to the interviewed students, there is always a tension between *learning tasks* and *production tasks* and the group members' individual idea of the optimum task division and distribution are often not aligned. This *misalignment* results from a number of reasons, for example, some group members want to put more effort into their individual design projects or some students are more product-oriented and think that the production tasks are more important. Thus, *Formation* can be seen as a phenomenon to achieve *team balance* through the alignment of tasks at the beginning of the problem cycle – *initial formation* and subsequently during the course of solving the problem – *re-formation*.

The diagram in the top-left corner of Figure 4.4 shows the preferred task mix of a student who is more production-focused than the group. This student wants to end the learning tasks and concentrate on production tasks earlier. Thus, he/she is only willing to engage in less learning tasks and more production tasks (blue dashed line) relative to the group's agreed

task mix (black dashed line). Consequently, the student may go back to the group after individual work sessions with incomplete or unsatisfactorily completed learning tasks. This leads to *frustration* and *collaboration problems* in the group. The remaining group members either allow the student to redo the tasks or take up the residual learning tasks (Figure 3, bottom-left) themselves.

Figure 4.4

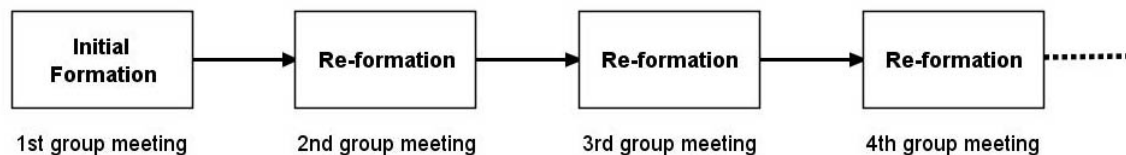
Misalignment between group and individual member preferred task mix



On the other hand, there are also students who desire to learn more and devote much of their time to learning tasks at the expense of production tasks (Figure 4.4, top-right and bottom-right). They leave behind residual production tasks in their groups that need to be dealt with through re-formation. In both cases, the initial formation needs to be changed, that is, *re-formation*.

Figure 4.5

Initial formation and re-formation



In summary, *Formation* is not a single event at the beginning of the problem process. Instead, the group responds to the various factors and constantly adapts its formation. Therefore, after the *initial formation* at the beginning of the problem cycle, the group would continue to go through a series of *re-formations* until the very end of the problem case (Figure 4.5). The group meetings can be either scheduled ones during class or ad-hoc ones outside of class.

4.4 The Factors of Formation

The theory of Adaptive Formation encompasses four main categories of influencing factors on individual behaviour. They are: 1) *group members*, 2) *group collaboration*, 3) *problem*

brief, and 4) *tutor influence* (Table 4.2). Moreover, not all factors influence both stages of *Formation*. As only a minimal amount of group activities have taken place during the first meeting, *group collaboration* has not been mentioned by any of the participants as a major category for *initial formation*. *Group collaboration* only begins to become a factor after all the tasks have been divided and distributed. Thus, all four factors have an impact on *re-formation*.

Table 4.2

The categories and sub-categories of factors influencing formation

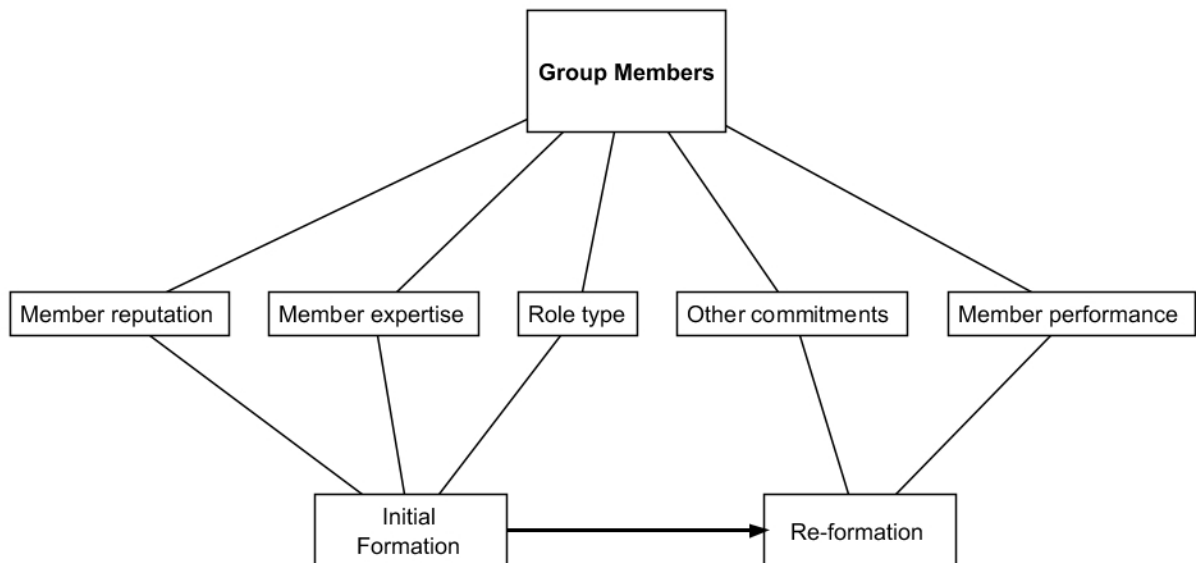
Factors		Stages of Formation	Processes
Categories	Sub-categories		
Group members	Member reputation	Initial Formation	Contributing: Individual group members are responsible for searching for information and other materials to contribute to the group.
	Member expertise		
	Role type		
	Other commitments	Re-formation	
	Member performance		
Group collaboration	Teamwork	Re-formation	Deliberating: The group deliberates the contributed material and the solution to the problem case.
	Agreement		
	Group affinity		
	Mutual trust		
Problem brief	Brief clarity	Initial Formation	Contextualising: The problem brief sets the context in which the knowledge from different disciplines are integrated.
	Previous knowledge	Re-formation	
	Information overload		
	Resources availability		
Tutor influence	Tutor reputation	Initial Formation	Evaluating: The tutor constantly provides evaluation to the group’s materials, solution, progress, process, etc.
	Interpretation of brief		
	Tutor style		
	Tutor comments	Re-formation	
	Tutor emphasis		

4.4.1 GROUP MEMBERS

The first category, *group members*, consists of five concepts relating to individual performance and other *group members* attributes of individual students (Figure 4.6). Three of the concepts, *member reputation*, *member expertise* and *role type*, are associated with *initial formation* and the remaining two, *other commitments* and *member performance* are associated with *re-formation*. The category of *group members* is linked with the process category of *contributing* as individual group members are responsible for searching for information and other materials to contribute to the group discussion in the course of solving the problem case.

Figure 4.6

The category of group members and its concepts

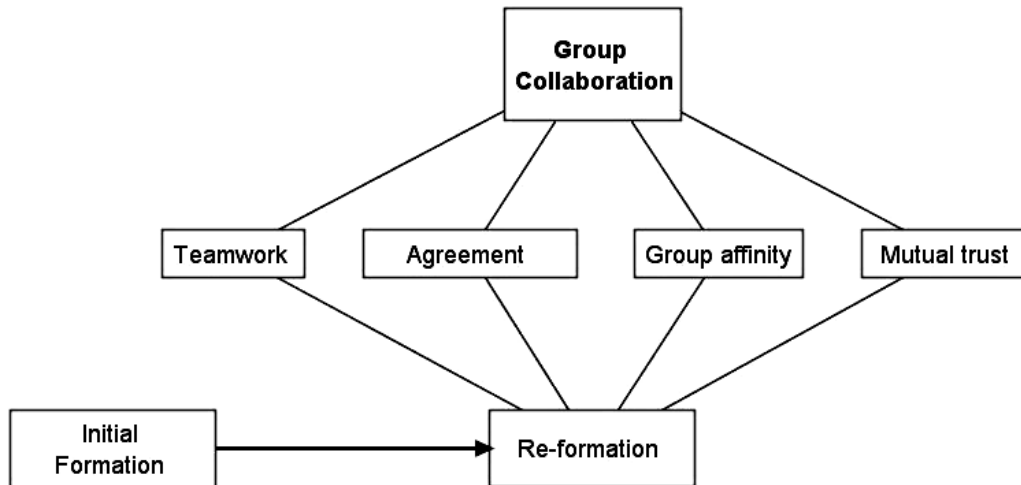


4.4.2 GROUP COLLABORATION

The second category, *group collaboration*, comprises four concepts relating to the interaction between the group members in the PBL tutorial and outside of class (Figure 4.7). As mentioned, since these group activities take place after *initial formation*, all four concepts of this category, *teamwork*, *agreement*, *group affinity* and *mutual trust*, are associated with *re-formation* only. The category of *group collaboration* is linked with the process category of *deliberating*, which relates to the interaction between group members and discussion on the materials each member contributes to the group as well as the solution to the problem cases.

Figure 4.7

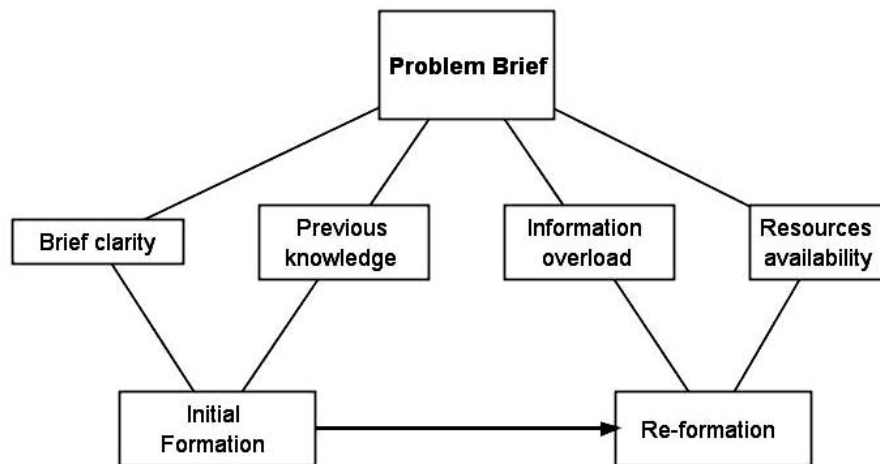
The category of group collaboration members and its concepts



4.4.3 PROBLEM BRIEF

Figure 4.8

The category of problem brief and its concepts



The third category, *problem brief*, contains four concepts relating to the design of the problem cases and the details given in the teaching plan and problem statement (Figure 4.8).

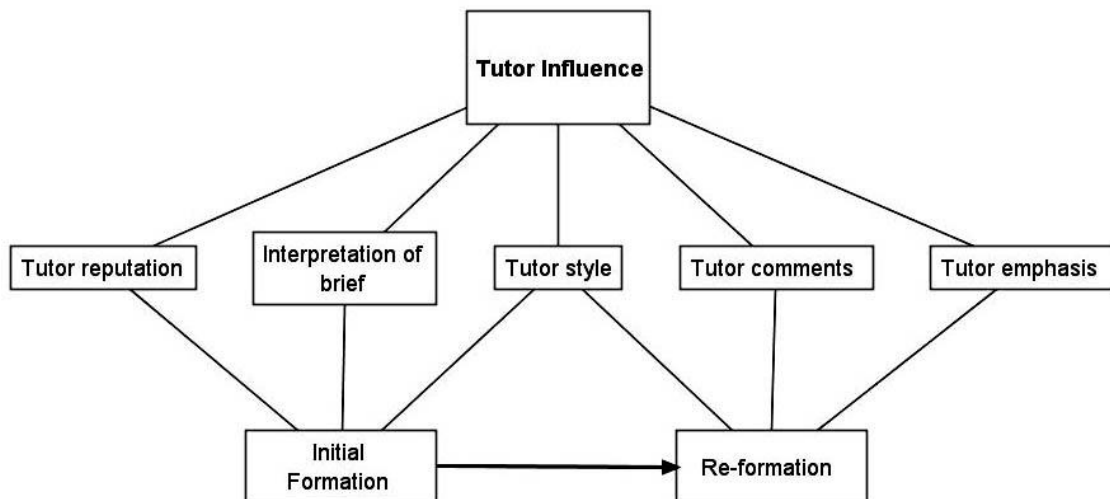
Two of the four concepts, *brief clarity* and *previous knowledge*, are associated with *initial formation* and the remaining two, *information overload* and *resources availability* are associated with *re-formation*. The category of *problem brief* is linked with the process category of *contextualising*. The *problem brief* establishes the context in which the knowledge from different disciplines are applied in an integrated manner to produce solutions to the problem cases.

4.4.4 TUTOR INFLUENCE

The fourth and final category, *tutor influence*, contains five concepts relating to the explicit and implicit influences each tutor brings to the learning group (Figure 4.9). Three of the concepts, *tutor reputation*, *interpretation of brief* and *tutor style*, are associated with *initial formation*. The last concept, *tutor style*, is the only concept that is related to both *initial formation* and *re-formation*. The remaining two, *tutor comments* and *tutor emphasis* are associated with *re-formation*. The category of *tutor influence* is linked with the process category of *evaluating* since the tutor constantly provides evaluation to the group's materials, solution, progress, process, and so on, thereby guiding the group to determine what needs to be changed in their approach.

Figure 4.9

The category of tutor influence and its concepts

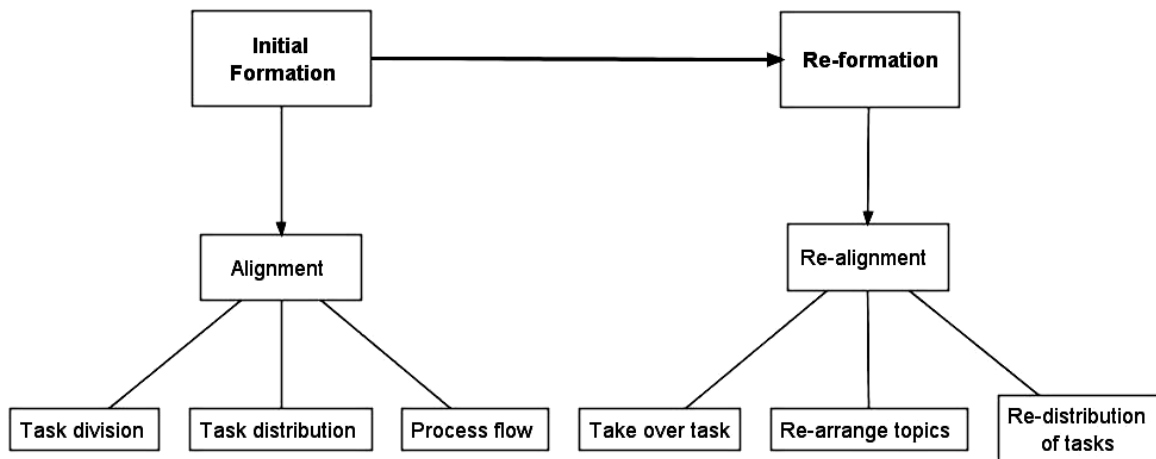


4.5 The Outcomes of Formation

The main objective of formation is *alignment* for *initial formation*, and *re-alignment* for *re-formation*. The category of *alignment* is composed of three concepts: *task division*, *task distribution* and *process flow* (Figure 4.10). These are the outcomes of *initial formation*, when the members of the group make decisions on the division of the tasks to be undertaken, the distribution of the tasks among the group members, and the variation of task mix and distribution over the problem cycle.

Figure 4.10

The categories and concepts of the outcomes of formation



Once the problem process has started and the PBL group begins both individual and group work, the original formation would need to be changed constantly to respond to different situations due to *misalignment* between the group members and the tasks assigned or other

reasons. The concepts for the category of *re-alignment* are *take-over (accept) the task*, *re-arrange topics* and *re-distribution of tasks*.

4.6 Typology of Participants

There are generally two types of participants in the small group learning process - the *active* and *passive* participants. Each type contains two categories, giving a total of four categories. As the name suggests, the *active* type participants are those who actively participate in the group activities and play an influencing role in determining the *formation* of the group. The *active* type consists of two categories: *drivers* and *adventurers*.

Table 4.3
Categories and sub-categories of participants

Type	Category	Sub-category
Active	Drivers	Leaders Editors Dominators “Assistant teachers” (助教)
	Adventurers	Learners Challengers Explorers
Passive	Workers	Technicians Researchers Secretaries “Worker ants” (工兵蟻)
	Riders	Audience Slackers “Echoers” (回聲筒)

Conversely, the *passive* type group members take a back seat during the group process and generally accept the decisions of the other members of the group. The *passive* type also comprises two categories: *workers* and *riders*. The categories of participants, and their respective sub-categories, are listed in Table 4.3. The concepts in quotation marks denote *in vivo* codes with the original Chinese code in parentheses.

4.6.1 DRIVERS

Drivers are focused on getting the job done and producing high quality deliverables at the end of the group process. They will try to control the group discussion process to make sure that the group operates in the most effective and efficient manner. They often make decisions regarding *formation* on the group's behalf as well as serve as the spokesperson for the group during tutor facilitated sessions.

Table 4.4

The sub-categories of drivers

Category	Sub-category	
Drivers	Leaders	This is different from the appointed chairperson of the group. Instead, they emerge as the leader of the group through their actions in the group interactions.
	Editors	They monitor the materials contributed by group members and take charge of the production of the deliverables. The member with the best English normally take up this role.
	Dominators	They like to dominate the discussion and push the group to accept their views. They even interfere with other group members' tasks.
	"Assistant teachers"	Similar to the dominator, they like to take over group discussions. However, their intention is not to promulgate their views. They like to demonstrate their knowledge.

Although they think that the group should follow the *initial formation* as much as possible, they do not hesitate to trigger *re-formation* when things do not progress according to plan.

Table 4.4 shows the different sub-categories of *drivers*.

4.6.2 ADVENTURERS

Adventurers are more process-driven and demonstrate the most interest in the discipline of architecture. Their ultimate goal is not to simply complete the deliverables on time but to take the problem cases as opportunities to cover more knowledge on architecture. They deviate from the initial formation often.

Table 4.5

The sub-categories of adventurers

Category	Sub-category	
Adventurers	Learners	Their principle objective is to learn more, even though it may mean pushing back production tasks in favour of learning tasks. Often pursue their assigned topics to a much deeper level than other group-mates.
	Explorers	Like to explore subjects they find interesting more than those immediately relevant to the problem cases. Sometimes bring in materials outside the originally agreed scope to share with group-mates during class.
	Challengers	They challenge most of the time, but not always challenge-for-challenge sake. Sometimes challenge to clarify things.

Although their intentions are positive, they are often viewed by the other types as disruptive to the problem-solving process as their actions / proposals inevitably create additional work and delay the process. Table 4.5 shows the different sub-categories of *adventurers*.

4.6.3 WORKERS

Often hidden from the tutors are the contributions of the *workers*. They make behind-the-scene contributions that are crucial to the operation of the group as well as the success of the problem solving process. With the *drivers* and the *adventurers* dominating the PBL tutorial sessions, the *workers* are happy to take a back seat and refrain from joining the deliberations, especially when debates break out between the *drivers* and the *adventurers*. Some of them think that they do not even need to be present during the group discussions and just need to be informed of their tasks and group direction afterwards. Table 4.6 shows the different sub-categories of *workers*.

Table 4.6

The sub-categories of workers

Category	Sub-category	
Workers	Technicians	They have good computer skills, for example, word processing, photo editing, graphics, etc. They take up most of these tasks for the group and sometimes even teach their group-mates.
	Researchers	They are adept at finding information from the internet, books and other sources. They help other group-mates find information that is difficult to locate.
	Secretaries	They help to set-up out-of-class meetings, organise the meeting minutes, acts as liaison between group members.
	“Worker ants”	They run errands for the group, for example, printing, report-binding, going to the library to get a book, etc.

4.6.4 Riders

Riders are the lazy group-mates, or the free-riders. They try to get by with minimal input and benefit from their group-mates efforts. They are the ones who are likely to cause *re-formation* due to their below par performance and sub-standard work that needs to be re-done or taken over by another group-mate. Table 4.7 shows the different sub-categories of *riders*.

Table 4.7

The sub-categories of riders

Category	Sub-category	
Riders	Audience	They only sit and listen during group discussions and never contribute to the deliberation, even when the tutor is present.
	Slackers	They never spend much effort doing any of the work and often leave their tasks incomplete.
	“Echoers”	They do not contribute their own views to the group and blindly support, or “echo”, whatever group-mates say.

4.7 Conclusion

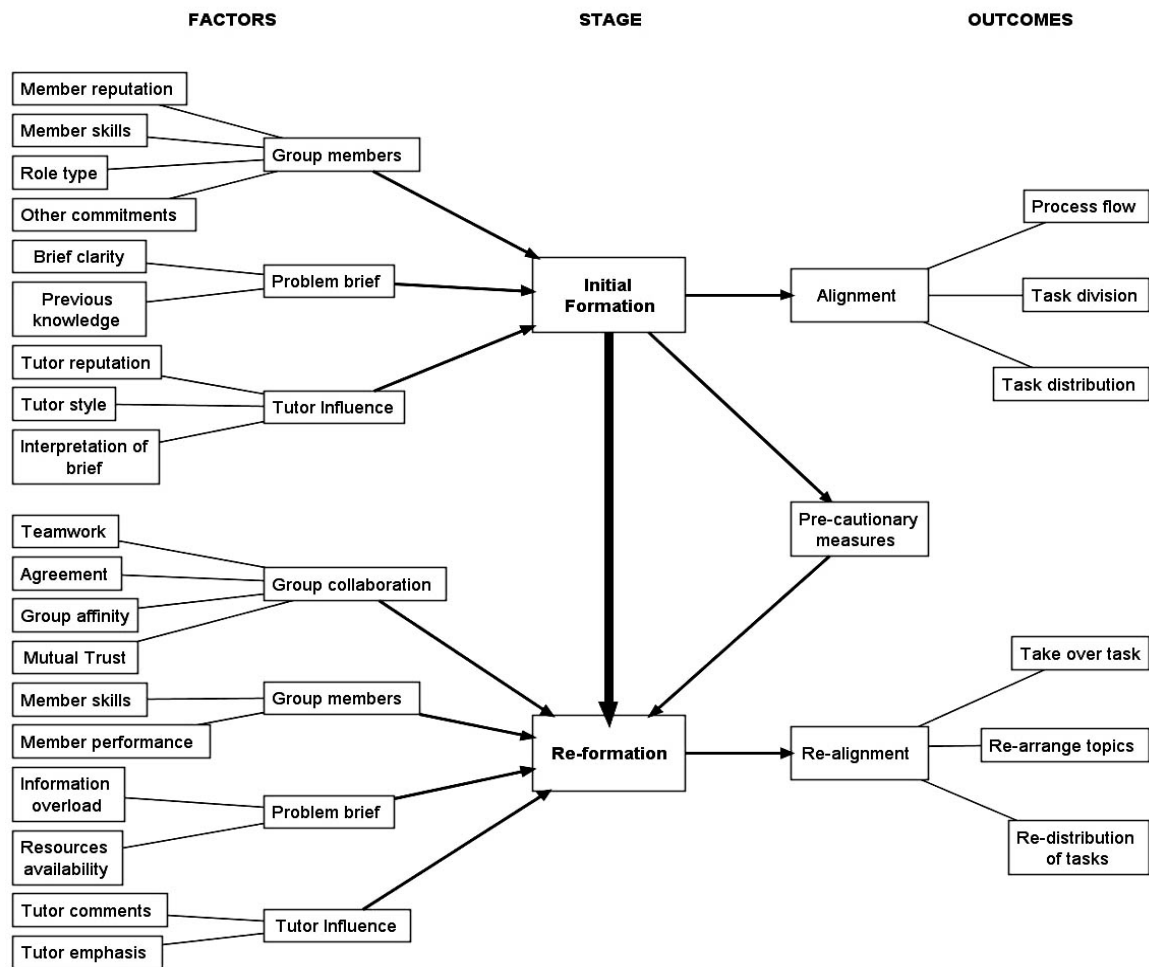
This chapter has provided an overview of the theory of Adaptive Formation and a brief introduction to the different categories and sub-categories associated with the theory. This theory describes the phenomenon of constant formation and re-formation adopted by students in the PBL tutorial groups to cope with problems arising from the learning process.

Figure 4.12 illustrates all the discussed categories and sub-categories, and the inter-

relationships between them. The categories and sub-categories of the theory of Adaptive Formation will be elaborated in detail in Chapter 5.

Figure 4.11

The categories and sub-categories of the theory of Adaptive Formation



CHAPTER 5:

CONCEPTS AND CATEGORIES OF THE THEORY OF “ADAPTIVE FORMATION”

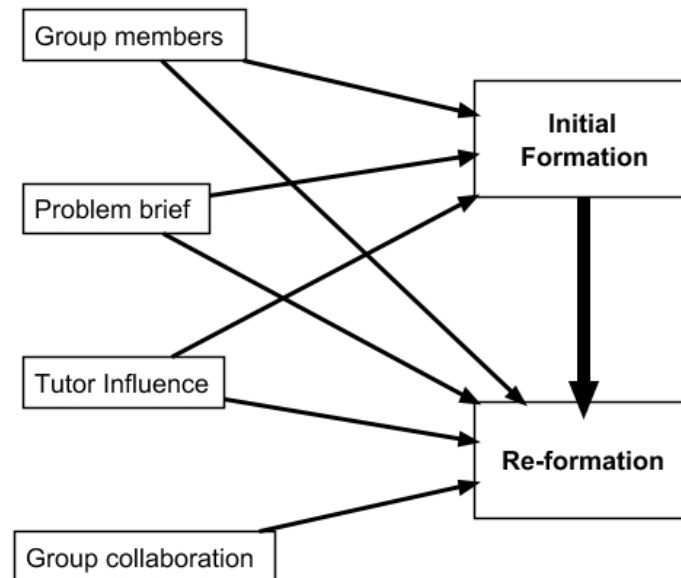
5.0 Introduction

A summary of the theory of Adaptive Formation is given in the previous chapter together with a brief introduction of the key factors and categories. This illustrates an outline of the relationship between these factors and the processes of *formation*, namely the two phenomena that have emerged from the data – *initial formation* and *re-formation*. Figure 5.1 shows how the different categories of factors – *group members*, *problem brief*, *tutor influence* and *group collaboration* – influence the formation process. The factor *group collaboration* only influences *re-formation*.

This chapter presents a comprehensive “story line” of the theory of Adaptive Formation along with detailed references to the research data. The research data are primarily extracted from the interview transcripts of the twelve participants in this research. The participants are from two PBL tutorial groups with six students in each group. To protect the identity of the participants, each student is identified by a single letter. Students in the tutorial group (I) in the first round of interviews are identified by letters “A” through “F” and those in tutorial group (II) in the second round letters “U” through “Z”.

Figure 5.1

The categories of the factors of formation



The remainder of this chapter is divided into the following sections:

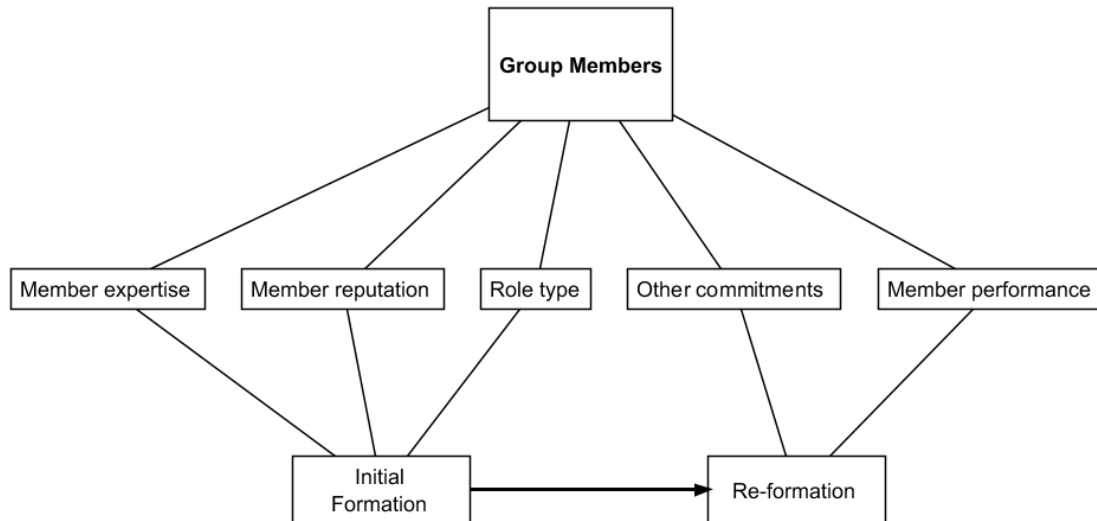
- 5.1 Category Group Members
- 5.2 Category Problem Brief
- 5.3 Category Tutor Influence
- 5.4 Category Group Collaboration
- 5.5 Conclusion

5.1 Category Group Members

The first category, *group members*, consists of five concepts relating to the individual performance and other *group members'* attributes of individual students. Each group-mate brings to the group “their own diverse experiences and learning, which in turn stimulate their own thinking and self-assessment” (Lee & Tan, 2004, p.138). Woods (1994) echoes this view, “The more variety in the group the richer and better the result. However, that very variety may also breed conflict, the nature of which is capable of tearing the group apart if [the students] do not learn how to handle the group dynamics effectively”(p.4-1).

Figure 5.2

The category of group members and its concepts



The effectiveness of the collaboration in PBL groups hinges upon how successfully the differences between the individual *group members* are either erased or accepted. Three of the concepts, *member expertise*, *member reputation* and *role type*, are associated with *initial formation* and the remaining two, *other commitments* and *member performance* are associated with *re-formation* (Figure 5.2).

5.1.1 MEMBER EXPERTISE

The students in the class bring to their group specific capabilities that their group-mates may not possess. As in any group-work situation, including those in a working job situation outside of school, the group takes advantage of the expertise of each group member and assigns tasks accordingly to maximise efficiency and effectiveness. Similarly, in the PBL small group learning situation, *member expertise* is taken into consideration when groups distribute the tasks at the *initial formation* stage. Students are not notified of the coverage of the problem cases beforehand. The groups construct their understanding of the problem based on individual members' prior knowledge related to the problem (Schmidt & Moust, 2000). Thus, *member expertise* plays a strong role in determining how the problem is structured and how the tasks are divided and distributed.

Student E explains how the group divides work:

We tried to let group mates do whatever task they are strongest in. So in a sense it is more target-oriented – to get the report and presentation completed. But to make sure that everybody learns content as well, all group members were given part of the content research work though some might get much less than others.

Student U elaborates that *member expertise* can be further separated in two kinds – *skills* and *knowledge*. When asked about the factors affecting the group's distribution of tasks, Student U states:

Firstly, it's based on abilities. If someone is familiar with writing formats, then he/she would be responsible for the meeting minutes, or the member whose good in English would be assigned the introduction and the editing role. Or when someone is very familiar with a topic, then obviously that part of the work went to him/her. So it was distributed both according to skills as well as knowledge.

In the above case, the *skills* part of *member expertise* refers to the functional tasks that are required to complete the problem cases, such as, taking minutes, compiling the PowerPoint, computer graphics, report layout, and so on. The *knowledge* aspects, on the other hand, refer to the content of the problem cases.

Sometimes the group-mate with *member expertise* in skills may want to teach other group-mates the skills to share out the task. The other group-mates may want to learn a new skill to enhance their own capabilities as well. Student V remarks:

Back to the question of sharing [skills]. There's another situation. It's actually two extremes. Either one shares his/her skills, or the group would give all the tasks of that nature to him/her because he/she possessed the skills. [Researcher question: Which had happened more?] Delegating tasks according to skills because of time concerns.

Although the students are willing to learn new skills and more skilful group-mates are willing to teach fellow students, the tight schedule of the problem cases often prevents the students from doing so. Student X describes what he has seen in other groups and what has happened in his own group:

I have seen groups where someone would only contribute about 10-20% during the information search stage but take up the majority of the PowerPoint, MSWord or minutes parts. But that has seldom happened in my groups. At most, the person with the best graphic skills would develop a template for all to follow.

Student Y has a similar observation:

Sometimes there maybe a group-mate who is really good with PowerPoints, then he or she would take up less of the research work and work more towards the latter stages to refine the presentation.

So besides affecting the nature of the tasks undertaken, *member expertise* also has an impact on the variation of work load over the problem cycle for different group members.

Sometimes, “expertise” becomes a relative term in the PBL tutorial groups and the group member with only a little more knowledge on a topic would become the de facto “expert” of that topic in the group. When asked about how does her group distribute the tasks, Student Y remarked:

It is based on many different factors. One of the points is who has said the most about a particular topic, indicating an understanding or at least an interest in the topic. So, interests come first. Secondly, motivation. It is rather risky to assign the major parts to the group-mates who are less motivated about that topic.

The group member who has been able to contribute more on a topic during the initial discussion becomes the group's expert and would be assigned that topic for information search.

With only two weeks for each problem cycle, the students are more concerned with finishing their tasks to produce a complete submission at the end of the problem than acquiring new skills. As a result, the group would more likely distribute tasks during *initial formation* according to *member expertise*. This may result in uneven work load among group-mates over the different stages of the problem cycle.

5.1.2 MEMBER REPUTATION

Member reputation refers to reputation of students among the class. As the membership of the PBL tutorial groups is changed after each problem cycle, the students get to work with many different classmates over the course of the semester. The past performance of each student in the small group learning environment is therefore at least known by the student's previous group-mates. The students regroup at the beginning of each new problem case and new groupings are formed. Naturally, students would like to know more about their new group-mates and try to find out from other classmates. This is how *member reputation*, especially for the poor performing students, spreads in the class. Some lazier students are even "black-listed" by fellow classmates because of their *member reputation*.

Student U recalls what he had learned from classmates about *black-listed students*:

Although there were known “black-listed” students in our class, who perform poorly in PBL, I had never worked with them. [I had heard from other group-mates that you] really had to do their parts for them, such as finishing their PowerPoint part as the “bad” group-mate was still struggling with the report part. I was lucky in that I had never been grouped with such people. I had lazy group-mates but not to the degree that tasks remain incomplete despite repeated prompts or reminders.

Therefore, *member reputation* affects the *initial formation* of the group and the distribution of tasks at the beginning of the problem process becomes uneven. In this case, the students use *initial formation* as a means to cope with a potential problem in the small group process.

As Student X explains:

These people would take up relatively less work. So the others might think that this kind of group-mates would do little or come back with substandard work anyway, then they would rather do more themselves, so the distribution of tasks would not be balanced.

When students with an unfavourable *member reputation* enter a group, the rest of the group takes some “precautionary measures” to prepare for the situation. One of the ways a group accommodates a group-mate with bad *member reputation* is to alter their normal *formation* strategy regarding the distribution of tasks. Student V states:

There were people who came into the group with a reputation of being lazy, so we would assign the lighter tasks at the very beginning. Even without the reputation, it wouldn't take long to notice whether one was lazy or not as we work as a group at least twice a week and with the research tasks in the beginning things were due every time we met.

However, the exact measure taken also depends on the severity of the situation. If the group thinks that the group-mate with the unfavourable *member reputation* should be given a chance to participate normally, less drastic action would be taken during *initial formation*.

Student X further claims:

For the more serious cases, we might assign them the simpler tasks or the less important ones. More often though, we would begin with a more or less even distribution. If after the second or third meeting, some group-mates still come back with substandard work, we would make other arrangements then. Well, it meant others simply had to take over the substandard tasks.

The impact of *member reputation* plays a significant part in determining the *initial formation*.

As described above, the group's perception of the expected level of performance of their group-mates, especially those *black-listed* ones with a bad *member reputation*, affects how the group distributes the requisite tasks among its members.

5.1.3 ROLE TYPE

Role type refers to the *team roles* that students consistently tend to take up within a group.

These tendencies would emerge as early as during the first meeting for new groups and

affect the manner in which the *initial formation* is set up. Student F recalls that some students are only willing to perform certain roles or tasks within the group:

Some of my classmates were already “stereotyped” to play a particular role within the group, which was well recognised by others. There were students who really did not want to discuss at all and just wanted to move on to producing the report as quickly as possible so that they could concentrate on their project.

One of the most influential *role types* is that of the *emergent leader*. The *emergent leader* is different from the appointed chairperson of the group. The *emergent leader* can be any member of the group, whose leadership qualities and role emerges during the group activities. Student E states the following regarding the effect of her *role type* as the *emergent leader* on the distribution of tasks among the other group-mates:

As I normally assumed a somewhat leader’s role in discussions, other group mates might do things like researching for information, borrowing books, producing the presentation PowerPoint, which were the more “technical” roles.

Hence, the respective *role types* of the group members would determine not only the tasks taken up by an individual student but also what tasks are left for the other group members to assume.

The presence of members with more active *role types* would affect the group’s *initial formation* more as their impact would take effect right at the beginning at the group-process. Besides the *role type* of *emergent leader* described above, the relatively active *role type* of

challenger may also affect the task distribution approach from the start. Student E recounts her experience with a *challenger* in her group:

There were group members who always questioned whether a point was good or not. These were not constructive type of questions but more like challenging for challenging sake. They would even challenge what kind of tasks we need to undertake and how we divide up the tasks in the very first group discussion.

On the other hand, the passive *role types* would also influence *initial formation* since they are not willing to take up the roles that require more proactive participation and prefer assuming the other roles instead. When asked about the recognisable roles other than the more conspicuous ones such as *leaders* and *challengers*, Student F replied:

[Other recognisable roles include] design tasks, such as report cover, selection of fonts, etc. There is also the graphic presentation part. Since some group members did not contribute to the discussion verbally, they would help to search for information more and take up a more passive role.

The reluctance to take certain types of tasks may also be due to the differences in learning goals. Ee and Tan (2009) assert that students “with an ego avoidance goal have a tendency to avoid difficult tasks for fear of failure” (p.43).

According to the data, many groups allow group-mates to select their own preferred tasks first before using other methods, such as drawing lots. Thus, group members are often delegated tasks in agreement with their *role types* at *initial formation* stage. Although some tutors may attempt to assign or rotate roles to the members of the groups under their

supervision, “assigned roles will start to feel artificial to them and students will begin to not take them seriously, which of course will completely undermine the purpose of the roles” (Savin-Baden & Major, p.87). This would just lead to more *formation* changes during the *re-formation* stage.

5.1.4 OTHER COMMITMENTS

Once the problem case gets underway, other factors come into play. *Other commitments* refer to the other engagements the students have besides the problem case. There may be “other obligations within the curriculum that may vie for everyone’s time” (Ee & Tan, 2009, p.61). For example, the integrated architectural studio course being studied contains an individual design project component in addition to the group problem case. Students always have to balance between their *other commitments*. Student C comments on how group-mates try to manage the *project-problem balance*:

I think group-mates did try hard as the problem cases did account for marks too.

Unless the project submission was really tight then group-mates might start to concentrate on working on their own things. Then they would spend less effort on the problem cases.

Similarly, students may have *other commitments* due to coursework for other courses, which cause them to perform at a lower level because of less time spent on the problem cases. Students may also have *other commitments* outside of school, as Student X remarks on students with part-time jobs:

I have heard from others that they were group-mates who might not have been that “into the programme”, or had part-time jobs outside, they would simply just do the minimum.

The impact of *other commitments* is therefore a lack of effort from these group-mates as they are less motivated to give maximum effort to the group work required for the problem case. The following are comments by Student E on the performance of her group-mates with *other commitments*:

There were people who just did not have as much motivation [in the problem case] as others due to other engagements. They were just going through the motions of finishing their task. I could tell that he/she might not be as hard-working as the others and not as involved but all you could do was to try to influence him/her and bring him/her up to speed.

Student F discusses the discrepancy between students who focus on the problem case and those who put emphasis on other things:

As a result, some members of a group might think that it was important to discuss things thoroughly while the others felt that it was not necessary to discuss so much and that there was not much to discuss about. “Just get it done.” Sometimes, it was almost like they would finish the whole problem case within the first week and submit.

The outcome of *other commitments* is a reduced effort being spent on the problem cases. Too much emphasis on these commitments has led to substandard work and incomplete

tasks, causing the group to redistribute the affected tasks among the other members. As a result, the formation is changed and *re-formation* takes place.

5.1.5 MEMBER PERFORMANCE

One of the most common factors that lead to *re-formation* is *member performance*.

Whenever a group-mate fails to perform up to the expected level the group may have to consider taking action because it affects the performance of the whole group. Each group member has two responsibilities to the group: to sustain the morale of the group in addition to completing tasks for the group. However, one inevitably affects the other. When tasks are left incomplete, the morale of the group is low, and vice versa (Woods, 1994, p.5-8).

Student A claims:

Sometimes even though we had divided up the work and agreed to a certain date of completion, the lazier group-mates would fail to complete their portion of work and only start during the meeting and hence slowed down the group's progress.

Moreover, since the duration of a problem cycle is very short, the group cannot always afford the time to let the progress of the whole group slacken because of the lack of performance by one group member. Consequently, the other group-mates may intervene and re-assign the tasks in question to another group-mate. Student A continues:

It was very difficult to complain at him/her as we are not children anymore. Most of the time, the other group-mates would just take up more work and do his/her part. It would be pointless to do as they did and ending up not getting any work done. Or we would re-assign the simpler or less demanding work,

such as work that requires less “thinking through”, e.g. just presenting, then it would be easier to cooperate together.

Student B echoes this view:

But it is not always the case that all group mates would put in 100% effort. As a result, it is very demanding for the more hard-working students within a group. They often have to take up the parts of the lazier students.

However, despite the tight schedule, the groups sometimes allow the problematic group member another chance to perform at an acceptable level. Student B describes his group’s action when faced with group-mates with poor *member performance*:

If someone didn’t complete his/her designated tasks or when the information presented was not useful and too superficial then I would probably still allow that group-mate to continue his/her task first. And when there were no improvements and the situation persisted I would immediately talk to him/her about it...I would let them try their best as much as possible first, because if the more capable students or the leaders always completed all the work then the others could not learn anything.

Student Z recounts a similar experience when asked about experience with weaker group-mates:

If we knew that the group-mates in question have lower abilities, then we would ask others to take over. It is easier to progress this way. It is not that they had done nothing, but the quality was not up to standard. So instead of wasting more

time to let them try again, the others would do extra and then allow the weaker ones to assist.

So, if time permits, the groups would allow the lazier group-mates another chance to complete their tasks before taking them over.

In both cases above: 1) taking over tasks from poor-performing students, and 2) allowing the students another chance to complete their tasks properly, the group is forced to change or deviate from their *initial formation*. Obviously, *re-formation* happens when the tasks from the poor-performing student are re-distributed to the other group members. Student Z describes another way in which the agreed *initial formation* is changed:

Apart from the one or two lazier group-mates, most of us could find a lot of information. So the lazier ones could use the information the others found to complete their parts of the production work.

By doing this, the group has effectively changed its agreed organisation of topics because the topics assigned to the lazier group-mates now have less coverage in the problem solution due to the lack of information. So instead of a re-distribution of tasks in the *re-formation*, the framework of topics is changed.

Even when the poor-performing student retains the tasks, the order of tasks of the group is mostly altered because of the missing parts. Hence, *re-formation* of the *process flow* takes place because the original sequence of individual and group activities agreed during *initial formation* is changed to respond to the impact of poor *member performance*.

However, it must be noted that not all cases of poor performance are due to lack of abilities.

Student Z reports:

In very rare cases there may be group-mates who disagree with the group's decision on how to re-divide the topics and re-distribute the tasks, and return the next session with not much work done, almost as a kind of protest.

The students in question failed to perform up to the other group-mates' expectations because they are not motivated by group decisions that they do not agree with. The group has proceeded onto self-directed learning without actually reaching a consensus among group members first.

5.1.6 SUMMARY OF THE CATEGORY GROUP MEMBERS

The concepts 1) member expertise, 2) member reputation, 3) role type, 4) other commitments, and 5) member performance are all covered under the *group member* category, which informs the impact of individual group members on the *formation* of the PBL tutorial groups. The first three concepts affect *initial formation*, influencing the division of the problem tasks, distribution of the tasks among the group members, and the sequencing of these tasks over the course of the problem cycle. The data also reveal that the groups incorporate *precautionary measures* into *initial formation* to cope with problematic group members and the potential disruptions to the problem cases that these members may cause.

The latter two concepts are related to *re-formation*, leading to revisions in task division, re-distribution of tasks, and re-sequencing of the tasks. According to the participants, the groups may not take over incomplete tasks from poor-performing students immediately.

Depending on available time, the groups would allow the poor-performing students to redo their work if the substandard work is discovered in the early stages of the problem cycle.

The above findings agree with previous studies on collaborative learning and confirm that positive results do not automatically come out of simply grouping students together (Johnson & Johnson, 1990; Dyer, 1995) since the group must resolve problems arising from the preferences and characteristics of individual group members. This also confirms the view of Miller et al (1994) that “group work can be a messy and uneven business” (p.35). During both the *initial formation* and *re-formation* stages, an uneven distribution of the work load among the group members follows the group’s consideration of the different abilities and motivation of individual group members.

Unfamiliarity with fellow group members may thus result in hindrance of the collaborative learning process (Mpofu et al, 1998) because the group cannot take precautionary measures – such as, assigning a lighter load, delegating extra help, and so on – at the *initial formation* stage to account for the poor-performing students. Inevitably, further adjustments need to be made over the course of the problem cycle by the group to respond to issues relating to the category *group members*, resulting in *re-formation*.

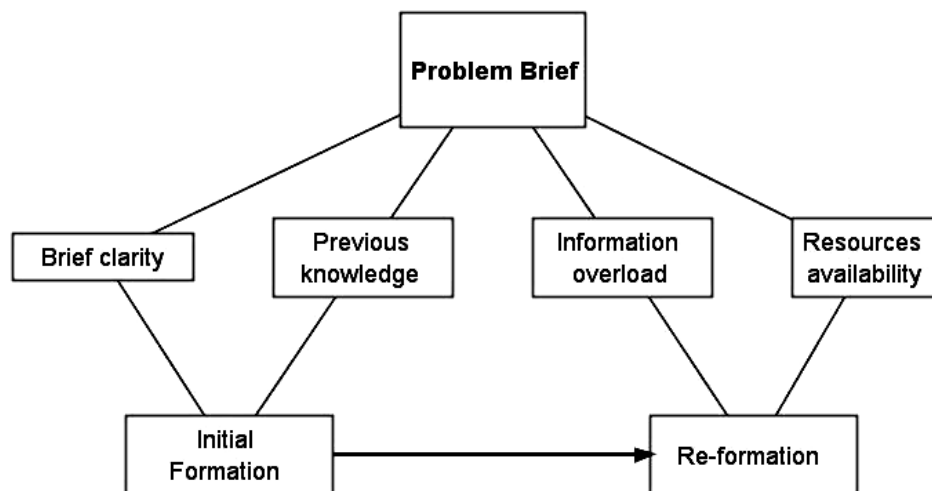
5.2 Category Problem Brief

The second category, *problem brief*, comprises four concepts relating to the contents of the handout given out to the students when the problem cases are assigned to the class. The

problem brief is central to the PBL process as it “triggers the context for engagement, curiosity, inquiry, and a quest to address real-world issues” (Tan, 2004, p.9). Two of the concepts, *brief clarity* and *previous knowledge* are associated with *initial formation* and the remaining two, *information overload* and *resources availability* are associated with *re-formation* (Figure 5.3).

Figure 5.3

The category of problem brief and its concepts



5.2.1 BRIEF CLARITY

Brief clarity refers to the amount of information contained in the *problem brief* that presents the problem case given to the students as well as the usefulness that information is to the students. In the studied programme, students undertake two weeks of group work based on information that fits onto one side of a sheet of A4 paper. The information includes: the problem statement, key concepts, suggested references, time schedule and submission details.

Since the *problem brief* is so concise, it is therefore difficult to balance between the amount of guidance given and flexibility for knowledge discovery.

A poorly composed problem case can lead to a lot of abortive work because students are often unclear about how to proceed with the problem case, as Student A claims:

At first, there was a bit of not knowing what to do and how to start, for example, do we just borrow some books from the library? Or do we search for information in the internet to compile the report? And we did not really understand the real purpose of the problem cases.

Misconception of the problem brief would lead to students assigning group-mates to look for information in irrelevant areas. As a result, students start off with the wrong *initial formation* and must revise their approach later on.

Theoretically, the *problem briefs* contain adequate information for the students to proceed with the problem process, especially when “key concepts” denoting the main learning objectives of the problem cases are given. The key concepts provide strong clues to the groups on how to start of their learning activities. Student W states:

We would naturally divide up the work according to the key concepts given. If there were no such key concepts it would be more difficult to understand the brief as it tended to be rather vague and broad.

But sometimes even the key concepts are not adequate to get the PBL process started as Student Z recalls:

Sometimes we are not so clear about the key concepts. The key concepts consist of only one or two words, so the direction is not clear. We need to discuss a few times before we can grasp what is required. We also need the tutors' input.

However, Student W also replies that, "It wasn't always so clear from the brief what was expected of the students," when asked about the negative side of the PBL experience.

Student U states:

Once I understand the topic, I could quickly find some material from the internet using some key words in Yahoo. When these were insufficient, then I would look for more useful information from books in the library.

Brief clarity is critical because the groups' interpretation of the *problem brief* determines the subsequent learning strategy the group adopts to tackle the problem case: which topics are important, how to divide up topics and distribute the tasks, and so on.

Moreover, some students appreciate the chance to learn something that may not be directly related to the problem case on hand. Student W explains:

There are a lot of opportunities for students to proactively search for information. Once given a topic, it is not like just learning from a lecture, where I only learn what the tutors teach. But now that I am searching for things myself, I may find materials that cannot be foreseen, and can actually learn something extra.

Hence, a *problem brief* that is "too clear" and, gives away too much information and direction may limit how much the students can learn from the PBL group process.

Paradoxically, this tends to happen when the problem cases are designed to cover a pre-determined set of knowledge.

A key feature of PBL is that “real-world problems” are used to drive learning (Barrows, 1988; Woods, 1994). To maintain motivation, students need to be able to connect the problem case to other aspects of their architectural education. Student Z states:

I think it is not always the case that we can apply what we had learned in the problem cases to the design project. Sometimes the things we found for the problem are too specific, too theoretical, and there is not enough time for us to comprehend and integrate the knowledge into our projects.

Savin-Baden and Major (2004) think that the “starting point for designing problems should not be the knowledge base or the type and level of skills but rather the capabilities that students need to develop that will equip them for working in a shifting and complex world” (p.66). The connection to the design project should not be vague so that students can appreciate the potential for applying the knowledge acquired from the problem cases.

A related concept is the appropriateness of the problem case to facilitate the group collaborative learning process. Student D complains about a problem case that he thinks hindered the PBL process:

I do not think every topic is appropriate for PBL. I remember there was one problem case last year where we were asked to find a schematic design. I think it did not really resemble a problem case as it was mostly about information

collection and not about problem solving. I realised that the problem case itself must be well-written. And I did not do too well in that particular problem.

Another dimension of *brief clarity* is thus the clarity with which the *problem brief* is presented as a problem that drives learning and is not a series of prescribed tasks. Studies by Woods (1994) show that the more successful PBL groups spend more of their time *deciding what tasks to take* while the less successful ones spend their time *undertaking tasks*. Hmelo and Evensen (2000) concur with this view that the groups should spend more time planning their action than taking action: “The emphasis in PBL is not necessarily on having students solve the problem; rather, it is on having them understand the cause of the problem.” (p.3).

However, the direction in which the group leans depends a lot on the design of the problem brief. One of the recurring issues regarding problem design is that often problem cases are composed without much attention to the different types of problems available and how these are related to the knowledge level of the students (Savin-Baden & Major, 2004).

5.2.2 PREVIOUS KNOWLEDGE

After studying in the programme for a while, the students begin to build up a body of knowledge in architectural studies. This *previous knowledge* would affect how the groups identify key areas to look for information at the beginning of the problem process. Student C describes the differences between how her group approached problem cases when they first experienced the PBL process compared to later on:

In the beginning, we mostly followed the organisation suggested by the brief’s “key concepts” and started with those. Later on, as tutors suggested, we needed

to analyse more and looked at the relationships between the key concepts. We came up with more questions for ourselves to answer.

So, instead of relying on the key concept given to guide their *initial formation*, Student C's group utilizes their *previous knowledge* to analyse the key concepts first before formulating questions for themselves to answer.

Besides content knowledge, the group and its members' *previous knowledge* also includes functional knowledge, or procedural knowledge, which relates to the process of resolving the problem cases instead of the information required to do so. Student D remarks:

There was hesitation about choosing the "correct approach" in the beginning but later I realised that there were many feasible ways. It was most important to determine the objectives and the approach.

This shows that the students are gaining knowledge on *how* to solve problem cases effectively. This *previous knowledge* on process would influence the groups' way of task division as well as determining the process flow.

In addition to the process flow, *previous knowledge* on the *problem brief* affects how the tasks are distributed among the group members. Student X explains:

After the first discussion, there would be some kind of a framework. Then we would think back and see who actually contributed more to which part of the framework and seemed familiar with that part. We would ask that group-mate to take up that part.

The group is reviewing their initial discussion to see how the *previous knowledge* of the group members are contributing to the problem case and divide up the work as well as delegate the tasks accordingly.

Previous knowledge allows the groups to divide and distribute the work load more evenly because they have a better idea of estimating how much work is required. Student V claims:

We would look at the list of topics and determine which were the heavier parts and the lighter ones. Then we try to package them together so that there was more or less a balance distribution of tasks.

With more accurate estimates of work load based on better *previous knowledge*, the groups have a much higher chance of producing a balanced task distribution during *initial formation* and thereby reducing the need for re-distribution of tasks during *re-formation*.

5.2.3 INFORMATION OVERLOAD

Information overload refers to the situation when too much information on the problem cases is available and the amount of information is so vast that it becomes difficult for group members to handle. This can happen when tutors make the mistake of designing over-complex problems (Savin-Baden, 2004). The design of the *problem brief* decides the number of different disciplines from which the groups search for information. When asked about *problem briefs*, Student E replies:

At least provide more information for the initial parts so that there was more direction for students to follow. Sometimes the problem cases were very broad

and involved too many aspects – technical, environmental, social, etc. It would be better if they were more focused and specific.

It is well understood that students “need to critically evaluate the resources they have used” and “to consider the reliability of the resources” (Hmelo & Lin, 2000, p.230). However, studies have shown that many PBL students do not know how to assess the accuracy and validity of information found nor do they know how to evaluate the usefulness of the information (Blumberg, 2000). When the coverage of the problem is too broad, then the original task distribution would not be focused enough to lead towards a solution for the problem case. Inevitably, the groups must refine their information search tactics to become more focused, resulting in *re-formation*.

Student W explains one of the reasons why *re-formation* took place in her group:

We would simply each take up one or two topics in the beginning but it might turn out that some topics required a lot more work than others or covered a much wider scope. Thus, a rearrangement of topics might follow after the first round of information sharing. We would try to distribute the workload as evenly as possible based on prediction of how much work each part would incur.

As mentioned in the previous section, groups can only rely on their *previous knowledge* to try to predict the amount of work required for each of the assignments to group-mates during *initial formation*. So when any topic from the *problem brief* causes *information overload*, the group must re-distribute the topics to ensure a more even division of work load.

Sometimes, *information overload* is simply the logical result of the nature of PBL problems, which are characterised as ill-structured problems. These types of “real-world problems” often do not have a solution set with clear boundaries and structure. Porath and Jordan (2009) further state that, “[m]ost problems, in reality, are confounded with other variables and need to be teased out of the social, emotional, cultural, and environmental contexts” (p.63). The broad coverage of PBL problems would lead to *information overload* when the group do not pay adequate attention to the setting up of the problem and selection of key topics for research.

Sometimes, instead of re-distributing the work load among individual group-mates in *information overload* situations, the groups may work together to resolve the problems.

Student X recalls such a situation:

When the group-mate was simply overwhelmed by the sheer volume of material, the whole group might sit around computer and try to sort out the material collectively and research the topics more. If one group-mate stumbled during the learning stage, the whole group helped out. Sometimes we might have divided the topic a bit too disorderly or there were simply too much information available, then yes, the whole group helped out.

In the above case, the *re-formation* involves more than just a re-distribution of tasks to even out the amount of work each group member is responsible for. The *process flow* is also changed as the information search task that is originally planned by the group to be an individual task now becomes a group task.

5.2.4 RESOURCES AVAILABILITY

Resources availability is the opposite of *information overload*. While an over-supply of information causes problems among the groups, the lack of available information likewise causes problems of its own. There are two causes for the lack of *resources availability*.

First, it may be caused by a problem design that is too narrowly focused, which leads students to target a more simplistic solution (Savin-Baden & Major, 2004) and search for information from a limited number of topics. Naturally, the amount of information available is limited because the search area is narrow. Second, it may simply be due to an inadequate number of related books – still the main source of information – available from the library.

Student V states:

There is a lot of group work in PBL. How much you learn depends on the kind of information you could find at the time. There is not a set of prescribed learning materials which you could surely acquire something if you study it properly. You would learn less if you could not find the appropriate materials.

Student Y claims another problem is that not all of the already limited available resources are useful:

I am not that used to the approach in the beginning because the materials are not from prescribed textbooks and we have to spend considerable time searching for them. We have to spend a lot of time searching for material because not all the things we found are useful and we need to evaluate and select the useful ones.

The success of the problem case, as well as the amount of knowledge that the students in the group acquire, is directly related to the amount of information that the group can find. It is

obviously a problem when not enough information is available. The group must then review their *task division* and *process flow* in view of the resources its group members can find.

Although the students in the study find that searching for information on the internet is more convenient, they have been instructed from the start of the programme that they must ascertain the reliability of these sources and avoid depending on limited sources of information. Books in the library remain their primary source of information. To familiarise the students with the book search system and other resources in the library, every student in the class has taken part in a library workshop during orientation week before they encounter their first problem case. However, due to the large class size with around 100 students and 16 groups all targeting the same set of materials, not every group can retrieve the books it want in a timely manner. Student E complains:

Most of the time, the more useful books were already checked out when we get to the library. It would be better if the essential books were kept on reserve.

Student V explains the consequence of the lack of *resources availability*:

Sometimes some teachers would encourage us to read certain books, but due to lack of time or because the books are not available, then we kind of learned less.

The student points out that the lack of *resources availability* causes them not only to have less material to resolve the problem cases but also to learn less.

There are generally two types of resources: teacher-directed and self-directed (Blumberg, 2000). While teacher-directed resources are specifically highlighted by tutors, self-directed resources are often whatever books students can find in the library that in any way relate to

the problem case topics. Student B recognises the issue of *resources availability* relating to self-directed resources and thinks that students can share books and other forms of information to overcome this problem:

I think it is important that the students are not selfish and share with everyone all the information gathered. For example, relevant books in the library would be cleared out from the stacks. I think if people are willing to share, then we all learn faster.

Therefore, in addition to intra-group collaboration, the students need to accept more inter-group collaboration and share the materials found to help each other learn to overcome problems associated with *resources availability*. In any case, the groups must change their *formation* either by re-arranging their topics and division of tasks in response to *resources availability* or by changing their *process flow* and collaborate more with the other groups.

5.2.5 SUMMARY OF THE CATEGORY PROBLEM BRIEF

The concepts 1) brief clarity, 2) previous knowledge, 3) information overload, and 4) resources availability constitute the category *problem brief*, which informs the impact of the problem statement and related information assigned to the students on the *formation* of the PBL tutorial groups. The first two concepts affect *initial formation*, influencing the division of the problem tasks, distribution of the tasks among the group members, and the sequencing of these tasks over the course of the problem cycle.

According to Barrows and Wee (2007), the problem brief is critical to the students' learning because "they stimulate learners to determine what it is that they need to learn and to provide

both an anchor and an organizer for learner” (p.89). The tutors must take special care in the design of the problem brief to maximise the effectiveness of *initial formation* so as to minimise the need for *re-formation*, which may be disruptive to the learning process.

There are a number of factors that the tutors must pay attention to in the design of a problem case. They must balance the *brief clarity* of the problem case. On the one hand, if the problem brief is too vague, then it would be very difficult for the students to decide where to begin their problem-solving process. On the other, if the problem brief is too clear, then it would give away too much information and limits the groups’ learning. The tutors must also take into consideration *resources availability* when compiling problem cases to ensure that the groups have access to adequate relevant materials through different sources.

The problem cases should build on the students’ *previous knowledge* – both content knowledge and functional knowledge – progressively. Students rely on their *previous knowledge* to determine the important *formation* outcomes of *task division* and *task distribution*. Problem cases that overly depend on the search for new information can cause *information overload*, in which the amount of information available exceeds the processing capacity of group members. As a result, either more group-mates are re-assigned to help with the information search for that particular topic or the topics needs to be re-defined.

Since the problem case plays such a central role in the success of PBL (Barrows, 1988; Woods, 1994), the question that needs to be answered is: What are the characteristics of a good problem? Moreover, despite the obvious need for high-quality problems, studies are

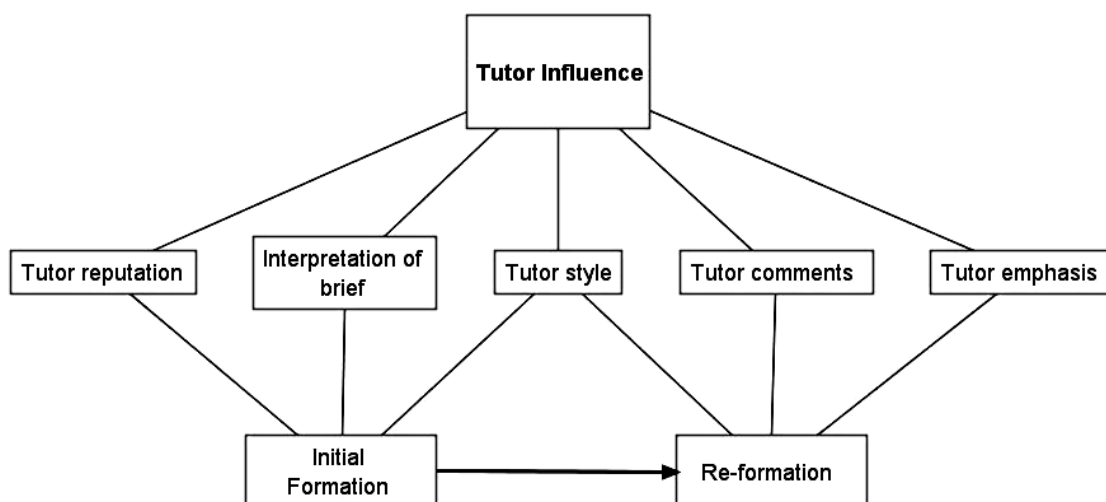
not conclusive about what are the properties that constitute a good problem (Schmidt & Moust, 2000). More comprehensive studies are required in this area.

5.3 Category Tutor Influence

The third category, *tutor influence*, contains five concepts associated with the impact of the tutors' behaviour and characteristics on PBL small group learning. Three of the concepts, *tutor reputation*, *interpretation of brief* and *tutor style* are associated with *initial formation* and the remaining two, *tutor comments* and *tutor emphasis*, together with *tutor style* are associated with *re-formation* (Figure 5.4). The concept *tutor style* affects both *initial formation* and *re-formation*.

Figure 5.4

The category of tutor influence and its concepts



5.3.1 TUTOR REPUTATION

Just as students bring into new groups their *member reputation*, the tutors also have *tutor reputation*, which is mostly built up of exchanges between students from different tutor groups or information passed down by senior students. According to the participants, the groups would try to predict the preferences of the tutors based on their respective *tutor reputation*. The influence of *tutor reputation* is especially significant for the first few problem cases because “the student confronts a situation where he or she needs to accomplish an objective, and the means is something new or unknown to the student” (Tan, 2004, p.9) and tends to follow any clues available to kick off the learning process.

Since all the tutors in the programme are involved in PBL and the tutors are rotated at the middle of the semester, the majority of the tutors would have facilitated a PBL tutorial group over at least one problem cycle by the end of the new students’ first semester in the programme. The PBL experience with different tutors spreads quickly among students.

When asked about how she discovers the tutors’ preferences, Student Y replies:

It’s a common perception, almost a consensus among classmates. So in the beginning we would discuss which tutor would facilitate us and we should do this in terms of tasks division and that in terms of process. Some may like more visual stuff, and not so much text.

This group is therefore making decisions on their *initial formation* based on *tutor reputation*.

When asked about the reasons for putting more effort into the group problem cases while some classmates are saying that they would rather spend more time on their individual design projects, Student D replies:

I think it had to do with my tutor, who gave us the impression that the problem cases were very important.

Student D further answers the follow-up question of how important he thinks tutor influence is:

[Tutor influence] is quite important. My impression was that sometimes our problem reports were a lot more detailed than those from groups that were under a different tutor, implying differences in emphasis. It also showed the “seriousness”, or lack of it, that different groups placed on the problem cases.

The above shows that students would compare the different ways separate tutors approach the problem cases. This is one of the ways that *tutor reputation* is formed.

Besides *tutor reputation* on whether or not a tutor values problem cases relative to the design projects, there is also *tutor reputation* on the criteria used for assessment. Student F speaks of his perception of an instructor’s *tutor reputation* and its influence:

I have heard of instances when during presentations the tutor did not really seem interested in paying attention to the content and did not give much comment either. And the groups could get good marks with decent graphics even though the report lacked substance. Naturally, students would choose the easier way and “buy” that method.

In his response, Student F is talking about a tutor who has never facilitated his groups before. His remarks are based on *tutor reputation* instead of actual experience of studying under the tutor. Student F further thinks that groups would choose to plan their work according to their impression of the tutor's preferences. Studies by Savin-Baden and Major (2004) demonstrate that, "which collaborative skills are valuable is largely based on a view of students' conformity to tutor preferences" (p.73). Therefore, it comes as no surprise that groups base their *initial formation* on their perception of *tutor reputation*.

5.3.2 INTERPRETATION OF BRIEF

Interpretation of brief refers to individual tutors' understanding of the problem brief. Each of the problem cases is facilitated by at least four tutors but the problem brief is designed by one of the tutors. Although there are inputs from other tutors on the compilation of the problem cases and a set of core guiding questions has been given to them, the tutors each have their own individual views on both content and process. The groups' *initial formation* follows accordingly, particularly during their first experiences with the PBL approach.

New students coming into the programme are often quite confused about how to begin the learning process, as Student X recalls:

I remember that we were quite lost in the beginning, clueless about how to proceed. Nothing happened until the tutor sat down and helped kick off the discussion.

When the students rely on the tutor to help them kick off the discussion, the initial framework for relating the key concepts of the problem case becomes guided by the tutor's

interpretation of brief. The *initial formation* of the group is thereby affected by the tutor's *interpretation of brief.*

This influence is particularly significant during the early stages of the students experience with PBL, when the tutors tend to give more guidance to the students: "Early in the PBL process, the facilitator may question students to help them realise what they don't understand...As students become more experienced with the PBL method and take on more of the responsibility for identifying learning issues, the facilitator is able to fade this type of support, or scaffolding." (Hmelo & Evensen, 2000, p.3).

After the problem case has commenced, the tutor's *interpretation of brief* continues to influence the group's *formation*. The groups' inexperience in both the content and process of the problem cases causes them to constantly look for reassurance that they are on the right track. Student D remarks:

We asked the tutor more questions and tried to get more feedback. We also tried to compare our own work with other groups and exchange ideas. We were not trying to get more information or content, but rather to clarify our own approach on how to formulate the key questions.

Student D's group is trying to "clarify" their understanding of the problem case by comparing their own approach to the tutor's *interpretation of brief*. The formulation of the key questions decides the main subject areas from which the group members search for information. Thus, the tutor's *interpretation of brief* affects how the group selects topics in the beginning and divide up the tasks, that is, *initial formation*.

5.3.3 TUTOR STYLE

Tutor style refers to the tutors' behaviour during their interaction with the students in the facilitated PBL tutorials. The tutors are not given specific guidelines on how to conduct group learning. Therefore, tutors use different methods to facilitate student learning, for example, briefings, in-class questions-and-answers, show-and-tell, short presentations, and so on. An important aspect of *tutor style* is the manner in which scaffolding is provided in the form of guiding questions that “offer a framework for reasoning about a topic and applying prior knowledge” (Koschmann et al, 2000, p.62).

Savin-Baden and Major (2004) highlight that the tutor should give minimal intervention when the PBL group is first presented with the problem brief in order to stimulate discussion among the group members. Student B thinks that such *tutor style* has a strong impact on their learning:

Often, the tutors' behaviour imposed significant influence on the outcome.

Some would let you explore on your own first while others might stop you immediately from straying too far “off topic.”

And when asked about which *tutor style* he prefers, Student B answers:

I prefer the freedom with the first kind as you get to think more on your own.

But there are advantages in both tutor styles as the second type may help us avoid too much abortive work.

The *tutor style* thus dictates how broad the group would go to search for topics. Groups facilitated by tutors who allow more “freedom for exploration” would begin their problem process with more topics for investigation than those under facilitators who control the

students' exploration more closely. As a result, the former groups would begin their PBL process with more topics in their *initial formation* than the latter groups.

The two differing *tutor styles* underscore the pedagogical differences between conventional and PBL tutoring: "Whereas the goal, from the tutor's perspective in a conventional tutorial, is to bring the tutee to a negotiated level of understanding, the primary objective of the PBL tutorial is just to make deficiencies in the learner's understanding evident" (Koschmann et al, 2000, p.65). PBL environments are designed to provide students with the opportunity to engage in self-directed learning, "thereby making them, rather than the teacher, the persons who develop the questions" (Porath & Jordan, 2009, p.63).

Besides having an impact on *initial formation*, *tutor style* affects *re-formation* as well whenever the tutor's behaviour deviates from the group's expectation and leads the group to focus on other matters. Student F explains:

I think the tutor played quite an important role. For example, some tutors would require complete PowerPoints and stuff during interim presentations which I felt actually took up valuable time that could have been spent on working out the content part of the problem case. I would prefer that the tutor actually focused on asking us questions on areas where we still had problems. The presentation works were not required until the final review.

Some groups are therefore forced to change their *process flow* to include more *production tasks* in the earlier stages of the problem cycle than preferred. Hence, the *misalignment*

between planned tasks and required tasks that necessitates *re-formation* results from *tutor style* and not *group member* factors.

Student F also points out that the impact of *tutor style* extends beyond one problem case. The *tutor style* moulds a student's approach to PBL and affects how the student behaves even when the student is being facilitated by another tutor. Student F states:

The most important is the tutor assigned in the very first semester as he/she sets the style for all the groups under his/her supervision, which would end up being generally the same. So that is why when we changed tutors at the middle of the semester or changed groupings the next semester, there would be some conflicts between how students worked because they had been working under different modes in their previous groups.

When students who have worked under different *tutor styles* are grouped together, there are discrepancies between the required standards for different tasks. These conflicts result in *misalignments* that require tasks to be redone or redistributed.

One of the participants, Student W thinks that the impact of *tutor style* is more limited to presentation aspects:

I don't think the tutor style had a big influence on the division of work. I think the influence was more on the production, e.g. the presentation flow. So we might decide to work less on a part because we need to refine the presentation flow as some tutors emphasised the flow more.

However, by directing more of the group's effort into *presentation tasks*, the group inevitably spends less time on *learning tasks*. The student admits that they need to “work less on a part”, which means less research work on a topic. Student Y and Student Z have related observations on presentation requirements of different tutors. From Student Y:

The tutors' preferences would affect how we work. For example, there are some who like more information and we would include more text into our report.

Others may be the opposite and prefer diagrams that are supplemented by verbal explanations. This would affect how we compose the PowerPoints.

Student Z explains:

Another aspect [of the tutors' influence] is on the process. Some tutors like more graphics and less text. We may then spend less time discussing the material and more time on making the PowerPoint nice. And these are explicit comments from the tutors.

So, while the more direct impact is on the *presentation tasks*, there are direct and indirect impacts on the *learning tasks* as well. With a limited amount of time available, devoting more time to refine the presentation materials according to the tutors' requirements inevitably leads to spending less time on *learning tasks*.

5.3.4 TUTOR COMMENTS

While *tutor style* refers to the general approach tutors adopt in group facilitation, *tutor comments* refer to the actual comments the tutors give to students on specific matters. The majority of the *tutor comments* come after *initial formation* and target work completed by students. Student U remarks:

We mostly follow what the tutor has explicitly stated are important or we should focus on. So we would re-arrange the topics/tasks we have distributed previously and change accordingly.

This shows that *tutor comments* have a direct impact on the *formation* of this student's learning group and the group changes their *task division* and *task distribution* by following the tutor's specific comments.

Student Z has also experienced changing his group's task distribution due to tutor comments. He states that apart from misunderstanding of the problem brief:

The other times that we need to re-distribute tasks are due to tutor's comments on our direction or we need to change the framework, or presentation flow, for organising the information. When the framework changes, we need to re-divide and re-distribute the tasks...The tutor can tell you whether the direction is correct or not, which controls the presentation framework. So much so that we may have to discard a lot of the information we have on hand and have to search for new materials.

This shows that the group rely heavily on the tutor to give them guidance and to evaluate their work. They are willing to cast off information already collected as abortive work in order to follow *tutor comments*.

Apart from responding to *tutor comments* on work completed by group-mates, the groups sometimes proactively solicit comments from tutors to assist their problem-solving. Student U states:

We had pretty good group dynamics and we would assist one another when we had difficulties. If someone really couldn't find anything on a topic, we would discuss and also ask opinions from the tutor to resolve the problem as a group.

This supports the observation that the influence of *tutor comments* is more specific than *tutor style*, which tends to affect the student's general understanding of the "proper" approach to PBL. Besides, students with some PBL experience seem to consider the tutors as a "last-resort device" (Schmidt & Moust, 2000, p.40) and seek assistance from their tutors when facing difficulties only after attempts to resolve the issues on their own, fail.

The students perceive the tutor's views and opinions as the "correct answer" and naturally try to follow *tutor comments* closely in order to get good results. Student V describes how they determine whether they have adequate coverage over the information required by the problem cases:

We seldom failed to discuss everything needed, that is, the topics we selected in the beginning. The only missing parts were those that we discover after the [interim] presentation, points that the tutor has raised during the presentation.

After getting feedback during the interim presentation, the group would rearrange their topics to include the "missing parts". This leads to additional tasks that need to be distributed to the group members at *re-formation* stage. Moreover, to facilitate deeper learning, *tutor comments* should come in the form of questions rather than answers – tutors should provide "a good amount of scaffolding through good questions" (Tan, 2004, p.12).

5.3.5 TUTOR EMPHASIS

The final concept under the category *tutor influence* is *tutor emphasis*. As mentioned before, the design studio course is divided into two main components: the individual-based project and the group-based problem. Students have to constantly balance their time between project and problem. In a tutor group, the same tutor runs both components for the same group of students and *tutor emphasis* refers to which component – project or problem – that the tutor put more emphasis on. Savin-Baden and Major (2004) find it important that tutors are truly committed to their role as facilitators in PBL. Otherwise, their actions and counter-emphasis are likely to be disruptive to student learning as well as become the cause of unnecessary abortive tasks that needs to be re-considered and/or re-distributed during *re-formation*.

When the students first enter the programme, they are often not clear about the assessment methods and *tutor emphasis* plays a strong part in determining their understanding of relative importance. Student A claims:

Classmates feel that the percentage of marks assigned to the project is higher due to the tutor's remarks. Therefore the problem only needs to be concise, and as long as we tried our best and the outcome was about average then it would be OK. They think that the project is more important.

Moreover, while some tutors emphasise the project component more, others may do the opposite and give the students the impression that the problem is equally, if not more, important. The effect of *tutor emphasis* is similar to what Schmidt and Moust (2000) term

“assessment orientation”, the extent to which a tutor’s emphasis on a certain form of assessment directs the students’ learning (p.42).

Speaking about the differences between his own emphasis during the beginning of the programme and at the time of the interview, Student D explains:

Actually, I think most students focus on the design projects more now. Back then, it was the influence of the tutor that led to everyone putting more emphasis on the problem cases...I think it was because the first tutor demanded a very high standard from us in terms of the problem cases, which forced us to spend a lot of time on them. After the first problem, we started to demand a lot from ourselves too, even without the tutor’s requests.

The impact of *tutor emphasis* on *formation* appears more towards the later stages of the problem cycle, when submission deadlines for the individual project come up. Groups under tutors who emphasise the project more would cut down on problem tasks and divert more effort to the project submissions.

Similar to the outcome of learning under different *tutor styles*, group-mates who are used to different *tutor emphases* may have conflicts over which tasks are necessary. Student F agrees:

So far, only two of the four tutors I have had seemed to really focus on the problem and encouraged extensive discussion. What the tutor required of us pretty much determined the mode of working. As a result, some members of a group might think that it was important to discuss things thoroughly while the

others felt that it was not necessary to discuss so much and there was not much to discuss about – “Just get it done.”

These conflicts lead to disagreements over tasks requirements and standards, which in turn cause tasks re-distribution. When certain group-mates insist that a problem task is completed and refuse to improve it, there is nothing the rest of the group can do apart from taking over the task themselves.

Student Y finds it frustrating when the tutor fails to place adequate emphasis on the problem cases:

The tutor may not be strict enough sometimes. Even when some group members are absent from the PBL tutorials, the tutor would not do anything. After a while, more group member starts to skip the PBL sessions. It's demoralising to come back and find that there is not enough group members present for a meaningful discussion.

When too many members start to skip the group discussions, the group cannot perform much of the collaborative learning tasks properly. As a result, the remaining members are forced to take over the whole group's work.

5.3.6 SUMMARY OF THE CATEGORY TUTOR INFLUENCE

The concepts 1) tutor reputation, 2) interpretation of brief, 3) tutor style, 4) tutor comments, and 5) tutor emphasis constitute the category *tutor influence*, and together constitute the impact of the tutor on the group members' approaches to the *formation* of the PBL tutorial

groups. The first two concepts affect *initial formation*, while the last two affect *re-formation*. The concept *tutor style* affects both *initial formation* and *re-formation*.

Barrows and Wee (2007) assert that “the role of the tutor is central to the success of the PBL method where the focus is on learner-directed learning” (p.55). Students in PBL, especially those new to the setting, require the optimum level of “nurturing” from the tutor initially to familiarise them with the new learning approach. As a result, the students’ first encounter with a PBL tutor often constructs their conception of the “correct” approach to working on problem cases in the curriculum.

The influence of the concepts *tutor style* and *tutor emphasis* in the first experience with PBL is therefore critical to how the students formulate their *formation* strategies in the small group learning setting. To distinguish the two concepts, *tutor style* refers to the balance between *learning tasks* and *production tasks* as directed by the tutor, while *tutor emphasis* refers to whether the tutor focuses more on the design project component or problem case component in the studio course. The effects of these concepts are therefore on the *process flow* part of *formation*.

On the other hand, *tutor comments*, and *interpretation of brief*, refers to the tutors’ specific responses to the work of the groups and their views on the problem brief. The impact of these concepts is more targeted on specific topics and the associated tasks. Thus, their influence is more on the *task division* and *task distribution* parts of *formation*. One of the main parameters of tutor performance is “cognitive congruence”, which Schmidt & Moust

(2000) define as “a tutor’s ability to understand and to express him or herself at the students’ level of knowledge” (p.43). The tutors must therefore not only phrase their comments appropriately but also time their interventions to the students’ needs to minimise unnecessary *re-formation*.

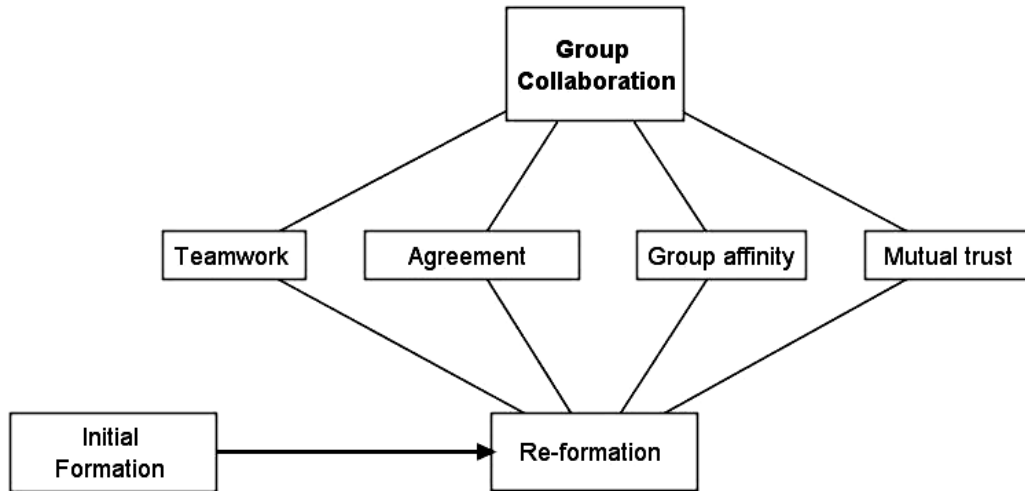
Ideally, all tutors in PBL curricula are competent in both facilitation skills and subject content. Nevertheless, tutors who are proficient in both procedural and content knowledge are “the exception rather than the rule,” according to Schmidt and Moust (2000, p.35). Schools can however try to make sure that their tutors are not of the worst kind described by Barrows (1988) – strong in subject matter but weak in tutoring skills – by providing proper training in small group facilitation to the tutors.

5.4 Category Group Collaboration

According to Lee and Tan (2004), “collaboration as a competence includes inter- and intrapersonal skills and effective communication and social skills” (p.141). The final category, *group collaboration*, comprises four concepts associated with the interaction between group members in the problem-solving process. All four concepts, *teamwork*, *agreement*, *group affinity* and *mutual trust* are associated with *re-formation* (Figure 5.5). None of the concepts of *group collaboration* relates to *initial formation* because issues relating to group interaction mostly emerge after the first group meeting.

Figure 5.5

The category of group collaboration and its concepts



5.4.1 TEAMWORK

Teamwork refers to the interaction between group members in the collaborative learning environment. The students come into the programme lacking experience in PBL and small group learning. Woods (1994) cautioned that effective *teamwork* does not just simply happen automatically, “[d]eveloping effective teams is hard work, demands skills and dedication from all team members and takes time” (p.4-3). It takes time for them to realise the benefits from working in groups over working individually. Student A describes the advantage of collaborating with others:

Before, I could just go over the material by myself a few more times if I didn’t understand but now I would discuss with my group-mates more when I encounter problems. By getting more points of view from more people we could select the best option to go ahead with. I think in order to perform well in

the problem cases, we must discuss among ourselves a lot and work together.

The result from this approach was better than dividing up the tasks for working individually on your own at home and simply grouping the various parts into the final submission.

Student A's emphasis on discussion is supported by Schmidt and Moust's (2000) view that there is a higher positive impact on prior knowledge activation in small-group analysis than in individual analysis: "Group discussion had, in particular, a considerable effect [on direct prompting of prior knowledge], suggesting that elaboration on prior knowledge and learning from each other, even before new information is acquired, are potent means to facilitate understanding of problem-relevant information" (p.31).

Through gathering opinions from group-mates and analysing the different views, the group can come up with better decisions. Student U describes good *teamwork* in his idea of the "ideal group":

I can talk about the "ideal group": We would briefly discuss how to divide up the topics and go back to search for information. After sharing the found information the next session, we could get a better idea of what this problem is about and develop more concrete divisions. This is the beginning of the learning part.

In this conception of the "ideal group", there are specific steps in the group learning process. More importantly, the assumption is that all the group members work at the same pace and to the same schedule.

Moreover, the effectiveness of *teamwork* depends on the composition of the group. Student V acknowledges another benefit of relying on group work: “I think the advantages were the team-work skills that we had picked up. The drawbacks were due to bad group-mates, which are difficult to avoid.” but points out the concern regarding working with group-mates.

Student D explains some of the concerns of working in groups:

In terms of division of work and working with others, it really depended on whom you were working with and the different ways we interact with each other. For example, there might be problems with coordination as people worked at different paces. Especially when the time schedule was not set clearly and we could not work together. I think PBL requires a lot of time to work things out. It was not like we were working together in an office where we could gather around for a meeting anytime we wanted. As we all had our own timetables, we could not always set a time for group meetings.

Student D points out two potential problems that may lead to *misalignment* among the group members, which requires review of the *formation*. First, the group members work at different paces and not all of them are able to complete their assigned tasks by the agreed time. Second, despite the advantages of working in groups, it is often difficult to set up regular working sessions outside class with all the group-mates. Student W agrees with this observation:

With a group of five to six students, normally only two to three would work together. It is difficult to arrange a timeslot that fitted all five to six group-mates. So the group work in which the whole group participated was mainly during class time.

So sometimes “group decisions” are made by a few members instead of the whole group.

The remaining group-mates may dispute these decisions when problems arise. Besides, one of the conditions for the results of group learning to be superior to other learning approaches and environments is that the students are more actively engaged in the learning process (Savin-Baden & major, 2004).

One of the ways that groups start to overcome some of the concerns is for a more dominant group-mate to start monitoring the activities of the group. Student U states:

If the group is loose or the members are not as capable, then someone would stand out and start telling members to do this or complete that on time.

This is the situation regarding the *emergent leaders* described in the typology of participants in Chapter 4. When trying to infuse some control into the group, the *emergent leaders* may accelerate changes to the *formation* of the group. Gerhardt and Gerhardt (2009) believe that, “successful teams have leaders who keep the team on target” and “these leaders are goal directed...leading their team members through difficult transitions to get it” (p. 110-111).

Teamwork is not something that could be taught, so students need to learn through experience. Student X thinks that the problems relate more to collaboration among group-mates:

It has been OK for me as I had small group learning experiences before from secondary school. I didn't really see others having major difficulties with this approach since entering the programme. The difficulties, or arguments, arose

more from collaboration problems with group-mates – who hadn't been doing enough, or who had been grabbing all the tasks.

One of the aspects that the students must learn is how to balance the distribution of tasks. Due to the coverage of the problem cases, students must rely on group-mates to share out the requisite tasks. It is critical for them to realise that they must balance the workload among group members. This is done through *re-formation* when the group continuously tries to optimise the balance through the problem process.

5.4.2 AGREEMENT

Agreement refers to the ability of the group to reach consensus among its group members on various matters regarding the problem solving process – task division, task distribution, process flow, and time-table. The group's level of *agreement* also affects the motivation of its members, which is underpinned by the whole team's "belief in the value of both teamwork itself and the task being undertaken" (Savin-Baden & Major, 2004, p.78). Student B describes the first group she has worked with, which has a high level of *agreement*:

The most successful time was in semester B last year when the whole group shared a common direction, which means that we all agreed and set a schedule, such as determining the outputs for each week. And everyone could rely on each group-mate for his/her designated part. Then, before the submission we all bring back our own work and share with each other.

Student A shares a similar experience with one of his groups:

In my first group, every group-mate were very enthusiastic when first assigned a problem case and would immediately go to visit the site and if there were

unresolved issues we would visit again for further analysis until we understood the situation... We began by following the instructions of delegating the roles of chairperson, recorder, time-keeper, etc., but in our group eventually everyone participated and shared a similar workload.

When the groups attain a high level of *agreement* among group members regarding their group strategy and the workload is more or less balanced, the need to re-distribute tasks during *re-formation* is reduced.

However, Student A has also experienced lack of *agreement* in another group later on.

Student A states:

But in later groups, different combinations of students resulted in different ways of doing things, and this required some getting used to... And in my last group, my group-mates did not put so much focus on the problem cases and would just search the internet for appropriate information to put together a report. As a result, I felt that I had learned less during the process. They were not as concentrated on the problem process.

The lack of *agreement* described by Student A is related to the *tutor influence* issues discussed above. When students who have grown used to different *tutor styles* or *tutor emphases* are grouped together, it is more difficult for them to reach *agreement*. Students will try to link current problems with previous problems by considering their similarities and differences (Hmelo and Evensen, 2000). Hence, conflicts arise when there are discrepancies among the respective previous experiences of the group members.

Besides being introduced to the PBL method under different tutors, and hence different approaches, another factor affecting the ability of groups to attain *agreement* is the lack of an obvious hierarchy in the PBL groups. Student B claims:

There is another issue: because we are all students – at the same level – within the group and, as architecture students, we all had individual ideas, so sometimes it was really hard to reach consensus.

The groups are composed of students at the same level. In particular in the first semester, the students have yet to receive any summative assessment to distinguish between the better-performing and poor-performing students. Under these circumstances, the participants find it hard to convince others to compromise to work towards a group *agreement*.

There are a number of outcomes associated with the lack of *agreement* among group members. Student B claims:

I think that if everybody focuses and puts in the effort, PBL is a good method. But it is not always the case that all group mates would put in 100% effort. As a result, it is very demanding for the more hard-working students within a group. They often have to take up the parts of the lazier students.

Student B continues:

I do not think we resolved the differences and we ended up submitting a solution that was of poor quality. The final result was rather fragmented as group-mates each insisted on their views.

Apart from impact on the group process, the lack of *agreement* affects the product as well.

When the *agreement* problem persists and the group fails to reach *agreement* even at the end

of the problem cycle, the quality of the submission suffers. One way to overcome some of the *agreement* issues is to establish ground-rules for the group right at the first meeting to facilitate team-building and the collaborative process (Gerhardt and Gerhardt, 2009).

The tight schedule may also be a factor affecting the *level of level of agreement* over various matters within the PBL groups. Groups that rely solely on the class meetings for group work are simply spending not enough time to resolve differences among group members. Student C states:

When time was not that rushed we actually spent more time discussing and expressing each one's own ideas than on finding information.

Time is an important factor as it allows the group to deliberate their individual views and work towards a consensus. As the problem duration is fixed, the only way to afford more time for group discussions is to arrange outside class meetings for the whole group.

Moreover, Savin-Baden and Major (2004) think that conflicts resulting from a lack of *agreement* are “not necessarily a bad thing” as they “can result in creative confrontation in which new solutions or approaches emerge as a result of the interaction of the conflicting parties” (p.87).

5.4.3 GROUP AFFINITY

Group affinity refers to how close the group members are to one another and how well they know their group-mates. Very few of the students come from the same secondary school. Therefore, relationships between classmates are mostly developed after coming into the programme. Hmelo and Evensen (2000) stresses the importance of establishing *group*

affinity, “Before beginning to grapple with a problem as a group, students must get to know each other, establish ground rules, and establish a comfortable climate for collaborative learning” (p.2).

The participants are split about the impact of *group affinity*. Some think that having a close relationship with group-mates has a positive effect on group learning. Student U remarks:

It particularly depends on the group-mates. There would be much less sharing if we are not familiar with one another. We would just take care of our own parts and submit the report.

Besides the level of sharing between group members, there are other group learning activities that may be hindered by lack of *group affinity*. When asked about group activities outside of class time, Student B replies:

Honestly, unless the group-mates themselves were close and knew each other quite well, it would be difficult to organise much, outside class meetings.

Student E agrees with the advantages of high *group affinity*:

I did two problem cases with the second group after switching groups. Things were not that smooth in the first problem case. But we worked better together after getting to know each other better. However, I must say this is not always the case. In that group, although not every member took up active roles they tended to accept others’ opinions more readily. So that worked to my advantage as I expressed my views a lot.

When the group members know one another better, it is easier for them to interact and engage in more group activities that contribute to the problem case.

The participants have also expressed that there may be problems too when *group affinity* is too high. Student C states:

But knowing each other too well might also become a problem as it would be difficult to tell them to do things.

Besides the issue of monitoring one another's progress, Student C also raises another potential problem:

There was one issue regarding the peer- and self- assessment after a problem case. The assessment might not be truthful if you were too friendly with your group-mates. So it was better if you were not too close to your group-mates in this regard.

Faced with a new learning method, the students are very concerned about the “fairness” of assessment. Although the peer- and self- assessment components together accounts for only 5% of the overall marks, the students would not accept a system that they perceive as unfair.

The tutors re-group the students within the same tutor group in the middle of the semester. Most of the time, the students are re-grouped randomly. But sometimes tutors may allow the students to re-group themselves, which naturally results in some groups with high *group affinity*. Student F objects to this re-grouping approach:

In terms of group dynamics, I think that it was better if we were not able to form teams on our own when we changed the groupings at the middle of the semester. If we could choose our own teams then we ended up working with more or less the same people – those we know well – all the time. I would prefer to see

other students' "styles" and I think I could learn more this way. I think we could learn something from everyone. We actually learn all the bad habits of your group mates if you work with them all the time.

Thus, there are both advantages and disadvantages of having high *group affinity*.

5.4.4 MUTUAL TRUST

Mutual trust refers to the confidence the group mates have on one another. The higher the level of *mutual trust* among the group members, the less they need to constantly monitor the progress of group-mates. This reduces the amount of tasks that needs to be redone or re-distributed during the *re-formation* stage. Woods (1994) calls trust "the glue that builds relationships" (p.5-5). More trust in group-mates also leads to more interaction among group members because they believe in their abilities and are not afraid to rely on group-mates when faced with difficulties. Student U states:

We had pretty good group dynamics and we would trust one another for help when we had difficulties. There is more interaction among group-mates. If someone really couldn't find anything on a topic, we would discuss and also ask opinions from the tutor to resolve the problem as a group.

The *mutual trust* in Student U's group facilitated the group's overall problem process by raising the level of interaction among group members.

Mutual trust among group members does not just suddenly appear. It needs to be developed through more interaction between group-mates. Student E talks about how he develops trust among his group-mates:

I would try to involve more of the group members in the discussion to build up our trust and understanding in one another. Also, if I could bring up the interest in other group members then later work would be efficient. At least it was easier to share out the work load as there would be less worries about group-mates' abilities.

One of the keys to building *mutual trust* lies in the way group-mates listen and respond during group discussions, they “need to communicate empathetically” (Woods, 1994, p.5-6). With more confidence on the abilities of fellow group members, the problem-solving process becomes more efficient as well because tasks are distributed based on better understanding of what to expect from group-mates.

Higher *mutual trust* among group members would also lead to more discussion. Student F recalls his reaction after a poor submission due to lack of discussion:

After experiencing the submission of a sub-standard report, I told myself to remember to start finding information earlier and hold meetings earlier. But I still believe that it was best not to divide up the work at the beginning. We always need to discuss more. I mean we need to encourage more interaction and trust one another more. If not, we are just dividing up the work and doing our own part separately.

As already mentioned, there would be more discussion among group members if they trust their group-mates more and think that there is something to learn from group-mates. When the level of *mutual trust* is low, the students would rather work on their own than spending

time to discuss as a group. When every group member works individually, the need for *re-formation* increases as the students would not know what to expect from group-mates.

In secondary school, students can rely on themselves because they can learn directly a pre-determined set of material from prescribed textbooks or notes. The open-ended nature of the problem cases and their broad coverage do not favour students who prefer to work individually. Student Y states:

Mainly due to the lack of a model answer, we have to depend a lot on ourselves to determine what is correct. And, since everyone is working on different topics, we can only rely on other group-mates to help when things go wrong. There's really no one else to turn to for answers because I may be the only one working on that particular topic in the whole class!

Since each group comes up with their own unique solution to the problem cases, students can only make sense of their own share of information in relation to the larger picture formed by those collected by the rest of the group. If students do not trust their group-mates and work individually to develop their own share of work in isolation, it is likely that it would become disconnected from the collective development of the group. Consequently, either the work needs to be redone by the student or taken over by the other group members.

The lack of *mutual trust* can lead to other *formation* issues. Student X shares his observation on a small group within his tutor group:

I could see that there were a lot of difficulties during the discussion in groups with a higher number of lazy people. Some were just lazy, while others might

want to try but their abilities were limited. It had become difficult to assign tasks among one another because they didn't trust their own group-mates' performance.

The result of the low level of *mutual trust* in the group is that tasks are mostly divided up and assigned without much discussion among group members. Consequently, there is a much higher need to re-think the task division and re-distribute the tasks during the latter parts of the problem cycle – more frequent and higher degree of *re-formation*.

5.4.5 SUMMARY OF THE CATEGORY GROUP COLLABORATION

The concepts 1) teamwork, 2) agreement, 3) group affinity, and 4) mutual trust constitute the category *group collaboration*, which indicates the influence of the groups' interaction and dynamics on the *formation* of the PBL tutorial groups. As the issues regarding *group collaboration* mostly emerge after the commencement of the problem case, there is no impact of note on *initial formation*. All four concepts affect the *re-formation* stages.

The success of the small group learning process depends highly on the level of *group collaboration*. Despite the many potential benefits of group learning, sub-standard interaction among group members can lead to many problems. Lee and Tan (2004) remark that, "The result of poor collaborative learning could be a 'pooling of ignorance'" (p.136). This view is affirmed by Woods (1994): "We can learn more effectively and efficiently if we work actively and cooperatively to learn knowledge. Yet, working in groups is hard work. For groups to be effective we need to be skilled in interpersonal relations and in group process." (p.4-3).

Thus, achieving an optimum level of *teamwork* is critical to the success of PBL. Moreover, *teamwork* must be distinguished from *group affinity*. As we have seen above, *teamwork* may actually be hindered when the group members are too close to one another. Their personal relationships may get in the way of their working relationships leading to incomplete tasks because the students are not willing to comment negatively on their close friends' sub-standard work.

The studies of Savin-Baden (2000) on PBL point out that “much of the real learning that occurred through problem-based learning [] arose through group interaction” (p.78). However, constructive interactions that lead to learning are only possible when the group can reach a high level of *agreement*. Besides working towards *agreement* in terms of content, the group must also strive for *agreement* in terms of process, especially when group members have worked under tutors, or with groups, with contrasting approaches to PBL.

In addition to a high level of *agreement*, high-performing groups must attain a high level of *mutual trust* among group-mates. According to Schmidt and Moust (2000), “[t]he collaborative effort, by which students help each other in clarifying the issues, is a central element of problem-based groups” (p.24). Students need to have a certain level of trust in their group-mates to be willing to accept other views for the clarification of issues emerging from the problem cases. Hence, it is important for the group members to develop a high level of *mutual trust* to allow the groups to perform effectively.

5.5 Conclusion

In the preceding chapter, an overview of the storyline of the Theory of Adaptive Formation has been provided together with a presentation of the typology of participants of PBL students in the programme being studied. This chapter further elaborates on the theory and discusses in detail its categories – 1) Group Members, 2) Problem Brief, 3) Tutor Influence, and 4) Group Collaboration – and their respective concepts. The researcher has examined each of the categories, using collected data in association with supporting literature.

Introduced recently into the programme, PBL as a new learning approach presents an array of difficulties for the students to cope with. Besides facing pedagogical practices that are entirely different from their secondary school experiences, the students must cope with a new subject discipline, different tutors as well as changing group-mates in their PBL tutorial groups. Emerging from the data, the Theory of Adaptive Formation explains how PBL groups utilise their *formation – task division, task distribution and process flow* – in relation to the conditions and in reaction to circumstances that arise over the PBL experience.

There are two stages of *formation* in the PBL group process: 1) an *initial formation* stage at the beginning of the problem process when the group establishes its *formation* and selects topics to work on and assign the work among its members based on a set of factors, and 2) a *re-formation* stage during the course of the problem process when the group adapts its *formation* in response to another set of factors. While the concepts of the categories *group members, problem brief* and *tutor influence* affect both the *initial formation* and *re-*

formation stages, all the concepts of the category *group collaboration* influence the *re-formation* stage only.

An important aspect worth examining is the degree of control over these factors, especially in view of the coordinators and tutors of the PBL programme. While the programme has no control over the category *group members*, the PBL coordinator has partial control over the category *group collaboration* through grouping strategies and teamwork training for students. For the two remaining categories, *problem brief* and *tutor influence*, the programme asserts almost full control through regular reviews and, tutor selection and training, respectively. This addresses which areas of the curriculum designers and tutors should work on to improve the PBL programme and the students' learning experience.

After presenting the categories of the Theory of Adaptive Formation in detail in this chapter, the following chapter will discuss propositions based on a typology of participants in relation to these categories. The conclusions, implications and recommendations of this research will be presented in the final chapter.

CHAPTER 6:

A TYPOLOGY OF UNIVERSITY STUDENTS' COPING STRATEGIES WITH PROBLEM-BASED LEARNING IN HONG KONG

6.0 Introduction

The preceding two chapters outlined the storyline of the theory of Adaptive Formation and elaborated on the categories of the theory respectively. The main hypothesis of the theory that has emerged from the data is the use of *formation* by students in Hong Kong who are experiencing PBL for the first time to respond to various situations they face in the small group learning environment. The categories: 1) Group Member, 2) Problem Brief, 3) Tutor Influence, and 4) Group Collaboration and their concepts have been discussed together with an examination of their impact on the two stages of *formation* – *initial formation* and *re-formation*.

While the categories constitute one of the integral aspects of the theory of Adaptive Formation, the different types of participants constitute the other (Figure 6.1). This chapter focuses on illuminating the relationship between the four categories and the typology of participants: 1) Drivers, 2) Adventurers, 3) Workers and 4) Riders (Table 6.1). A detailed description of the typology of participants has been provided in Chapter 4.

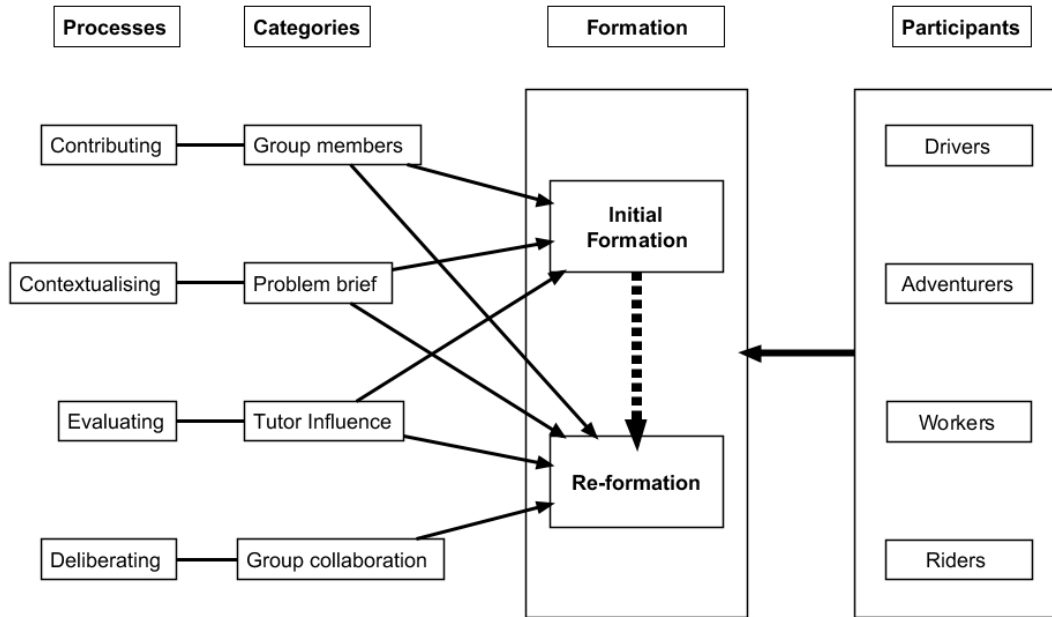
Table 6.1

The Relationship between the Typology of Participants and the Categories of the**Theory of Adaptive Formation**

	Group Member	Problem Brief	Tutor Influence	Group Collaboration
Drivers (D, E, V, X)	Monitor work of group-mates to ensure delivery of submission on time	Concerned about brief clarity. Ensure all objectives are met and follow project brief closely.	Follow tutor comments closely.	Try to control the group dynamics by leading / dominating.
Adventurers (A, B, W)	Focus more on achieving own objective. Do not really pay much attention to member reputation and performance.	Less concerned about brief clarity. Enjoy information overload because it lets them learn more new knowledge.	Prefer tutors who emphasise problems and encourage more learning tasks, which allow more freedom for knowledge discovery.	Do not try to control group. Focus more on the front end of the problem cycle when there are more learning tasks.
Workers (C, F, U)	Care about other members' expertise and role type so that work can be divided equally and effectively.	Concern about clarity of key concepts, so that work can be divided clearly, and resources made available.	Prefer tutor to give clear interpretation of brief so that there can be less discussion. Prefer clear directions from tutors in terms of tutor style.	Avoid group work and do not contribute much to discussion. Contribute to group behind-the-scene.
Riders (Y, Z)	Do not care as long as there is someone to cover up when they perform poorly or fail to deliver.	Prefer clear problem briefs, so that there can be less group discussions.	Prefer tutors who give clear guidance.	Avoid group work and do not contribute much to discussion.

Figure 6.1:

Summary of the Theory of Adaptive Formation



6.1 The Drivers

Drivers are focused on getting the job done and producing high quality deliverables at the end of the group process. They will try to control the group discussion process to make sure that the group operates in the most effective and efficient manner. They often make decisions regarding *formation* on the group's behalf as well as serve as the spokesperson for the group during tutor facilitated sessions. Although they think that the group should follow the *initial formation* as much as possible, they do not hesitate to trigger *re-formation* when things do not progress according to plan. The sub-categories of *drivers* are: 1) Leaders, 2) Editors, 3) Dominators, and 4) "Assistant Teachers". Students D, E, V and X are identified as *drivers*.

6.1.1 THE RELATIONSHIP BETWEEN DRIVERS AND THE CATEGORY GROUP MEMBERS

The main goal of the *drivers* is to deliver the best outcome possible according to what they determine to be the most effective way. More product-driven than process-driven, *drivers* consider the other *group members* as contributors to the problem process and judge their group-mates by their output. Student E comments on *group members* who are less proactive, “There were people who just do not have as much motivation as others. They were just going through the motions of finishing their tasks. I could tell that they might not be as hard-working as the others and not as involved but all you could do was to try to influence him/her and bring them up to speed.”

As a result, *drivers* constantly monitor the work completed by their group-mates. Student V explains, “When the group-mates were more capable, then I was much more assured and did not need to check so much. Besides, I was required to do a lot less work because there was more checking when the group-mates were not as capable.” The *drivers* also play a main role in the decisions on the *formation* of the group. Student X explains how he deals with poor-performing *group members*, “For the more serious cases, we might assign them the simpler tasks or the less important ones right from the beginning. More often though, we would begin with a more or less even distribution, but if after the second or third meeting, some group-mates still come back with substandard work, we would make other arrangements then. Well, it means others simply have to take over the substandard tasks.”

The focus of the *drivers* is mostly on getting the work done. When asked whether he would encourage more discussion during the PBL tutorials, Student E answered, “Yes, I would try to involve more of the group members in the discussion. If I can raise the interest in other group members then later work would be efficient. At least it was easier to share out the work load.” Apparently, the ultimate purpose is not to enrich the discussion but to facilitate getting more contributions from other *group members*.

6.1.2 THE RELATIONSHIP BETWEEN DRIVERS AND THE CATEGORY PROBLEM BRIEF

The *problem brief* is like a direction map to the *drivers*, who follow it closely to ensure that all objectives are met. Once given the *problem brief*, they will direct the group to reach an agreement on the interpretation of the brief so that every one is clear on how to proceed. Student V describes her group’s actions after receiving the brief, “I would look at the list of topics and determine which were the heavier parts and the lighter ones. Then we try to package them together so that there was more or less a balanced distribution of tasks. After that, we just open up and ask group-mates to choose which tasks they wanted for themselves.”

Drivers are highly concerned about *brief clarity* because if the *problem brief* is not clear, then the group needs to spend a considerable amount of time deliberating on the interpretation of the brief instead of searching for information that directly contributes to the problem solution. Student E complained about the lack of *brief clarity* in some cases, “[The brief should] at least provide more information for the initial parts so that there was more

direction for students to follow. Sometimes the problem cases were very broad and involved too many aspects – technical, environmental, social, etc. It would be better if they were more focused and specific.” Another key concern of *drivers* is to secure adequate information resources, such as books from the library, as soon as possible. Student E suggests putting all the essential books on reserve to ensure that every group would have a chance to access material.

6.1.3 THE RELATIONSHIP BETWEEN DRIVERS AND THE CATEGORY TUTOR INFLUENCE

Drivers believe that one of the ways to ensure getting good results in the problem cases is to follow the *tutor comments* closely. After all, it is the tutor who assesses the problem reports in the end. Student D explains, “We asked the tutor more questions and tried to get more comments. We also tried to compare our own work with other groups and exchange ideas. We were not trying to get more information or content, but rather to clarify our own approach on how to formulate the key questions.”

In addition, Student D also thinks that *tutor influence* is “quite important”. She says, “My impression was that sometimes our problem reports were a lot more detailed than those from groups that were under a different tutor, implying differences in emphasis.” Thus, the *drivers* will direct their groups as close to the tutors’ preferences as possible and would spend considerable time during facilitated tutorial sessions to clarify various issues with the tutor.

6.1.4 THE RELATIONSHIP BETWEEN DRIVERS AND THE CATEGORY GROUP COLLABORATION

The *drivers* most likely would take up a leading role in the group. The leader is not necessarily the assigned chairperson of the group, as Student D explains, “Of course we had a chairperson in the beginning but a new leader might emerge after a few rounds of discussion.” She continues after being asked what she would do to lead, “Lead the discussion. I think the discussion was the time when the leader became obvious. So the first discussion was important for learning about the group-mates’ personalities.” The *drivers* try to control *group collaboration* by taking up a leadership role or dominating the discussion. This is clear from the observation data as the two *drivers* from each of the groups took up more than half of the discussion time in their respective groups.

Taking up a leading role also means that the *drivers* spend a proportion of their time maintaining group dynamics. Student E describes the tasks he undertakes, “I had tried to prepare an agenda before every group meeting to list out in simple terms the topics for discussion so that at least we had some targets to meet and some tactics to avoid lack of input from members. I would also call up members to remind them to attend the meetings and complete their share of work.” This may cause them to spend less time on the *learning tasks*, such as searching for information.

Sometimes, the *drivers* may not act as the leader throughout the problem process, as Student V describes, “Sometimes the assigned chairperson might leave out some matters, then they needed to be brought to the other group-mates’ attention. Or when the discussion becomes

too quiet then my personality is to contribute to the conversation.” Thus, some *drivers* may take up a more proactive role in monitoring group collaboration only when they felt that their intervention is required under the current circumstances.

6.2 The Adventurers

Adventurers are more process-driven than the *drivers* and demonstrate the most interest in the discipline of architecture. Their ultimate goal is not to simply complete the deliverables on time but to take the problem cases as opportunities to cover more knowledge on architecture. They deviate from the *initial formation* often. Although their intentions are positive, they are often viewed by the other types as disruptive to the problem-solving process as their actions / proposals inevitably create additional work and delay the problem-solving process. The sub-categories of *adventurers* are: 1) Learners, 2) Explorers, and 3) Challengers. Students A, B, and W are identified as *adventurers*.

6.2.1 THE RELATIONSHIP BETWEEN ADVENTURERS AND THE CATEGORY GROUP MEMBERS

Unlike the *drivers*, *adventurers* are more focused on achieving their own aims and do not try to control the other *group members*. Student A remarks, “I really liked my very first group because we worked well together and no particular group-mate really tried to control the group activities.” Instead, *adventurers* may try to influence their group-mates into joining them to learn more from the problem cases. Again, Student A describes how he tried to influence his group-mates, “I would try to gauge their reaction by expressing my own

attitude towards the problem cases first. Maybe they were not as proactive but I let them take their time. I tried to influence them through setting an example and letting them know what I expected to get out of the PBL process and hope that they accept.”

Adventurers also take a very different approach from the *drivers* when faced with group members who failed to complete their tasks properly. Student B explains her strategy for dealing with poor-performing group-mates, “I would let them try their best as much as possible first, because if the more capable students or the leaders always completed all the work then the others could not learn anything.” So, the *adventurer’s* concern is that if the group takes over the incomplete tasks too early, the group-mate(s) in question would not be learning from the problem cases. In any case, not limited to their own assigned topics, *adventurers* may already have some information on hand that can fill up the knowledge “gaps” left open by other group members. According to Student W, he often ends up finding information on topics assigned to other group-mates instead and he would share this with the group as well as the group-mate the topic is originally assigned to.

6.2.2 THE RELATIONSHIP BETWEEN ADVENTURERS AND THE CATEGORY PROBLEM BRIEF

While the *drivers* prefer the highest level of clarity in the *problem brief*, the *adventurers* do not object to a lower level of *brief clarity*. Some *adventurers*, especially the *learner* type, actually enjoy a vague problem brief because it gives them more freedom to explore new knowledge. When asked about the difficulty he had faced with PBL, Student W answers, “Not for me. I think that it was actually better for my learning. Made me more proactive to

search for material and learn things. It was not that it is not good to be taught by the tutors, but when I search for materials myself, I could find something that was not included in the brief and could raise my interest.”

Adventurers are less concerned with the actual *problem brief* itself as they are more interested in the learning process that utilises the problem cases as a vehicle. Student A describes his perception of problem cases thus, “I actually quite like the problem process myself. At the beginning when I was not familiar with problem cases I thought that I could learn more through the design project, where you could try to apply what you had learned. But later I realised that the analysis after researching for information is really critical in the PBL process. One can understand the learning objectives of the problem cases through these analyses and consequently can learn a lot from them.”

Adventurers also do not object to *information overload*, as Student W remarks, “If you had interest to search for information then there should be some eagerness to carry on. This has happened to me and I have seen group-mates do this too. After all, learning more would be beneficial to the project as well.” A more open-ended problem case affords the *adventurers* more scope for discovery and acquiring new knowledge.

6.2.3 THE RELATIONSHIP BETWEEN ADVENTURERS AND THE CATEGORY TUTOR INFLUENCE

Always with a penchant for discovery of new knowledge, *adventurers* prefer tutors with a *tutor emphasis* on problem cases and a *tutor style* that encourages more learning tasks over

the problem cycle. Student B expresses her views on *tutor influence*, “Often, the tutors’ behaviour imposed significant influence on the outcome. Some would let you explore on your own first while others might stop you immediately from straying too far off topic...I prefer the freedom with the first kind as you get to think more on your own.”

Besides tutors who emphasise the design project more than the problem case, *adventurers* would like to avoid tutors with a *tutor style* that values the *production tasks* more. Student W remarks, “I don’t think the tutor style had a big influence on the division of work. I think the influence was more on the production, e.g. the presentation flow. So we might decide to work less on a part because we need to refine the flow as some tutors emphasised the flow more.” With a tutor that puts more emphasis on production, *adventurers* would feel that they are not spending enough time on *learning tasks*.

6.2.4 THE RELATIONSHIP BETWEEN ADVENTURERS AND THE CATEGORY GROUP COLLABORATION

The *adventurers* concentrate more on the learning tasks and thus put more emphasis on the front end of the problem cycle. Student A echoes this view, “I would discuss with my group-mates more when I encounter problems. By getting more points of view from more people we could select the best option to go ahead with. I think in order to perform well in the problem cases we must discuss among ourselves a lot and work together. The result from this approach was better than dividing up the tasks for working individually on your own at home and simply grouping the various parts into the final submission.” This preference is further reinforced by Student A’s description of his best *group collaboration*

experience, “We arrange extra meetings. We would also go to the library and check out a lot of books together and then collectively decide which books were useful and which ones to discard. At night, we often kept in touch through MSN and checked on each other’s progress.” However, this may lead to conflicts between *adventurers* and other group members, who may be more product-oriented and prefer less group *learning tasks*.

One of the sub-types of *adventurers* is the *challengers*. Moreover, they are not the students who challenge for challenge sake, but genuinely attempt to discover more about their group-mates’ differing views. “I challenged quite a bit. Actually, I like to challenge,” replies Student B when asked about challenging and he continues to explain, “I think through constantly challenging each other we could improve not only the solution to the problem, we could also improve our own knowledge and skills.” Hence, Student B’s acts of challenging are means of involving others in the group in the adventurer’s “journey of discovery.”

Process-driven, adventurers do intend to control the group, as Student B states, “As I do not know everything myself I do not dare to try to manage the whole group.” Nevertheless, although the adventurers do have the same intention of leading the group as the drivers, they are in fact influencing the actions and direction of the group through challenging.

6.3 The Workers

Often hidden from the tutors are the contributions of the *workers*. They make behind-the-scenes contributions that are crucial to the operation of the group as well as to the success of

the problem solving process. With the *drivers* and the *adventurers* dominating the PBL tutorial sessions, the *workers* are happy to take a back seat and refrain from joining the deliberations, especially when debates break out between the *drivers* and the *adventurers*. Some of them think that they do not even need to be present during the group discussions and just need to be informed of their tasks and group direction afterwards. The sub-categories of *workers* are: 1) Technicians, 2) Researchers, 3) Secretaries, and 4) “Worker ants”. Students C, F and U are identified as *workers*.

6.3.1 THE RELATIONSHIP BETWEEN WORKERS AND THE CATEGORY GROUP MEMBERS

Workers more readily accept the *role types* of group-mates and would prefer distribution of tasks accordingly. Student F remarks, “Some of my classmates were already “stereotyped” to play a particular role within the group, which was well recognised by others. For example, some were particularly suited to playing the role of the “secretary” in the group. They help to organise the data, type up the points in MSWord, etc. There were students who were especially suitable for performing certain tasks.” As *workers* emphasise individual work rather than working together as groups, they prefer clear-cut *task divisions* so that it is easier for them to work individually.

Since the *workers* are working hard away from the group to prepare materials for the group, they become really frustrated when other group-mates fail to perform at the same level. Student E complains, “My results were affected by anyone not hard-working in the group and I became really frustrated. Most of them might start off working hard like everyone else

but start to slacken off towards the end. And I had to take care of their parts too.” The same sentiment is shared by other *workers*, such as Student C, “As we did not expect that they would fail to do anything, then there was nothing we could do except to complete their part for them,” and it is the workers who often pick up the uncompleted tasks from the poor-performing group-mates.

6.3.2 THE RELATIONSHIP BETWEEN WORKERS AND THE CATEGORY PROBLEM BRIEF

Workers’ main concerns about the *problem brief* are *brief clarity* and *resources availability*. Student C describes his actions after receiving the *problem brief* in the first problem class, “I do not talk much during initial meetings because I may not yet be familiar with the details of the brief and do not have enough information. Only in the second meeting, after collecting some information and understanding the brief better, would I start to express my own opinions...In the beginning, we mostly followed the organisation suggested by the brief’s “key concepts” and started with those.” To *workers*, it is important that the key concepts listed in the *problem brief* are clear because most groups rely on the key concepts to structure their approach to the problem.

Once the group’s approach to the problem is set, *workers* can begin one of their more important tasks to the problem process – searching for information. Student U replies when asked about the difficulties some students face in the self-directed learning part of PBL, “Not really. I think it had not been that difficult for me. Once I understand the topic, I could quickly find some material from the internet using some key words in Yahoo. When these

were insufficient, then I would look for more useful information in the library.” For *workers*, their tasks are completed once they finish the search for information; group discussions to deliberate the information are not seen as essential.

6.3.3 THE RELATIONSHIP BETWEEN WORKERS AND THE CATEGORY TUTOR INFLUENCE

Workers are strongly affected by *tutor influence* and prefer tutors who give clear and direct *interpretations of the brief*. This way, the need for group discussions is minimised and they can spend more of their time working individually. Student U states, “We mostly follow what the tutor has explicitly stated is important or we should focus on. So we may re-arrange the topics/tasks we have distributed previously and change accordingly.” Instead of complying with the agreements from group discussions, the *workers* follow more closely the *tutor comments* in carrying out their tasks.

To the *workers*, the tutors’ decisions become more influential than the outcomes of the groups’ own deliberations. Student F explains, “We are mostly getting things done very “last minute” and would spend most of the time before the tutor comes around on preparing our own materials.” The *workers* are relying on the tutor’s guidance for evaluation of the material they have found, so they spend the unfacilitated tutorial sessions processing the information and do not join in the group discussions.

6.3.4 THE RELATIONSHIP BETWEEN WORKERS AND THE CATEGORY GROUP COLLABORATION

One of the workers, Student U describes the ideal group” as follows: “We would briefly discuss how to divide up the topics and go back to search for information. After sharing the found information the next session, we could get a better idea of what this problem is about and develop more concrete divisions. This is the beginning of the learning part...Then the last two to three days would be spent entirely on production, doing our own parts, without any sharing.” *Workers* try to avoid group work because for them effective *group collaboration* means that all *group members* have completed their individual parts as agreed. The parts can then be combined to form the submission. Student U estimates that he spends almost 90% of his time in PBL doing individual work with not much face-to-face sit-down meetings.

The focus on individual work for *workers* becomes stronger towards the latter parts of the problem cycle. Student C states, “In the beginning of course we would try to come up with the best possible solution and would be more eager to express one’s own ideas. And we could help each other in the process. But as the submission deadline approaches you need to be more realistic about completing on time and cannot afford wasting time in group deliberations.” The *production tasks* towards the end of the problem cycle are predominantly individual tasks.

As mentioned earlier, the hard-working workers are reluctant to take over the load of under-performing group-mates because they feel strongly that all group-mates must undertake a

similar work-load. Student U explains how he deals with lazier group-mates, “I am more practical. So when we divide up the tasks, the “grouping” task would go to the person with the lightest designated load. And in the previous case, where one of the members was really late, we would pass the grouped version to them to insert the final part.” Once the *workers* have completed their own share of designated tasks, they think that it is the remaining group-mates’ responsibility to complete the whole submission.

6.4 The Riders

Riders are the lazy group-mates, or the free-riders. They try to get by with minimal input and maximum benefit from their group-mates efforts. They are the ones who are likely to cause *re-formation* due to their below par performance and sub-standard work that needs to be re-done or taken over by another group-mate. The sub-categories of *riders* are: 1) Audience, 2) Slackers and 3) “Echoers”. However, since the participants would not describe themselves as *riders* due to the obvious negative implications, the researcher has relied on the responses of the other participant types to construct the following propositions.

Furthermore, identification of *riders* based on interview data has become difficult. Students Y and Z are thus identified as *riders* through observation data collected instead of interview data. Both students had failed to complete their assigned tasks and provide their group with any information at the video-taped PBL tutorial session. Student Z had not joined the discussion over the entire observed session.

6.4.1 THE RELATIONSHIP BETWEEN RIDERS AND THE CATEGORY GROUP MEMBERS

When assigned to a new group, *riders* are most concerned as to whether there are hard-working group-mates to cover for them. This attitude is apparent in Student Z's description of his group, "There are more students with higher GPAs in my group [this semester] and they contribute more. They have better abilities and can naturally do more, for example, a bit more on information search or a better PowerPoint." *Riders* thus believe that the better students should do more for the group and take over when any tasks are substandard or left unfinished.

The above approach of the *riders* to PBL causes frustration to their group-mates, especially the *drivers*. *Driver*-type Student D comments on her experience with *riders*, "No, we would not immediately take over because we had a lot to do ourselves. The best was to discuss with them and see if help from another group-mate was required. But when time is tight, we inevitably had to do it ourselves." A similar observation is made by another *driver*-type Student E, "My results were affected by anyone not hard-working in the group and I became really frustrated. Most of them might start off working hard like everyone else but started to slacken off towards the end. And I had to take care of their parts too." As the *riders* know the *drivers* are concerned that any "weak-link" in the problem solution would drag down the groups' results, the former regularly depend on the latter to improve or complete any leftover tasks towards the end of the problem cycle.

6.4.2 THE RELATIONSHIP BETWEEN RIDERS AND THE CATEGORY PROBLEM BRIEF

The *riders* do not actively take part in the PBL group process and thus do not benefit from group discussions in gaining a better understanding of the problem cases. Student Y remarks on the *problem briefs*, “It is difficult to determine the direction of what we need to do based on the few sentences on the problem brief...There are not enough guidelines. Some of the problem cases are too broad and vague. More guidance is needed to help us kick off the process.” They must rely on *brief clarity* for guidance.

Besides seeking more guidance, another reason for *riders* to demand clearly-structured problem cases is that a lack of *brief clarity* often leads to both re-division and re-distribution of tasks, that is, *re-formation*. Student Y continues, “Sometimes after dividing up the work, we may end up having to re-divide the work because there are problems with how we understand the brief because the problem statement is very imprecise and it may not always be that clear in terms of where to start. A lot of time is thus wasted in more discussions.” Decisions on *re-formation* are primarily made over group discussions, which *riders* do not wish to participate in.

6.4.3 THE RELATIONSHIP BETWEEN RIDERS AND THE CATEGORY TUTOR INFLUENCE

The *riders*’ aversion to joining in the group discussion also has an impact on their relationship to the category *tutor influence*. Student Z comments on *tutor influence*, “Quite substantial! The tutor can tell you whether the direction is correct or not, which controls the

presentation framework.” There are similar comments from Student Y, “The tutors’ preferences would affect how we work. For example, there are some who like more information and we would include more text into our report. Others may be the opposite and prefer diagrams that are supplemented by verbal explanations. This would affect how we compose the PowerPoints.” Thus, *riders* turn to the tutor for guidance more than the collective decisions of their own group-mates. In connection, *riders* prefer *tutor styles* that focused less on facilitating discussion and more on giving direct comments on how to proceed. Student Y remarks, “I think it is important that the tutor spend more time to check on our progress and comment on the new materials that we bring back.”

6.4.4 THE RELATIONSHIP BETWEEN RIDERS AND THE CATEGORY GROUP COLLABORATION

Like the *workers*, *riders* avoid group collaboration. Student Y thinks that participation in the PBL group process is not essential, “Sometimes there maybe a group-mate who is really good with PowerPoints then he or she would take up less of the research work and work more towards the latter stages to refine the presentation. It is ok not to be involved in the group discussion.” But unlike the *workers*, *riders* do not give much “behind-the-scene” contribution back to the group. Driver-type Student E talks about the difficulties working with *riders*, “Actually, it was quite difficult to control. They might submit something but the quality was just not up to standard. Then we would share the work among the remaining group-mates and redo that particular part on our own.” *Riders* therefore clearly have a negative impact on *group collaboration*.

6.5 Conclusion

The examination of the behaviour of students in an associate degree programme in architectural studies has generated a typology of Hong Kong students who are experiencing PBL for the first time. The typology delineates four types of participants that have emerged from the data collected and analysed. To further enrich the Theory of Adaptive Formation, a detailed account of the relationship between each of the four types and the four categories has been elaborated in this chapter. A summary of the research and conclusions to the research questions will be presented in the final chapter, together with the major implications and recommendations.

CHAPTER 7:

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

7.0 Introduction

The objective of this study is to examine the behaviour of university students in Hong Kong who are experiencing formal small group collaborative learning for the first time. The setting for the research is a sub-degree programme in architectural studies, which combines the traditional project-based learning in the design studio with problem-based learning (PBL). The research focuses on the PBL component of this programme, in which five to six students work collaboratively in a period of between four to six weeks to solve architecturally-themed problem cases that are designed to be closely related to the topic of the design studio project.

This research adopts the interpretivist paradigm and employs a grounded theory approach to research methodology for the study of student behaviour pertaining to small group collaborative learning under a PBL context. Combining field data with documentary data, the study relies on the triangulation of multiple sources of data to enhance rigour. With the methods outlined by Strauss and Corbin (1998) as the foundation, key concepts on how students coped with the new learning experience in the PBL curriculum have been generated

from the data and formed into categories during the open coding stage, while relationships between these categories have been elaborated during the subsequent axial coding stage.

Throughout the data analysis process, the use of the graphic thinking skill of diagramming has become a major tool to supplement the grounded theory coding process. In the final stage of the coding process, selective coding, the core category of Formation has been developed to focus the analysis. The result is the identification of key factors, and their concepts, that influence the core category Formation as well as a typology of participants that form the foundation of the emergent Theory of Adaptive Formation for comprehending the student behaviour in a small group collaborative learning environment in a university in Hong Kong.

This final chapter is composed of three sections. The first section presents a conclusion of the research results of the study that summarises the theory that has emerged from this research and a response to the research questions. The second section examines a set of theoretical and practical implications of the research findings. The third section suggests a number of recommendations for further study.

7.1 Conclusion of the Research Results

This section provides a summary of the outcomes of the research and is divided into three sub-sections: 1) Summary of the Theory of Adaptive Formation, 2) Typology of Participants, and 3) Response to the Research Questions.

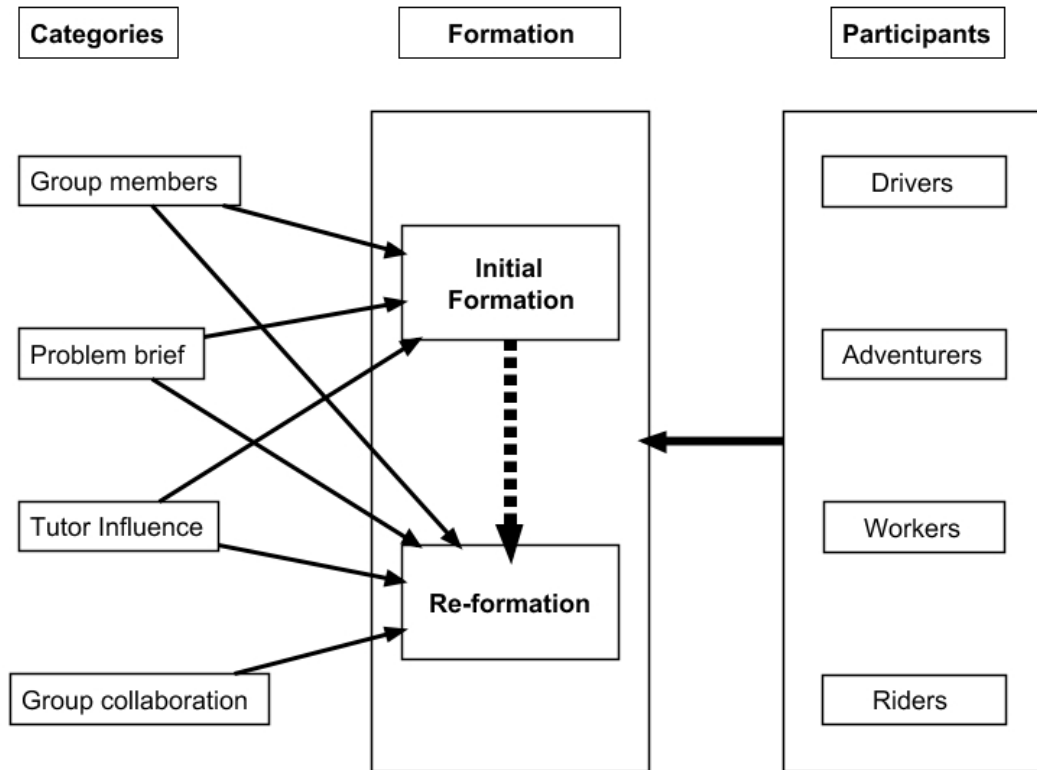
7.1.1 SUMMARY OF THE THEORY OF ADAPTIVE FORMATION

The Theory of Adaptive Formation that has emerged from this study explains the interactive processes that determine student behaviour and group dynamics in the PBL small group collaborative learning setting. At the centre of the theory are three major components: the phenomenon of *formation*, the categories of key factors, and the typology of participants (Figure 7.1). The phenomenon of *formation* describes the means through which student groups manage their small group learning process, and consists of two stages: *initial formation* and *re-formation*. An analogy can be drawn to football parlance, where “formation” refers to how a team organise their positions and assign these positions to the team’s players.

In a PBL setting, students no longer acquire knowledge as individuals only, but depend on interaction with their group-mates to enrich their learning. It is imperative for the students to understand that they must contribute to the group activities while at the same time adequately complete their assigned work to maximise their group’s performance and thereby maximise learning. The PBL groups must devise ways to put their resources to their best use and work together efficiently and effectively by dividing up and distributing the requisite tasks among the group’s members in the most appropriate manner, as well as to structure a strategy for organising the material. These are the key components of *formation – task division, task distribution, and process flow*.

Figure 7.1

Summary of the Theory of Adaptive Formation



Just as a football team may need to change its *formation* because it has become ineffective or it needs to counter the opposing team's new tactics, the PBL teams adjust their *formation* constantly to respond to the changing conditions over the problem cycle. When the collaborative learning groups first receive the problem brief, the members of the group will discuss various aspects of the brief to arrive at a common understanding of the problem case. From this understanding, the problem case is divided into key tasks, which are then distributed among the group members. According to the data, there are two major types of tasks: *learning tasks* – primarily the individual information search, self-directed learning,

and group discussions – and *production tasks* – such as, compiling the PowerPoint, producing the report, graphics, and so on. This is the *initial formation* stage and the categories of factors affecting this stage are: *group members*, *problem brief* and *tutor influence*.

Moreover, various situations after the first group meeting necessitate changes to the *initial formation*, for example, the tutor may introduce a new topic for consideration, there may be inadequate information for some of the original topics, a group member fails to complete his/her tasks, and so on. All these will cause the group to change its *formation* in reaction to the current situation, leading to *re-formation*. The factors affecting the *re-formation* stage are the three categories affecting the *initial formation* stage – *group members*, *problem brief* and *tutor influence* – plus *group collaboration*. These four categories together build up the main categories of the emergent theory and have been described in detail in Chapter 5.

The emergent Theory of Adaptive Formation describes how the PBL groups constantly adapt the *formation* of their groups to cope with the consistently changing conditions. Since problem cycles run between four to six weeks and the PBL tutorials meet twice a week, the collaborative learning groups engage in collective activities at least six times over the course of a problem case. Each group session inevitably introduces new situations involving one or more of the categories that the groups must respond to in order to maintain progress and direction towards successful completion. The groups respond by continuously adapting their task division, task distribution and process flow in reaction to the new situations and in order to solve any difficulties that arise.

7.1.2 TYPOLOGY OF PARTICIPANTS

Examining the data of the participants with respect to the main categories and their concepts has led to the discovery of distinct types of students in a PBL setting. These types contributed to the formulation of a Typology of Participants explicating the behaviour of Hong Kong university students who are experiencing PBL for the first time. There are four main types identified in the typology: 1) Drivers, 2) Adventurers, 3) Workers, and 4) Riders. The first two categories are *active* types, who participate in the group discussions proactively, while the latter two are *passive* types, who avoid taking part in the group deliberations. The four types of participants in the typology act and react to being assigned a PBL problem case in diverse ways and are each influenced by the categories of factors of *formation* in a different manner. The following describes the behaviour of each of the participant types when coping with the PBL process.

7.1.2.1 Drivers

Participants of the *driver* type are mostly product-driven and focus on completing a high quality submission within the time given. To achieve this objective, they try to control the group interaction and dominate the decision-making process among group members. Most *drivers* are also the emergent leaders who take over the leadership role from the assigned chairpersons of the PBL groups. Besides acting as the groups' leaders, *drivers* also serve as the liaison between their groups and the tutors and dominate the exchanges with tutor during facilitated sessions. Despite believing that closely adhering to the *initial formation* would be the most efficient, they readily accept the need for *re-formation* when new situations arise. The sub-categories of *drivers* are *leaders*, *editors*, *dominators* and “*assistant teachers*.”

When first given a problem brief at the beginning of the first class meeting, the group will immediately spend a little time studying the brief before commencing their group discussion. The assigned chairperson may start off leading the discussion, but very soon the *drivers* of the group will take over and dictate the discussion. If there are no particularly strong views from the other group-mates, the *drivers* will impose their understanding of the problem case on the group by directing the discussion and use this as the basis for dividing up the tasks. *Drivers* thus prefer problem briefs that are clearly presented and straight-forward so that less time needs to be spent formulating the problem-solving approach with their groups. As *drivers* focus on completing the problem cases in the most efficient manner, *brief clarity* and *tutor comments* are key factors that influence their behaviour during the *initial formation* stage.

After the first meeting, the *drivers* monitor the progress of their group-mates closely to ensure timely completion of all distributed tasks. *Drivers* like to keep subsequent group discussions short to focus less on deliberation and more on getting actual work done. They will continue to try to control the group dynamics by leading and dominating the group discussions, making sure that all listed objectives are met and the project brief is followed closely to allow as little deviation from the *initial formation* as possible. Moreover, when new situations calls for *re-formation*, for example, due to new *tutor comments* or incomplete tasks by group-mates, the *drivers* don't hesitate in leading the group to re-divide and re-distribute the required tasks to complete the problem case.

7.1.2.2 *Adventurers*

Participants of the *adventurer* type demonstrate a real passion in learning more about architecture and tend to be more process-driven in the PBL setting. While similarly active in the group discussions, the *adventurers* differ from the *drivers* in that they are less concerned with completing the deliverables on time. Instead, the *adventurers*' main interest is to acquire new architectural knowledge through the PBL process. As a result, they deviate from the *initial formation* often and the other participants may think that the *adventurers* are hindering the group's progress. It is therefore a common sight in PBL tutorials to see the *adventurers* and *drivers* competing for control over the group discussion. The sub-categories of *adventurers* are *learners*, *explorers* and *challengers*.

When first assigned a problem case, the *adventurers* are much less concerned about *brief clarity* than the other members of the group. In fact, they do not mind getting a vague brief as it can provide opportunities for more discovery in the problem-solving process.

Adventurers are more self-centred during the *initial formation* stage and are therefore less affected by *member reputation* because they are more focused on achieving individual objectives than producing a good group submission. They do not really try to control the group discussion in the first meeting except to influence the group to cover as wide a spectrum of topics as possible for the information search. *Adventurers* will actively pursue the topics they are interested in when the tasks are distributed.

While the other participant types generally dislike a problem brief that leads to *information overload*, which inevitably causes delays to the problem process, the *adventurers* enjoy such

circumstances because it gives them more material to learn. Whenever a group member comes back with excessive information on a particular topic, the *adventurers* will take up a considerable amount of time in the group discussion to question and challenge these materials. For obvious reasons, *adventurers* prefer *tutor styles* that emphasise problems and encourage more learning tasks, which in turn allow more freedom for knowledge discovery. Their influence on the group fades towards the completion of the problem cycle because they focus more on the front end of the problem cycle when there are more *learning tasks*.

7.1.2.3 *Workers*

Participants of the *worker* type are the behind-the-scene contributors, who are crucial to the operation of the group as well as the success of the problem solving process. It is often difficult for the tutors to gauge the performance of the *workers* because the *workers* do not actively participate in the PBL tutorials, especially when the tutors are present to facilitate the discussions. They are content supporting the *drivers* and *adventurers* with information during the PBL tutorial sessions. *Workers* emphasise the tasks outside of the PBL tutorials and hence do not always feel that their presence during the group discussions is necessary. The sub-categories of *workers* are *technicians*, *researchers*, *secretaries* and “*worker ants*”.

When first assigned a new problem brief, the *workers* look for clarity – *brief clarity* and clarity in the tutors’ *interpretation of the brief* – so that there can be less discussion among group members to clarify matters over the first tutorial meeting. A clearly written and presented problem brief allows the tasks to be divided quickly and clearly. As in most meetings, the *workers* seldom engage in the discussion during the first meeting with the

group to discuss the problem brief. However, they may listen in with more interest at this time because they prefer clearly defined *task division* and *task distribution* to minimise the need for *re-formation*. For the same reasons, the *workers* prefer clear directions from the tutor in terms of *tutor style* so that they would not need to go back to the group to clarify their tasks that result from the *initial formation*.

Once the *initial formation* is set, the *workers* minimise their participation in the group learning activities and concentrate on performing their individual tasks. Sometimes, the *workers* may skip the PBL tutorials because they think that looking for information in the library is more important. Even when they are present in the tutorials, the *workers* avoid participating in the group discussions. When the group decides on the direction for *re-formation*, the *workers* simply accept whatever topic is assigned to them because they are skilful in information searching and are not concerned about which topics interest them. Depending on their sub-type, the *workers*' contribution may vary over the course of the problem cycle as the proportion of tasks – *learning tasks* or *production tasks* – changes over the cycle.

7.1.2.4 *Riders*

Participants of the *rider* type are the low performers in the class. They are the lazier students who are not enthusiastic about the small group collaborative learning methods. The *riders*, or the free-riders, benefit from their group-mates' hard work but put in minimal efforts themselves. Consistently turning in sub-standard or incomplete work, they are most likely to

cause *re-formation* since their work often needs to be re-done or taken over by another group-mate. The sub-categories of *riders* are *audience*, *slackers* and “*echoers*”.

When being given a new problem case, *riders* look for clearly defined problem briefs so that the first discussion would be short. As a passive participant type, the *riders*’ attitude to group activities is similar to that of the *workers* at both the *initial formation* and *re-formation* stages – they avoid any engagement in group deliberations on the problem and the information collected. But while the *workers* put in considerable efforts during the self-directed learning period between tutorials, the *riders* minimise such individual work. For example, instead of searching for materials from books in the library, they would simply rely on the internet to search for information as it is readily available. Since the *riders* are not motivated to participate in the PBL tutorials, they are often absent as they do not care about the group meetings as long as someone is there to take over when they perform poorly or fail to deliver.

7.1.3 ADDRESSING THE RESEARCH QUESTIONS

One of the most important factors to the success of PBL programmes is how to optimise the group dynamics of students with different backgrounds and learning attitudes (Barrows, 1988; Woods, 1994; Savin-Baden, 2000). After reviewing the relevant literature from three key areas, namely problem-based learning, dynamics and roles in PBL teams and group dynamics in non-educational collaborative settings, the main research question posed was as follows: *How does a group of architectural studies students in a Hong Kong University cope with the group dynamics, both inside and outside the classroom, when experiencing a PBL*

situation in their programme? To help investigate this subject, four specific research questions were generated to enrich the main research questions. This section will examine these specific research questions one by one.

7.1.3.1 *How do students manage the process of learning and the team roles in a PBL tutorial small group setting?*

PBL involves a substantial amount of self-directed individual and small group learning (Woods, 1994). In addition to their own individual learning, students in a PBL setting must also contribute to the management of their groups' collective process of learning to achieve success. The data reveals that the PBL groups manage their learning through the process of *formation*, which has three components: *task division* – determine the requisite topics to target for information search and associated tasks, *task distribution* – allocate the topics and tasks to individual group members, and *process flow* – determine the sequence of the tasks and the structure for organising the information / material. The groups first set up an *initial formation* upon receiving the problem brief and through successive *re-formation* adapt to the changing situations to manage their process of learning.

Nearly all *formation* decisions are made during group discussions in the PBL tutorials when the majority of the “situations” emerge – new tutor comments, incomplete tasks from poor-performing group-mates, too much / little information found on a particular topic, and so on. Since the active types – *drivers* and *adventurers* – dominate the group discussions over the passive types – *workers* and *riders*, it is the active team role incumbents who control the management of the whole group's learning process. Moreover, the *drivers* and *adventurers*

often have conflicting objectives as the former focuses on the product while the latter attends to the process. The actual *formation* taken depends on which participant type asserts stronger dominance in the group during group discussions.

A further key aspect of managing their own learning is how the PBL students balance the individual and group work. From the discussion on the typology of participants, it is clear that each participant places different emphasis on the group and individual activities (see Table 7.1). Hence, considerations of how PBL students manage their learning should include both a group perspective as well as an individual perspective.

Table 7.1

Comparison of Emphasis on Group and Individual Work by Participant Type

Participant Type	Emphasis	
	Group Work	Individual Work
Drivers	Strong	Moderate
Adventurers	Strong	Strong
Workers	Weak	Strong
Riders	Weak	Weak

7.1.3.2 *Do recognisable team roles develop in the PBL tutorial small groups, with or without formal assignment? Are these team roles consistently assumed by students, or do students assume different team roles at different times?*

The discovery of the four-fold typology of participants – *drivers, adventurers, workers* and *riders* – that is grounded in the data clearly demonstrates that recognisable team roles develop in the PBL tutorial small groups. Each participant type exhibits its own distinct characteristics and relates to the categories of the key factors influencing *formation* differently. These team roles emerge on top of the “official roles” assigned to group members by the tutor or elected by fellow group members at the beginning of the first problem meeting – chairperson, “scribe”, secretary, time-keeper, etc. – and determine how each of them behaves in the group. For example, although the tutor may turn to the assigned chairperson for an overview of the group’s progress to kick off a facilitated tutorial session, the *drivers* would assume the leadership role and “chair” the session instead. Furthermore, the data show that if the assigned chairperson belongs to one of the passive types, he/she would naturally defer the leadership to the active types without much objection.

The study has not generated conclusive direct evidence to answer the question whether the identified team roles are consistently assumed by students, or whether students assume different team roles at different times. To answer this part of the research question, a longitudinal study of students and their behaviour in the learning groups over the whole semester is needed to investigate whether the same team roles are assumed over the whole problem process as well as when grouped with different students. However, there are two indirect observations that support the view that students consistently assume the same team

roles. First, a number of the participants have reported that there are students who constantly take up the same roles, such as secretary, leader, challenger, and so on. Second, the participants have discussed the concepts of *member reputation* and *role types* under the category of *group members*, which describe repeating roles and behaviour among some of the PBL students.

7.1.3.3 *What group activities do the students conduct outside the PBL tutorials to manage the PBL learning and group dynamics?*

Barrows and Wee (2007) encourage group-based self-directed learning outside of class because “much of the important interactions among the group members and much of their learning occur in these spontaneous, collaborative sessions during self-directed learning” (p.33). However, the data show that there has been little group interaction outside of class time among the participants in this activity. The only time that the students from a whole group have collectively engaged in a learning activity associated with PBL has been a site visit for their very first problem case in the programme. Since then, the only outside class interaction between group-mates has been sporadic e-mails and MSN “chats” when one of the group members needed information from another.

Students have spent the majority of the time between the PBL tutorials on individual self-directed learning, which consists mainly of information searching, and working on non-PBL coursework, such as their individual design projects. Besides, the groups have tried to minimise the need for “extra” group sessions and limit their group activities to the collaborations during class PBL tutorials. With only the *drivers* and *adventurers* placing

strong emphasis on the group discussions during class time, it is not surprising that the groups have seldom conducted any group activities outside of class. The participant groups have depended almost entirely on the interaction during the PBL tutorials to maintain group dynamics and achieve the effect of small group collaborative learning.

7.1.3.4 *How, if at all, do students change their behaviour to improve their performance – their own and the group's – in the PBL small group learning setting? What actions, if any, do they take to cope with problems they encounter in the PBL process?*

Individually, the main behavioural changes among the students are related to their attitude towards participation in the group discussions. On the one hand, some students have indicated that they have been engaging in the group discussion more and undertake more *learning tasks* because of their positive experience with tutors who have placed strong emphasis on the deliberation of problem cases. This change not only improves the overall coherence of the final group solution to the problem, it also enhances the knowledge acquisition of the students who have raised their level of participation.

On the other hand, some students have changed their behaviour in the opposite direction and devote more time to *production tasks* in the expense of *learning tasks*. Paradoxically, *tutor influence* has also been cited as the main reason for this change. According to the participants, some tutors have given them substantial comments on their presentation and graphics during the interim presentation. As a result, these groups have opted to focus more on improving the quality of their problem reports and PowerPoint presentations than the

actual content. Hence, *tutor influence* has a strong impact on how students change their behaviour as the tutors are responsible for the final assessment and thereby dictate the students' perception of what is important in PBL.

The main actions that the student groups take to cope with problems they encounter in the PBL process are conducted through successive *formations*, which begin with the *initial formation* at the first PBL meeting to a series of *re-formations* over the problem cycle. The actions taken during *initial formation* are mostly *precautionary measures* to prevent problems from developing, such as distributing a lighter load, or assigning an extra member to help, group-mates with a negative reputation. Most of the groups have also allowed group members to choose the topics they are most interested in for conducting an information search so that most of them can get their preferred topics. In addition, the *driver* types will closely monitor the progress of group-mates, especially the *riders*, to ensure that every group member completes their tasks in a timely manner and delivers up to standard work.

At the *re-formation* stages, the actions taken are of a more reactionary nature – reacting to difficulties arising from self-directed learning (*information overload / resources availability*), to changes in direction (*brief clarity / tutor comments*), to sub-standard work (*other commitments / member performance*), and so on. If these problems have surfaced at the earlier stages of the problem cycle, the group may choose to monitor the situation first before taking stronger action. But when time is tight, the groups become more proactive and re-arrange the key topics to counter problems relating to information search, and re-

distribute tasks away from the poor-performing group-mates to replace sub-standard work.

7.2 Implications of the Findings

This section will address implications on theory and for all the stakeholders. The section is divided into four subsections: 1) Implications on Theory, 2) Implications for Students, 3) Implications for Tutors / Facilitators, and 4) Implications for Curriculum Designers / Programme Coordinators.

7.2.1 IMPLICATIONS ON THEORY

The major outcome of the study is the substantive *Theory of Adaptive Formation* and a typology of participants in the small group collaborative learning. Just like a football team, students in a PBL small group adopt certain “formations” to divide up the problem-solving process into separate tasks, distribute the tasks among the group members, and device a flow of activities to complete the tasks. The Theory of Adaptive Formation that has emerged from this study has three strong implications on the development of theory on the behaviour of students in small group learning contexts: 1) the study of small group learning in an Asian context, 2) an investigation on the unfacilitated student activities in PBL, and 3) an understanding of student behaviour from both individual and group perspectives.

With accelerated reform on teaching approaches – such as the push for outcomes-based approach by the University Grants Committee in Hong Kong – and the movement to adopt smaller and smaller class-sizes in secondary schools, more and more facets of education are

embracing small group collaborative learning as a key learning mode. As mentioned before, despite the growing use of small group learning modes, there have been limited studies on the actual behaviour of students in such learning settings, especially in the Asian context. Such knowledge can provide valuable insights and information for tutors, curriculum designers as well as the students themselves to enhance their learning experiences and make small group approaches as effective and efficient as possible.

PBL and other forms of small group learning are growing strategies of teaching and learning activities that are being increasingly adopted in both Asian universities and schools. We therefore need more research on how different types of students from these regions behave and react to PBL and small group learning. The diversity of student behaviour that results from cultural differences has been well-documented. While existing studies have come mostly from Western contexts, this study makes a contribution to the discovery of theory relating to these topics by developing a substantive theory that encompasses the small group learning process, the influencing factors and students from a Chinese culture – an architectural studies programme at a university in Hong Kong.

Despite observations that students behave differently between tutorials with and without a facilitator (Barrows, 1988; Woods, 1994), researches on student behaviour in actual PBL tutorials have mainly emphasised the sections when a tutor is present to facilitate the discussion among students. This study has specifically focused on the unfacilitated deliberations among the group members during PBL tutorials for the field observations. With larger class sizes, it becomes inevitable that the tutor must rotate from small group to

small group to facilitate the student discussions. The unfacilitated period during the PBL tutorials represents the majority of the students' group self-directed learning time over the problem process. The findings from this study thus contribute towards a more complete theory on student activities and interactions in a PBL setting by reinforcing existing theories on facilitated behaviour with unfacilitated behaviour.

The theory that has emerged from this research is grounded in data from both an individual perspective – interviews and reflective journals – and a group perspective – observations of group discussions. This provides the foundation for a robust framework to, 1) situate the individual behaviour of students during PBL tutorials in the context of the larger group dynamics, and conversely, 2) connect group behaviour to the preferences and actions of individual group members. For example, the inter-relationships between the two key influencing factors, *group members* and *group collaboration*, and their sub-categories, contribute to the development of a more comprehensive theory on PBL student behaviour that integrates individual group member actions with group interactions.

7.2.2 IMPLICATIONS FOR STUDENTS

While it is commonly accepted that the benefits students gain from PBL is proportional to their level of participation in the group learning activities (Barrows, 1988; Woods, 1994; Savin-Baden, 2000), students in PBL need to know what kind of collaborative learners exist in order to adjust their behaviour to maximise learning. However, although there are studies on group types (Faidley et al, 2000), there have been few previous studies on a comprehensive typology of students in a PBL setting. Related studies have approached

student types or behaviour types from the perspective of guidelines – what should be done – or deficiencies – what should be avoided. An example of the former is Woods' (1994) discussion of the four dimensions of a “valued member of the group” in terms of both team morale and tasks, and one of the latter is Barrow and Wee's (2007) list of ineffective problem-solving strategies, which are in fact deficiencies attributable to a typology of PBL participants.

The findings of this research, in particular the typology of participants, have strong implications for students experiencing PBL for the first time. Most significantly, it allows students to reflect on their position within the typology and to gain a better understanding of their own impact on both the self-directed and group-directed learning components of PBL. Studies have found that students participate unequally in the PBL group process (Duek, 2000) and as a result both the groups and the individual group members suffer in terms of learning. Dolmans, Wolfhagen and van der Vleuten (2001) point out the possible vicious cycle of an imbalance in group member participation: “A low quality of interaction leads to less motivated students, which implies that some students let others do the work. This subsequently results in withdrawal of students who were initially motivated.” (p.140). Although the tutors can help direct the students to more balanced participation among the group members, the students spend the majority of their time in unfacilitated group activities and must rely on themselves more to do so.

For example, *workers* need to realise that they can contribute to the group more if they can determine when searching for additional information is no longer worthwhile (Barrows &

Wee, 2007) and when it is better to turn to participate in group discussions instead. Similarly, *drivers* and *adventurers* need to understand that their dominance of the group discussions limits the coverage of their groups' learning to what the former *need* to know and the latter *want* to know. They must try to encourage their group-mates to participate in the PBL discussions more in order to generate better resolved solutions to the problem cases. However, the implications of a disproportionately high number of active types in a PBL group have not been thoroughly researched and are therefore not clear.

7.2.3 IMPLICATIONS FOR TUTORS / FACILITATORS

Many researchers agree to the notion that the facilitation of the tutors is central to the PBL process and group learning (Schmidt and Moust, 2000; Savin-Baden, 2003). The tutors' different behaviours during tutorials and approaches to facilitation have a significant impact on the learning experience of PBL students. The findings of this research have strong implications for tutors and facilitators in two main areas. First, understanding of the typology of participants can help the tutors cope with different types of students more effectively. Often, tutors apply the same mode of facilitation regardless of the types of students they are facing. Second, most tutors in PBL lacked formal training in facilitation beyond a few workshops on PBL facilitation (Savin-Baden, 2003). The majority of them are not aware of how their behaviour affects the students and their groups.

Barrows and Wee (2007) believe that one of the ultimate responsibilities of tutors is to “encourage learners to take on responsibility for their own learning, evaluation and interpersonal dynamics” (p.66). To achieve this, the tutors need to understand the typology

of participants to approach different student types with appropriate strategy. Equipped with an understanding of the characteristics of each PBL student type from the team roles typology that has emerged from this research, the tutors can identify the various types through the students' behaviour in the PBL tutorials and formulate specific ways to motivate individual students of different types. Being familiar with the differences of the four participant types is thus essential to smooth and effective facilitation of PBL groups.

The typology of participants is also helpful to the tutors when problems arise. In reviewing the approaches adopted by faculty members to resolve the case of a poorly functioning PBL group in a medical school, Dolmans, Wolfhagen, and van der Vleuten (2001) have opined that the solutions failed because tutors have made the mistake of using teacher-centred instead of student-centred solutions to solve the problems of poorly performing tutorial groups. In another case involving a problematic PBL student, Kaufman and Mann (2001) have concluded that "Early diagnosis and intervention should have been undertaken to alleviate the problem" and that, the student "should have had feedback on his performance mid-way through the unit and been offered some constructive suggestions for improving his performance" (p.147). In both cases, timely and appropriate diagnosis is only possible if the tutors have a firm grasp of the relationship between the different participant types and the categories of *formation* that underpins the PBL group process.

This research has shown that tutor influence affects individual and group behaviour in diverse ways. It is therefore imperative that tutors comprehend the various sub-categories of tutor influence and their impact on the *formation* stages for more effective facilitation. For

example, the distinction among the sub-categories *tutor emphasis*, *tutor style* and *tutor comments* has emerged from the data. This allows tutors to monitor their own behaviour across the three levels to optimise the balance of the problem case and other learning components (*tutor emphasis*), *learning tasks* and *production tasks* in their PBL groups (*tutor style*), and the extent of *re-formation* from meeting to meeting (*tutor comments*).

7.2.4 IMPLICATIONS FOR CURRICULUM DESIGNERS / PROGRAMME COORDINATORS

The Theory of Adaptive Formation that has emerged from the data comprises four major categories. Three out of the four categories, *tutor influence*, *problem brief* and *group collaboration*, can be more directly influenced by the school. The direct implications of the *tutor influence* for tutors have been discussed in the preceding section. For the programme coordinators and university administration, the implications regarding tutors are two-fold: First, they must accept that facilitation is “not just another form of teaching” and ensure that all tutors receive proper training in PBL facilitation. This would certainly alleviate some of the problems associated with inconsistent, and sometimes inappropriate, tutor approaches. In particular, the data have indicated that the first tutor the students work under would assert the strongest impact on how students perceive the “correct way” of conducting PBL. Second, the programme coordinators should rotate tutors among the tutor groups so that the students would have a balanced experience with different tutor types. Since the findings show that the students and their groups change their behaviour to suite different tutor types, rotating tutors can thus help to prevent the domination of any particular tutor approach to PBL and its influence on the student behaviour.

The quality of the problem cases and the briefs has a direct impact on the performance of PBL groups (Barrows, 1988; Savin-Baden, 2003; Schmidt & Moust, 2000). The curriculum designers have to take care in selecting appropriate topics for the problem cases not only with a view of content coverage but also problem formulation to promote group deliberations. According to the data, some students think that they have encountered problem cases or topics that are not appropriate for PBL because these cases demand more *production tasks* than *learning tasks* and the groups ended up performing minimal group learning activities. Other students have mentioned problems associated with problem briefs that are too vague and therefore made it very difficult for the group to determine where to begin their discussion. The curriculum designers should review the problem cases used and the corresponding performance of the students to continuously improve the design of the problems.

One area that the curriculum designers should pay attention to is the degree of structure in the PBL problem cases. The student and tutor roles can vary significantly between a highly structured and unstructured PBL approach. Thus, the problem cases should be designed with flexibility in its structure to allow adjustments to different students and tutors. One way to achieve this is to provide separate sets of divergent and convergent prompting questions in the tutor-guide which allow the tutors to control the structure of the discussion by opening up the structure with divergent questions or reinforcing the structure with convergent questions.

Another implication of the findings is that although the mix of student types has a strong impact on the group dynamics when students engage in PBL, course coordinators seldom consider balancing different student types to be an important factor when grouping students in PBL teams. Too many of a particular type of students in a PBL tutorial group would have significant negative implications on the proper functioning and performance of the group. For example, one of the participants has describe the problems associated with a group comprising mostly lazier students – *riders* – where the students seem lost and there are no *driver* types to lead the discussion. In the programme studied in this research, two approaches have been used to determine the student groupings – either the students are divided into groups randomly or grouped according academic results based on their grade point average (GPA). Both approaches failed to take into account the mix of student types. The typology of participants generated from this research can thus help programme coordinators and tutors to identify different student types and form student groups with as balanced a composition as possible.

7.3 Recommendations

Unlike quantitative researches who emphasise *generalisability*, this research has adopted the qualitative approach of grounded theory which, instead, puts emphasis on the question: “Are the conclusions transferable to other settings and contexts?” (Punch, 1998, p.261). Here, the key question is the *transferability* of the research findings. The main objective of this research on PBL in a Hong Kong associate degree programme is to develop a substantive theory to contribute more in-depth understanding of group dynamics problems encountered

in small group learning by students whose previous education was conducted predominantly in teacher-centred methods.

Although the aim is not to develop a *formal theory* that is generalisable to other settings to explain the group dynamics of all small learning teams, the research is designed to enhance its transferability. The main strategy adopted in this research to achieve some transferability was the production of *thick descriptions* (Gall et al, 2003; Glesne, 1999) to capture the rich and diverse details of the case (Eriksson & Kovalainen, 2008). The aim is to provide richly described data that allows future researchers and practitioners to judge the transferability of these findings to other contexts. A full description of the university, the programme and its courses, student background and culture, and so on, is critical for researchers and practitioners to determine the extent to which the findings are applicable to their own context.

7.3.1 RECOMMENDATIONS FOR FURTHER STUDIES

Further studies may consider taking the findings of this research as the starting point to further develop the Theory of Adaptive Formation by testing out the grounded theory in other PBL and small group learning settings with varying parameters – such as, different student groups in terms of age, gender, group size, culture and type of course, and degree of PBL structure. As one of the key components of PBL, the typology of PBL students and their team roles that have emerged from this research can serve as a framework for investigations on the other key components – tutor types, problem types, group types, and so on – and their inter-relationships. Examples of further studies expanding on the findings of this research may include the following:

7.3.1.1 *Are there other team roles not covered by the current typology?*

A similarly designed research with a larger sample should be conducted to investigate whether the typology of team roles that have emerged adequately represents students new to a PBL setting. The scale of this doctoral research has been limited to twelve students. There is a possibility that there are additional team role types not covered by the relatively small sample.

7.3.1.2 *Do team roles change over the course of a problem case?*

A longitudinal study could usefully be conducted to study the team role changes, if any, of the group members over the course of a problem cycle. Through periodic video-taped observations, such as once a week, of the PBL group in action and interviews at the beginning, middle and after the conclusion of the problem case, we can analyse the behaviour of the students. An important question is whether team roles in PBL are transitional or permanent. By studying the behaviour of individual group members over a period of time, we can gain a better understanding of how a student's behaviour evolve over the different stages of the problem and does it constitute a change in team role type.

7.3.1.3 *What are the different types of PBL tutors and facilitation behaviour?*

Both Barrows (1988) and Woods (1994) have discussed tutor roles as a kind of model (Barrows, 1988; Woods, 1994) and presented a set of guidelines for good practices. In reality, tutor styles are likely to be as diverse as student types and vary over context and culture in ways similar to student types (Savin-Baden, 2003). A research study to

investigate and develop a substantive theory on the typology of PBL tutors would help the tutors to identify their own position within the typology and gain a better idea of how to improve their performance.

7.3.1.4 To what extent does tutor type affect student behaviour and performance?

With the findings of the study on a typology of PBL tutors, a study would be beneficial to examine the behaviour of the different student types in relation to tutor types. It would be important to compare the behaviour of each of the student types facilitated by different tutor types, especially when the behavioural changes are significant. How the various student types perform under the facilitation of different tutor types would also provide insights on ways to create a better PBL tutorial environment for the students.

7.3.1.5 What are the different types of PBL groups?

According to Dolmans et al (2001), the factors associated with poorly functioning tutorial groups have not generated adequate research interests. Most current studies have focused on ideal group composition and practices (Duek, 2000; Schmidt & Moust, 2000). It is worth studying the activities undertaken by groups composed of different combinations of student types and investigate whether groups of similar compositions exhibit consistent behaviour and group dynamics.

7.3.1.6 How do different student types react to different problem types?

The typology of problems is one of the better covered topics in PBL literature (Barrows & Wee, 2007; Bridges & Hallinger, 1995). Further study might focus on how students of

different types react to different kinds of problem cases. This study should cover both the action taken by students during the PBL tutorials as well as their self-directed learning conducted outside the group sessions when working on different problem types.

7.3.1.7 *Are there identifiable patterns of formation?*

This research has analysed a group each at the *initial formation* and *re-formation* stages of the problem cycle. A more detailed study might analyse the *formation* changes – *task division, task distribution* and *process flow* – of the PBL groups from the beginning to the end of a problem case. Tracking the evolution of the *formation* of these groups can provide valuable insights regarding the patterns of *formation* from *initial formation* through the various stages of *re-formation*.

7.3.2 RECOMMENDATIONS FOR PRACTICE

The development of the substantive Theory of Adaptive Formation has established important insights on the individual and group behaviour of PBL students. For example, the discussion of the four main categories – *group members, problem brief, tutor influence* and *group collaboration* – informs curriculum designers and course co-ordinators as to which key factors are under their control to enhance group dynamics and learning experience in a PBL setting. Based on these insights, this researcher has the following recommendations:

7.3.2.1 *Stronger orientation programme*

PBL programmes should strengthen their orientation programmes and not only explain to students how PBL works but also provide training in group work, such as trial problems,

before starting PBL tutorial activities. According to Savin-Baden (2003), students need to be equipped “to be directed in a variety of ways” (p.56) in order to perform well under different tutor styles. New students should also be introduced to the various factors of tutor influence, for example, different *tutor styles* and *tutor emphases*, to prevent their perception of the “correct” way of conducting PBL group work being dominated by the preferences of the first tutors they encounter.

7.3.2.2 *Tutor facilitation training / workshops*

Before the actual problem cases start, programme coordinators must ensure that all tutors involved in PBL facilitation, full-time or part-time, must receive proper training in facilitation, including the typology of PBL students and the processes of *formation* so that the tutors are aware of differences in student behaviour. Besides the initial training sessions at the start of the semester, programme coordinators should also arrange the facilitation workshops at the end of problem cycles or the semester for tutors to share issues and “best practices” as well as to draw the tutor team attention to any potential problematic cases. This could help to raise the facilitation capabilities of the programme as a whole.

7.3.2.3 *“Provisional” list of student types for grouping*

The findings point out that the different types of students not only behave differently in the PBL setting but also affect their respective groups’ learning in significant ways. An unfavourable combination of student types, such as too many active types or too many passive types in a group, may seriously affect the group dynamics and proper functioning of a group. Closely working with the students, the tutors should be able to give provisional

assessment of their student types on top of their performances at the end of each problem case. This typological assessment should be listed together with the students' academic records and used for grouping students to avoid adverse composition of student types.

7.3.2.4 *Inventory of problem cases and student reports*

The department should keep an inventory of problem cases, samples of student reports, assessment of the students' and their groups' performance and feedback from students. The tutors involved in facilitating the problem cases should also contribute written comments regarding student behaviour, performance and degree of *re-formation*. This information would be invaluable for creating better-designed problem cases and improvement of the ones in use. It can also serve as helpful references for tutors who are charged with the responsibility of designing problem cases for the first time.

7.3.2.5 *Rotation of tutors among different groups*

Due to the strong influences that tutors have on PBL students and the dynamics of their groups, the programme coordinators should rotate tutors around the different groups. This allows students to experience different tutor styles and emphases as well as to prevent over-influence by any one tutor's preferences. Besides, since each tutor approaches the problem cases differently based on their own background and expertise, the students can thus benefit from examining the problems from different perspectives as well as to experience various problem-solving approaches.

7.4 Conclusion

The grounded theory of “Adaptive Formation” that has emerged from this study provides answers to the questions: “How does a group of architectural studies students in a Hong Kong University cope with the group dynamics, both inside and outside the classroom, when experiencing a PBL situation in their programme?”, and offers an explanatory framework for the behaviour of students new to PBL in Hong Kong. This research has revealed the individual and group behaviour of students new to a PBL setting in Hong Kong. In answering the research question through qualitative methods, the *thick description* generated in this research may enhance the transferability of the findings to other PBL and small group collaborative learning contexts.

Emerging from data collected from twelve students comprising two PBL tutorial groups, the phenomenon of two formation stages – *initial formation* and *re-formation*, four categories of key factors – *group member*, *problem brief*, *tutor influence* and *group collaboration*, and the typology four student types – *drivers*, *adventurers*, *workers* and *riders*, represent only the beginning of the development of the Theory of Adaptive Formation. In its current form, this theory is predominantly considered substantive in nature, that is, it remains largely specific to a group and place (Strauss & Corbin, 1998). Much work and further research remain to be conducted before the substantive Theory of Adaptive Formation can be developed into a formal theory that can be applied to a broader context.

PBL and other forms of non-traditional teaching and learning methods, such as outcomes-

based teaching learning (OBTL), are gaining broader acceptance in higher education and are being implemented in a variety of ways in Hong Kong. Besides PBL, many of them have incorporated group deliberations as one of the main teaching and learning activities. This research and its findings provide a useful framework for researchers, practitioners and other stakeholders working on making the learning environment more conducive for small group collaborative learning in Hong Kong.

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Appendix B1

Sample of Problem Brief

BST10281 INTEGRATED STUDIO 1			Date	4 Sep 09
			Prepared by	

STUDIO PROBLEM BRIEF			Studio No	1A.1
Year	1	Semester A (2009-10)	Week	1-3
1A.1	HONG KONG ARCHITECTURAL TOUR One-day Education Programme for Primary School Students			

DISCUSSION STATEMENT

In an effort to promote the architectural profession to the public, the Hong Kong Institute of Architects (HKIA) together with the Tourist Association are jointly initiating a new programme to educate primary school students about the fundamentals of architecture. One of the high-lights of this programme is a one-day architecture discovery tour. Representatives from the HKIA will bring groups of students to famous buildings in Hong Kong and introduce them to the various aspects of architecture. Each tour will consist of a visit to two of these buildings and an "educational" session at the end of the tour. Your task is to select two appropriate buildings for the tour, compile an informational booklet that will be handed out to the students at the beginning of the tour, and design the programme for the concluding session.

The Information Booklet consists of two major parts: An appreciation of Architecture with an evaluation of architectural merit; and A Glossary of Architecture.

KEY CONCEPTS

Evaluation of architectural merit; Aspects of a building project; Building components and elements; Glossary of architecture.

COURSE INTENDED LEARNING OUTCOMES (CILOs)	SUBJECT AREA
<i>Establish</i> the relationship between the various architectural components of a building design and <i>integrate</i> the different parts into a coherent whole.	Integrated Studio
<i>Identify</i> buildings of special cultural, aesthetic and social values and <i>evaluate</i> their relative merits under the different aspects and contexts.	Social
<i>Identify</i> and <i>correlate</i> the various building components and elements.	Technical

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SUBMISSION

Week 1: 4 Sep 2010 – Problem Exploration.

Week 1: 6 Sep 2010 – Final presentation of the first part - Glossary of Architecture.

Week 3: 19 Sep 2010 – Submission of A4 report to studio counter.

Week 3: 20 Sep 2010 – Final presentation to group.

Appendix C1
Sample of Student Reflective Journal

In this semester, this is quite special for me. It is because I am the leader of my group, not only learning the architectural languages, but also the interpersonal, communication and leadership skills, which is good for my further studies. In assessing my performance in this semester, I think I learn much in problem works, I think I have better performance in the project of library design, since there are many changes in the design and I use computer skills to help in my design; conversely, in the project of designing the youth hostel, I satisfied the outcome of design.

Generally, there are four areas I gained by doing problem works

- attitude in problem works, I trained up the spirit of “never give up”. Since I am the leader, I want our group to have the best work to present out. SO , I think this kind of spirit can help me in doing my project works, I try to critics my work before showing to the tutor and show the best work I did in the project crit session in the studio course. So, I will do my best in all my works in the future.
- Architectural knowledge

In problem 1, we are supposed to know the knowledge of the design trend of library, by comparing the function, design strategies, I learn much in the cases. For example, nowadays, we don't need to provide a large space in putting bookshelves, but the put computer for the users. Also, the design of circulation is convenient to user, it inspired me a lot. To sum up, problem 1 gave a lot of useful information that helped me in designing the library.

In problem 2, I learnt about the process to build a building. The whole process is, how to begin? Who will be involved? How long does it take? At last we did a master programme a project. So, I know what are the procedures will be involved in my library, that helps me in my design and also further works.

In problem 3, we are supposed to gain knowledge from the existing renovation work, so to have some techniques on the project works. I learnt some of the social techniques, by judging which elements are important to the historical meaning, I know how to preserve the

Mei Ho House. So I think the most important element is the H form, then I preserved it in my design. Furthermore, I learnt some of the technical techniques, for example, how to create a void for linking two unite? How to give support when I break one wall? Etc.

In problem 4, we are supposed to re-renovate the case we chose, this problem provide a way for us to implement a new design, using different technical techniques to achieve our design. I think it is quite similar to our project works, but in a more technical way.

I have learnt grouping skills and time contribution in doing the problem works. Apart from guiding the teammates, grouping the groupmates work is the work that I contributed most, I hope it may help my teammates in understanding the whole process of our problem work.

Samples of Hand-drawn Relational Diagrams from Notebooks

```

graph LR
    Problem((Problem (Pr))) --- helps --- Project((Project (Pr)))
    Problem --- GroupWork((Group work (Pr)))
    Problem --- IndWork((Ind. work (Pr)))
    Project --- IndWork
    GroupWork --- IndWork
  
```

```

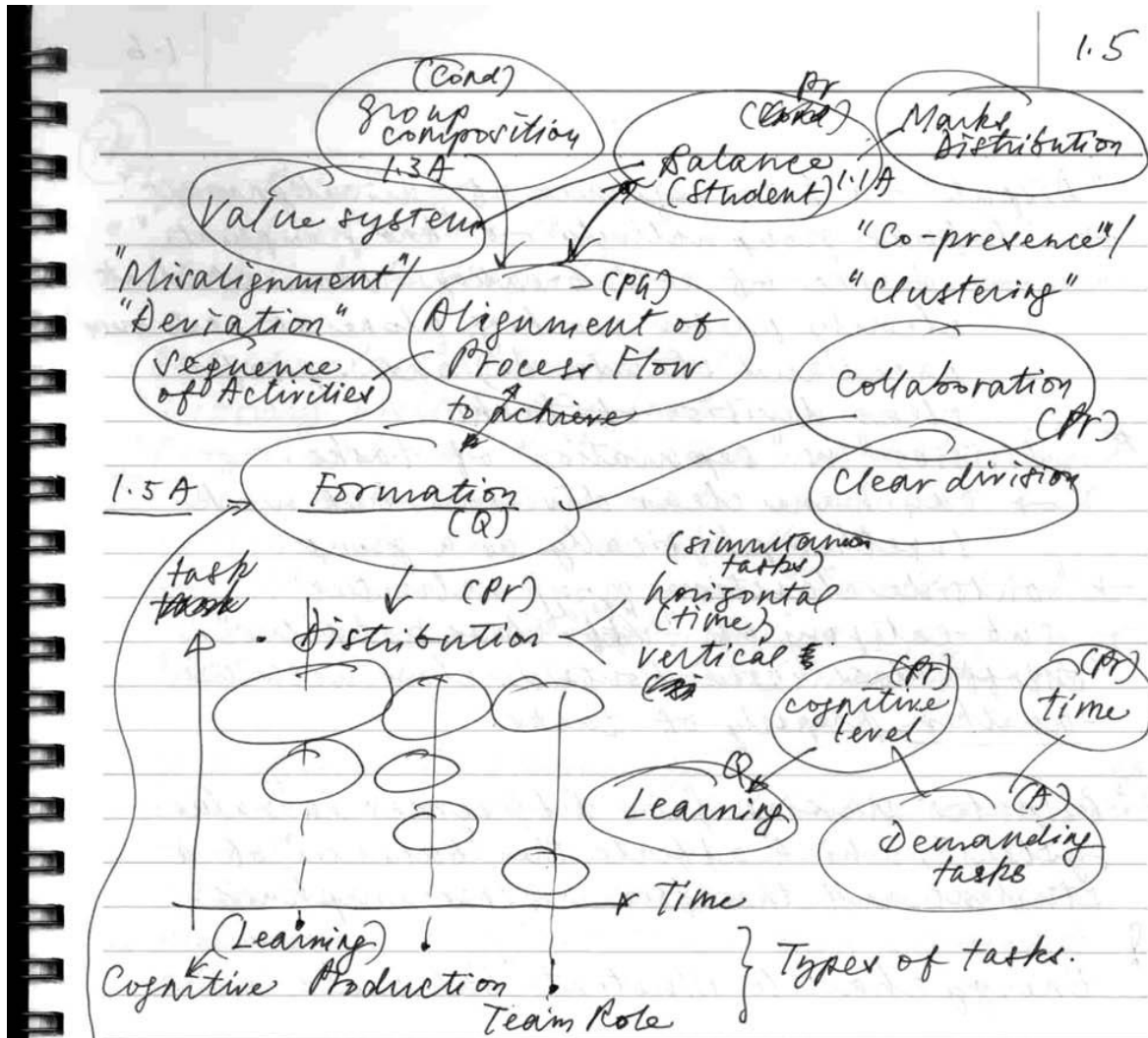
graph TD
    A((Many suggestions)) --> B((Different Ideas))
    B --> C((Follow-up))
    B --> D((Progress Check))
    C --> E((Complete for group mate))
    D --> F((Failure to complete tasks))
    D --> G((Difficult to force))
    F --> H((Same level))
    G --> H
    E --> I((Do not follow group decision))
    I --> J((No compromise))
    J --> A
  
```

1. There seems to be a tension between maintaining

```
graph TD
    DGM["Disagreement of group mates (P1)"]
    ARG["Argument (I1)"]
    DIS["Disagreement (I1)"]
    COM["Compromise (I1)"]
    REAL["Realisation (A)  
- no work done  
- no consensus"]
    INC["Incorporate others ideas (A)"]
    TS["Take sides w/ majority view (A)"]
    NGM["Neutral group mates (A)"]

    DGM --> ARG
    ARG --> REAL
    DIS --> ARG
    DIS --> COM
    COM --> INC
    COM --> TS
    DGM -.-> NGM
    NGM --> TS
```

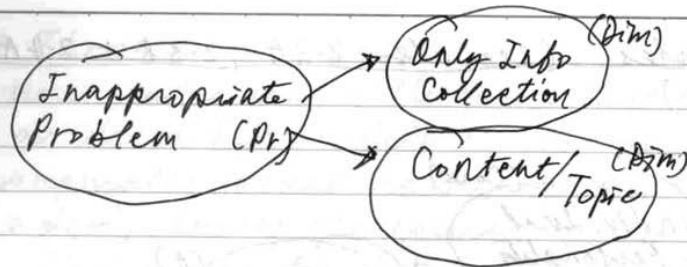
Samples of Hand-drawn Relational Diagrams from Notebooks



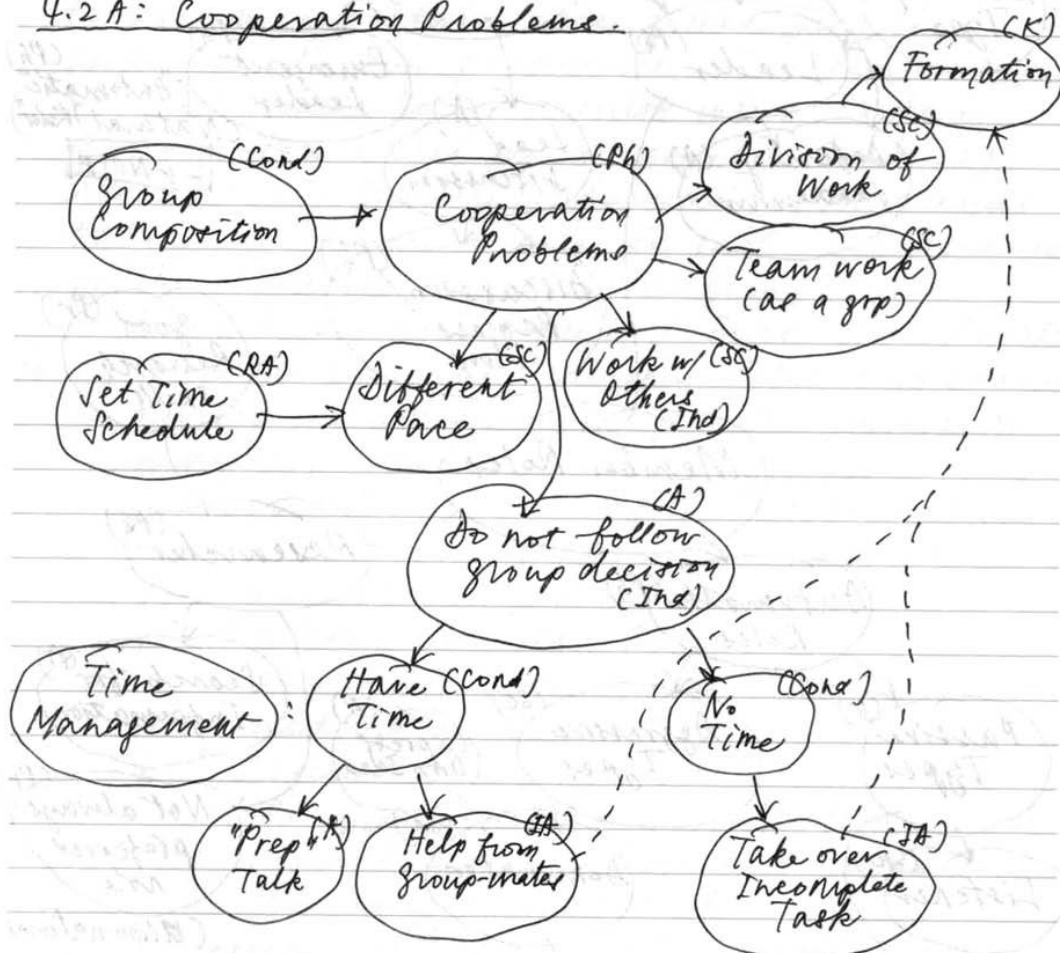
- "Familiarization" with process flow (1.18)
- takes time & take break to "clear up flow"
- ★ Proper "formation", as well as any idea of "alignment", is not possible before some level of "familiarization" is achieved. Students need to learn/understand the process flow through taking part in the small group process, i.e. in-action (Schön).
- "Learning curve" (INT-002)

Samples of Hand-drawn Relational Diagrams from Notebooks

4.2

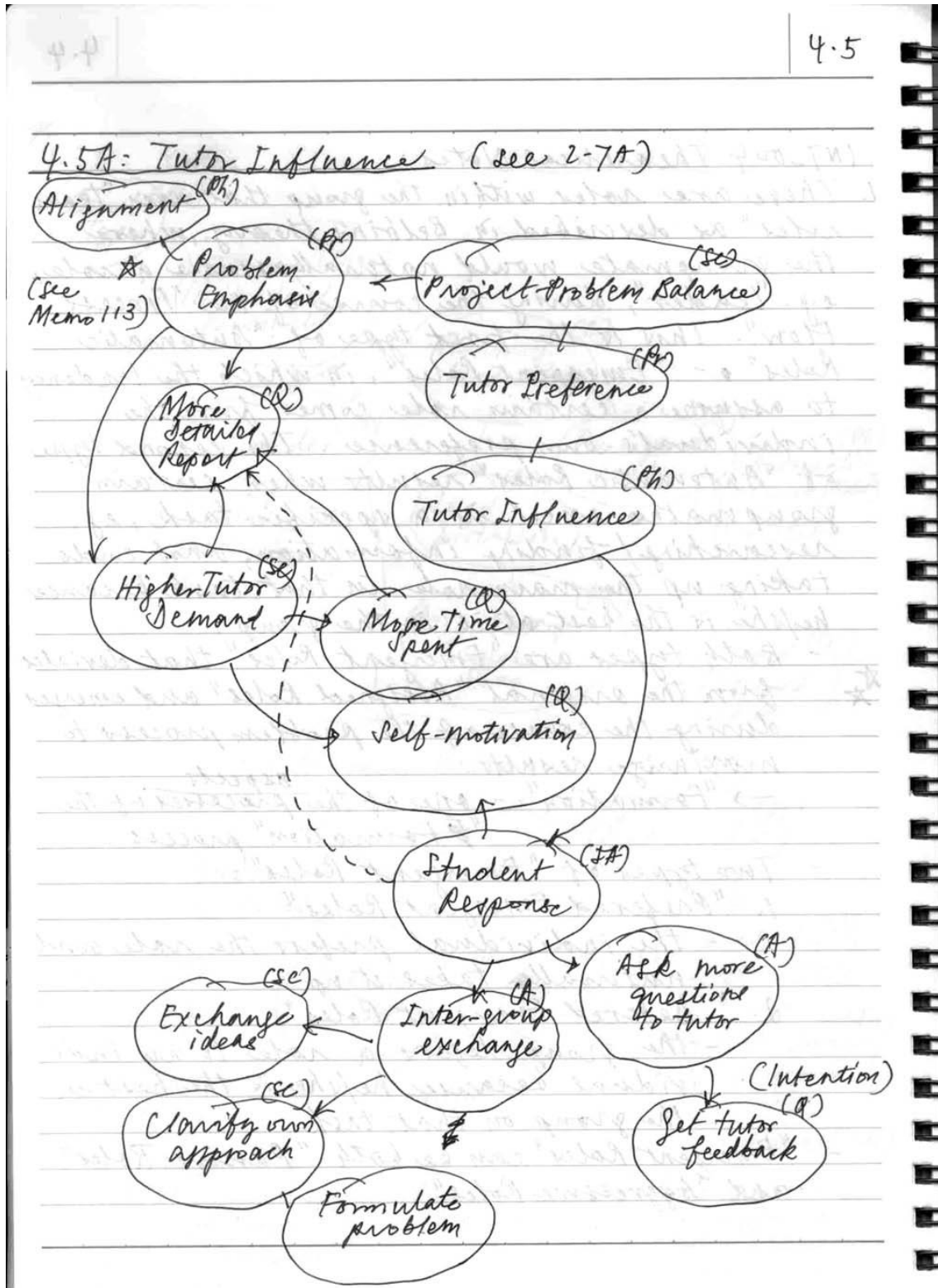


4.2 A: Cooperation Problems.



This shows that "Formation" (task division) can change over time.

Samples of Hand-drawn Relational Diagrams from Notebooks



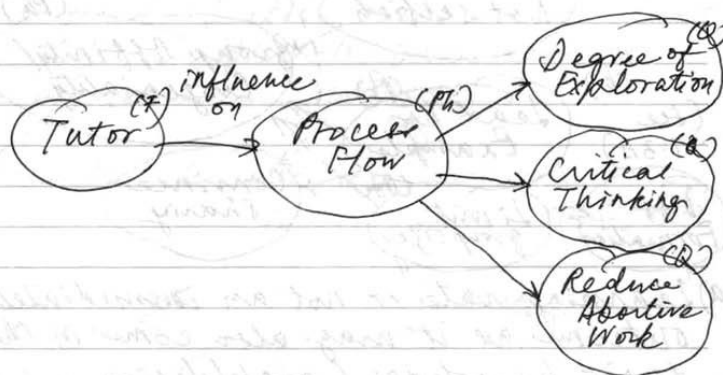
Appendix C3

Samples of Theoretical Notes Recorded in Hand-written Form

2-7

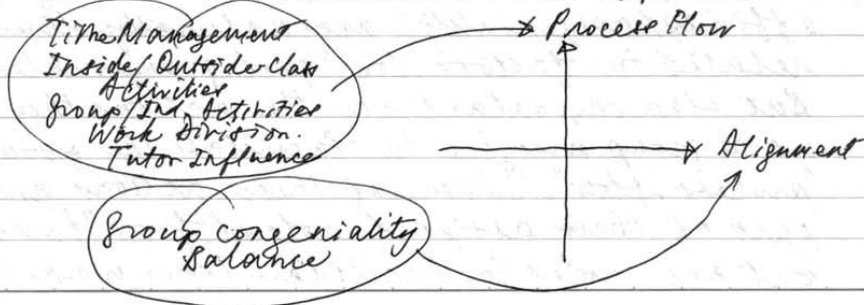
role) and influence teammates.

2.7A: Tutor Style and Influence.



(NT-002 Theoretical Notes:

1. Further factors on the disposition of group within the alignment-process diagram (1-9A). "Formation" shifts results from the "level of engagement of" the group members and other factors, which in turn is a sub-factor of "group congeniality". Factors can therefore be associated/divided with/into "Alignment" factors and "Process Flow" ones. But some still remain interrelated as expected.



Samples of Theoretical Notes Recorded in Hand-written Form

2.8

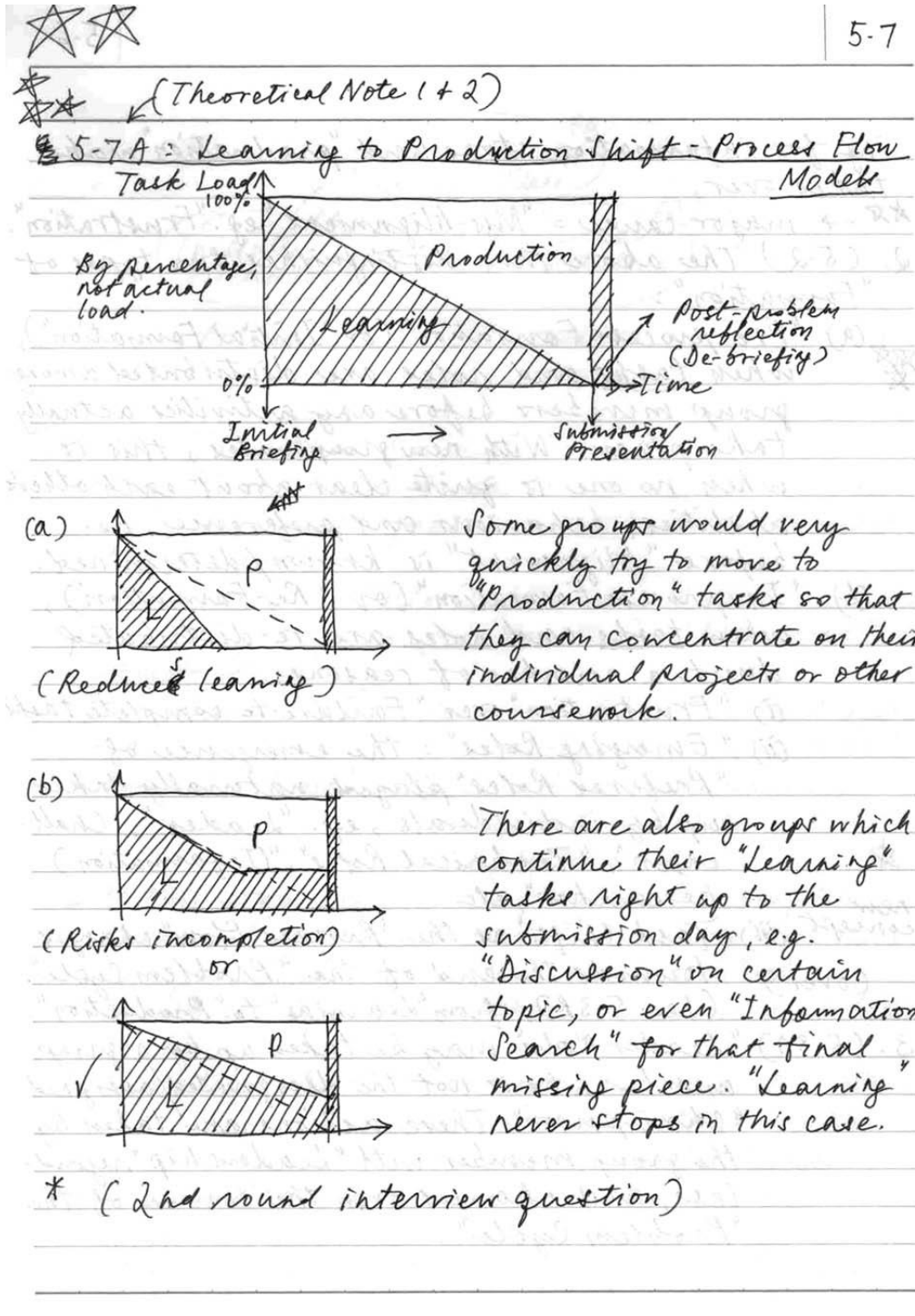
2. Another important concept that emerges is the direct relationship between the group process and learning and how students recognise the objective of "Learning" as separate from (or sometimes even in conflict with) completing the problem case, i.e. "Production". So, "Production" can be seen as an entirely different process type from that of "Learning". In an ideal curriculum design and student behaviour, the two would be aligned.

* There are then two dimensions of "alignment": group member alignment, which can be replaced with "group affinity" or "congeniality", and "process alignment" (Learning vs production).

3. Constituents of "Roles" also begin to emerge - "challenger", "worker-ant", "leader" - but it is not clear whether these roles were assumed consistently by the same people or not. These "Roles" should be understood to be distinct to "Task" divisions ("Work division"), which refer to work directly related to the "Production" process, e.g. researching on diff. topics, graphics, powerpoint, presenting, binding, etc. This relates to 1.2A, the 3 ~~objectives~~ aspects of the process flow.

4. 2.4B illustrates factors affecting "work division", and hence "Formation", and the close relationship w/ "group affinity". Furthermore, "GA" is a key factor to BOTH improving "Learning rate" + "Performance".

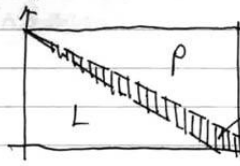
Samples of Theoretical Notes Recorded in Hand-written Form



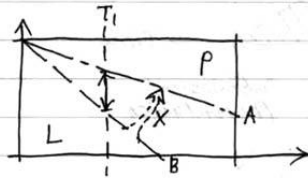
Samples of Theoretical Notes Recorded in Hand-written Form

☆☆ | 5-8

"Mis-Alignment" ~~task~~ occurs when the slopes of the Learning-Production Front differ too much between groupmates as well as between those of individual groupmates) and the group's agreed one.



"Mis-Alignment" wedge: when area is too large then "Alignment" problems appear.



Front A - Group

Front B - Individual groupmate

At any time over the "Problem Cycle", the individual groupmate is only doing "Learning" tasks that is less than the group's preferred amount (or standard). As a result, when persuasion ("Prep-talk", "By influence", etc) fails to shift the groupmate's behaviour, the difference will be taken over by the other groupmates. → "Reformation" (X)
(Football Analogy: when one of the defender is putting in a poor effort, or lacks mobility, in a 3-5-2 format (as he may prefer a 4-4-2 instead) The mid-fielders may have to run back a lot more to help out the defence.)
(over)

Appendix C4

Description of City University of Hong Kong (CityU)

Associate of Science in Architectural Studies (AScAS) Programme

(Amended from a programme document written by the researcher)

Introduction

The Division of Building Science and Technology (BST) of the City University of Hong Kong offers a two-year Associate of Science in Architectural Studies (AScAS) degree programme for students aspiring to become an architectural technologist. The AScAS degree is the only programme of its kind in Hong Kong recognized by the Chartered Institute of Architectural Technologists (CIAT). The programme aims to provide a sound education and training for students to become high level technical personnel in the architectural discipline. It seeks to prepare students for a role that is complementary to that of the architect in the preparation of design and production information, statutory submissions and in the administration of contracts of building projects.

Graduates will have a sound grasp of the physical principles and processes required to construct buildings. Students will also acquire knowledge of the organization and operational practices of the building industry, and will be able to exercise co-ordination and administration tasks appropriate to the production of building information. They will have an awareness of methods used to prepare and analyze the tender and contract documents generated under the various contractual systems in use and will be able to carry out contract administration and site supervision duties.

Project- and Problem- Based Learning (PPBL)

Project- and Problem- Based Learning (PPBL) is an alternative approach to teaching and learning gaining broad acceptance in recent years in all levels of education. One of the major keys to PPBL is that students assume the responsibility for their own learning and the focus of learning is switched from the teacher to the students. Replacing traditional lecture-based teaching where the teacher becomes the major source of knowledge, PPBL encourages

the students to actively seek out and share appropriate learning resources and expand their information / knowledge base through various means.

Forming the core teaching and learning components of the curriculum, the key to both the design projects and problems cases is the setting up of real-life situations in the architectural and building industry as the learning platform for students. Designing the problems and projects involves determining specific tasks that the students must complete in order to develop solutions to the problems and projects. In addition, students achieve these ILOs integratively in the context of the real-life-like problems and projects, thereby further enhancing their appreciation and understanding of the inter-relationship between the various subject areas.

The AScAS Curriculum

In the AScAS curriculum, all subject area courses – communication studies, environmental studies, social studies, technical studies and professional practice – are integrated with the studio component, which takes the form of problem cases and design projects. Instead of achieving all the aims and ILOs of a subject area under isolated courses, these ILOs are distributed strategically over the problem cases and design projects of the project studios. Students will learn about a subject area, e.g. structures, in the context of a building project. The main difference is that they will not only be acquiring knowledge of the various disciplines but they will also understand the relevance between the many disciplines as well as with the field of building in general.

In a problem case session, students work in teams of 5 to 6 students to solve problems that are set to resemble real-life problems in architecture as oppose to a design project on architecture. The problem cases are semi-structured with key concepts and references listed as guidance to the students. The major difference between the design project and problem case discussion is that the former is convergent in nature while the latter is divergent. Student will develop each of their unique design solutions based on this set of general information. On the contrary, the problem case discussion begins with a very particular

problem scenario and through dissecting the problem into a multitude of interrelated issues students acquire knowledge from various topics concerning these issues.

Constructive Alignment: PILOs, CILOs, TLAs and ATs

The Programme Intended Learning Outcomes (PILOs) for the AScAS curriculum are formulated by referencing to a number of key sources: the Quality Assurance Agency for Higher Education (UK) Subject Benchmark for Architecture, comments from relevant professional institutes (Hong Kong Institute of Architects and Chartered Institute of Architectural Technologists), as well as the CityU Ideal Graduate Attributes.

To maximise student learning and CILO achievement, the AScAS programme has adopted a Teaching and Learning Activity (TLA) based approach since the introduction of the PPBL curriculum in 2003. Instead of organising the curriculum (and students' weekly time-table) around individual courses, the AScAS curriculum is structured by TLA cycles to enhance the achievement of the CILOs. The different kinds of TLAs for the students are: Design Project, Problem Case, Individual Supervision, Lecture, Tutorial, Seminar, Workshop, Laboratory and Internship. The programme also employs different learning units (class sizes) to improve the effectiveness of each of the TLAs: Large-class at 80-100 students (Lecture, Seminar), Small-class or group at 20-25 students (Tutorial, Workshop, Project), Team at 5-6 students (Problem Case, Laboratory), and Individual (Project, Individual Supervision). As a result, a multiple learning unit approach is used to match each TLA to the optimum learning unit / class size based on its own nature.

Constructive alignment for the AScAS programme is not limited to an intra-course process and extends to a number of levels: 1) Intra-course teaching and learning elements (CILO-TLA-AT) alignment for individual courses, 2) Horizontal inter-course/intra-semester alignment across the subject area courses and integrated architectural studio within the same semester, and 3) Vertical inter-semester alignment across the increasingly complex integrated architectural studios and their associated subject area courses.

Appendix C5

Letter issued to all prospective participants before the proposed research (Page 1)

14 November 2009

Dear [Name of Student],

Re: Joseph Francis Wong's Doctoral Research on Group Dynamics in PBL
Participation in Study

I am currently working on my doctoral degree in education at the University of Leicester with the research topic of "Group Dynamics in Problem-Based Learning (PBL): A Case Study of Architectural Students in a Hong Kong University". There exists a large volume of research on various aspects of PBL, but very little is about how students interact with each other in a small group collaboration learning setting, especially in Hong Kong. To gain more knowledge in this area, I have chosen to study the group dynamics, and its influencing factors, of first year students in the Associate of Science in Architectural Studies programme at the City University of Hong Kong. I am seeking volunteers for my study, and I am hoping that you will consider participating in this research.

If you decide to participate in my study, here is what would happen:

1. I will video-tape one of your PBL tutorial sessions to study the group dynamics and you interact with other group members during the session. One digital camera will be set up to record your actions. I will not be present during the video-taping to minimise disturbance to your studies. I will transcribe your discussions into English and the transcription will be verified with you before being used in the research. Your name will not appear in the video transcriptions.
2. I will interview you to find out about your actions and interactions with your group-mates in the PBL tutorial, as well as any problems that you have encountered and your reaction to these situations. The interview will be conducted in Cantonese and will last about 25-30 minutes. I will record the interview with a digital voice recorder and transcribe your responses into English. The transcription will be verified with you before being used in the research. Your name will not appear in the interview transcriptions.
3. I will collect a copy of your reflective journal at the end of the semester to supplement the data collected from the video observation and interview. All the names from the journals will be removed before being used in the research.

Participation in this study is voluntary. Your decision whether or not to participate will not affect your relationship with the division and the university. If you decide to participate, you are free to withdraw your consent and discontinue participation at any stage of the research without penalty. This study will be conducted during your normal class hours.

Letter issued to all prospective participants before the proposed research (Page 2)

All data collected for this study become the property of the researcher. Any information that is obtained in connection with this research that can be identified with you will remain confidential and will not be disclosed without your consent. Although complete anonymity is not possible with the methods of this research, all possible safeguards will be taken to protect your anonymity. All participants will only be identified as "Student A", "Student B", etc. in the data as well as the dissertation. All video and audio recordings will be destroyed at the conclusion of this study.

If you have any questions, please do not hesitate to contact me by phone (3442-4957) or email (bsjwong@cityu.edu.hk).

If you would like to volunteer to participate in this study, please kindly sign in the space provide below.

Your signature indicates that,

you have read and understand the information provided above;

you willingly agree to participate;

you may withdraw your consent at any stage of the study and discontinue participation without penalty;

you are not waiving any legal claims or rights.

_____	_____	_____
Name (Print)	Signature	Date

Please return this form to my office (MMW5425) before 28 November 2009. A copy of the form will be returned to you for record.

Thank you.

Yours truly,

Joseph Francis Wong

Figure 3.7: The master relational diagram incorporating all the concepts from the open coding stage (Page 106)

