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THE IMPACT OF IMPLEMENTING PROBLEM-BASED LEARNING IN A THAI UNIVERSITY

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AALBORG UNIVERSITY

THE IMPACT OF IMPLEMENTING PROBLEM-BASED LEARNING IN A THAI
UNIVERSITY

A Dissertation

Submitted to the Department of Planning and Development

of

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by

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This thesis has been submitted for assessment in partial fulfillment of the PhD degree. The thesis is based on the submitted or published scientific papers which are listed above. Parts of the papers are used directly or indirectly in the extended summary of the thesis. As part of the assessment, co-author statements have been made available to the assessment committee and are also available at the Faculty. The thesis is not in its present form acceptable for open publication but only in limited and closed circulation as copyright may not be ensured.

Summary

Stemming from the quest to develop a learning and teaching strategy that aims to implement the activeness of learning dynamics and which will consequently result in a 21st century learning outcome for an English-medium university in Thailand, Problem-Based Learning (PBL) attracted my attention for deeper exploration of the possibility of implementing PBL within this local educational context. Through the journey of the implementation process, design based research (DBR) became the main methodological approach in designing, implementing, and evaluating this PhD research project. The primary objective of this study was to investigate the impact of PBL curriculum design and the PBL practice initiated at a Thailand university which uses English as the medium of instruction. In accordance with DBR process, there are three phases to be enacted: the preparation phase, the implementation phase, and the evaluation phase. This PhD research project strictly followed the three phases of DBR. Data collection throughout the three phases can be divided into two stages. The first stage was conducted during an initial 18 month period at Aalborg University in Denmark. The process of this stage included document analysis, a case study, and interviewing PBL experts. The results of this first stage inspired and guided the PBL designs to be implemented within an English-medium instruction university in Thailand. The designs involved both PBL curriculum design and PBL staff training design. Stage two of the PhD research project concerned the actual implementation of the two course designs which investigated the impact of the implementation, as well as evaluating the designs at the end of the research project. This stage took place at Mae Fah Luang University in Thailand. This second stage of the PhD project lasted for another 18 months. This second stage involved numerous actions, especially collaboration and negotiation between the researcher and teachers, and also with top managers in order to finalize the realistic designs to be implemented in this local context. Two case studies were therefore conducted to evaluate the new PBL curriculum designs and to study the impact of the practices of PBL in this local Thai context.

Data obtained throughout the study of this second stage came from both qualitative and quantitative inquiries which encompassed 1) methods of qualitative data collection consisting of observations, semi-structured interviews, document/textual analysis from existing literatures, and open-ended questionnaires; and 2) methods of quantitative data collections in

questionnaires and the final scores or grades of students. Both qualitative and quantitative results and the analysis of the different case studies suggested issues in the overall study.

1) In accordance with the perspective of educators in the field of curriculum development, the term 'Problem-Based Learning', whether it is viewed and implemented as an instructional approach or as an educational strategy, must be redefined and redesigned, so that PBL curriculum designs and practices are suitable for implementing in a particular local context.

2) To initiate and maintain PBL implementation in any context, it is necessary to prepare academic staff to be on the same page in 1) having an in-depth understanding of PBL principles and process; and 2) their commitment to the practice. Furthermore, a systematic support and training system needs to be provided to the change agents for the sake of the professional growth of both individuals and the organization.

3) The analysis of PBL curriculum design and practice in the context of Mae Fah Luang University in Thailand indicates that PBL implementation there led to significant improvement in active learning dynamics and consequently enhanced student motivation, collaboration skills, communication skills, problem solving skills, self-directed or autonomous learning skills, and critical thinking skills.

In addition to discussing the research findings, the study also presents a detailed analysis of the implementation of PBL at Mae Fah Luang University, and points out the potential for generalization to other educational contexts.

Keywords: Problem-Based Learning (PBL), Design based research (DBR), PBL curriculum design, PBL staff development, English as a Foreign Language (EFL), interdisciplinary learning.

Sammendrag

Udgangspunkt var en søgen efter at udvikle en lærings- og undervisningsstrategi til at implementere en aktiv læringsdynamik, der vil føre til læringsudbytte for det 21. århundrede i et engelsksproget universitet i Thailand. Her har problembaseret læring (PBL) tiltrukket min opmærksomhed mhp. grundigere at afsøge muligheden for at implementere PBL i denne lokale uddannelsessammenhæng. Hovedformålet med ph.d.-projektet var at undersøge indvirkningen af et initiativ med PBL-curriculumdesign og -praksis på et engelsksproget universitet i Thailand. Fremgangsmåden for ph.d.-projektet var 'Design Based Research' (DBR) mht. design, implementering og evaluering. I overensstemmelse med DBR skal tre faser gennemføres: Forberedelse, implementering og evaluering. Projektet har nøje fulgt disse tre faser i DBR.

Dataindsamling gennem de tre faser kan opdeles i to trin. Første trin blev udført igennem de første 18 måneder på Aalborg Universitet i Danmark. Processen inkluderede her dokumentanalyse, et casestudy og interview med PBL eksperter. Resultaterne heraf inspirerede og guidede et PBL design til implementering på et engelsksproget universitet i Thailand. Disse design omfattede såvel PBL-curriculum som PBL-oplæring af personale.

Andet trin af ph.d.-projektet berørte den egentlige implementering af de to kursusdesign og indeholdt en undersøgelse af virkningen af implementeringen såvel som en evalueringen af disse design ved afslutningen af projektet. Dette andet trin fandt sted på Mae Fah Luang Universitetet i Thailand og varede 18 måneder. Andet trin involverede talrige aktiviteter, herunder særligt samarbejde og forhandlinger med undervisere og ledelse for at kunne færdiggøre realistiske design til implementering i den lokale kontekst. I den forbindelse blev der foretaget to casestudier, dels for at evaluere de nye PBL-curriculumdesign og dels for at studere PBL-praksis' indvirkning i den Thailandske kontekst.

Data indsamlet i løbet af dette andet trin stammer fra såvel kvalitative som kvantitative undersøgelser, herunder 1) metoder til kvalitative dataindsamling baseret på observationer, semistrukturerede interviews, analyse af litteratur samt spørgeskemaer med åbne spørgsmål og 2) metoder til kvantitativ dataindsamling i form af spørgeskemaer og studerendes kursuskarakterer. Såvel kvalitative som kvantitative resultater samt analysen af casestudier peger på følgende forhold i den samlede undersøgelse:

1) I overensstemmelse med perspektivet fra undervisere inden for curriculumudvikling må begrebet 'Problem Baseret Læring', uanset om den betragtes og implementeres som en undervisningstilgang eller som en uddannelsesstrategi, redefineres og redesignes, således at PBL-curriculum design og praksis er egnet til implementering i en given lokal kontekst.

2) For at påbegynde og fastholde PBL, uanset kontekst, er det nødvendigt at forberede det akademiske personale på at blive en del af den fælles tankegang mhp. 1) at have dybtgående forståelse af PBL-principper og -processer, samt 2) deres forpligtelse over for PBL-praksis. Derudover er det nødvendigt med systematisk støtte og uddannelse til disse forandringsagenter for at understøtte den professionelle udvikling af medarbejdere samt af organisationen.

3) Analysen af PBL-curriculumdesign og -praksis på Mae Fah Luang Universitet i Thailand indikerer, at implementeringen af PBL førte til signifikante forbedringer af aktiv læringsdynamik og som konsekvens forøgede de studerendes motivation samt deres færdigheder inden for samarbejde, kommunikation, problemløsning, selvledt eller autonom læring og kritisk tænkning.

Udover at diskutere forskningsresultaterne præsenterer afhandlingen også en detaljeret analyse af implementeringen af PBL på Mae Fah Luang Universitet og påpeger potentialet for generalisering til andre uddannelseskontekster.

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There are two more groups of people to whom I would like to extend my thanks and my appreciation. First are my husband and son, Larry and Ulyssess Coffin, who have been a constant support to me in every possible way in completing my study. The second group of people is my friends in the PBL group at Aalborg University with whom I have shared information and experiences. This has helped me learn a great deal throughout the period I was at Aalborg University.

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CHAPTER ONE

INTRODUCTION

This chapter outlines the background, rationale, research questions, and significance of the PhD research project. The chapter also further explains why problem-based learning (PBL), English as foreign language learning, (EFL), and interdisciplinary learning (IL) were chosen as the major factors for the design of an education intervention at Mae Fah Luang University (MFU).

1.1. Background of the study

At present, Problem-Based Learning (PBL) has been widely used as an alternative instructional approach and as an educational strategy at many universities across the world. PBL has been implemented successfully in several academic disciplines, such as medicine, science and engineering. Throughout the decades since it emerged in the 1960s, many research findings have supported the idea that the PBL approach to learning enhances problem solving skills, communication skills, collaborative skills, in depth content learning, and self-directed learning (Savin-Baden & Major, 2004; Barrows & Kelson, 1990; Kolmos *et al*, 2004). Despite the success of PBL implementation in the medical and engineering fields, PBL does not appear to have had a significant influence on the humanities, particularly in the field of language teaching and learning.

This study has emerged from my own experience of attempting to develop an approach to second language learning that is more active in a traditional learning and teaching context. I am a university lecturer who is a non-native English speaker and has been involved in teaching and developing English courses for non-native speakers of English in a Thai context. The English language has become increasingly important in Thailand, and the Thai government has enforced a National Education Act since 1997 in order to improve the quality of English language teaching and learning. Nevertheless, there is still no evidence that the English curriculum in Thai universities meets the demands of English use in the workplace. In other words, it can be concluded that a majority of Thai university graduates do not use a satisfactory level of English language from the perspective of their employers (Wiriyachitra, 2001). Regarding the National Education Act, student-centered approaches such as Communicative Language Teaching (CLT), Task-Based Language Teaching, and Content-Based Instruction are introduced and implemented with English teaching and learning at Thai

schools and universities; however, learner performances have shown no significant improvement. This situation exists at Mae Fah Luang University where I have worked since 2005. One of the university's policies is using English as the medium of instruction and this policy has brought quite a few challenges for the academic staff and for the students. Despite the university's policies, in practice in order to operate an English-medium instruction university successfully is considered an enormous mission because of contextual factors. A study by Klaassen (2001) presented a situation of English-medium instruction employed by a university in the Netherlands, and showed that contextual factors played a crucial role in determining whether the program was successful or a failure. One of those contextual factors was staff development, because staff are a key element in initiating changes in an educational context. Using English as the medium of instruction has been a huge challenge for MFU staff. In both the short and long term it is necessary to deal with the challenge of how to handle the quest of producing prospective graduates with the skills and competences which are desirable for future employers. This quest requires the university academic staff to reflect on their pedagogical stance: how to conduct these English-medium classes so as to help students learn in a meaningful way, so that they become skillful and competent learners who are prepared to cope with the global demands on their career qualifications after graduating. Regarding the educational context of MFU, I recognize that whenever there are challenges, problems or even crises arising, there is an opportunity to learn and make a difference. As for the situation at MFU, I envision having an opportunity, as a language teacher who is a non-native English speaker, to make a contribution to the field of second and foreign language learning, as well as to the field of interdisciplinary learning. The situation at MFU is unique in the sense that the knowledge and skills of English can be integrated within most fields of studies offered because of its status as an English-medium instruction University. After examining PBL principles and practices, I can see that there is a link between learning outcomes of PBL, EFL, and IL; this is why the focus of the study and the focus of the curriculum design of this PhD research project, consists of three pillars of the study area: Problem-Based Learning (PBL), English as a Foreign Language (EFL), and Interdisciplinary Learning (IL).

1.2. Context of Mae Fah Luang University: a potential PBL University

Mae Fah Luang University was established in 1998 as an autonomous public university under the Royal Charter, and has received support from the Royal Thai government since its establishment. The university is founded on the principle of "New, Better, and Different", and so is always striving to be creative in order to improve the quality of its education. MFU always seeks to provide students with opportunities to study newly developing fields, and to become innovators in new industries. The university aims to produce graduates to meet international academic standards and serve its community as an educational hub. As a young autonomous university, MFU has been making a great effort to adapt itself to the standards of international education, as stated in its directions of operation as follows:

- Being a medium-size , quality educational institute;
- Being an academic center of the Greater Mea Khong sub-region (GMS);
- In collaboration with the region's policy and in compliance with the national policy.

In order to achieve the status of international education quality, the university has therefore incorporated English-medium instruction (August 2008) and PBL principles (in 2010) as a part of its long term policy (www. mfu.ac.th/plan/).

PBL was first introduced to MFU by professors from UNESCO Chair in PBL at Aalborg University (AAU) in 2008. The School of Information and Technology was the first to make contact with PBL experts from AAU to run a PBL workshop to inspire its staff about the new pedagogy. In 2009, in order to learn more about PBL in action, a group of university staff including the president, a dean, heads of divisions, and academic staff paid a visit to Aalborg University in Denmark. On their return from the visit to AAU, four academic staff introduced PBL on a small scale as a pedagogical method in their classroom context. Reports of the small scale PBL integration in some existing courses were presented to the committee of the university board. This was the beginning of a PBL trial practice and it continues to put the university in a reflective mode regarding the possibilities and challenges in implementing PBL in its context.

All lecturers at MFU have always realized that teaching subject matter in English through the PBL process is indeed very challenging. It is recognized that there are several elements that need to be re-organized and prepared for the change, if PBL is to be implemented as an educational strategy. There has been a more strategic approach to PBL implementation since 2010. Since then the university has been in transition towards being a PBL-oriented

university. Sending four delegates to study in-depth, on PhD programs, PBL curriculum and practices within a PBL University in Denmark (AAU) has been a part of the strategy of change. While working on their PhD project at AAU, some candidates continued to work with different agents at their home university, such as teachers, program co-coordinators, and staff from the Teaching and Learning Development Center who are implementing PBL in their environment. PBL implementation has been rather informal in the initial stage, and was initiated by a group of teachers who have a genuine interest in making changes in their pedagogical practice. The common objectives of these teachers in making changes are to improve learning so as to be more active and more meaningful to learners. A PBL community of practice at MFU has existed since 2012, in which PBL practitioners from different faculties have begun to collaborate and share knowledge and experiences to support one another in implementing PBL.

1.3. Rationale and objectives of the study: Why Problem-Based Learning?

I was introduced to PBL at Aalborg University in 2009 when I paid a visit with seven other delegates to learn about it as an education strategy. The principles and practices of PBL at AAU certainly have made a lasting impression on me. Upon my return, I began to explore PBL in more depth by informally integrating it within my own classroom practice. This trial had a very positive effect on the process of learning and the final product itself (see Appendix N). Based on both theoretical and empirical studies, I recognized that PBL could potentially be a great learning and teaching approach that would have positive effects on acquiring language skills and competence in foreign language learners. The PBL process will also enhance other practical skills and learners' in-depth knowledge of their discipline. Wanting to learn more about PBL for the purpose of utilizing PBL characteristics and processes to improve the learning environment at MFU by being more active inspired me to begin my PhD study. Initially, the focus of my PhD research was more on integrating PBL with EFL education because that was the area in which I have the most knowledge and experience. As well as being an English teacher, I am also currently involved in the professional development of staff in the English Department. Through the process of reflecting on challenges in making learning more active and meaningful, I see the challenges of learning and teaching at university from a broader perspective. Based on an on-going conversation with teachers from different faculties, I have recognized that in every faculty there exists a small group who genuinely strive for change to an active learning environment. I therefore considered how to make my PhD research project beneficial to other teachers and students

outside the field of EFL education. The scope of PBL curriculum design and the scope of the research study into PBL implementation have therefore become broader, due to the context of the University which is using English as the medium of instruction, to encompass integrating interdisciplinary learning with PBL and EFL.

Design-based research (DBR) is used as the entire approach to this PhD research project because of the nature of the project itself, which aims to develop and assess an educational intervention at an English-medium instruction university. Consequently, DBR is considered an appropriate alternative for study to improve systematic designs and instructional strategies, as well as to assess the impact of the intervention. The design and process of this PhD research project comprises three educational areas: PBL, EFL, and IL. Details of DBR and why it was chosen as the research methodology of this PhD research project are given in Chapter 3. This research project can also be viewed as one of the components of educational intervention that Mae Fah Luang University will use to promote its education strategy. Although there is very little evidence that PBL has ever been introduced to and applied within the field of English language teaching and learning (i.e. the studies by Mathews-Aydinli, 2007; Jiriyasin, 2011; Ng Chin Leng, 2009; Othman& Shah, 2007; Yusef, 2010, most of which were conducted on a small scale involving 10- 80 participants), I am certain to discover more about PBL organized studies implemented within the field of language education. As PBL is interdisciplinary in its nature, and English language learning (as the medium of instruction), can fit all disciplines, one of the aims of this research project is therefore to make a contribution to the pool of knowledge and pedagogical practice in the fields of EFL education and interdisciplinary learning. Consequently, my interest and challenge is to design an education intervention for EFL and interdisciplinary learning based on the principles of PBL, as well as to discover the impact of implementing PBL in the field of EFL and interdisciplinary studies. As well as focusing on curriculum design, this PhD research project extends its focus to academic staff development in PBL. I personally believe that without involvement or a contribution from individual teachers throughout the design and the implementation process, the change process will eventually fail. Educational intervention through the implementation of PBL requires understanding and collaboration among researchers/developers, teachers/practitioners, top managers, and students. This is why there must be equal emphasis on PBL staff development and PBL curriculum development. The objectives of this research project can therefore be summarized as follows:

1) Identifying necessary elements of PBL curriculum for a Thai university context where English is used as the medium of instruction.

2) Developing a PBL curriculum for EFL interdisciplinary studies.

3) Identifying the needs of local staff in practicing PBL.

4) Developing a PBL academic staff training program for a Thai university.

5) Identifying the PBL characteristics and practices that work with the study context (the EFL learning environments).

6) Detecting values gained from practicing PBL in the study context.

1.4. Research questions

This research project aims to develop a PBL model of practice for a Thai university and to study the impact of the design and the practice of PBL for this particular context. The process of the study has become complex as it involves preparing both curriculum and academic staff for change. The PhD research project therefore deals with one main research question which aims to investigate the impact of PBL implementation in the study context. In order to obtain the most complete answer to the main research question, four subsidiary questions are also formed. The relevant answers to the first two subsidiary questions develop crucial elements of the design of PBL in English as foreign language (EFL) interdisciplinary studies and in the design of a PBL academic staff training program. The other two subsidiary questions involve an investigation of the impact of implementing the two designs. Details of the research questions are presented in the following table.

Main Research Question	**1) What is the impact of implementing PBL with EFL in interdisciplinary studies?**	
Four Subsidiary Questions	1.1) What are the essential elements in designing PBL-EFL interdisciplinary curriculum?	1.2) How does PBL in EFL interdisciplinary studies contribute to student learning?
	Identify needed curriculum elements>>>>>>>design>>>practice>>>>>>>>>>output and learning outcomes	
	1.3) What skills and competences are needed by the academic staff in order to manage and supervise PBL-EFL interdisciplinary studies?	1.4) What do PBL organized studies contribute to the teaching and learning experience?
	Identify staff needs>>>> >>>>>staff training design >>> practice>>>>>>assessing their new experience	

Table 1: Research questions of the PhD research project

The project is divided into two phases. Phase 1 took place during the first 16 month period at AAU. The process included document analysis, a case study, and interviewing PBL experts. The results of these phase 1 studies inspired and guided the proper designs of PBL in EFL interdisciplinary studies and a PBL academic staff training program for Mae Fah Luang University. Phase 2 of the research project involved redesigning syllabi and the actual implementation of the two final designs, an investigation of the impact of the implementation, and evaluation of the designs. This phase took place at Mae Fah Luang University and lasted for 12 months.

1.5. Significance of the study

This PhD research project stems from the university's vision and policy in searching for an educational strategy that will foster active learning. The designs of PBL for EFL Interdisciplinary Studies as well as the practices of PBL in the study context yield results which may be evidence of how PBL can change educational practice in the study context so as to be more active and meaningful to learners. Consequently, the impact of the study's results will also influence the enactment plan for PBL implementation on a larger scale in the future. The implementation of PBL in this study context is the first and most comprehensive model of practice in Thailand. The contribution of this research project is that its findings support the possibility of implementing PBL with positive effects on learning in the fields of EFL and interdisciplinary studies in a traditional educational context. The overall objectives of the research project are to design, implement, and assess the impact of PBL curriculum for English interdisciplinary studies. In order to achieve the objectives set forth, design-based research (DBR) played a crucial role throughout this PhD research project. Because of the influence of DBR, implementing PBL at MFU proceeded through a systematic process of planning, implementing, and assessing the new designs. In addition, the study also identified two important elements which need attention and effort when designing an intervention process; that is PBL curriculum design and PBL academic staff development. As well as achieving concrete products in the two designs for PBL practice for curriculum design and the staff development program or system, the eventual result of the design and practice is a strong PBL community of practice. These elements of the PhD research project have become influential factors in the change process in this traditional education context.

1.6. Defining the term 'PBL' implemented in the study context

PBL practices exist in various forms and levels across the globe. They are also flexible and oriented to their cultural context. PBL practices range from an instructional approach, which can be used with single or multi-subjects, to an institutional educational model. The diversity of PBL practice therefore has an effect on how one defines PBL once it is implemented in different contexts. Defining PBL is therefore also necessary in the context of this PhD research project. As a consequence of the dissemination of PBL over the decades, the definition of PBL is now broadening, and it is now viewed as a philosophy and a set of learning principles rather than as only one of the instructional approaches to active learning. To better understand PBL curriculum design and PBL practice at Mae Fah Luang University in Thailand, it is necessary to note that the inspiration for design and implementation is derived from the Aalborg PBL model and practice. As stated by Kolmos and Graaff (2013), the PBL principles and practice at Aalborg University cover both problem-based and project-based approaches to learning, in which a semester project starts with a problem.

The learning objectives of the PBL curriculum implemented at MFU were inspired by, and stemmed from, the learning philosophy and learning principles of cognitive theories, experiential learning, and social constructivist theories (Piaget, 1974; Dewey, 1938; Kolb, 1984; Vygotsky, 1978) and the three main clusters of learning principles by Kolmos and Graaff (2009): the learning (problem and project-based) approach, the social approach, and the content approach. The practice of learning and teaching based on these learning principles emphasizes the mental (learning) process rather than a product. The mental (learning process) will eventually activate the acquisition of disciplinary knowledge, practical/interpersonal skills, and professional competence. Designing the PBL syllabus and curriculum to be implemented at MFU concerns the acquisition of content (disciplinary) acquisition, cognition acquisition, and social skill acquisition as inspired by the previously mentioned learning principles. The learning principles influence the curriculum designs implemented at MFU is presented in Figure 1.
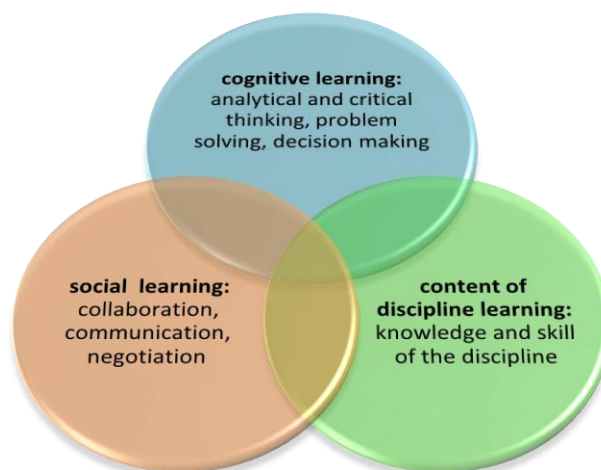
Figure 1: Learning principles influence PBL curriculum and practice at Mae Fah Luang University

It is acknowledged that the focus of the PBL approach to learning is to organize curricular content around problems rather than to organize curricular content based on subjects or disciplines. This does not mean that disciplinary consideration is not taken into account, however (Savin-Baden & Wilkie, 2004). Due to limitations to the curriculum structure of a traditional university (the context of this study) the content of discipline learning cannot be completely excluded; therefore learning principles which influence the design and practice of the study context must incorporate disciplinary learning. Problem formulations in the study context can be performed by either students or teachers and are used as the starting points in leading students to content learning.

In addition to considering learning principles which influence PBL curriculum design and practice in the study context, characteristics of PBL implemented at Mae Fah Luang University also need to be delineated. The term 'PBL', used in an MFU context, derives its characteristics from the problem-based and project organized learning of Aalborg and Roskilde Universities and from some characteristics of curriculum practice defined by Savin-Baden and Major (2004) in which they argue for the diversity and flexibility of PBL. PBL characteristics at McMaster's and Maastricht are studied and compared as sources of the inspiration in developing a PBL syllabus and curriculum for a Thai university. The following table compares and contrasts PBL characteristics of the classic model with the PBL-Aalborg and Roskilde models and with the PBL curriculum practice of Savin-Baden and Major. These

PBL characteristics are the sources of inspiration for developing PBL in the characteristics of EFL interdisciplinary studies which were implemented at MFU.

Problem-based learning of McMaster's and Maastricht	Problem-based and project organized learning (project work) of Aalborg and Roskilde	PBL modes of curriculum practice by Savin-Baden and Major

1. Problems which are in the form of complex and real world situations which have no one correct answer as the core focus and stimulus for learning
 	
2. Problems lead to development of problem-solving capacities
 	
3. Student-centered approach to learning
 	
4. Leaning occurs in small teams where students work together to develop viable solutions to problems
 	
5. Teachers have become facilitators of the student learning process
 	
6.Students acquire new information through self-directed learning
 	
Based on (Barrows and Tambyn, 1980 and Barrows, 1996)
	1. Learning by doing and experiential learning (two major principles) which categorize into these seven principles:
	
	  1.1 Problem orientation
	
	  1.2 Project organization through teams or group work
	
	  1.3 Participant-directed
	
	  1.4 Experience learning
	
	  1.5 Activity-based learning
	
	  1. 6 Interdisciplinary learning
	
	  1.7 Exemplary practice
	
	Based on (Graff & Kolmos, 2003 and 2007)
		1. Students (in teams) engage with one problem at a time and meet 2-3 times with a tutor over the course of each problem. Lecture is used but infrequently.
		
		2. Problem used tends to be discipline-based and used in some areas of the curriculum.
		
		3. The funnel PBL in which PBL is gradually integrated though out 3-4 year programs. Using a cohesive framework where problems are built upon one another.
		
		4. The PBL integrated approach in which the problems are sequential and cross disciplinary boundaries.
		
		Based on selection of eight modes of PBL curriculum practice by (Savin-Baden and Major, 2004)

Integration of problem and project based learning to be implemented at MFU

1. Problem and project themes (open-ended)

2. Small teams, 4-6 students, work together to develop possible solutions/answers to the problems

3. Interdisciplinary content

4. Lecture is selective to accommodate problem themes or project

5. Autonomous/self-directed learning

6. Facilitation by teachers and use of peer coaching

7. Peer and self-assessment is inclusive

8. Final product and report in English

Based on Kolmos, Fink, & Krogh, 2004; Graaff & Kolmos 2007; Savin-Baden & Major, 2004 and Barrows, 1996.

Table 2: Sources of PBL characteristics to inspire characteristics of PBL in EFL interdisciplinary studies

The scheme in Table 1 shows that the PBL characteristics to be used in the MFU context are the result of selection from the three original sources, as presented in the scheme, and can be realistically practiced. The process of selecting PBL characteristics is based on a need analysis and research results that identify the possibilities of implementing PBL at MFU. In addition to the selected characteristics, other necessary characteristics for active learning will be included for the purpose of strengthening the direction of PBL practices at MFU.

Once the PBL characteristics of the study context are identified and addressed so as to accommodate the design process of PBL in EFL interdisciplinary studies, the term "PBL" in the context of this PhD must also be defined. The term "PBL", as used in this research project, springs from a combination of a reflection on and a synthesis of literature which involved learning principles, PBL principles, and modes of PBL curriculum practice. Comprehending and synthesizing these three elements in relation to the term 'PBL', the meaning of the term in this case refers to problem oriented projects and problem oriented case scenarios. The purpose of this is to encourage students to engage with the learning process of enquiry by means of team work to solve problems of the project and case scenarios.

1.6.1 The terms 'problem' and 'project' used in the MFU context

The term 'problem' as used in this study context was inspired by the different definitions and perspectives of PBL scholars. First is the work of Barrett, Cashman, and Moore (2011) in which they define the notion of 'problem' as a starting point for learning which can be a challenge, a dilemma, a story, or a scenario that is open-ended and allowing for a variety of

ways to solve the problem. The second work is by Jonassen and Hung (2008) who articulate problems used in PBL into three different types: decision making, diagnosis-solution, and policy problems, and they further state that the types of problems used in PBL vary from one discipline to another, depending on the nature of the discipline. In accordance with many PBL researchers, Jonassen and Hung (2008) outline general principles of what problems in PBL should involve.

> PBL problems should be open ended, ill structured, however, with a moderate degree of structureness. PBL problems should be complex, challenging, motivating, engaging students' interests, providing opportunities for students to examine the problem from multiple perspectives or disciplines, adapting to students' prior knowledge and cognitive development. Lastly, PBL problems should be authentic which means contextualized to students' future or potential workplaces. (p.16)

Third, Savin-Baden and Major (2004) give an insight into the idea that what counts as a problem in PBL not only relates to the problem design but also involves ways to engage students. Therefore it is essential to consider the balance between discipline knowledge and process skills when designing a problem in PBL. Although this PhD project stemmed from a focus on education development, to serve the institute's needs in solving education problems, gradually the research element strongly influenced the development element. What counts as a problem in this development and research context is presented in the following section. Problem design in the context of this PhD study encompasses different forms of learning drives. The problems as learning drives in this context are in the form of case scenarios, stories, questions, and phenomenon which are incomplete or ill-structured. These problems or learning drives demand further research and investigation in order to derive possible answers or solutions. The problems as learning drives can originate from a concrete/practical channel or from a more abstract, theoretical and hypothetical channel. These problems must function as a link or a connection between academic knowledge and the contextual learning experience. Using problems relevant to learning experiences, so as to trigger their learning process will eventually stimulate a sense of ownership over the learning experience. This sense of ownership occurs when learners perceive that they can aim to solve problems that are relevant to their life and their interests, and elevates their motivation for learning.

The following figure demonstrates the ideal problem formulation used in the context of PBL development and research at Mae Fah Luang University.
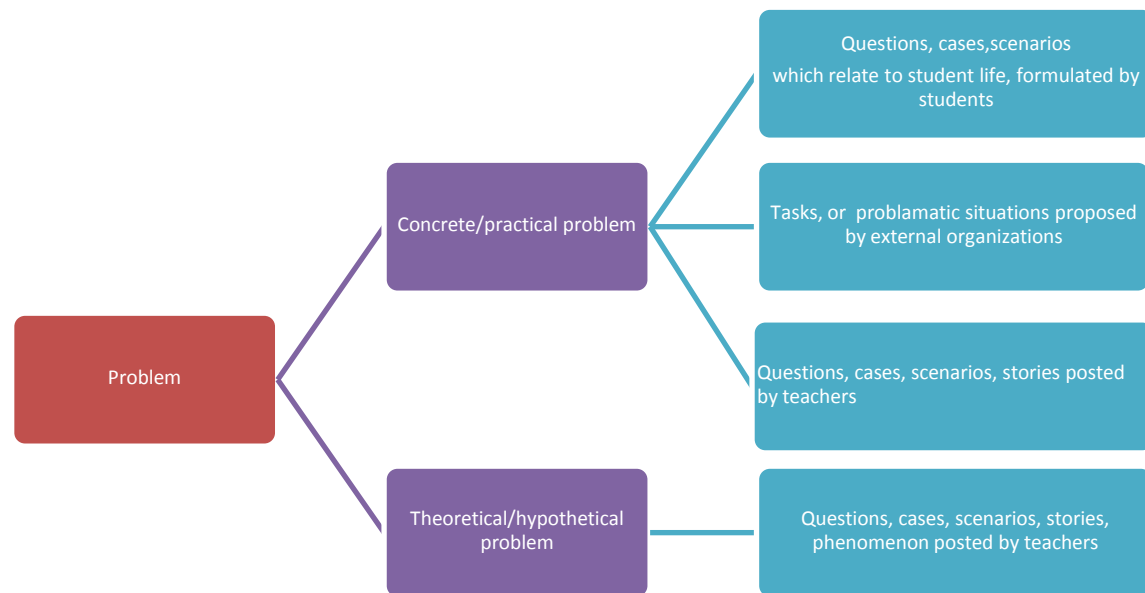
Figure 2: Types of problem and sources of problem formulation used in MFU context

The term 'PBL' used in this PhD study context also involves the terms 'project' and 'case scenario'. Consequently, there is a need to further clarify these two terms. When the term 'project' is used in PBL practice at MFU it involves more than an assignment that students have to perform within a short time period. The team project is emphasized in this study context, and therefore must contain a complex dimension of a problem or case that needs the team's effort and cognition to complete the project. As a result, the term 'project' used in this study is best adapted from "the discipline project" defined by Graaff and Kolmos (2007, p. 5) in which the disciplines and subject area methods are chosen in advance by teachers but students are required to identify, formulate, and analyze the problem within the guidelines of the described disciplines. The term 'case scenario' used in this study is adapted from the term "scenario-based learning" defined by Savin-Baden (2007, p. 16) in which the case scenario represents a realistic problem from a life situation and requires students to work through it.

1.7. Structure of the thesis

This PhD thesis is a combination of a monograph and a series of research papers. The thesis consists of eight chapters, some of which are based on conference and journal papers. These papers are the result of empirical research studies which were conducted throughout the three phases of DBR. What is included in each chapter, and details about it, are as follows.

Chapter One outlines the background, rationale, research questions, and significance of the PhD research project.

Chapter Two summarizes and synthesizes prior and relevant studies and literature considered in the research project. The related literature involves five issues: 1) PBL principles and practices across the subject area, 2) student-centered approaches to EFL education (focusing on CLT), 3) identifying an alignment between the principles of PBL and CLT, 4) PBL curriculum models, and 5) PBL academic staff development as the major element for development when changing to PBL.

Chapter Three presents the overall research design which uses Design-based research (DBR) as a total approach to the PhD research project.

Chapter Four describes the design frameworks of the PBL curriculum for EFL interdisciplinary studies and PBL staff development, which are based on literature review and empirical studies during the planning phase of DBR. This chapter also presents reports of three different empirical studies which were conducted during the preparation phase of DBR to inspire local design and practice of PBL. The first study presents a need analysis and reflections on the benefits and challenges of integrating PBL with a trial case study. The second paper presents a case study exploring PBL practices and their impact within the PBL Aalborg model. The last empirical study identified needs to develop a PBL staff development program as a part of PBL implementation initiative.

Chapter Five describes the way PBL is implemented with an English cohort (3 teachers and 182 students), beginning with a description of the second round of a redesigned PBL syllabus for EFL interdisciplinary study, and further supported by a summary of an empirical study which investigated the impact of the implementation in that context. The case study conducted during this implementation period also investigated the impact of the design and practice of PBL with the English cohort. Chapter Five continues to present and discuss the retrospective analysis phase of DBR used with the PBL implementation and this English cohort.

Chapter Six presents the way PBL is implemented with a cohort in the IT School. The chapter provides a description of PBL design and practice within this context which involves three subjects, three teachers, and 158 students. The result and the impact of PBL implementation within the IT cohort are presented using a triangulated method. The

triangulated information (result) further leads to a retrospective analysis of this case of implementation.

Chapter Seven provides a description of PBL staff training practice which consists of two sessions: a PBL workshop initiative and PBL on-going consultancy. The impact of PBL staff development is also presented through empirical data and its retrospective analysis.

Finally, Chapter Eight draws together the answers to the research questions, which are the result of a series of both theoretical and empirical studies conducted throughout the three year period. The chapter further presents discussions on the issues of accountability and generalizability of the study, the contribution of the study, limitations of the study, reflections on the practices from the developer's perspective, and recommendations for further stud

CHAPTER TWO
LITERATURE REVIEW

The literature review presented in this chapter is devoted to the presentation of the summarized and synthesized prior and relevant studies, and literature about the research project. The major focus of this research project is to extend the current theory and practice of PBL as well as to add new elements EFL learning and interdisciplinary learning, to the development of the PBL mode of practice. This chapter therefore reviews five major related areas of study relevant to the PhD research project.

2.1. PBL literature across subject areas: principles, characteristics, and process

Problem-based learning (PBL) emerged, formally on record, in the 1960s for the purpose of developing a new approach to medical education at McMaster University. The implementation of PBL at McMaster has been well recognized and marked a distinctive feature in problem-solving learning. The early version of PBL at McMaster proposed learning in which problem scenarios were used to engage students in the learning process. The PBL model practiced in medical schools has the following characteristics: 1) complex real world problematic situations used as a starting point to drive content learning; 2) teamwork and collaborative learning in which students are required to work in teams to deal with and find solutions to the problem scenarios; 3) new knowledge is gained through self-directed learning; 4) teachers have become facilitators to student learning; 5) problems from real world situations eventually lead to the development of clinical problem-solving capacities in learners (Servant, 2013; Savin-Baden & Major, 2004; Barrows &Tymblyn, 1980). PBL has quickly expanded across the world since the 1960s in parallel with the development of the Mc Master Model. The initial expansion was within medical schools, such as Maastricht Medical School in the Netherlands, Michigan State University in the USA, and Newcastle University in Australia, as well as in other fields. The expansion of PBL made the concepts of PBL more flexible and diverted, as emphasized by Savin-Baden & Major (2004). The concept of flexibility and diversity in PBL is not new, and was supported by Boud (1985) when he pointed out that PBL differs depending on the discipline and the goals of each program. The development of PBL has sprouted from problem-centered drives for learning which also complies with learner-centeredness approach to learning and teaching. Boud further outlined eights characteristics of PBL which correspond to the concept of flexibility and diversity of PBL: 1) PBL is based on the experience of learners; 2)

PBL encourages and emphasizes that learners must take responsibility for their own learning; 3) PBL encourages cross-disciplinary learning; 4) PBL is a learning approach which intertwines theory and practice; 5) PBL focuses on process rather than the product of knowledge acquisition; 6) Teachers or tutors change roles to be facilitators of student knowledge acquisition; 7) PBL assessment includes and utilizes peer and self-assessment; 8) PBL focuses on the communication and interpersonal skills which students need to acquire in order to share knowledge.

The term 'PBL' emerged during the period of the educational reform of the reform universities in the period 1965-1975 on both the North American and European continents. The term has been used for both problem-based and project-based learning. In northern Europe, PBL was also practiced as a result of educational reform and had somewhat distinctive features from what was practiced at medical schools in North America. The introduction of project work, problem-based learning and project-oriented problem based learning (POPBL) by Roskilde University and Aalborg University in Denmark in the early 1970s was a result of both the educational reform and student revolts in the 1960s (Kolmos & Graaff, 2013). PBL practice at these two institutes was grounded on a broader philosophy of PBL and on the three principles of learning: learning, content, and social element (Graaff & Kolmos, 2007). Kolmos (1996) further explained that the education philosophies of Roskild University and Aalborg University were based on the principle of experience-based learning, which synchronizes the principle of an integration of problem-based learning and project work. The introduction of integrated problem-based learning and project work in the 1970s at these two universities formulated four characteristics of PBL practice: 1) problem orientation and interdisciplinarity; 2) an open curriculum and experience-based learning; 3) basic year and gradual specialization; and 4) project work in study group (Kolmos, 1996, p. 142). Currently, PBL is viewed and understood at two levels, as a pedagogical approach and an educational strategy. PBL principles and characteristics can then be defined through the view as a learner-centered approach to learning and teaching which combines theoretical subject knowledge with practical skills. One of the most prominent features of PBL is using problems as the basis of the starting point of learning and acquiring content knowledge (Barrows, 1984). PBL principle and practice in all forms consequently promotes active learning, meaningful learning, self-directed learning, and lifelong learning, in which learning takes place through real life cases or contexts. PBL learners are required to cope with complex real-world problems, and PBL facilitators are required to use problems to motivate,

encourage, and initiate student learning processes (Amador *et al*, 2006; Poikela & Poikela, 2005; Schwartz *et al.*, 2001).

The theoretical basis of PBL is that "learning is a process in which the learner actively constructs knowledge" (Gijselaers, 1996, p. 13). PBL therefore emphasizes the learning process rather than the product. Whether PBL is viewed as an educational strategy or a pedagogical approach, the ultimate goal is to organize student learning processes in such a way that students are actively engaged in finding answers or solving problems by themselves. Through the PBL process student learning processes are stimulated and progressed by means of small group work. This of course means that PBL also encourages the process of collaborative learning where students are provided with opportunities to learn to work together as a team (Graaff & Kolmos, 2007). The PBL learning process occurs when learners are put into a tutorial group in which they share, facilitate, or even coach each other in what they have learned. In general, the PBL learning process therefore involves the following four steps.

1. Learners, as a team, encounter a problem which they can either formulate as a problem on their own or is presented by the teacher as a problem case. Based on the formulated problem, they identify their learning goals.
2. They then begin independent study by collecting and studying resources.
3. Learners then have team discussions, share learned knowledge, revisit the problem, and may generate a possible solution or additional hypothesis.
4. Learners report, summarize, or integrate what they have learned for their audience.

(Hung, Jonassen, & Liu, 2010; Mathews-Aydinli, 2007)

The four steps of the PBL learning process obviously respond to learning principles of experiential learning and constructivism proposed by Piaget, 1974; Dewey, 1938; Kolb, 1984; Vygotsky, 1978, and Kolmos & Graaff, 2009. Moreover, the PBL process also involves facilitation, sometimes called tutorials, which enrich student learning outcomes, labeled as knowledge, problem solving, self-directed learning, and collaboration (Barrows & Kelson, 1990).

2.2. PBL practice across disciplines and across cultural contexts

PBL has become a prominent approach to learning in medical schools because of the initial efforts and influence of three universities: McMaster, Maastricht, and Newcastle. PBL

practice has spread to higher education institutes around the globe; and the application of PBL has developed and made a mark in many different fields of study. Despite the success of the PBL model practiced within medical schools around the world, it cannot be implemented effectively with all schools and all disciplines. Implementing PBL with different disciplines and in different contexts has been different due to differences of circumstance in the existing curriculums, staff, space, social structure and institute structure. The following section presents PBL practice in diverse cultural contexts.

PBL practice has spread across cultural contexts because of the ongoing demand for educational change worldwide to be more active, meaningful, and relevant to the lives of learners. The majority of the literature associated with PBL implementation describes PBL as an instructional approach rather than as an educational strategy. Since the 1970s PBL has been well accepted and highly successful in its implementation in the fields of science and engineering across Europe, North America, and Australasia. In the 2000s, implementation of PBL spread to the Asian continent and also expanded to humanities fields such as ICT, Business, Language, and Interdisciplinary Studies. Depending on the context, PBL was modified into different formats before its implementation. In Asia, countries such as Hong Kong, Singapore, Japan, and Malaysia have begun to introduce PBL to their classroom contexts. PBL implemented at Asian universities is more likely to be in the form of instructional approach which is implemented within a single subject. For instance, Ng Chin Leong (2009) reported that PBL was adapted and used in a Business English class at a university in Japan. In this case, PBL was used as an instructional approach where students worked on a group project in which the problem was presented by the teacher as a class assignment.

Three universities, Maastricht, Aalborg , and Samford in Alabama in the US are notable for practicing PBL across disciplines. As well as implementing PBL within the fields of science and engineering, these three universities have extended the practice of PBL into the areas of arts and humanities (Savin-Baden & Major, 2004). Kolmos et al. (2007) have described how PBL is practiced across disciplines within three PBL universities. First, at Maastricht University in the Netherlands, PBL was first introduced to the Medical School. The curriculum consists of a thematic block, where the theme is introduced to students by means of problems. In tackling problems, the Seven-Jump approach to PBL was developed as a guide to PBL practice. PBL later spread to seven other faculties. Practicing PBL at each faculty at Maastricht had called for adaptation of the PBL model in order to suit the needs of

each particular field of study. At Aalborg University (AAU) in Denmark, PBL is implemented with all programs in all faculties. The PBL Aalborg model is founded on problem-based project work. The project work is formulated within the framework of the given theme and the theme covers a great variety of problems. The project theme is changed each year and the selected theme comes from a combination of proposals from staff, students, industry, public administration, and other external organizations. PBL practice at AAU varies depending on the program or field study. PBL implementation at Samford University in Birmingham, Alabama, in the US where PBL is incorporated at the course-based level in various undergraduate programs within the Schools of Arts and Science, Business, Education, Nursing, and Pharmacy (Savery, 2006). In order to facilitate PBL practice here, the university established the Center for Teaching and Learning Scholarship (CTLS) which creates guidelines to assist teachers in designing PBL courses and to practice PBL. Teachers can choose their own instruction strategy but must comply with the guidelines outlined by CTLS.

2.3. Student-centered approaches to English as a Foreign Language education (EFL): Emphasizing the Communicative Language Teaching approach (CLT)

Language teaching and learning has moved its paradigm towards student-centered learning. Communication or interaction has been central to the theories and practice of language learning, including EFL, since the 1980s. As a result, the current syllabus/curriculum of language teaching pays attention to the use of the target language. Syllabus types in language education can therefore usually be linked to specific teaching approaches (Richards & Rodgers, 2001).

One of the most prominent, as well as controversial, language teaching approaches is known as Communicative Language Teaching (CLT). CLT has been widely accepted in the language teaching field around the world. It made a mark at the beginning of a major paradigm shift within the language teaching field in the twentieth century. CLT has gone through several phases in order to develop its syllabus to where it is today. According to Breen & Candlin (1980), CLT is a student-centered approach where teachers have two main roles: to facilitate the communication/learning process, and to act as an independent participant within the learning-teaching group. The concept of CLT was introduced in the late 1960s in response to criticisms of the audio-lingual method which inadequately addressed the functional and communicative potential of language. A group of experts in the field then saw that language learning needed to focus on communicative proficiency rather than on mere

mastery of words and sentence structures. David Wilkins was one of the pioneers who proposed the concept of two new designs for organizing the content of language teaching: notional and functional syllabuses. His proposal for these syllabuses was that students should focus on understanding language systems, how they work, and what learners should be able to do with the language. He proposed a functional or communicative definition of language which revised his 1972 document and was called *'Notional Syllabuses'*. The primary focus of this functional-notional approach was on learners and the functions of language. Sensitivity to individual learner needs was a core characteristic of the approach (Wilkins, 1976). The concepts of Wilkins' notional syllabuses later had a significant impact on the development of CLT. In the mid-1970s, the scope of the notional-functional or communicative approach to language teaching and learning expanded. From the late 1970s to the mid-1980s several scholars, such as Savignon, Widdowson, and Piepho, had developed language-teaching syllabuses based on the acquisition of communicative competence from the old concept of the notional syllabuses. They developed what came to be known as the communicative language teaching method (CLT). The primary goal of the learning outcome in language teaching based on the CLT approach is to develop what Hymes (1972) called learner's 'communicative competence' which refers to the ability to use language to effectively communicate in an authentic social context. To be more explicit about what communicative competence is, Canale and Swain (1980) later identified four dimensions of communicative competence:

1. Linguistic or grammatical competence which refers to the ability to understand and use language conventions (grammar), vocabulary and syntax.
2. Sociolinguistic competence which refers to awareness and the ability to use language appropriate to a given context, involving roles of participants, the settings, and the purpose of the interaction.
3. Discourse competence which refers to the ability to recognize different patterns of discourse. Understanding how ideas of the discourse are connected in terms of sentences to an overall theme or topic, pattern of organization, the inference of the meaning of large units of spoken or written texts.
4. Strategic competence which refers to the ability to overcome language gaps and to compensate for imperfect knowledge of linguistics, sociolinguistic, and discourse rules. Be able to maintain the conversation in order to achieve the objective/goal of that particular conversation.

Acquiring communicative competence is the core principle of CLT; consequently, when designing a language syllabus based on CLT principle, the learning outcomes must incorporate communicative competence. CLT is viewed as a learner-centered approach to language teaching which promotes language learning through communication in pairs or small groups, in authentic social environments. The concepts of CLT and acquisition of communicative competence have influenced many other language teaching approaches, such as the Natural Approach, Content-Based Learning (CBT), Cooperative Language Learning (CLL), Competency-Based Language Teaching, and Task-Based Teaching. These approaches to language learning and teaching were developed based on the core principle of CLT, which is that language acquisition happens through the use of language in authentic communicative situations which allow learners to exchange information. The differences between these approaches to language teaching and learning are in the design of learning materials; some focus on contents, some on tasks, and some on activities (Richards & Rodgers, 2001).

2.4. Identifying the synergy between the principles of PBL and a communicative approach to second language learning: Resulting interdisciplinary learning

This section presents common features of learning principles and learning outcomes presented in both problem-based learning (PBL) and the communicative language teaching approach (CLT) to language learning. A general assumption of the characteristics of both PBL and CLT approaches to learning is that they are both viewed as learner-centered approaches which foster active learning principles. Before demonstrating what are considered the common principles and learning outcomes of the two approaches, the core characteristics/principles of PBL and CLT are presented. First, a summary of the ten core principles of the current CLT approach to language learning proposed by Richards (2006) is presented:

1. Language learning occurs when learners are engaged in interaction and meaningful communication;
2. Learning materials, tasks, and exercises must provide opportunities for learners to negotiate meaning, expand their language resources, notice how language is used, and take part in meaningful interpersonal exchange;
3. Meaningful communication results from learners processing content that is relevant, purposeful, interesting, and engaging;
4. Communication is a holistic process that often calls for the use of several language skills or modalities;

5. Language learning is facilitated both by activities that involve inductive or discovery learning of the underlying rules of language use and organization, as well as language analysis and reflection;

6. Language learning is a gradual process that involves creative use of language which involves trial and error. Despite errors in learning products, the ultimate goal of learning is to be able to use the target language both accurately and fluently;

7. Learners develop their own paths to language learning, progress at different rates, and have different needs and motivations for language learning;

8. Successful language learning involves the use of effective learning and communication strategies;

9. The role of the teacher in the language classroom is that of a facilitator, who creates a classroom climate conducive to language learning and provides opportunities for students to use and practice the language and to reflect on language use and language learning; and

10. The classroom is a community where students learn through collaboration and sharing.

Second, the core characteristics of PBL practiced at McMaster and Maastricht and at Aalborg and Roskilde are compared in order to identify some common characteristics between PBL principles and CLT principles. The characteristics of PBL based on these two presented models are used as the basis for designing the PBL modes of practice to be implemented in the study context (MFU). The following table presents PBL characteristics of the PBL practiced at McMaster and Maastricht and at Aalborg and Roskilde

PBL characteristics cover traditional PBL model practices at McMaster and Maastricht	PBL characteristics cover both PBL traditional models and the project models practiced at Aalborg and Roskilde
1. Learning is student-centered; 2. Learning occurs in small student groups (5-8 members according to the early PBL model practiced in medical schools); 3. Teachers are facilitators or guides 4. Problems form the organizing focus and stimulus for learning; 5. Problems are vehicles for the development of (clinical) problem-solving skills; and 6. New information/knowledge is acquired through self-directed learning	1. The problem is the starting point of the learning process; 2. Problem formulation/statement is based on the participant directed learning process or self-directed learning; 3. Experience learning is an implicit part of the participant-directed learning process; 4. Activity-based learning is a central part of the PBL learning process; 5. Interdisciplinary learning relates to problem orientation and participant-directed processes; 6. Exemplary practice; 7. Group-based learning.
Barrows & Tambyn, (1980) and Barrows (1996)	Graaff & Kolmos (2003)

Table 3: Characteristics of PBL implemented at McMaster, Roskilde, and Aalborg Universities

The common features of PBL and CLT are delineated by the researcher, drawing on the characteristics of PBL defined by Graff and Kolmos (2003), Barrows & Tambyn, (1980), and Barrows (1996) and then comparing them with the ten core principles of the current CLT approach to language learning defined by Richards (2006). The next figure, Figure 3, demonstrates the common features of the two approaches delineated, and further demonstrates how the principles and learning outcomes of the two approaches to learning, PBL and CLT, are aligned.
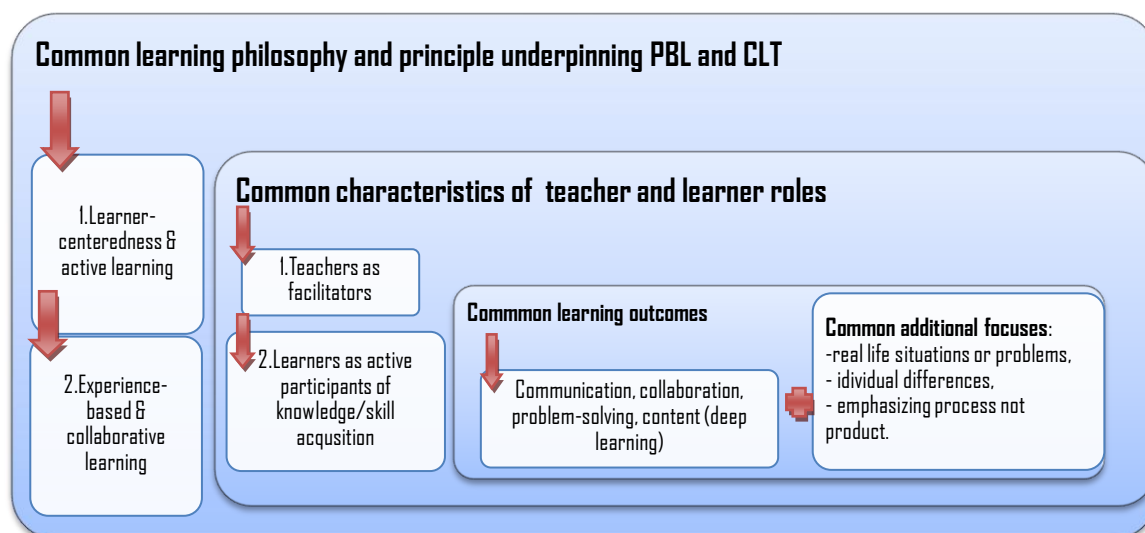
Figure 3: Common features of PBL and CLT based on the researcher's view

Based on the common features of the two approaches proposed by the researcher, it can be concluded that the learning philosophy and principle of PBL and CLT is learner-centeredness, where active learning is fostered. Active learning underpins the characteristics of PBL and CLT, requires a change in the roles of both teachers and learners to create a learning environment which aims to produce lifelong learners who are well equipped with professional competences.

Experience-based and collaborative learning are required in order to activate active learning dynamics. There is a change of roles for both teachers and learners. Both PBL and CLT minimize the role of 'the sage on the stage' of teachers. On the contrary, teachers have become facilitators of the knowledge and skills acquisition of learners; and they have also become learners in some situations. As for learner roles, they are no longer passive receivers of lecture delivery. They are becoming active participants of knowledge and skill construction. They will learn content by doing and solving problems from real life scenarios in pairs or in teams. Through this strategy they will learn a great deal from each other through information sharing or peer-teaching. It can also be seen that PBL and CLT share some common learning outcomes, in addition to content learning. Even though the two approaches label the intended learning outcomes differently, they obviously mean or refer to the same things. Table 4 demonstrates the common learning outcomes desired by PBL and CLT.

PBL learning outcomes		CLT learning outcomes
Communication skills	⬌	Discourse competence+ sociolinguistic competence
Collaboration skills	⬌	Discourse competence +strategic competence
Problem-solving skills	⬌	Strategic competence+ discourse competence+ sociolinguistic competence

Table 4: Common learning outcomes of PBL and CLT

Evidence from implementing PBL in a language classroom can be elicited from Mathews-Aydinli (2007) and Larsson (2001) who point out that PBL can promote meaningful interaction and autonomous learning in the second language classroom due to integrating real-world problems or issues with language learning. There have been some attempts to implement PBL into the syllabus or curriculum in the field of English as Foreign Language (EFL)its, however, PBL implementation in the field of language education appears to be at the instructional level, as a teaching approach, and PBL is mainly used within single courses, not for the whole curriculum. For instance, Othman and Shah (2007) described how PBL was implemented with a stylistics class which aimed to develop language skills and enhance

critical thinking skills. They concluded that the results showed improvements in student reading skills in the PBL group.

2.5. PBL curriculum models: A variety of PBL models in theory and practice

Concepts of PBL are popularly integrated and implemented into various types of classrooms and disciplines because it promises to produce the targeted learning outcomes which promote in depth content learning, increase problem-solving skills, and increase self-directed learning abilities (Hmelo-Silver, 2004). Since the implementation of PBL spread to different disciplines on different levels, a variety of PBL models and practices has also emerged. PBL scholars have acknowledged the emergence of a flexibility of PBL practice. For instance, Savin-Baden and Major (2004) point out that the current PBL curricular practice is too complex to be put into only one or two models (traditional and hybrid). Boud (1985) supports this, as he states that the classic PBL model cannot be applied to all disciplines and contexts, but the development of PBL should account for diversity which has sprouted from problem-centered drives in learning. The definition of PBL in Boud's opinion therefore depends on the discipline and the goals of each program.

At present, PBL is used at 2 levels: as an instructional strategy (at course/subject level) and an educational strategy (at program or institution level). Most tend to see that there are two basic PBL curriculum types: a traditional model and a hybrid model, and most models practicing outside the medical field tend to be classified as the hybrid model. From the viewpoint of seeing PBL as a curriculum model(s), Savin-Baden and Major (2004) believe that the current PBL curricular practice is more complex than seen in only two models. They therefore divided PBL curricular practice into eight PBL curriculum modes, of which these curricula represent a three year program.

1) Single module approach which is often implemented in a one year program. This module is adopted the practice of the McMaster model in which students engage with one problem at a time and meet with the tutor 2-3 times over the course of each problem;

2) Problem-based learning on a shoestring approach, which involves a few tutors and is approved by the head of the program deciding that PBL can be used in some areas of the curriculum. This module appears to be subject or discipline based and scattered throughout the program;

3) The funnel approach which requires initiation from the curriculum design team or head of the department. This module starts on a lecture-basis in the early years and then gradually incorporates problem-solving learning in later years;

4) The foundational approach, which is similar to the funnel approach but places more emphasis on providing knowledge to students first, in the form of lectures, tutorials, and laboratories, whether in content of the subject or in the concepts of PBL and problem-solving;

5) The two-strand approach is designed to compromise and run simultaneously with the other learning methods. This module can be confusing to students because the taught content of one subject rarely applies to practice, so they may find it hard to understand how these approaches are related to one another;

6) Patchwork problem-based learning approach which requires students to take 2-3 problems which are not necessary related at the same time from different subject areas. This module therefore creates confusion and difficulty for students when handling the extra workload from different subjects;

7) The integrated approach in which PBL is implemented as a whole curriculum philosophy. This module design is based on the McMaster model and all the problems are cross-disciplinary, sequential, and linked to one another, however, the assessment of this module is not necessary reflected in PBL principles because multiple choice exams are still used to assess student learning;

8) The complexity model which embraces knowledge, action, and self awareness into curriculum organizing principles. These three domains do not necessarily have the same weight and they may be integrated or held separately depending on the nature of each curriculum or discipline (based on Savin-Baden and Major, 2004).

It can be summarized that a variety of PBL models and practice have been supported and accepted among PBL scholars for the objectives of learning diversity of different disciplines.

2.6. PBL curriculum design

The PBL curriculum reflects the constructivist theory where the core idea is that learning is an active process. Learners are expected to construct knowledge for themselves and actively participate in the learning process by taking an active role in setting learning goals, and monitoring and evaluating their own learning (Savin-Baden 2004). Elements that curriculum developers should take into consideration when designing a PBL curriculum or

syllabus will be discussed in this section. According to McKimm (2007) curriculum development can be viewed from two philosophical approaches: 1) the objective model, which is considered a very systematic approach and focuses on what students should be able to do after studying the program; 2) the process model which highlights the process of learning and that learning occurs through experience and through the dynamics of group process. According to Harsona (2013) a prescriptive curriculum generally consists of four elements: objective, content, teaching and learning strategy, and assessment/evaluation. It is important to be certain that these four elements are aligned when designing a new curriculum. Harsona recommends that the first objective must be formulated or determined and after that the other elements of the curriculum can be articulated, based on the objective. When an institute makes a decision that PBL will be used as a total approach to education, Barrett recommends that a PBL initiative should start by considering the four components of PBL: the philosophical principles underpinning of PBL, PBL curriculum design, PBL tutorials, and PBL compatible assessments.

In designing a PBL curriculum or redesigning the existing curriculum into a PBL format, the design should be behaviorally focused, or what is called process model curriculum development. Savin-Baden (2003) suggests that when designing a PBL curriculum, it is important to keep in mind the question of what exactly we want our students to learn. This will help in designing the framework for the learning intensions and problem scenarios. Developing a PBL curriculum is also about encroaching on the roles and responsibilities of both students and teachers. Schunk (2009) further explains that the teacher's role in PBL is to structure situations in a way that allows learners to become actively involved in the learning process. According to Conway and Little (2000) PBL curriculum development needs to articulate and emphasize these four elements:

1. Selection of content from practice,
2. Process as content,
3. Concepts as the organizing structure of the curriculum,
4. Graduate learning outcomes, not subject-based outcomes.

As well as an alignment of these four curriculum elements, Savin-Baden and Major (2004) further emphasize that a PBL curriculum also requires developers to be sensitive to the cultural and the institutional dimensions. What does it mean to align all elements of curriculum when changing to PBL? Graaff and Kolmos (2003) deliberate the didactic principles of PBL, in that when changing to PBL if one element of the curriculum is changed, the other elements must be changed as well. For instance, it is not enough to simply change

the program format or the objective, or change only the material selections, the change must align learning and teaching methods and forms of assessment with the two changed elements as well.

As mentioned earlier, curriculum objectives or the expected learning outcomes can be the starting point to determine the other curriculum elements, the focus of this section is therefore to elaborate on what constitutes learning outcomes of PBL curriculum. Originally Barrows and Tamblyn (1980) set forth the learning outcomes from PBL organized studies focused on problem-solving skills and self-directed learning abilities among medical students. A review by Hung, Jonassen, & Lui (2010) of PBL research from the past 30 years examined the effectiveness of PBL in terms of student learning outcomes. They pointed out that several research papers have claimed PBL students gain long term retention of knowledge, problem-solving skills which transfer to workplaces, higher order thinking, self-directed and life-long learning skills, positive self-perception and confidence. A study of PBL and language learning by Larsson (2001) also claimed that PBL helps language learners improve their communicative skills and gain a deep sense of understanding of language usage. Furthermore, a study by Simone (2008) reveals that teachers who are trained and practice PBL exhibit the ability to define problems, generate solutions, and teach/work collaboratively. Therefore, it can be concluded that the objective of the PBL curriculum, as well as the expected learning outcomes of the PBL organized study, are quite different from those of the traditional curriculum. Even within the PBL models and practice, PBL is also known for its varieties in order to respond to the diverse learning outcomes.

2.7. PBL academic staff development

One of the hidden objectives of the research project is to initiate an educational intervention by implementing PBL. Though my major role is a researcher in the PhD study, I must also consider the roles of a developer and a change agent if I wish to see the fruit of the implementation. Consequently, staff development has become one of the major elements of my PhD research project, to be studied, developed and researched. As PBL implementation in this study context will eventually lead to a change process in the institute, staff development cannot be neglected. Reviewing the literature on PBL academic staff development is therefore necessary in the context of this study.

Staff development is essential for higher education institutes in general as it is considered the major channel for increasing the quality of the teaching and learning of an institute. In

order to better student learning outcomes, academic staff must continually develop effective educational practices. When organizing professional or staff development personal development, classroom instruction, curriculum organization, organizational development, assessment, and technology use must all be considered (Saroyan & Freynay, 2010). The importance of staff development also applies to PBL organized study. Savin-Baden and Murray (2000) state that in the field of PBL, staff development is perceived as the key to success in PBL implementation. Implementing PBL at any level involves changes to all aspects of the education paradigm. Handling these changes calls first for training academic staff as change agents. Becoming a PBL teacher involves complex teaching competencies which including knowledge, skills, awareness, engagement, and personal commitment; the teacher must therefore understand how to take on new roles in their teaching practice (Kolmos *et al.*, 2008). What can be done in relation to PBL staff development then? Kolmos *et al.* (2008) also point out that PBL staff development can be done in various forms, through workshops, short courses, seminars, and long term pedagogical training programs; however they all have shared the same goal, which is to assist individual lecturers acquire complex teaching competences which involve knowledge, skills, engagement and personal commitment. This section presents viewpoints with examples of how PBL staff development is essential to the success of PBL implementation. The universities that are well known for implementing PBL all recognize the importance of PBL to staff development. A short summary of PBL staff development in those universities follows.

At McMaster, the facilitators' role is viewed as highly important for PBL development and self-directed learning. Facilitators' needs are therefore identified in order to provide ongoing support and training. Saarinen-Rahiika and Binkley (1997) describe the PBL staff development program in the Physical Therapist Faculty at McMaster as involving workshops, independent reading, and faculty discussion, as well as pairing inexperienced and experienced tutors for training. In addition to those activities, meeting with the unit chair regularly to discuss unit objectives and receiving evaluations from students are important sources of tutoring skills development. PBL staff training has been compulsory for staff at the Medical School at Maastricht University since 1982. The training program is a mixture between pre-service and in-service activities in order to prepare and equip teachers for the PBL environment. Workshops and seminars are provided as platforms to shape new learning and teaching behavior. During the workshop sessions, new faculty members confront different scenarios of expectations about teaching and learning, so in coping with the

scenarios they experience PBL in action as learners and facilitators at the same time (Bouhuijs, 2011). At Aalborg University, PBL workshops which train faculty members to be adequately prepared to supervise students in the PBL environment are embedded in a professional development program for assistant professors. New assistant professors are required to attend this program which comprises a series of workshops to help sharpen their teaching skills and competences. This program is mandatory and constitutes a workload of approximately 175 working hours within 15 months or 3 semesters (Krogh 2010). PBL faculty development in Australia has been documented by Brodie and Jolly (2010); they report that a PBL staff training program at the University of Southern Queensland is offered through a one day workshop and online up-to-date library of reference works. Similarly, Aldred (2003) describes the PBL faculty development program at Central Queensland University (CQU) as comprising faculty-based seminars and workshops and web-based or online courses for academic staff. Dalrymple *et al.* (2006) explain that when major pedagogical or curricular change takes place at a US university, there is really a need for the institution to embark on faculty development for better understanding of teaching and learning associated with the change. They explain that when the University of Southern California School of Dentistry (USCSD) went through two major curricular reforms in initiating PBL in the dental curriculum (D.D.S) in 1995 as a small pilot program, and in the entire school in 2001, both required the initiation of faculty development programs. Especially in the 2001 curricular change, the PBL faculty development program "was identified as a component in the school's Strategic Plan for education and Learning" (p. 949). In order to maintain the implementation of PBL school-wide, USCSD emphasized the importance of PBL faculty development by establishing a subcommittee of Faculty Development, Mentoring, and Evaluation (FDME). The PBL faculty development program is run under the subcommittee of FDME. The program also comprises a series of sequential workshops called the PBL core skills workshops. The sequent of running the workshops is as follows: 1) the PBL process workshop; 2) the facilitation of learning workshop; 3) the assessment and feedback workshop; and 4) the PBL in the clinical environment workshop. Participants of the workshops have an opportunity to do role-playing with subsequent criteria-based feedback from the entire workshop group. In addition to the workshops, short introductory seminars and scenario-based discussions are used as the follow-up activities.

2.8. Summary

This chapter gives a summary and synthesis of literatures related to the PhD research project which considers five major issues:

1. PBL principles, PBL characteristics, and PBL process across subject areas;
2. Student-centered approaches to EFL education which emphasize the Communicative Language Teaching approach (CLT);
3. Identifying an alignment between the principles of PBL and the communicative approach to second language learning which result in interdisciplinary learning;
4. A variety of PBL curriculum models which emphasize how the principles of diversity and flexibility of PBL practice influence PBL curriculum design for a particular local context; and
5. Emphasizing the importance of PBL academic staff development when changing to PBL.

Based on these five major topics, the study focuses on two major elements related to PBL implementation: PBL curriculum development and PBL staff development. In order to contribute new aspects and dimensions of PBL practices across cultural contexts, this study has extended its research scope to include two more educational areas for integration and study. The two areas are the development of teaching and learning English as a Foreign Language, and interdisciplinary learning. Due to the study context in which English is used as a medium of instruction, the design and practice of PBL, integrated with English language learning, aims to enhance interdisciplinary learning (discipline knowledge + English skills + practical skills fostered by PBL).

CHAPTER THREE
METHODOLOGY

The overall PhD project is in the form of design-based research (DBR) which involves the whole process of planning and designing, implementing, and evaluating the PBL curriculum and the PBL staff development program at a Thai university: Mae Fah Luang University. Because the research project strongly involves design elements of a syllabus and a curriculum, it is considered appropriate to use DBR as the whole approach to the study of this PhD project. DBR is also considered a mixed method research approach by nature and also addresses the issues, and links the theory and practice in educational research which are required for this research project. The core principle of DBR is described by Wang and Hannafin (2005) as follows.

> A systematic but flexible research methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real world settings, and leading to contextually-sensitive design principles and theories. (p.6)

DBR also plays a crucial role in innovative curriculum or syllabus design. For instance, some cases designing a Problem-Based Learning (PBL) curriculum, which requires consideration and alignment of curriculum elements (Stojcevski and Du, 2009), also use DBR as a research methodology in developing the curriculum. Before getting into the details of other elements of research methods used with this PhD research project, it is necessary to first introduce DBR and discuss why DBR is a proper research methodology for this study.

3.1. Roles of DBR and its strengths in education research

Education research has encountered severe criticism regarding the limited weight and impact of its findings on education practice (The Design-Based Research Collective, 2003). Results of educational studies are often irrelevant to actual education problems and everyday practices. Further criticism has been made that the results of educational research are just common sense for those with experience in educational settings (Dede, 2005). Consequently, the emergence of DBR in the early nineties changed the education research paradigm. DBR aims to make a significant difference in improving the quality of research results and consequently impacts the utilization of education research. It is expected that the utilization of education research via DBR will eventually reinforce the improvement of educational

practices (Anderson & Shattuck, 2012). DBR also emphasizes the need for theory building and the development of design principles as guidelines to improve both research and practice in educational contexts (The Design-Based Research Collective, 2003).

The Design-Based Research Collective (2003) suggests that DBR is a coherent methodology of education research because DBR can bridge theoretical research and educational practice. It is further believed that DBR is able to create and extend knowledge about developing, enacting, and sustaining the educational intervention and innovative learning environments. DBR is therefore an emerging education research paradigm to study learning and teaching in context through systematic designs, as well as to study instructional strategies and tools. Wang and Hannafin (2005) identify five characteristics of DBR: that it is pragmatic grounded in theory, interactive and flexible, integrative, and contextual. Although DBR has emerged recently, first proposed by Brown (1992) and Collins (1992), it has developed into a valuable research methodology for education research because the ultimate goal of DBR is "to make learning research more relevant for the classroom practices" (Reimann, 2011, p. 37). Steps in conducting DBR involve: 1) addressing theories of learning; 2) identifying constraints and needs of the local context; 3) constructing cumulative design knowledge and designed artifacts; 4) enacting interactions in local practice; and 5) reflecting on and evaluating the produced designs. These five steps eventually aim beyond designing and exploring intervention designs, to further enhancing effective learning in educational settings and generating usable knowledge about educational practice (The Design-based Research Collective, 2003). The obvious expected outcome of DBR is a design solution, which in this case may be a program outline and action plan, and a handbook of guidelines for PBL practitioners of the particular model(s), syllabus, lessons, and activities.

3.2. Challenges of using DBR as a research methodology and being DBR researchers

DBR is considered relatively new as a research paradigm, and therefore challenges and criticisms in terms of validity, reliability, generalizability, objectivity, and its impact on real education setting are unavoidable. Another concern about conducting DBR is the issue of maintaining a productive collaborative partnership between researchers and participants throughout the research process. The DBR process can take many years, beginning with identifying the needs of intervention in a local context, multiple designs of interventions, enactment of the designs, and assessments and reflections on the designs, so gaining long-term commitments from researchers, designers, and participants is highly challenging.

3.2.1. Challenges of DBR in terms of validity, reliability, and generalizability

Validity, reliability, and generalizability are the foundations of the traditional criteria for ensuring the creditability of research data and its analysis. Traditional researchers value statistical validation, which is defined as measurable effect sizes, as much as they value reliability which accounts for the consistency of the measurements. Even though DBR is considered a mixed method in its nature, for some traditional researchers there is a challenge in how to make DBR a scalable methodology. DBR is perceived as relying more on techniques used in qualitative methods, such as observation and interviews, and so the strategy of measuring and interpreting validity and reliability does not sit well with traditional research which favors quantitative methods. In terms of generalizability, it has been pointed out that DBR deals with a particular education context, and consequently, generalizing its results and effects is questionable. DBR researchers must be able to defend how study in a particular context can be generalized to a global scale. This is a challenge and a delicate issue for DBR researchers who should make an explicit stand in defending their research paradigm.

3.2.2. Challenges in terms of objectivity and bias of DBR researchers

In the process of educational intervention, education researchers, including DBR researchers, are often involved in the conceptualization and development of designs, implementations and interactions with other participants; consequently, an issue of concern is how these researchers assure their objectivity and are able to remove or minimize their bias from the research process. This is a challenging issue that I have always been aware of; consequently, as the researcher, I make sure that data obtained throughout the study must come from a variety of sources.

3.2.3. Challenges in terms of DBR's results and impacts on real education setting

It is a huge challenge for DBR to achieve ambitious dual goals in serving local values of educational innovation and to develop and to fulfill globally useable knowledge for the field. Riemann (2011) pointed out that while DBR claims that it has brought learning research closer to classroom practice, it is an unclear whether the results of DBR ever make any impact at the level of policy enactment.

3.2.4. Arguments about how challenges of conducting DBR can be dealt with

Design-based research has become recognized and accepted as a practical research methodology because it bridges various theoretical learning perspectives and empirical studies to engineer and sustain complex educational interventions in everyday settings (Bell,

2004). Despite some criticisms, DBR assures the issues of validity and reliability by using triangulation of data from multiple sources. DBR researchers are obliged to demonstrate an alignment between theory, design, practice, and measurement in order to argue for the validity and reliability of DBR. At first, action research was considered an alternative research methodology for this research project because its characteristics and process serve most objectives of this research project. However, once the researcher looked more deeply into other educational research methodologies, it was discovered that DBR, which resembles action research, was more suitable for this research project. O'Brien (2001) points out that the distinction between DBR and action research is that in action research the practitioners usually initiate the research process while the researcher comes to help facilitate the process; but in DBR the researcher is usually the designer and takes the initiative in the research process. According to the circumstance of this research project, the researcher acted as the designer of the educational intervention and also takes the initiative in the research process. This research project therefore requires the utilization of DBR over action research. Another criticism that DBR must deal with is the criticism of subjectivity, and potential bias of DBR researchers because they are heavily involved in both design and research processes. Anderson and Shttuck (2012) see the direct involvement in a different light as they argue that the involvement and commitment of the researchers throughout the process yields a deep understanding of the context and consequently contributes to valuable insights. This inside knowledge or insight can also be used as a very valuable research tool.

3.3. Phases of DBR

Brown (1992) and Collins (1992) are acknowledged as the pioneers of making DBR known as a research methodology. They described DBR as a research methodology that requires: addressing problems or needs for the educational intervention of the actual studied context; establishing a committed collaboration with local practitioners and participants; integrating known learning theory and design principles with new plausible design solutions; implementing plausible design solutions; and reflecting and redefining design principles. DBR can require substantial time commitment from both researchers and participants. DBR researchers suggest that the lengthy time for conducting DBR can be divided in to three or four phases. Cobb and Gravemeijer (2008) suggest three phases in conducting design experiments for educational settings: preparation, experimentation, and retrospective analysis. Each phase comprises activities for conducting a design experiment, as per details in the following figure.
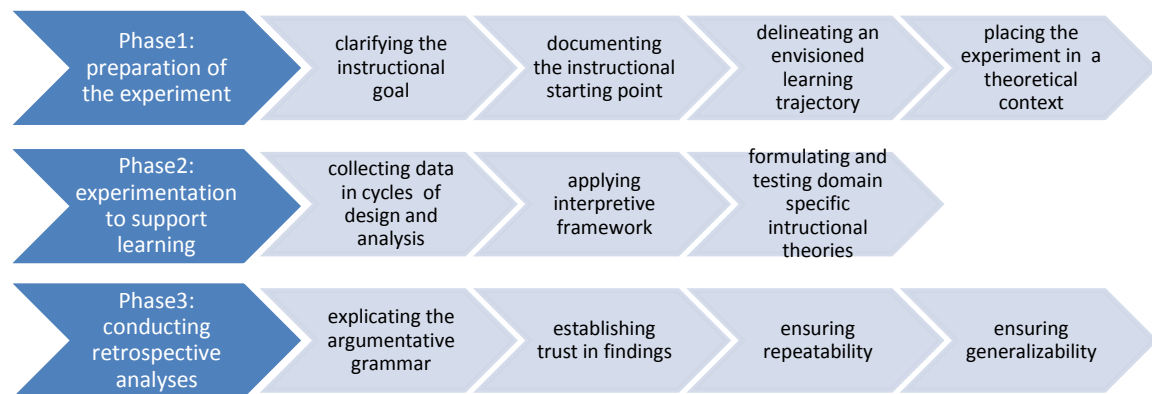
Figure 4: Phases of design experiment by Cobb and Gravemeijer (2008)

Reeves (2006) proposes four phases of DBR to be used as guidelines in conducting DBR; especially, for PhD students who wish to use DBR as a research methodology for their PhD project. Details of activities and descriptions of each phase are presented in the figure below.
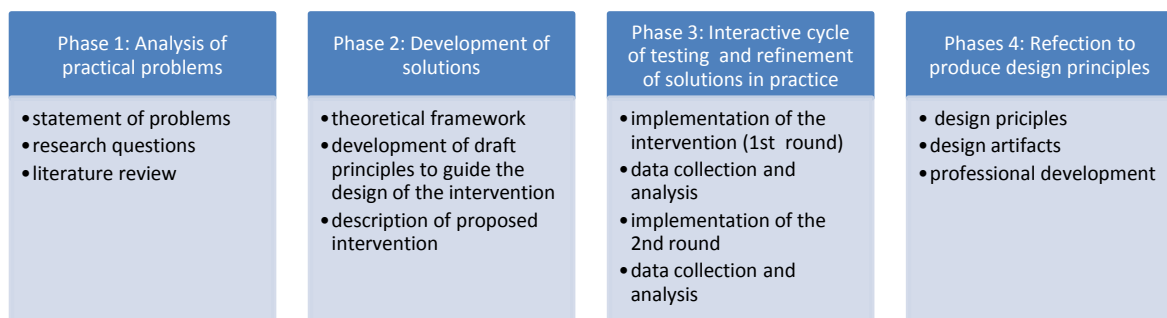
Figure 5: Phases of DBR proposed by Reeves (2006)

The decision to develop the framework of DBR phases in this PhD research project was based on first studying and comparing the existing literature about DBR phases. In the process of synthesizing the existing literature, the descriptions of DBR phases and the parameters of each phase characterized by Cobb and Gravemeijer (2008) and Reeves (2006) were the most appealing to the needs of research protocol of this PhD research project. Based on the frameworks of these scholars, combined with an analysis of needs in addressing problems for interventions in the studied context, the researcher has derived a modified framework of DBR phases in approaching the PhD project. The three major phases of DBR remain the same as the phrases defined by Cobb and Gravemeijer (2008), but the parameters

of each phase were redefined based on both Reeves (2006) and Cobb & Gravemeijer (2008), and as based on the needs of the context of the study. A more suitable framework of DBR phases and the parameters of each phase used in guiding the PhD research project are presented in the following figure.

Phase 1: The preparation phase of DBR + conceptual framework design

- Identifying local needs and possibilities of the interventions : a preliminary case study at the local context, empirical study
- Studying the existing PBL model and its effects theoretically and empirically in the form of a case study of the original model context, and interviewing experts.
- Output: design framework (theory) of programs for the local context, a handbook of practice, and a master plan in establishing a community of practice

Phase 2: The implementation phase of DBR comprises redesigning negotiated curriculum + practice + data collection

- Enactment of PBL staff training workshop and consultancy for practitioners
- Redesigning the negotiated curriculum designs +enactment of the two modes of PBL practice in the local context (conducting case studies)

Phase 3: Retrospective analysis: findings, analyses, and reflections

- Questionnaire and relection notes to assess the success rate of the workshops
- Triangulated data and results of actual practice of students and teachers to assess the first cycle of the implementation of the designs in the local context
- Reflection and redesign of the second cycle of practice (limitations of the study and designs and further recommendations)

Figure 6: Modified DBR phases and activities/parameters of each phase used in approaching the PhD research project

3.4. Parameters of the preparation phase of DBR and its importance

The preparation phase of DBR can take quite a substantial amount of time and effort in order to achieve suitable designs for the local context. The PBL design of the Thai context involves the integration of PBL and English as a Foreign Language (EFL), and interdisciplinary learning. The ideal curriculum design consists of three modes of practice: single subject, multiple subjects, and the semester mode.

The designs for the Thai context aim to empower both teachers and students to acquire learning experiences which stimulate application of knowledge and skills to their novel learning situations. In this study/design context, the English language is used as the medium of instruction, which suggests that PBL could be used as an education strategy aiming to enhance the application of the knowledge and skills of the disciplines and the English proficiency of students at the same time. In order to begin the design process, the constraints and possibilities of implementing PBL in a Thai university context first need to be identified.

They are divided into five categories. Details of the identified constraints and possibilities, and the parameters used within the preparation phase of this PhD project are as follows.

3.4.1 Constraints and possibilities in terms of Motivation in the Thai context

The constraints and possibilities of motivation in the Thai context involve motivation of teachers, motivation of students, and motivation of executive managers. Motivation amongst some executive managers and teachers for using PBL to enhance values and qualities of active learning is currently limited. Due to much greater workloads and commitment in terms of time spent on the facilitation of practicum sessions, as compared to the traditional approach, teachers may feel ambivalent about stepping out of their comfort zones if there is no concrete support from executive managers. There is a good possibility to implement PBL as a total approach to education at Mae Fah Luang University (MFU). The executive managers hope that using PBL will improve the quality of the graduates in order to serve the needs of global employers and will consequently promote the university's academic standard. As for the motivation of both teachers and students, some have tried PBL at a course level since 2009 and the result in general was that most teachers and students had a very positive attitude toward PBL approach, even though they had confronted some difficulties in their practice.

3.4.2. Constraints and possibilities in terms of the cultural dimension or values towards Thai education.

Based on the score of cultural value dimensions proposed by the Hofsted Centre (n.d.), the PDI index of Thailand = 57 which means that Thai values and culture accepts inequalities of power distance in their society and information flow is hierarchical and controlled. Prpic and Kanjanapanyakom (n.d.) further point out that the culture of Thai schools and universities is very teacher-centered. Teachers are viewed as experts in content and have all the answers. Consequently, it can be considered that most Thai people see a teacher as an authority figure. A good student in the Thai's view is quiet, respectful, and loyal to the teacher. A good Thai student does not ask questions in class that may cause the teacher to lose face. Therefore, having confrontations, disagreements, arguments or even questioning teachers is not acceptable in the context of Thai classrooms.

Thai students in general are perceived as passive learners; consequently, the classroom environment is perceived as passive as well. The stereotype of a good classroom in the Thai context is that it is quiet and students are obedient, quiet, and maintain high grades. In

general, the Thai education system, the structure of curricula and subjects, appears to be more important than the practice and its content. Student-centered learning methods have been encouraged within the Thai education system; nevertheless, teacher-centered and a lecture-based teaching approach still dominates in practice. Although the values of a traditional hierarchy education are rooted amongst Thai students and teachers in general, the university (MFU) in which PBL will be implemented encourages active learning. MFU is a new university and is in the stage of building its academic standard; therefore, emphasizing and supporting an active learning environment through implementing PBL is a viable alternative. In principle, PBL implementation is supported by top managers at MFU, but in the actual practice of PBL in this context there is a need to improve the competence of academic staff and the support system, especially the workloads of staff, to maintain the implementation of PBL.

3.4.3. Constraints and possibilities in terms of curriculum and course structure

This issue involves educational objectives, content, teaching methods, assessment and allocated time. Current curricula in the Thai context can be seen as fragmented and disciplinary-oriented which means each subject is taught separately. In some semesters the contents of those single subjects are not relevant, and sometimes they overlap. A lecture-based teaching approach still dominates in most classes. Summative evaluation and letter grades appear to be the measuring sticks of learners' success. Such a content, teaching method and assessment approach obviously encourage rote learning. The emphasis of rote learning can result very little or no application of knowledge. In the study context (MFU), despite constraints in some elements of the curricula, trusted lecturers do have some flexibility in adjusting or modifying the elements of the curricula in practice on the semester basis. There is also a slim possibility of formally adjusting the whole syllabus and curriculum to PBL once the curriculum finishes its term (4 years) when it is required that the curriculum be revised for the next four years of use.

3.4.4. Constraints and possibilities in terms of the administrative system

In this Thai context, the administrative system and registration system are designed to accommodate a traditional learning environment. Importance is given to lecture time; rooms and time slots for lecture periods are assigned by the registrar division and the departments. When implementing PBL, lecture-time allocation for each subject will be reorganized to have a positive effect on the space allocation. If the PBL implementation is done at the subject level, there will be no need to involve the registrar division and this has been done in this

context with no problem. In contrast, if the PBL implementation involves many subjects and many teachers, it is necessary to collaborate with the registrar division. In the MFU context, reorganizing the registration system for the PBL cohort is possible, but the organizer needs to have sufficient time for planning and managing the system. The number of subjects integrated affects how much change needs to be made to the registration system. If the change requires the involvement of the registrar division, the plan of change must at least be formally presented to the faculty committee or to the university committee for approval.

3.4.5. Constraints and possibilities in terms of resources and facilities

This issue includes staff, materials, space, and finance. The practice of PBL is relatively new to the Thai education system. Even though some lecturers have participated in some kinds of PBL workshops and tried out PBL to some extent, there are still the issues of a lack of experienced staff and the needs of other resources for PBL implementation. Staff here will need on-going training and support in practicing PBL and recently a group of PBL practitioners has been formed, with support from the university, to create a space and a project to assist the practitioners in reflecting on and improving their practice and research in PBL.

Another issue of concern in implementing PBL is learning space. In this context, the lecture room is the major space required for teaching and learning to take place. There is no permanent private group-room for students in this context, as at Aalborg University. However, this issue is not a crucial problem because there is a way to work around it. Both PBL teachers and students can reserve small rooms (consultation rooms) in the library and in the Self Access Language Learning Center (SALLC) when they need to hold a meeting or supervision. It may be somewhat inconvenient that they have to reserve week by week, but this can also be used as an opportunity to train students about project management in practice.

Another issue is financial support in preparing a change to the PBL system; especially supporting staff development, which will consequently also affect PBL material development. To handle this issue, there must be a main/key person responsible for the PBL staff development project, by whom the project must be presented and defended for the yearly fiscal budget. Funding is possible for PBL implementation, but the PBL team of practitioners must be strong in defending and advocating the impact of the implementation.

After identifying both constraints and possibilities to implement PBL in this Thai context, the researcher further identified the relevant parameters of the preparation phase of DBR. The DBR phases developed by Cobb and Gravemeijer (2008) are used as the basis of the parameters in the Thai context. These parameters have played a significant role in the curriculum design process of the PBL curriculum for EFL interdisciplinary studies. In addition to the framework of Cobb and Gravemeijer, there are other aspects that have been included in the design framework of the preparation phase of DBR used in the Thai context; details of each parameter are presented in the following table.

Parameters of preparing experiments by Cobb & Gravemeijer	Actual activities and parameters of the preparation phase used in designing PBL curriculum for EFL interdisciplinary studies
1. Clarifying the instructional goals	**1. Analysis of practical problems by the researcher** - Alignment between educational goals, expected learning outcomes, and other elements of the curriculum - Identifying students' current learning in the context of the currently teaching methods *[documenting the instructional starting points]*
2. Documenting the instructional starting points	**2. Exploring possible solutions** - Literature review - arguing for the PBL approach - Documentation and participation in workshops and seminars about curriculum development - Conducting case studies to inspire and support the new curriculum model - Designing the general framework of the curriculum or curriculum prototype *[delineating an envisioned learning trajectory]* - Negotiation with executive managers and lectures (bridging an understanding and an expectation from both sides)
3. Delineating an envisioned learning trajectory	**3. A collaborative design for the semester module (curriculum)** - Involving lecturers in the curriculum design as co-designers when finalizing the negotiated curriculum design *[placing the experiment in a theoretical context]*. - Clarifying the semester's educational goal, learning outcomes, content, teaching and learning methods, and assessment *[clarifying the instructional goal]*.
4. Placing the experiment in a theoretical context	**4. A concrete result from the preparation phase** - A cohort of teachers from cross -disciplines who form a PBL community of practice. - A handbook of guidelines for the new curriculum and its approach to learning and teaching for lectures.

Table 5: Parameters of the preparation phase used in approaching the PhD project

It should be noted that the preparation phase of DBR used in designing a curriculum for the Thai context began with an analysis of the current situation at the institution which adds to the parameters of the preparation phase of DBR provided by Cobb and Gravemeijer (2008).

3.5. Research design

Data obtained throughout the study came from both qualitative and quantitative inquiries. The use of mixed methods in the research inquiry assures that the designs and

implementation of this study yields effective and reliable results. Because the mixed methods approach results in both qualitative and quantitative data, this allows the project to be a check and balance system in itself. The results and analyses of the study are considered reliable because they have gone through the process of triangulation of information/results.

The qualitative research method is the major component of this PhD research project. When looking at the two major research questions and the four subsidiary research questions, it can be pointed out that this educational research is qualitative in its nature. The aims of the overall study are concerned with the experiences and the perceptions of participants in producing subjective data which agrees with the description of the nature of qualitative research (Hancock, 1998). It is important to further explore how participants are affected by or react to the implementation of the new interventional educational designs. A case study is the major type of qualitative research used in this study. Methods of collecting qualitative data in this case involve observations, semi-structured interviews, document/textual analysis from literature, and reflection notes. Even though case studies have been criticized for generalization of theories, in the case of this PhD project a case study is appropriate for addressing the research questions which are concerned with the specific application of PBL initiatives to improve learning and teaching (Case & Light, 2011).

The first phase of the project was conducted at Aalborg University (AAU) in Denmark. Procedures in this phase were devoted to studying the principles and practices of PBL in the Aalborg context and analyzing how local context could be a great influence in developing a PBL curriculum and a PBL staff training program in a Thai university context. The studies of the first phase used a theoretical lens in qualitative research combined with a case study and interviewing PBL experts in a European context in order to guide two new designs. A case study of Phase 1 and interviews with PBL experts in Europe were conducted to explore existing PBL practice at AAU and to identify requirements for PBL academic staff development in a Thai university context. The second phase of the PhD project was conducted at Mae Fah Luang University (MFU) in Thailand. The case study conducted in the first phase was comprised of observations of lectures and supervision sessions of students and teachers from three different faculties at Aalborg University, a scale questionnaire to assess student perceptions of their learning in the PBL environment, and interviews with two PBL supervisors. The second phase was devoted to the actual implementation of the designs, the investigations of the impact from the implementation, and the process evaluation of the designs. The actual implementation took place during March- October 2012.

The quantitative data was obtained concurrently with the qualitative data while conducting the case studies. The quantitative data was from scale questionnaires and the final scores or grades of students. These quantitative approaches to data collection are embedded in the two case studies which took place at both Aalborg University and Mae Fah Luang University, as well as from a scale questionnaire distributed to 18 staff who participated in the PBL staff development workshops.

3.5.1. Methodological framework of the overall PhD project

The overall PhD research project embedded the three phases of DBR, preparation, implementation, and retrospective analysis, which were explained in the previous sections. Data collection took place mainly during the preparation and implementation phases of DBR. The methods and research instruments used in collecting data are presented in the following table.

Phases of DBR	Research methodology **Design-Based Research is used as the research methodology**	Methods/instruments	Output/Result
Preparation Phase took 16 months: Oct 2010- Feb 2012 at Aalborg University; consisted of two studies running simultaneously	- Bridging PBL and EFL principles and practice - Defining PBL to be used in a design framework of PBL curriculum for EFL interdisciplinary studies - Defining interdisciplinary learning	Literature review & document analysis	**Design1**: framework of PBL Curriculum for EFL Interdisciplinary Studies
	- Case Study 1 : A diversity of practice within the PBL- Aalborg Model	1. Observations 2. Interviewing AAU teachers and students 3. Student questionnaires	
	- Studying the importance of the academic staff training program	Literature review & document analysis	**Design 2**: framework of PBL Academic Staff Training Program for MFU context
	- Interviewing PBL experts about the importance of preparing staff for change to PBL educational practice	Interview guide	
	- Observing workshops and training sessions at AAU : 1.Teacher Training Course for Asst. Professors 2. PBL Workshop for Visitors 3. PBL Course for Asst. Professors 4. Pedagogy course for teachers	1. Observation 2. Document analysis	

Implementation Phase Took 7 months: March 2012- October 2012	1. Implementing PBL academic staff development program[implementing Design 2; in a form of PBL introductory workshop]	1.Pre- and post-workshop reflection notes 2. Questionnaire : Five point Likert scale and open-ended	Teacher perceptions towards the program, which will reflect and evaluate Design 2.
	2. Redesigning the negotiated designs (collaborative design) and on-going meeting and consultancy with two cohorts of teachers (English and IT)	Participatory observation and field notes	1.Modified syllabus for Writing 3 course 2.Guidelines and agreement of PBL practice and assessment for the involved subjects
	3. The actual practice [implementing the negotiated version of Design1 but with two different modes of practice]	1. Student questionnaire: Likert scale and open-ended (pre and post) 2. Teacher questionnaire: Likert scale and open-ended 3. Teacher interview guide 4. Observation	1.Student perceptions of their learning (from questionnaire) 2,3. Teacher perceptions of student learning and performance (from questionnaire and interview) 4. The observation and the interview resulting in the descriptions of PBL practice of the two cohorts
Retrospective Analysis Phase Took 5 months: Nov. 2012 -March 2013	1. Qualitative data analysis of: - Field notes from open-ended questionnaire and observations - Interviews 2. Quantitative data analysis - Five point Likert Scale survey questionnaire from three sources: i) teacher assessment of student learning and performance after going through PBL process ii) IT student self-rating of their learning after going through PBL process iii) participant perspectives of PBL introductory workshop - Pre- and post-Likert Scale survey questionnaire from the English cohort - Final grades of 182 English major students	Content Analysis Descriptive statistics analysis based in frequency, mean, and standard deviation Inferential statistics, Paired t-test	The retrospective analysis indicated PBL implementation of the following two major elements: 1.Reflections and assessments of the two modes of PBL practice between the English cohort and the IT cohort 2. A reflection on and an assessment of the PBL staff development model and practice at MFU

Table 6: Overall plan to approach the PhD research project

The way each phase and each case study are approached in terms of data collection the following figure illustrates the conceptual framework of the overall research project.
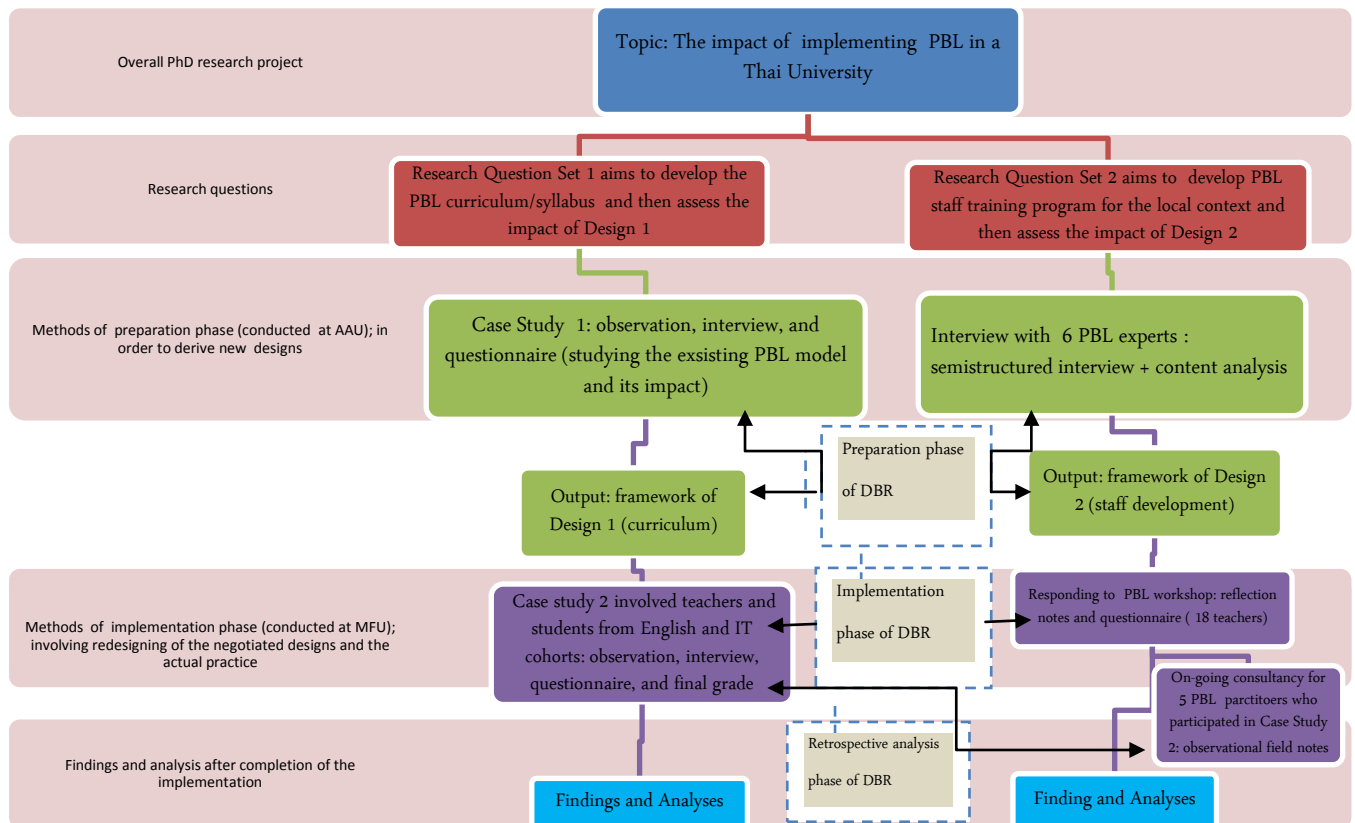
Figure 7: **The conceptual framework of the overall research project**

3.5.2. Using case studies as the major approach to inquiry

Case studies have played a crucial role as the major approach to data collection in this PhD research project because the case study approach allows a long process of DBR which involves planning and designing, implementing, and evaluating the educational intervention. Case studies employed within this research project help the researcher understand the challenges and the needs of the study context and consequently lead to problem solving or information about how to deal with the situation. Particularly, within the framework of DBR, two case studies were used as the strategy of inquiry during both the planning stage and the implementation stage of this PhD research project. Because these case studies explored the educational situations over time through a variety of detailed and in-depth data collection instruments, multiple sources of data/information (triangulation) have become the strength of this study. Case studies conducted within the DBR framework are therefore considered highly appropriate to use as the major approach to inquiry. These multiple sources of data from questionnaires, observations, field notes, and interviews allowed the study to explore and analyze the complexity of the educational situations. A case study can take a qualitative

and quantitative stance (Hancock, 2002). The case studies conducted in both stages yielded both qualitative and quantitative data. In order to meet the objectives and fulfill the three phases required by DBR, case studies have become the major means to help the researcher gain an understanding of the particular situation, especially during the implementation period. Despite several criticisms about invalidated generalization of case studies, I am confident that the use of case studies is highly appropriate in the context of this study. Merriam (1998) pointed out that a case study most likely focuses on "holistic description and explanation" (p. 29) and can consequently help researchers and readers confirm what is known, and be able to extend their experiences from the specifically studied cases. Yin (1984) further pointed out that a case study strategy, though it is qualitative and reflective in its nature, can be used with quantitative evidence. When taking a close look at the objectives of the project, the research questions, and the design of the overall study, there is no doubt that case studies used in this case can fulfill the needs of this educational research project. This is supported by the recent comment of Yin (2005) on the significance of case studies in educational research:

> One way of starting your inquiry [might be to] amass a lot of statistics....but statistics is not what education is really about. Starting to understand the whole world of education means bringing to life what goes on in [the setting] and how [this is] connected to a broader panoply of real-life... Case studies fill this need. They can provide both descriptive richness and analytic insight into people, events, and passions as played out in real-life environments. (p.14, as cited in Brown, 2008)

3.6. Research Instruments

In order to validate the result and the impact of the implementation, triangulated information is essential to this study. Consequently, various methods are employed which allow both qualitative and quantitative data to be collected. The following section presents different types of research instruments used with this research project.

3.6.1. Likert scale questionnaire and open-ended questionnaire (quantitative data)

In this study, students and teachers are the main sources of the information about the learning environments in both PBL and non-PBL environments. There are two types of questionnaires, Likert scale questionnaires and open-ended questionnaires, used as instruments or means to assess the performance of students and teachers in the PBL environment, the effectiveness of the workshop, and the impact of the implementation of the PBL curriculum and PBL staff development program. A Likert scale questionnaire was used within a case study conducted in the first phase of the PhD project. The design of the first set of the student questionnaire was inspired and adapted from the student expectation

questionnaire which was administrated to engineering students at Victoria University in 2006 (Keating & Gabb, 2006). The Likert scale questionnaire comprises 25 questions and these questions are clustered into 5 value-added elements: motivation, communication skills, collaboration skills, critical thinking and problem-solving skills, and self-directed learning skills.

3.6.2. Observation

In both stages of this PhD research project, observations were also used as the means to help the researcher to experience and understand the dynamics of the PBL environments in Denmark and Thailand. Observing the actual practice of PBL facilitators and their students helped the researcher confirm and bridge the theory and practice of both the old and new designs of PBL. Data from the observations was in the form of researcher field notes, which was used to confirm the triangulation of the results and the impact of the PBL process in the study context. An observation scheme was first designed. This same observation scheme was used with each observation as a tool for the researcher to make notes on what happened during each observation regarding the particular aspects that the researcher wanted to address (see Appendix E).

3.6.3. Semi-structured interviews

All the interviews conducted to obtain qualitative data were in the form of semi-structured interviews. They involved a series of open-ended questions based on the topic areas the researcher wanted to cover and explore. There were three sets of interview guides designed to obtain qualitative data from PBL facilitators at Aalborg University, PBL experts at Aalborg University and Coventry University, and PBL practitioners at Mae Fah Luang University (see Appendix D). Semi-structured interviews provide opportunities for both interviewers and interviewees to discuss the topics in detail and result in richer qualitative data or information. Before each interview, an interview guide was designed based on identified aspects that the research needed to address. The interviews with individual interviewees were fairly informal, but recorded. The rigorous preparation and the recording allowed an informal condition without being too worried about off-topic conversations. Conducting the interviews in this way allowed participants to act naturally because they felt that they were participating in discussions rather than answering formal questions.

3.6.4. Reflection notes (from participants)

At the beginning of the implementation period (Stage 2 of the research project), reflective thinking was exercised and then converted into written format by two groups of participants. The first group was the 18 participants who participated in the PBL staff training workshop. Before starting the workshop, these participants were asked to reflect (in written form) on their past teaching practice and then identify advantages and disadvantages of their past teaching approaches. They were also asked to express their preferences in teaching and learning environments and approaches. After the completion of the workshop, these 18 participants were asked to reflect again (in written form) on their pedagogical stance and their understanding of PBL and its possible application in their context. This post-workshop reflection was to see how much the workshop had influenced their pedagogical stance and future practice. The second group was the 4 teachers who practiced PBL during the first semester of the academic year 2012. These teachers were also participants in the PBL staff training workshop. After completion of the PBL implementation (October, 2012), these 4 teachers were asked to reflect on their PBL practice, the impact of their PBL practice on their students' learning and themselves, and advantages and disadvantages of PBL practice in their context. The reflection was also done in the written form.

3.6.5. Grades: student learning outcome (quantitative data)

Students' final grades were used as supporting evidence as a summative assessment of the impact of implantation of the PBL process in terms of the actual performance of students. The grading system used with this course was criteria-based, which means that all elements of the learning objective were assessed thoroughly based on rubrics. Graded elements are process- and product-based details as follows.

Process-based grading		Product-based grading	
PBL supervision session and participation in 4 workshops	20%	Individual written proposal	5%
Presentation and oral examination	10%	Team written proposal	10%
Peer and self-assessment	10%	Complete first draft	10%
		Abstract writing	10%
		Final draft	25%
Subtotal of process-based scoring	40%	Subtotal of product-based scoring	60%
Grand total of score			100 %

<div align="center">Table 7: Grading criteria comprised both process- and product-based assessment</div>

Once the grading criteria is designed and completed, the percentage of the grand total score is converted into letter grades. The grading scale is assigned by the Department Committee, details as follows.

Scores	Letter grades	Definition
85-100	A	Perfect score
80-84	B+	Very good score
75-79	B	Good score
70-74	C+	Above average score
65-69	C	Average score
60-64	D+	Below average score
55-59	D	Poor score
0-54	F	Fail/inadequate score

Table 8: Grading scale of the course

The final grades or the grand total score of 182 students were analyzed statistically to evaluate the impact of PBL practice and the quality of the overall student performance. Grading criteria or the assessment method implemented with this course was changed to PBL oriented assessment which places importance on the learning process equal to that of the learning product.

3.7. Participants

The whole PhD project consisted of two stages and these two stages comprised three phases of DBR. The two stages involve planning, implementing, and evaluating the designs and practices of PBL. Each stage of the research project comprised several studies which combined both qualitative and quantitative approaches. Through means of multiple-studies, participants in both stages can therefore be categorized as follows.

Stages of the research project	Research design and participants
Stage 1: Planning phase of DBR **Conducted at MFU and AAU**	**Case Study 1 (preliminary):** involved sixty-six English major students and sixteen English teachers who participated in a trial case study of integrating PBL characteristics with two English courses taught in tandem. **Case Study 2:** involved seventeen students and two PBL facilitators at Aalborg University **Study 1 (interview paper):** Six PBL experts from a European context
Stage 2: Implementation and evaluation phases of DBR **Conducted at MFU**	**Study 2:** involved eighteen academic staff of Mae Fah Luang University who participated in a PBL workshop in March 2012. **Case study 3:** involved 166 English major students who studied Writing 3 in the first semester of the 2012 academic year and two PBL supervisors who are English teachers at Mae Fah Luang University. **Case study 4:** involved 135 students who participated in the PBL-IT mode of practice in the first semester of the 2012 academic year and three PBL facilitators from the School of IT at Mae Fah Luang University.

Table 9: Participants of the six studies constituted the PhD research project

This research project engaged in four case studies. Case studies 1, 3, and 4 can be viewed as a form of experiment where the cases were selected to investigate the variation of the variables of each case and of the whole study.

3.8. Data collection and data analysis

The research deals with both qualitative and quantitative data, therefore, the analyses comprise content analysis, descriptive statistics, and inferential statistics. The following figure illustrates the scheme of data analysis for the overall PhD research project.
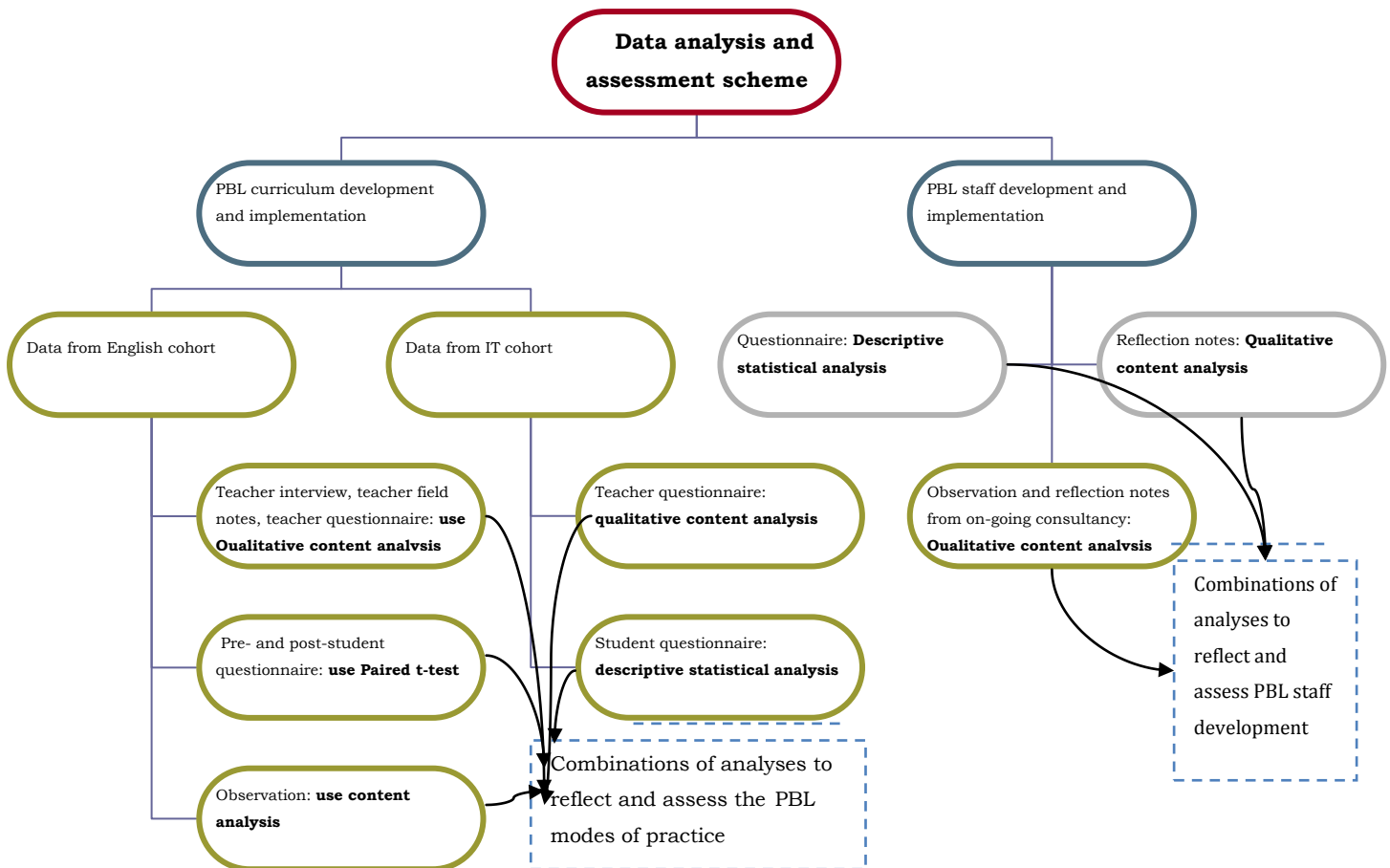
Figure 8: Framework for data analysis

3.9. Content analysis

Content analysis was used to deal with qualitative data from observations, interviews, and open-ended questionnaires. Content components were written words and sentences from open-ended questionnaires, observations, and transcription of words or sentences from the interviews. Content analysis is very useful in organizing a huge amount of qualitative data collected by various qualitative methods. The process of content analysis involves coding raw messages according to a scheme of classification. In dealing with the qualitative data of this research project, an inductive approach to the research questions seemed appropriate. The obtained messages were examined without preconceived categories; however, the researcher also noted applicable content categories or themes that could later be used as the basis for forming categories for quantitative/statistical analysis. Content analysis is appropriate for this interventional education research because it allows the use of retrospective data, and also tracking and assessing changes over a period of time. However, content analysis also has some challenges, such as that it is time consuming in organizing data and there are no

straightforward guidelines for its procedures. Despite these challenges, Kondracki *et al*.
(2002) argue that the tailored procedures of content analysis fully allow the exploration of the
richness of data.

3.10. Statistical analysis: descriptive statistics and inferential statistics

Statistical analysis was part of the quantitative approach to the research project. A simple
form of descriptive statistics was used to specify the averages and percentages of studied
elements. Statistical analysis affirms the research world of exploration, comprehension, and
decision making. More specifically, the program used to analyze some parts of data was
Statistical Package for the Social Sciences (SPSS). In particular, the paired t-test was used to
compare the before and after self-rating of students in: 1) the overall self-assessments of the
overall learning outcomes; 2) levels of motivation; 3) levels of collaboration; 4) levels of
PBL process in practice; 5) levels of self-directed learning; 6) levels of communication skills;
7) levels of utilization of peer assessment; and 8) levels of critical thinking skills.

3.11. Summary

This chapter described the research methodology of DBR, and the methods used in
addressing the research questions related to the designs of educational intervention and the
impact of the practices of the designs. Using DBR as the methodology in approaching the
whole PhD project involved two phases of action taken by the researcher. Phase 1 of the PhD
project was devoted to the preparation phase of DBR. In this phase, identifying problems,
challenges, and possibilities in the local context was essential. Investigating the existing PBL
model and practices of the successful PBL institute was also emphasized for the sake of re-
constructing new and proper models and practices in the target or local context. The output of
Phase1 was two designs: 1) 3 modes of PBL curriculum for the local context, and 2) the PBL
staff development program. Phase-2 of the PhD project was devoted to the actual
implementation of both designs. It took eight months to complete the practices of both
designs. Process evaluation was used to reflect and assess the effective rate of the two
designs. Process evaluation is an ongoing evaluation which aims to reflect on strengths and
weaknesses of the designs and will consequently lead to the reconstruction and improvement
of the designs and practices. The process of DBR used in approaching this PhD project was
complex and time consuming because the researcher, in this case the designer and
practitioner as well, must be thorough in the methods used in the data collection process. A

mixed method was used because it is crucial to minimize bias in the studies when designing research instruments. It is best to make sure that a triangulation of information (results) for both qualitative and quantitative data is used which will minimize bias of data analysis as well. Furthermore, the chapter argues that design based research can be a very effective research methodology for educational research. The preparation phase can play a particularly crucial role in influencing the implementation phase. A combination of theoretical and empirical studies can make a significant contribution to the validity and the reliability of DBR as the approach to a PhD project which involves educational intervention.

CHAPTER FOUR

DESIGN FRAMEWORKS OF THE PBL CURRICULUM AND PBL STAFF DEVELOPMENT PROGRAM

This chapter presents the development of the conceptual frameworks of the designs of the PBL curriculum and the PBL staff development program. In order to develop new concepts and theories of active learning through the PBL process in a Thai local context, the process of design development involved reviewing literature in parallel with conducting case studies, and the whole process took place during the DBR preparation phase. Both theoretical and empirical studies of existing PBL models and practices helped the researcher derive frameworks for designs and practices of PBL in a local Thai context. This chapter comprises three major parts. In the **first part** of this chapter, reports of two case studies and interviews with PBL experts to inspire local designs are presented. The first case study was conducted to identify the needs of the local context in implementing PBL. The second case study was conducted at a PBL institute to identify variation in PBL practice. The **second part** of the chapter then focuses on the chronology of developing a conceptual framework of PBL curriculum designs (Models 1 and 2) within the context of EFL interdisciplinary studies at MFU. The conceptual framework of Model 1 is used as the basis to influence the designs of the three modes of PBL practice at MFU. Later the three modes of PBL practice became the foundation for redesigning the negotiated PBL syllabi/curriculum and PBL practices with two cohorts of students and teachers for the English Department and IT School at MFU. The following figure (8) demonstrates the design process of PBL models and modes of practice in the MFU context which are derived from the studies of PBL curriculum design and practice in both theoretical and empirical dimensions.
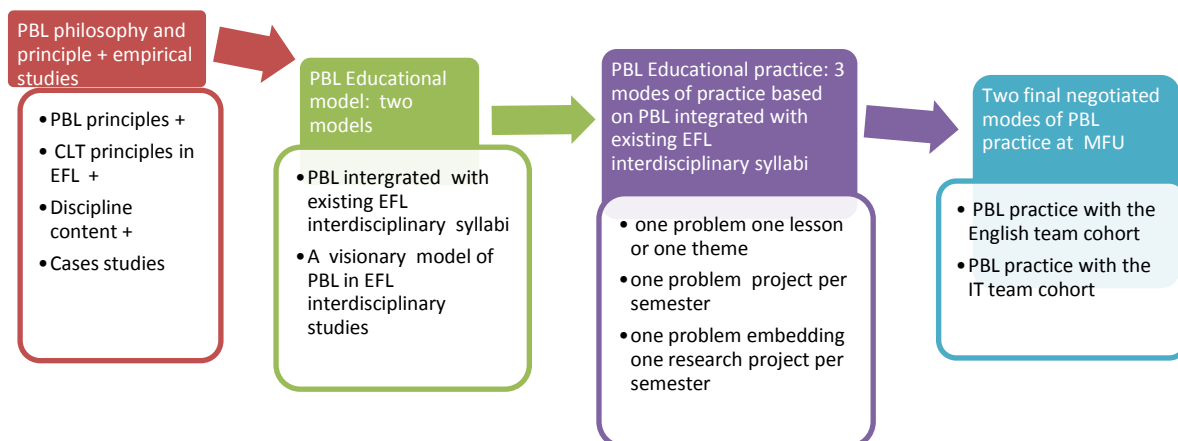
Figure 9: The design process of PBL models and modes of practice for the local context

From Figure 8, it can be seen that the design process of PBL models and modes of practice at MFU were inspired by the PBL literature of Graaff and Kolmos (2003) and Savin-Baden and Wilkie (2004) which propose that PBL can be viewed and practiced as categorized into three levels: PBL as learning philosophy and principle, PBL as educational model, and PBL educational practice. All three categories or levels of PBL and three empirical studies are incorporated in the design process of PBL implemented within the MFU context. Lastly, the **third part** of this chapter explains why proposing the establishment of a PBL Network in parallel with establishing an informal community of PBL practice is used as a strategy in implementing PBL in the MFU context. How the PBL Network (as a unit) should function to facilitate PBL practitioners is also deliberated.

Part I. Reports of three empirical studies conducted to inspire the local designs and practices of PBL

As explained earlier, this research project utilizes DBR as the research methodology which constitutes three phases: preparation, implementation, and evaluation. The first phase of DBR (preparation phase) is not only about theoretical study, but involves multiples empirical studies as well. For this research project, three studies were conducted during the preparation phase of DBR. Findings of each study were synthesized to develop the frameworks of the PBL model and practice in the local context. Each of these studies was disseminated at three

conferences. A summary of each study is presented in the following section and full papers can be seen in Appendices N, O, and P.

The first case study was conducted to identify the needs and ability to implement PBL in a local Thai context. This first case study was synchronized with the first parameter of the preparation phase of DBR which began with a trial case study integrating some characteristics of PBL with two required English subjects taught in the first semester at MFU in the 2009 academic year. The result stimulated the further pursuance of the larger scale design and implementation of PBL at MFU (Coffin, 2011). This case study was presented at the 7th ICE Conference in July 2011. Details and results of the first case study are as follows.

4.1. Summary of Empirical Study 1; Title -- *Integrating PBL pedagogy with EFL courses taught in tandem: Reflections on benefits and challenges* **(see Appendix N for the full paper):**

This case study describes an educational management experience, which integrates an innovative pedagogy called Problem-Based Learning (PBL) into language education where English is taught as a foreign language in a traditional educational environment. Despite difficulties and complexity of the integration process, PBL was adapted and used as an instructional strategy for two major required courses in the English program at in the 2009 academic year. The study involved 109 students and 16 teachers from the English Department. A course syllabus was designed which merged the two courses to be taught in tandem and integrated PBL into the teaching/learning process. Throughout the semester, teaching/learning was done through project work which was derived from student interests. Students participated in their projects in small groups of 6-7 members, and were facilitated by advisors. At the end of the semester, two sets of the questionnaire were distributed to both teachers and students in order to get feedback and reflections on teaching and learning using this new PBL approach. In-depth interviews with cohorts of students and teachers were also conducted to document their perceptions of the teaching/learning approach used with the two courses. The results indicated that participants perceived and reflected positively on the use of PBL instructional strategy. Teachers in particular assessed their students as exhibiting high quality presentation and communication skills, self-directed learning skills, team work skills, and a good quality final product. The paper also discusses the advantages and disadvantages of PBL used in the traditional educational environment, problems that arose during the

operational period, lessons learned from PBL integration into the existing syllabi, and possible solutions suggested for the future implementation of PBL.

The second case study was also conducted within the preparation phase of DBR; specifically, this study was evidence of how the second parameter of the preparation phase (exploring possible solutions) of DBR was utilized and became influential to the future design of the Thai context. The results of the second case study reflected on practices of PBL at a PBL university in Denmark. The case study further explored the impact of PBL practices based on both student and teacher perspectives. This case study was conducted for the purpose of developing sources of inspiration for the researcher to work on a PBL curriculum design for the Thai context. This case study was presented as a conference paper at the 3rd PBL Symposium at Coventry University in the UK in November 2011 (Coffin, 2011). A summary of the case study result is presented below.

4.2. Summary of Empirical Study 2; Title, *Reflections on Problem-Based Learning Practice at Aalborg University* (see Appendix O for the full paper)

This case study was conducted to develop an understanding of a range of differences in practicing problem-based learning (PBL) at Aalborg University (AAU). In order to gain a deeper understanding of PBL practices at AAU, the study investigated academic perceptions and learning experiences of both students and supervisors from two faculties and four disciplines, where PBL is used as an educational strategy. Data was obtained through observations, interviews and questionnaires. Reflections on a variety of PBL practices and results from the case study will be an inspiration and guidance for the researcher to further develop a framework for designing and implementing PBL within English as a Foreign Language (EFL) interdisciplinary program in a traditional education environment where English is used as the medium of instruction. The results from both observations and interviews confirm that there is no difference in the lecture sessions from the four disciplines. However, the results demonstrate that there are differences in the supervision sessions, types of projects, and the physical set up of working space for students at AAU. These differences depend more on the nature of fields/disciplines studied. The fields that deal with more concrete elements of doing project work and depend on experiments and external organizations are treated differently to the fields that deal with more abstract elements. Despite differences in practice, both students and supervisors expressed a strong appreciation of PBL used at AAU. They further explained that PBL also fostered many positive aspects of

learning for both students and supervisors, especially in motivation to learn and work on their projects, because students felt they had ownership of the project. Results from the questionnaire strongly support the claim that PBL fosters motivation, self-directed learning (SDL), and collaborative and communicative skills in the context of this case study. It can be concluded that the case study conducted at Aalborg University supports the concepts of flexibility and diversity of PBL practice, as the results showed that different disciplines practice PBL differently. Despite differences in practice, all disciplines utilized common characteristics of PBL and also shared common goals and objectives in the learning outcomes. The findings of the case study gave inspiration to the researcher to take into consideration the differences in context of institutes and students, and that differences in the nature of individual disciplines must be considered when designing and implementing PBL under any circumstance. For instance, in designing a PBL curriculum for EFL and ICT in the Thai context, the existing content of each subject and curriculum must be revised according to the limitations of those mentioned elements. It is important for PBL curriculum developers to be critical of alignments between different curriculum elements and PBL components and principles. When there is an intention to implement PBL in different contexts, a redefinition of what PBL is for in that particular context maybe necessary. Moreover, sensitivity to cultural and institutional needs must be included when designing a PBL curriculum for different contexts. It can therefore be concluded that the principles of flexibility and diversity best describe the current PBL practices.

As well as preparing and developing the PBL curriculum, syllabus, and activity, PBL implementation in the Thai context also emphasizes preparing and involving lecturers/ academic staff in the curriculum design process. In addition to conducting the two previous case studies as part of planning a suitable curriculum design for the Thai context, interviews with six PBL experts also giving insights and inspiration in how to prepare and implement PBL effectively. The results of the interviews with six PBL experts constitute another conference paper presented at the ICED 2012 International Conference at Bangkok in July 2012; Title: *A framework of PBL staff development program for a Thai University* (Coffin, 2012). This study was later modified as a journal paper submitted to the Journal of Problem Based Learning in Higher Education (PBLHE); Title: *Identifying needs to develop a PBL staff development program* (Coffin, 2013). A summary of this interview paper, the conference paper, is presented below

4.3. Summary of Empirical Study 3; Title - *Identifying needs to develop a PBL staff development program* (See Appendix P for the full paper).

Staff training or staff development is a crucial element in introducing educational intervention, especially in the case of implementing problem-based learning in a traditional education environment. Recognizing the importance of staff development, this study, which is in a form of an interview, aims to pinpoint suitable methodologies for developing the framework for a problem-based learning (PBL) academic staff development program for a Thai university. In order to accomplish the objective of the study two research questions were formulated. 1) How can university academic staff be assisted to acquire pedagogical competences for an initiative in implementation of a PBL curriculum? 2) What kinds of support do university academic staff need in order to maintain PBL implementation? Through the combination of a literature review, observations of staff development workshops and courses, and interviews with 6 PBL experts which emphasize the facilitator's roles in PBL, this study intended to produce guidelines for developing the framework for a PBL academic staff development program in a Thai university.

The paper also describes the methodologies of organizing an academic staff training program used at Aalborg University and also reports on the perspectives of PBL experts on the important elements needed for a PBL staff development program. The results and reflections of the study contributed to the suitable design of a PBL academic staff development program for a Thai university. Data analysis from different sources suggested that in order to initiate effective PBL implementation at least a year of preparation is required. A community of teachers who share the same visions and ideas and formal support from executive managers in terms of policy and financial issues are also required. In the preparation phase, staff training, along with curriculum development, is central; therefore, a new PBL staff training program and PBL community practice should be embarked on as early as possible when an institution wants to implement PBL. The establishment of a program and the community practice will the platform for staff to gain in-depth understanding and competences in both theory and practice of PBL. The proposed framework for a new PBL staff development program consists of two major elements: 1) a systematic staff training program; and 2) a PBL community practice. It is recommended that a unit of PBL associates should be established as soon as possible. Two major functions that PBL associates can provide are as follows.

1. Providing a PBL sequential training program for staff which consists of four elements (this is recommended as mandatory for staff).

a) Element 1: A series of PBL hands-on workshops which will be offered throughout the academic year.

b) Element 2: PBL mentors who would help PBL practitioners reflect on both PBL theory and practice via meetings and portfolios.

c) Element 3: Portfolio as a tool to reflect on the actual practice of each practitioner.

d) Element 4: Yearly PBL seminar as a platform to present and share their experience.

2. Providing a PBL community of practice as a platform for staff to support one another informally (optional). The PBL community of practice consists of two elements.

a) Peer coaching which can be initiated and managed by the practitioners themselves.

b) A PBL research group which will be mentored by, and collaborate with, the UNESCO Chair in PBL. This is a platform to support practitioners in building their research skills and connecting with other PBL networks around the world. There is one more important issue that needs to be included in this discussion: a reward system for PBL practitioners. Going through a change process without proper support can be very frustrating and easily result in failure. The change process of implementing PBL will particularly require a long period before seeing significant results. This long process will require a vision of life-long learning, strong leadership and support, a commitment from both staff and executive managers, and a tolerance for the long term process. Particularly, teachers who participate in the change process will have to contribute time, energy, and intelligence throughout the process. They therefore also need concrete and structured support from their institution. Change of any kind means hard work for all agents, and having strong support from all levels in the organization is important and valuable. It can be concluded from this study that making a change in an education system is a long process which requires support, commitment, creativity, and tolerance from all agents. As many experts have advised that preparation can take at least a year before actual implementation, having a well prepared staff to begin with is a good alternative. Well prepared staff can indeed come through a staff development program. Some studies suggest that PBL staff training has taken place mainly through a workshop format; however, this study adds more elements to the training system. It is believed that PBL should

not be viewed as an add-on teaching approach; it should be embedded in the system. Therefore, the PBL staff development program should also be embedded in the staff evaluation system (reward system).

Part II: A conceptual framework for PBL curriculum design in EFL interdisciplinary studies

This section explains how a conceptual framework for PBL curriculum design in EFL interdisciplinary studies is developed. In order to simplify the concepts, a series of terms will be addressed. An EFL interdisciplinary study in this study context involves the study/learning of two or more disciplines at the same time and in an integrated manner. Interdisciplinary learning requires the disciplines to interact with one another; therefore, each discipline has some effect on the other's perspectives (Shafritz, Koeppe, & Soper, 1980). Learning English as a Foreign Language in an interdisciplinary manner means that English should not be learned as a separate set of skills. Smith (1971) points out that learning English as a single subject and focusing on one particular set of skills at a time has caused concern in several scholars because it does not allow the learning application of all language skills in a real life context for the learners. In contrast, English will be learned and taught in a way that ties together the knowledge and skills of integrated disciplines that are necessary, useful, motivated, and purposeful in communication. The lessons and activities of English interdisciplinary study should be designed to empower students to seek solutions to their own questions, to let them see the connections between the disciplinary knowledge and their real needs and interests. One way to develop an English interdisciplinary study is to integrate PBL principles and process. PBL can help bridge the contents and skills of English and other disciplines. An interdisciplinary theme will provide an authentic rhetorical learning context. English learning and teaching must therefore broaden its scope beyond teaching grammar and the four skills as a discrete area of the subject.

If the English curriculum aims for learners to achieve communicative competence, the principles of interdisciplinary learning and PBL allow learning process to set forth communicative competence based learning outcomes. What is communicative competence? Basically communicative competence can be divided into two major elements: 1) disciplinary knowledge which is equal to linguistic competence and sociological competence; and 2) practical skills which are equal to discourse competence and strategic competence. On the other hand, in the PBL literature, it is claimed that PBL has contributed deep disciplinary learning, motivation, and added practical skills as major learning outcomes. The practical

skills claimed are communicative skills, collaborative skills, and self-directed learning skills (Barrows & Tamblyn, 1980; Hmelo-Silver, 2004). Therefore, it is obvious that what PBL aims to contribute is also what is called 'communicative competence'. The logic then follows that the competences desired for interdisciplinary studies can be achieved through the PBL approach. The conclusion thus can be drawn that some characteristics of PBL can be implemented with interdisciplinary studies, and in this case with EFL interdisciplinary studies.

When developing a PBL interdisciplinary curriculum for Mae Fah Luang University (MFU), it makes sense to connect both English language learning and problem-based learning to drive the disciplinary learning occurring at the same time. This will make students feel that what they learn or do is useful and necessary. At present, when analyzing curricula offered at MFU, they are discipline-centered and consist of fragmented courses each semester. Each course is independent from one another, incoherent in content, and requires many small tests and exams. On average, students are required to take 5-7 fragmented courses in one semester, 17-21 hours of lecture per week or 255- 315 hours per semester. Each subject also requires students to spend some hours on self-study. Some subjects also require lab time. The total time expected from students in one subject is around 6-10 hours per week or a total of 36-60 hours per week (6-7 subjects) or 540-900 hours per semester. An example of the four year study plan is illustrated in the next section.

4.4. English as a Foreign Language study (EFL) at Mae Fah Luang University: Background of the setting

English is used as the medium of instruction at MFU. Most disciplines (majors) instruct and administer exams in English and also use English teaching materials. The English Department is therefore available on request to provide all students with different types and levels of English courses. The English Department is responsible for designing English courses for: 1) English major students; and 2) Students from other majors. English major students are expected to complete 130 credits in four years of study. An example of a four year study plan is presented in Appendix L, Section 1.

Curricula offered at MFU are considered traditional, discipline-centered, and fragmented, according to the analysis of the curricula and course syllabi structures at MFU (see the example of a four year study plan). 'Fragmented' suggests that throughout a semester students take 5-7 courses, however most are not relevant to one another. In one day, students

move from one classroom to another classroom, from one time block to another, from one lecturer to another lecturer, and from one textbook to others. In each day, students collect disconnected knowledge and skills for one particular purpose: to pass exams with good grades. A good grade is very subjective in my opinion because the standard of a good grade varies from institute to institute. Higher education needs to move beyond producing students with good grades. Graduates from universities must be able to function or perform with competences from both academic knowledge and practical skills. University education needs to prepare students with competences that will help them cope with their unfamiliar future in the workforce.

When analyzing the content of a curriculum from one particular discipline, there are two issues that need to be pointed out. In one semester students either takes courses that are fragmented or they may take courses that are overlapping or redundant in content, along with some fragmented courses. The questions upon which to reflect are: 1) Will students actually benefit sustainably and learn meaningfully from these fragmented courses? 2) Will students be able to apply and synthesize knowledge from these fragmented courses in their future real life working scenarios? Some may argue that theses fragmented courses indeed have merits in their disciplines, but my counter-argument is that even though disciplinary knowledge is important to students, the way contents are selected and linked should make learning more meaningful and useful to students. Learning is more an issue of the knowledge construction process and that constructed knowledge is used in a practical sense. If we view learning as knowledge construction, rather than reciting existing texts, then it is time for us, as teachers, to reflect and be open to a new education strategy that will help us all (both teachers and students) learn in a more relevant and meaningful way. I also would like to make another case to explain why implementing PBL can enhance a more meaningful learning experience by pointing out that as well as courses being fragmented in the traditional curriculum, student learning schedules in the traditional curriculum also appear to be unrealistic, as in the example of an extracted student schedule in Appendix R, Section B. The schedule shows that in each week a student has a very heavy load of class time. This is an example of a typical weekly schedule of students in Year Two and Year Three. In this particular semester, presented in Appendix R, a student registers for 8 subjects and earns 23 credits. This also means the students must attend 23 hours of lecture time each week (total 15 weeks in one semester). As for time spent on self-study, 45 hours per week is required in this case. In order to improve the quality of learning by moving away from reciting teacher notes or lectures,

some elements of PBL could be the answer to the needs of MFU. Nevertheless, there is one more issue I would like to address in designing and implementing a PBL based syllabus or curriculum in MFU: that it is going to be hard work to change to a new way of learning and teaching. No one can achieve change alone; changing requires consistent support and commitment from both top management positions and teaching practitioners, from the design process up to the implementation process. This section has outlined the background of the EFL education setting at MFU for two purposes. First is to help readers to connect ideas about why it is possible to integrate PBL with EFL education in a broader framework, not just with the subject of English. Second is to demonstrate the connection of how integrating PBL with EFL education in MFU context involves interdisciplinary learning. The next section therefore presents the way a PBL curriculum for interdisciplinary EFL should work.

4.5. Interdisciplinary learning and interdisciplinary curriculum

Interdisciplinary learning differs from disciplinary-centered learning because it does not allow students to learn by memorizing facts or information and then reproducing the very same facts or information. Interdisciplinary learning shifts its focus to a central theme, application of knowledge relative to the theme, and reflection on the thinking process (Ivanitskaya *et al*., 2002). The intention in developing a PBL curriculum for EFL interdisciplinary studies is to empower both teachers and students to acquire learning experiences which stimulate application of knowledge and skills in novel situations. A new culture of learning, if it is organized correctly, will therefore result in community learning, community practice, and lifelong learning. The curriculum opens an opportunity for learning and teaching to connect courses with two or more disciplines and to build a research project in which courses are connected and students are involved even after graduation. Students will have the opportunity to immerse themselves in real life research projects. In teams, they will learn from one another, be more observant of the situations/problems around them and share knowledge in order to complete their research projects. Teachers will also be more active and learn more because they will have to practice collaborative teaching and learning in order to fulfill these new learning objectives/outcomes. Each semester, teachers must plan and work together to create an interdisciplinary theme. Content will be more selective and current situations/cases/problems will always be brought in as a part of the content of each semester's study plan. Based on the semester theme and the content, lessons and research projects can then be elaborated. The figures below illustrate the difference between a fragmented discipline-centered curriculum and a coherent interdisciplinary curriculum in general.

Five courses taught in one semester having one same common theme. Contents of each course serve the others.	Five courses taught in one semester are independent and irrelevant in content.
Figure 10: General interdisciplinary curriculum	Figure 11: Discipline-centered curriculum
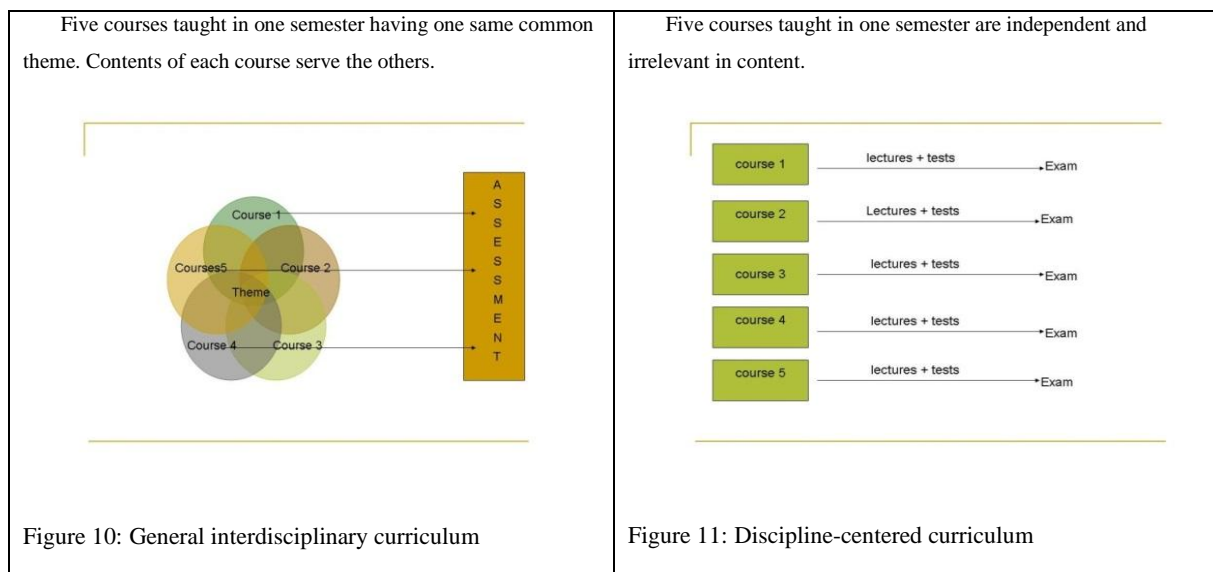
Assessment methods used between the two models are quite significantly different. A fragmented discipline-centered curriculum uses assessment tools focused on isolated facts and techniques which allow students to pass courses and curriculums by rote memorization (Shamsan & Syed, 2009). In contrast, an interdisciplinary curriculum uses assessment tools based on two sets of data: 1) entrance and exit surveys through self and peer evaluations of the learning progress; 2) grading rubrics for course or program learning outcomes relative to activities and projects (Repko, 2008).

4.6. A framework of PBL in EFL Interdisciplinary Curriculum Model 1: PBL integrated in the existing curriculum

From a broad perspective of designing a PBL curriculum, two visionary models of PBL in EFL Interdisciplinary studies were developed. The first model is designed for implementation with the existing curriculum or subject [Model 1]. For this particular model, adaptation and modification of the existing curriculum is the crucial step. Model1 is however limited in its modification because only some elements of the curriculum can be changed. Testing the first model will be less shocking for both teachers and students, who can deal with the change gradually. For example, the course names, course codes, and credit hours of each subject will remain the same, e.g. Academic English 3: 3(2-3-5).Although the amount of time for a subject remains the same, time spent on PBL activities and non-PBL activities must be reorganized. The contents of each subject will be modified to align with new

objectives/learning outcomes which must include PBL principles. Learning dynamics and teaching strategies will be changed to center on learners. Lastly, evaluation or assessment of intended learning outcomes will also take a new form by emphasizing learning process rather than product. For example, taking one semester from the existing curriculum, the subjects that are highlighted in green (see Figure 11) can be merged and form an interdisciplinary theme for the semester. Teachers of the highlighted subjects must plan lectures and activities together collaboratively. It will be necessary to revise content, teaching and learning approach, materials, and assessment strategy. Lectures on the highlighted subjects may contain selected old disciplinary content and other relevant new content which must complement and drive the semester research project (RP). In this model, the PBL process and practice occur when students work together in teams to complete their semester research project. The following figures illustrate how the first model works; the transformation from a traditional semester to a PBL interdisciplinary semester.

Figure 12: Traditional Semester

Figure 13: PBL Interdisciplinary Semester [Model 1]

Assessments of these subjects are paper based and emphasize reproducing isolated facts or information given by lectures.	Assessments of this model focus on student learning processes and competences gained through PBL and interdisciplinary learning and also traditional paper based exams (for S1, S2, and S3).

4.7. A framework of PBL in EFL Interdisciplinary Curriculum Model 2: an ideal PBL curriculum

In designing a PBL curriculum in EFL interdisciplinary studies, constructive alignment is used to encourage student learning engagement. Content knowledge, practicums (activities) and assessment methods used in this module must therefore be aligned. The objectives and content of the program should combine studies in English language focusing on

communicative competence, society, culture, business, technology or other disciplines. In developing this ideal conceptual framework for PBL as a total approach to EFL interdisciplinary studies, three major pillars need to be considered in designing the PBL semester module: English for communicative competence, the PBL process, and the content of involved disciplines. As well as the management of contents to be aligned with new learning principles, the issues of evaluation, time management and learning space must be reorganized.

The model and the description presented in this section is a visionary framework for a PBL curriculum in EFL interdisciplinary studies as a total approach to curriculum design, [Model 2]. This visionary model does not concern any existing curricula at MFU. It is a design for a brand new future program with full implementation of PBL as an educational strategy. The focus is upon interdisciplinary learning which strengthens knowledge application and competences through PBL principles in a semester research project. It is important to clearly state that in this model the amount of content and lecture time for course work is reduced to 1/3 of a semester. In contrast, 2/3 of the time will be spent on shared workshops, practicums, and research project facilitation sessions. In addition, an introductory course for the PBL approach will be part of the first semester for first year students and will be included in the 2/3 time slot. PBL principles and practice will be offered in the form of a series of workshops. The following figure illustrates how the second model works.
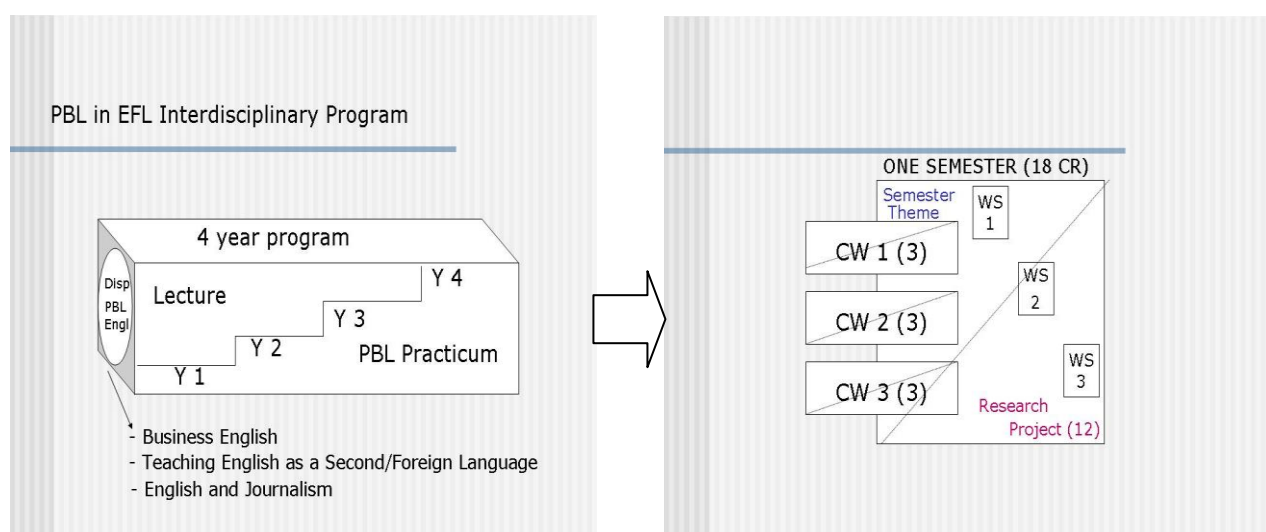
Figure 14: PBL-EFL Interdisciplinary Model 2

From Figure 13, it can be seen that the four year program will proceed with a stair step approach with a ratio between lectures and PBL practicums in research projects. For instance, in the first year of the study program lectures could dominate, but each relevant (PBL) subject may focus on a balance between lectures and hands-on activities within the lecture period. The first year could start with a mini research project which places importance on library research or analysis of secondary research. It is also a way to build a strong research foundation for first year students. In the second year, the level of difficulty of the research project should increase; therefore time for the PBL practicum of the research project should increase as well. In contrast, time spent on lectures should be reduced. The ratio between lectures and the PBL practicum of research projects continues to progress in a stair step format until the completion of the degree. In the second year the research project should go beyond own research. Collaboration with external units to some extent is highly encouraged. Students should be introduced to empirical research in their field. It is required that academic staff must decide on themes, activities and workshops to facilitate students' learning processes in each academic year. Model 2 of PBL in EFL interdisciplinary studies combines the essential characteristics of problem-based, project-based and inquiry-based learning which encourage student-centered and active learning. Learning processes and learning activities stimulate students to question, think critically, investigate, and be able to conclude with solutions (Savery, 2006). Each semester a theme and scenario that allows open-ended analyses of an ill-structured problematic situation will be proposed. Students will have to attend lectures, workshops, and other required activities to gain more knowledge to apply to their research project. The research project has no specification for a desired end product; therefore students must explore possibilities to develop a solution and an end product.

Another important element of curriculum design that must be addressed for the PBL curriculum in EFL interdisciplinary studies is assessment. Assessments used with PBL in EFL interdisciplinary modules must align with the semester module objectives (learning outcomes), and teaching and learning methods. In this case it should provide diagnostic tools to ensure that students are progressing adequately towards achieving learning outcomes that are set forth based on principles of PBL and interdisciplinary learning. The assessment strategy used with the PBL curriculum in EFL interdisciplinary studies consists of three types of assessment/evaluation: formative, summative, peer and self-assessment. Formative assessment is strongly encouraged because this type of assessment is diagnostic and goal directed and it also provides feedback to improve student learning or performance (Savin-

Baden & Major, 2004). It is also suggested that the assessment tools to be used in this case should focus on multiple skills and abilities, the learning process as well as product, involving facilitators, students and external evaluators. Peer and self-assessment is highly encouraged as a part of the PBL subjects or programs at MFU. Peer assessment is particularly crucial and should be included because an essential PBL characteristic is teamwork; team members should have a sense of ownership in being a part of the assessment system. However, peer and self-assessment continues to face criticism from some in terms of the quality and quantity of student responses, which consequently affect the effectiveness or validity of the overall assessment of that particular subject or program (Bronson *et al.*, 2007). Despite the criticism of validity and bias of peer assessment, PBL implementation in MFU will attempt to promote peer assessment, but with an awareness that there must be a strategic system to train students and develop a framework of peer assessment tools for both students and teachers.

4.8. PBL practice modes based on both Models 1 and 2 of PBL in EFL interdisciplinary studies

This section explains in more detail how PBL will be practiced in the MFU context. These PBL modes of practice were written after presenting the possibility of implementing PBL and the two ideal models of PBL in EFL interdisciplinary studies to the university's top managers. Consequently, what is presented in this section will constitute a PBL handbook of practice for MFU staff in the near future. The designs of the three modes of PBL practice were based on the possibility of implementing PBL in the current situation once the research had started forming the PBL community of practice in June 2012. This section offers advice and guidance to MFU lectures who would like to consider using PBL as an educational strategy in coping with their classroom learning and management. According to the design of the PBL curriculum in EFL interdisciplinary studies, there are three essential academic areas to be emphasized simultaneously when conducting teaching and learning this way. These essential components are the principles of Problem-Based Learning (PBL), English as a Foreign Language (EFL), and Interdisciplinary Learning (IL). The three areas of learning which constitute the PBL Curriculum for EFL Interdisciplinary Studies aim for similar learning outcomes (LO) which are in depth content knowledge learning, practical skills, and positive attitudes (motivation) toward learning. In the other word, these qualities expected of learners can also be called *'university graduate competences.'*

The main objectives in implanting PBL are to foster active learning and support knowledge construction; consequently, in-depth content learning, collaborative learning, autonomous learning, and further support lifelong learning will be enhanced. PBL practice at MFU constitutes three different modes: a single subject mode, a project report mode, and research project mode. Problems used in each mode are different and the types and sources of problems vary (see the explanation of the term 'problem' used in this study in Chapter 1). However, these problems all share some common features, as follows.

1) Problems are relevant to learners' real-life contexts and therefore engage learner interest and motivate learning.
2) Problems require learners to develop their reasoning and research skills.
3) Problems require collaboration from all team members in order to obtain findings.
4) Problems allow many methods or paths to findings.
5) Problems are open-ended and allow multiple legitimate findings.
6) Problems lead to in depth content learning.

In the MFU context, whether PBL is implemented with the existing courses (Model 1) or with a totally brand new program (Model 2), the PBL practice may use the three modes presented in this section. The three modes of PBL practice proposed for MFU are a combination of the different PBL modes described by Savin-Baden and Major (2004). The strategy used in practicing PBL here is called *'the PBL stair steps approach to education'*. The complexity of PBL practice in this strategy will be increased, while lectures about subjects will be decreased and changed in form. No matter which mode is used, assessment is another essential element that needs to be redesigned. The assessments to be used must be aligned with learning outcomes and compatible with the PBL process. Moreover, peer and self-assessments must be part of the overall assessment and students must be trained properly in this matter. It is recommended that peer and self-assessments should be provided in a workshop format.

4.8.1. *The first year PBL single subject mode*

The PBL single subject mode uses the **'one problem one lesson'** strategy or '**one problem one subject theme'** strategy. This mode is likely to be implemented with an existing course in which the teacher wants to improve student learning and the learning environment on their own. The different levels of restrictions to course requirements, PBL practice within this

single subject mode may be affected by different types of limitation in practice. Two strategies are proposed to deal with the single subject mode in PBL practice: '*one problem one lesson*', or '*one problem one subject theme*'.

Using one problem one lesson strategy with a single subject could be a starting point to help the teacher and students become familiar with PBL in practice. This one problem one lesson strategy was inspired by the single module approach (Mode 1) of Savin-Baden and Major (2004) in which they describe how students engage with one problem at a time, meeting 2-3 times with their teacher over the course of each problem. In the one problem one lesson strategy, some lessons of the subject can be learned via PBL by the teacher posing a problem for that lesson, which can be a case of providing a theoretical problem and then engaging students with the problem and allowing 1-3 weeks for the problem solving process. In this strategy, students could potentially work on 2-3 problems in different lessons in one semester. Each problem case is posed by the teacher to tackle the content learning of each particular lesson. Each lesson can last 1-3 weeks, depending on its difficulty and complexity. PBL practice at this level may make the problem cases appear as one of the course activities. The problems posed by the teacher may therefore appear to be discipline oriented. The following figure illustrates the possible course management of a problem on lesson strategy.

Figure 15: Course management of the one problem one lesson strategy

The one problem one subject theme strategy can be used with a subject that has more flexibility in the subject requirements. In this case, the entire subject could implement PBL throughout a semester and all lessons and learning activities could be totally redesigned to be PBL. However, the alternation of the subject content still compromises some elements of the original subject requirement. Some lectures are still necessary and will be conducted to

complement the subject theme which is learned via PBL. In this strategy, a problem within the subject theme will be posed by the teacher once per semester. In some cases, the problem will be posed at the beginning of the semester and in some cases the problem will be posed mid-semester. Lectures will be given as tools or guidelines for students to solve the problem posed and may not be in the same sequence or form as the original lectures. Some old content may be dismissed if it does not complement the PBL subject theme. This one problem one subject theme strategy can also emerge as multidisciplinary learning. PBL principles and processes make substantial contributions to all elements of the course. In this case, PBL is not used only as an add-on learning activity, like the one day one lesson strategy, but influences the redesigning and reorganizing of the whole subject. The following figure illustrates possible course management of the one problem one subject theme strategy.

Figure 16: Course management of one problem one subject theme

In both strategies, the PBL teacher must revise and set forth the learning outcomes and problem cases of the course before the semester starts. PBL single subject mode can be undertaken by a few lecturers who believe and keen in using PBL as a part of their courses at activity level. The lecturer of the subject will also be the PBL facilitator at the same time. In PBL single subject mode, lectures are not excluded, but minimized and the contents re-organized to synchronize with PBL activities. Short interactive lectures are utilized in this mode because Thai students may not be comfortable with a drastic change; they need gradually adjust to a new approach to learning. Sharing knowledge to be used when working on PBL activities may increase confidence in acquiring knowledge and as the inspiration to begin to work differently. As this PBL mode of practice tends to be teacher dependent some

principles of PBL are merged into the existing content and presented to students as a problem case with a solution which may take up to 2-3 weeks to find. The suggested steps to approaching PBL activities are as follows.

1. Handout problem cases or themes designed by the teachers, and have a preliminary discussion with the whole class.
2. When designing the problem cases or themes, the teacher must bear in mind that the designed problem cases must allow students to develop their research skills and allow multiple findings.
3. Lecture on and review necessary content before students start the PBL process.
4. Students discuss problems in a small group (5-6 members) to:

   -clarify the facts of the case (recall old knowledge)

   -analyze what the real problem of the case is

   -brainstorm ideas, identify what needs to be learned to solve the problem

   -specify an action plan of how to work on the problem

5. Students engage in collaborative and autonomous learning such as library searches, web searches, or resource people and observations.
6. Depending on an agreement about how often and how long the facilitation period should be, students return to the supervision session to share information, peer teach, and finalize problem solving. Time management for facilitation also depends on the needs of each team.
7. May provide additional lectures, if needed.
8. Presenting solution(s) to the problem (to the whole class).
9. Reflecting on their own and peers' learning processes; this can be done in the form of short report writing.

4.8.2. PBL integrated with semester project report mode (for the second year)

PBL integrated with semester project report mode utilizes the 'thematic interdisciplinary problem and project report' strategy. Collaborative teaching is essential, from the planning stage to the assessment stage. The strategy is used in implementing PBL with two or more existing courses which have some overlapping content. PBL integration can reduce redundant content and activity in each individual subject. In the planning stage of this mode, the individual subjects selected will be integrated in terms of content, teaching method, material,

and assessment. There should therefore be 3-4 subjects that can be merged in one semester. PBL must not be an add-on activity or lessons in a single subject. Instead, PBL should be integrated in related subjects. Each related subject must agree to allow at least 40% of its total final score to the PBL process and project report. Because this mode is integrated in existing courses, careful classroom management is essential. Each related subject must allocate time for students to work on their project. Lectures are given on a needs basis in the relation to the interdisciplinary project. In terms of assessment, each related subject must use both summative and formative evaluation depending on course objectives which are suitably predesigned for the project and the context of the subjects involved. This part of the assessment must not exceed 60% of the total score, however. When undertaking the PBL interdisciplinary project, an interdisciplinary theme will be formed as a semester project as the starting point for students. Students will be required to work in teams on one interdisciplinary project per semester in addition to taking those individual courses. Lecturers in the related subjects will then also become PBL facilitators. The following figure illustrates the management of the related PBL courses.
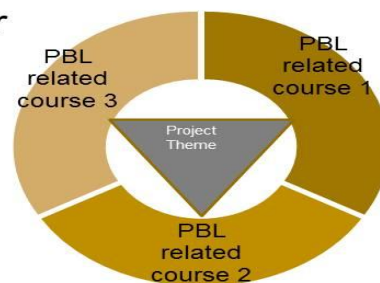
Figure 17: Course management of PBL project report mode

This PBL mode of practice is moving away from teacher dependent cases or projects. Students will exhibit more ownership over their project which will be based on their own interests. They will begin to formulate a problem on their own which will lead to decision making about how they will handle their project. It will take longer (one whole semester) to solve the problem and complete the project. The suggested steps in approaching PBL project report mode are as follows.

1. The semester's interdisciplinary theme will be presented to students, it must be open-ended.

2. Students team up and begin to explore and formulate the topics and problems of their project, within the given theme, from the very beginning of the semester.

3. Along with project facilitation, students are required to attend lectures in the related subjects. The lectures should be interactive and the content must serve the semester project.

4. Lectures in PBL related subjects must complement each other and be selective. Lecture time should be modified and rearranged.

5. Students are also required to document their teamwork process and each of one own learning process while working on their projects.

6. Each related subject will assess student content knowledge individually, for 60% of their total score.

7. Assessment of student competences through the project include (40% for each related subjects):
   - Team presentation and individual oral examination
   - Use of peer and self-assessment is strongly encouraged as a part of the project evaluation.
   - Complete final report of the project.

4.8.3. The PBL research project mode (for third and fourth year)

This mode utilizes the ***'PBL embedding in research project'*** strategy**.** This mode will require higher order thinking from both teachers and students as a result of the research elements. This mode also requires collaborative teaching and learning. PBL facilitators must be flexible, spontaneous, attentive to student learning processes, and have research skills. This mode should integrate two or more subjects in which the selected content must be researchable and stimulate students to make inquiries. This mode will run similarly to the thematic interdisciplinary problem and project report mode, but the research project itself will be worth at least 50% of the total score of each PBL subject. In this mode, research knowledge and skills will be emphasized as well. It is recommended that there should be two supervisors for this mode and evaluators for each group for the research component. Each PBL subject will have to rearrange its lecture time and give 50% to the PBL research supervision process. The research theme must be well designed from the beginning by PBL subject lecturers so that some part of the subject content can lead to the inquiry of the

research project and some part of subject content will be learned through the knowledge inquiry. In this mode, students are more likely to be those who formulate and analyze problems in order to lead them to the research process and eventually to a possible answer or solution to the problems they formulated are the beginnings of the semester. In designing this PBL mode, follow these guidelines:

1. Learning outcomes of PBL subjects and the research project must be first clarified.
2. Lectures should be interactive, supported by stimulus activities, and serve the research project.
3. The research theme must be open-ended and lead to innovative learning. The theme must be presented at the very beginning of the semester, by the PBL supervisor team.
4. Research topics and research questions must be within the premise of real-life problems, meaningful to learners, and relevant to the content of the PBL subjects. They must be formulated by students.
5. The research topics must allow multiple research methods and multiple findings.
6. The PBL process requires feedback and deadlines.
7. Students are also required to acquire peer and self-assessment skills; the intensive peer and self-assessment workshop is mandatory.

The following figure (17) illustrates PBL course management when embedding a research project.
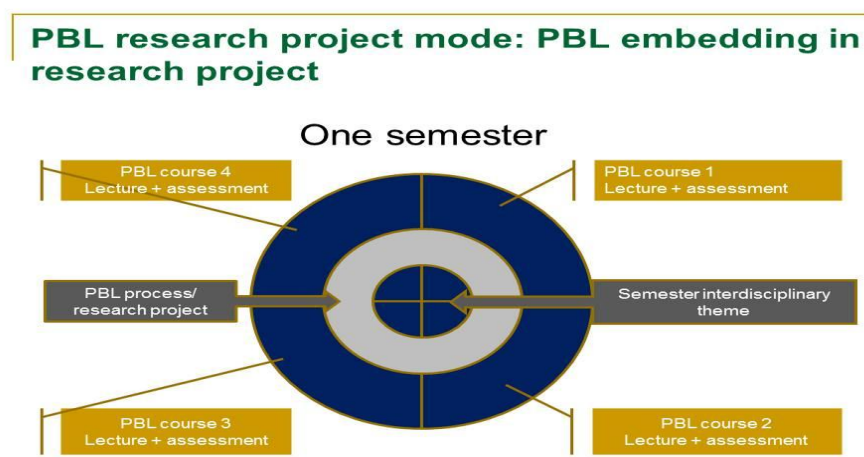
Figure 18: Course management of PBL research project mode

4.9. Recommended general processes of PBL practice at MFU

PBL practice at MFU must be an interactive process whether during lecture sessions or the facilitation sessions. Problems could be in various forms and levels, but they must stimulate learning. Trained PBL facilitators will be involved in all the process of PBL syllabus and curriculum development, starting from:

| planning | ››››› | action | ››››› | assessment | ››››› | reflection | ››››› | revision |

When implementing PBL at any level, practitioners must have an understanding of the philosophy and principles underpinning PBL and be aware which mode of PBL is used in that particular context. PBL practitioners also need to have a commitment to the PBL process from the planning stage to the revision stage. In the planning, PBL practitioners are required to take part in designing a comprehensive syllabus or curriculum which involves writing problem cases or themes and preparing relevant lectures and lessons. In the action stage, practitioners are required to take part in lecturing and giving workshops to learners in order to help them work on cases, projects and research, as well as facilitating the learning process.

4.10. Roles and responsibilities of PBL facilitators

Being a PBL practitioner requires a change in mindset towards learning and teaching, as well change in roles during the process of PBL facilitation. Depending on the level of the learners, the facilitators may use different strategies and modes to approach student learning. The facilitators must be observant and able to assess learners and situations; know when to be directive, when to intervene, and when to allow learners to work independently. In other words, the facilitators must learn to read learners and situations. The following are the guidelines for PBL facilitators.

- Guide learning or probe for deeper understanding in content by asking many open-ended questions, asking learners to elaborate on important points, asking learners to sum up each discussion.
- Do not give answers, but redirect questions addressed to you back to the team members.
- Involve all team members during the facilitation sessions and balance the dynamics of team discussion.
- Give constructive feedback.
- Be a role model for professional behavior in all respects.
- Evaluate both learning processes and learning outcomes.

4.11. Roles and responsibilities of PBL learners

PBL learners are active learners and become hosts of new responsibilities. PBL learners are required to actively construct knowledge, compare and contrast new knowledge with previous information, and share knowledge and responsibilities with team members. There are several changes to the roles and responsibilities of learners when PBL is central to learning and teaching. The following are roles and responsibilities for PBL learners to keep in mind.

- Become an observer, a thinker, and a researcher.
- Become a risk taker and an explorer.
- Become a decision maker.
- Become a contributor in knowledge sharing and problem solving (collaboration).
- Become a communicator.
- Become an autonomous or a self-directed learner.
- Become an assessor of self and peer learning.
- Become professional and ethical in practice.

4.12. Spaces for PBL practitioners

Learning space can include both physical and virtual locations where learning takes place. In a PBL environment, learning can take place beyond the classroom context. PBL involves both individual and team learning activities. One of the core elements of PBL is collaborative learning and teaching which means learners are required to meet and work in teams to identify learning issues, research, and reflect those learning issues. When involved with this type of learning process, learning space therefore becomes an issue to be discussed. In some PBL environments, learners are allocated their own private group room which they use as a place to meet regularly to work on their project. It is ideal if the institutes can afford to build group rooms for learners. In reality, especially in the MFU context, providing private group rooms to learners is not possible. PBL practitioners at MFU must be creative in utilizing the learning space. As well as lecture rooms, learners can also use other available spaces both on and off campus to meet informally to work on their PBL project. For the supervision period, it is recommended that booking the small group rooms provided by different faculties, the Self Access Learning Center, and the University Library are options in the MFU context.

Part III. A framework for the PBL staff development program

As well as considering PBL curriculum development and investigating the impact of curriculum design and its practice, this PhD study also focus on PBL staff development. Many scholars and researchers in the field have pointed out that staff development is definitely essential and necessary in initiating and maintaining PBL implementation. This study therefore highlights the importance of developing a PBL staff training or staff development program as a strategy to facilitate change in education practice and management. As pointed out by Coffin (2013), if one of the educational aims of Mae Fah Luang University is to implement PBL effectively, the university must invest and support staff professional development as early as possible. One way to approach PBL staff development at MFU is to establish a PBL Network which functions as the platform to bring together, support, and empower PBL practitioners to develop intellectual elements related to their pedagogy stance. This section is therefore devoted to developing and designing a framework for a PBL staff development program and the concept is as follows.

4.13. Vision and objective of the program

One of the policies of Mae Fah Luang University is implementing Problem-Based Learning (PBL) into its education system. This requires a PBL unit or MFU-PBL Network to facilitate the sustainable implementation of PBL. In addition, in terms of a long-term goal, because the PBL-MFU Network aims to offer consultancy and training in PBL professional development for other education organizations in Thailand and in the Greater Mae Khong Sub-Region, the unit must be sufficient and efficient in its performance. Gathering qualified staff who are able to disseminate knowledge and skills in active learning, collaborative learning, and autonomous learning is highly important. These qualified staff will become valuable resources in implementing PBL within the Mae Fah Luang University system and introducing PBL to other external organizations in the region.

The objectives of establishing the PBL Network Initiative at MFU are:

1. Fostering the development of a PBL pedagogy in MFU faculty members.
2. Fostering development of learning organization through promoting PBL as the education strategy.
3. Providing support to faculty members in pursuing research excellence in the field of PBL.

4. Enhancing active learning and autonomous learning in the organization, including administrators, academic staff, and students.

5. Building a connection and collaboration between PBL practitioners and researchers both locally and internationally.

In its initiative stage, it is essential to create a community of practice for PBL practitioners. As a result, the MFU-PBL Network will be a platform enabling lecturers at Mae Fah Luang University (MFU) to equip themselves with skills and competences to become facilitators in a problem-based learning (PBL) environment which will consequently enhance the quality of active learning and interdisciplinary learning of students. The core mission of this stage is the ongoing endeavor to encourage reflections on conceptions and practices of PBL as an educational strategy. The MFU-PBL Network therefore is responsible for:

1) Putting together a systematic sequential PBL staff training program for MFU lecturers throughout the academic year.

2) Assembling a PBL research group and PBL community practice which aims to further develop staff professional growth in the field of PBL.

3) Supporting staff's higher education in the field of PBL and interdisciplinary studies at both Master's and PhD levels (2 scholarships).

At the beginning of the PBL Network establishment at MFU, assistance in terms of human resources from the UNESCO Chair in PBL is a necessity. Support from the executive managers of the university in terms of policy, space, and finance are also crucial. The MFU-PBL Network will initially need a group of external experienced PBL practitioners and researchers who will assist in the establishment of the unit and mentor new PBL practitioners. At the same time, the university should begin to invest in human resources, so that the unit can sustain its activities without relying solely on external experts. Within two years the unit should have a sufficient number of internal PBL educators; consequently, the unit will be able to expand its services by offering a consultancy program to other institutes or communities in the Greater Mae Khong Sub-Region (GMS).The PBL Network can be embedded in the Teaching Development Center (TDC) which is already part of the structure of the Division of Quality Assurance and Curriculum Development at Mae Fah Luang University.

In order to run this unit effectively, there should be at least three academic staff and two administrative staff to start with. The academic staff should be able to handle workshop

planning, training and research. These PBL mentors (including external experts) are responsible for:

- Being speakers/trainers in PBL workshops;
- Acting as mentors or facilitators by giving advice to new PBL practitioners, encouraging reflections, and assessing the practitioners' pedagogic process.
- Being advisors to those who participate in the PBL research group.

Note: in the first three years there should be one external expert traveling to MFU each year for 3-6 months.

4.14. Functions

In action, the PBL Network at MFU will consist of three major elements: 1) a systematic staff training program; 2) the PBL community practice; and 3) two scholarships for potential candidates to further their study at the Master's and PhD levels.

The systematic staff training program should first be mandatory for staff: it consists of four elements.

1. A series of PBL hands-on workshops which will be offered throughout the academic year.
2. PBL mentors who help PBL practitioners reflect on both PBL theory and practice via meetings, consultations, and portfolios.
3. PBL teaching portfolios which will be used as a tool to reflect on the actual practice of each practitioner.
4. A yearly PBL seminar as a platform to present and share experiences.

Second, the PBL community practice will function as a platform for staff to support one another informally. This can be optional for staff who want to participate. PBL community practice consists of two elements.

1. Peer coaching which can be initiated and managed by the practitioners themselves.
2. A PBL research group which will be mentored by, and collaborate with, the UNESCO Chair in PBL. It is a platform to support PBL practitioners to build their research skills and connect with other PBL networks around the world.

The functions of these two elements must be explicitly included in the yearly evaluation of academic staff performance at the faculty level. In doing so, this will be an incentive for the PBL practitioners.

There will be two scholarships for potential PBL scholars: one at Master's level and another at PhD level. Master's scholars will be enrolled in the MPBL program offered by UNESCO Chair in PBL at Aalborg University in Denmark. The MPBL program is a long distance learning program in which students can continue to work normally at their own work place. The scholarship will therefore only pay tuition fees for the candidate (see the budget section for financial details). The PhD candidate will work on a research project related to PBL and Sustainability in Higher Education. There are two options for enrollment. In Option 1, the candidate can enroll as a PhD fellow of the UNESCO Chair in PBL at Aalborg University which requires students to be at AAU for three years. The scholarship should include tuition fees, a monthly stipend, and a round-trip ticket to CEI-AAL. In Option 2, the candidate can enroll in a Joint PhD Program between UTM in Malaysia and AAU in Denmark. In this case the candidate would take courses and spend most of their time at UTM and then spend one semester at AAU. The scholarship would include tuition fees, a monthly stipend, and travel expenses (see the budget section for financial details).

Note: The project to establish the MFU-PBL Network Initiative will take 36 months, beginning in September 2012 and ending in August 2015.

4.15. Reward System for PBL practitioners

PBL in practice requires a significant amount of time and energy from both trainers and trainees. Therefore, the University needs to understand and support the practice throughout the process. The suggested reward system is as follows:

1. One of the major characteristics of PBL is allowing students to work in-depth on a problem or a project in small groups. Whilst working on their project, they are facilitated by a PBL facilitator, in addition to attending lecture periods. The problem or project supervision periods must therefore also be counted towards the required hours of both students and teachers. Furthermore, the university must allow flexibility in time management for both lecture and practice periods. Collaboration with the registration division may also be involved.
2. For subjects which require students to acquire specific skills through actual practice, class size must not exceed 20 students per section.
3. The university should allow funding to support PBL practitioners and researchers in terms of participation in academic conferences and publications.

4. The university should allow funding for the PBL Network to manage its activities, such as workshops and a yearly seminar.

5. Implementing PBL successfully requires long term support from the executive managers, therefore, PBL teaching portfolios should be integrated into the university's evaluation system. It should be counted as a part of yearly staff evaluation and promotion.

4.16. A proposed systematic sequential PBL staff training program

In one academic year the program will offer three major hands-on workshops relating to PBL principles, practices, and research. These workshops will support the lecturers' current teaching practices and their teaching portfolios. An outline of each workshop is as follows:

Workshop 1 (two days): PBL introductory-cum-PBL team teaching workshop for staff

The PBL workshop initiative may consist of the following contents and activities.

- Rationale, principles and values of PBL, and research about PBL.
- Simulations - managing a PBL environment (or classroom) focusing student and teacher roles on the PBL process.
- Collaborative design of a PBL curriculum module, focusing on alignments between objectives, contents, instruction and facilitation, and assessment of the current semester. How much PBL is appropriate for us?
- Problem formulation/design and problem analysis (a scenario, a case, a challenge, or a puzzling phenomenon?)

Workshop 2 (one day): Reflections on PBL facilitations

This workshop is the continuation of Workshop 1, as a platform for PBL practitioners to share experiences, and learn from one another to improve their own practice. Workshop activities may consist of the following.

- Sharing and reflecting on their current practice as PBL facilitators (a reflective facilitation process)
- Giving effective feedback and developing questioning skills to help students set goals, monitor progress (individual, and group), activate prior knowledge and focus attention.

Workshop 3 *(one day): Reflections on PBL assessment*

This workshop is the continuation of Workshop 2 in which participants can reflect on their overall practice and assess their current practice in order to plan for the next round of their practice. The activities in this workshop may involve considering the following questions, and activities.

- What is involved in PBL assessment (knowledge, skills, and attitudes; process vs. product)?
- When and how does assessment occur?
- Who can carry out assessment?
- Sharing current assessment tools as used in their context.

4.17. PBL Teaching Portfolio
The teaching portfolio, including its process, consists of 3 elements.

4.17.1 Ongoing meetings with PBL mentors
Meetings with mentors can be face-to- face or online, and in the form of a PBL facilitation or supervision. This is a consultation session where PBL mentors will give feedback to PBL practitioners on their pedagogical practice and the progress of the portfolio.

4.17.2. Written Report *(the portfolio)*
The portfolio, or final report, is to be prepared and submitted to the PBL Network. The portfolio will be included as a part of a yearly staff evaluation. The procedures involved in completing the portfolio are:

1) Carefully plan and design a pedagogical project;
2) Try it out with the class you teach;
3) Evaluate the feasibility and effectiveness of the proposed strategy;
4) Reflect on possible modifications to achieve greater educational value and effectiveness; and
5) Complete documentation for the PBL portfolio and make a presentation at the yearly PBL seminar.

4.17.3. PBL Practitioner Presentations

Having PBL practitioners report and share their experience in implementing PBL in the classroom can be a strategy to strengthen individual practice as well as the PBL community of practice. The presentation or the dissemination of knowledge by these practitioners can be made in different layers. An informal form can be initiated and facilitated amongst peers and later a more formal yearly PBL seminar facilitated by the PBL Network committee.

The PBL Network committee can take roles in arranging time, place and commentators for the PBL practitioners. The following table presents an ideal plan to assist PBL practitioners to develop their professional competence in a one year period.

Program activities	March-May	June-October	November-February
1st Sequential Workshop (1)	2 day PBL WS (1)		
PBL practice with facilitation from PBL mentors (2)		Ongoing process for one semester (2)	
2nd Sequential Workshop (3)		One day workshop in August (3)	
Documentation of PBL process and practice under supervision of PBL mentors (4)		Ongoing process - based on actual practice and reflection (4)	
3rd Sequential Workshop (5)			One day workshop in December (5)
Completing portfolio and presenting at the yearly PBL seminar (6)			PBL Seminar in February (6)
	One year progress		

Table 10: The proposed ideal plan of progress for PBL Staff Development [in a one year period]

4.18. Summary

This chapter presents a theoretical framework for the PBL curriculum design and the PBL staff training program to be implemented at MFU. The PBL models and modes of practice, plans, or guidelines appearing in this chapter are the visionary designs developed by the research. These frameworks serve as general guidelines for other prospective PBL teachers who are collaborating with the researcher in developing and negotiating for a more specific PBL course outline or program for each particular discipline. However, when it comes to a realistic version of the syllabus and curriculum design, which is presented in the next chapter, modification of the designs happens once again. The designs implemented in this study

context are therefore the result of a PBL syllabus/curriculum reconstruction from the existing syllabus and curriculum. These realistic designs are the products of collaboration between DBR researchers and teachers in co-designing a syllabus and program that serves the needs of their local contexts.

CHAPTER FIVE

PBL IMPLEMENTATION WITHIN THE ENGLISH COHORT: IMPLEMENTATION AND RETROSPECTIVE ANALYSIS PHASES OF DBR (Study 1)

The frameworks of PBL models and modes of practice presented in Chapter Four were designed by the researcher, based on both theoretical and empirical studies. Taking the frameworks designed by the researcher as the departure point for implementation, it was discovered that it was necessary to redesign a more collaborative and realistic PBL syllabus for each cohort of students and teachers in different disciplines to practice PBL. This chapter presents the practice of the negotiated PBL syllabus with the English cohort, as well as the research approach and results of the PBL implementation with this English cohort. A summary of the research paper, *The Impact of the Implementation of the PBL for EFL Interdisciplinary Study in a Local Thai Context,* is included in this chapter. The research paper was presented at 'The 4th PBL Research Symposium 2013' in Malaysia on July 2nd - 3rd, 2013.

5.1. The negotiated design of PBL practice mode utilized with the English cohort

When it comes to the actual practice of PBL at Mae Fah Luang University, the PBL process has diversified depending on the nature of each discipline. As a result of dealing with existing curricula and syllabi, the actual design and practice of PBL in the English Department did not exactly follow the ideal plan presented in Chapter 4. Collaboration for the actual implementation of PBL at MFU took place and was documented only within the English major team (166 students + 3 teachers) and the IT School team (135 students and 3 teachers).

This section explains specifically how PBL is practiced in a mandatory English writing course (Writing 3). Ideally, it was hoped that PBL practice with the English major would integrate/synchronize the contents of 3-4 subjects by re-selecting the overlapping contents of each subject and using a term's research project to foster the content learning of each subject. The PBL process to be used with the English major group should be based on the third and fourth year PBL research project mode - *the PBL embedding in research project* approach, as explained in Chapter 4. However, due to current curriculum management in the English

Department, the implementation of PBL with the English major team took a bottom-up approach with implicit support from top managers (Dean and President). This means the implementation of PBL was not imposed on any subject or any teacher, but was encouraged. The subject coordinator who decided to implement PBL had some flexibility to adjust course objectives, content, teaching method, and assessment regarding PBL principles. English teachers seemed to have genuine interest in the PBL approach to learning and wanted to implement PBL, but they also confronted difficult situations. Due to time constraints and the extra workloads in preparing new lessons and material for both PBL and non-PBL course in a short period of time, all major courses which planned to run PBL, chose to opt out of the PBL implementation of the original plan. Although they agreed in principle, they appeared to be ambivalent about putting in extra work to redesign the learning activities and assessment tools for PBL. Consequently, there was only one subject, Writing 3, which continued with the plan. I therefore had to take charge of redesigning the course outline and learning activities in collaboration with two other teachers. The negotiated design of the EFL writing syllabus and learning activities were heavily influenced by the researcher, myself, with strong collaboration with other two teachers. Throughout the design and practice process, the team of three English teachers met informally every other week to reflect on their pedagogical practice and student learning. Conducting the workshop sessions and assessing student learning in particular, must come from teacher collaboration. In addition to physical meetings, e-learning was also used as a platform to share information and communicate with students throughout the semester. This section therefore presents the redesign of the negotiated design of the PBL syllabus for EFL Interdisciplinary Studies used with a single subject called Writing 3. Even though PBL was implemented in single subject mode (not exactly according to the plan), the objectives and learning activities were completely redesigned. The PBL process was emphasized from the very beginning. Although this PBL practice was used with a single subject, the PBL process according to the *'PBL Embedding in research project'* approach was fully implemented. Writing 3 is compulsory for English Major students at Mae Fah Luang University. The original course syllabus for Writing 3 required 45 contact hours of lecture or 3 hours per week for 15 weeks. In addition to lectures, writing activities were used as tools of the writing process for students to practice their writing skills. In the previous semesters writing activities were individually based and focused on a final product, which were drafts of academic papers. Even though the writing process (writing multiple drafts) has been used to foster student learning and writing skills, both teachers and students often expressed concern regarding correlation of the quality of

students' actual learning progress and their final grade. The real concern is the questionable issue of the standard of teachers' grading criteria. Even though a grading rubric was used, due to the nature of the course and because the assessments were subjective and involved many teachers, the grading standard in relation to actual learning continues to be problematic when the weight of a grade is placed on the final product.

The aim of implementing PBL into this learning scenario was to at least minimize these concerns and further enhance students' academic knowledge and practical skills. The PBL process was emphasized in this redesigned course which means the teacher of every section must document the progress of student learning associated with the problem solving of their research project. Redesigning the course syllabus and learning activities of Writing 3 was based on alignment between the PBL principles, the local cultural context, and the existing syllabus. Alignments between the four elements of the syllabus were used as the basis of the redesign. The four elements were learning outcome, content and material, learning and teaching method, and assessment. The objectives of the course were based on three major pillars, which were English communicative competence, PBL and research process, and additional discipline content. The differences between the existing course syllabus and the new redesigned course syllabus are demonstrated in the following table.

Activity	Previous Writing 3 syllabus	PBL Writing 3 Syllabus
Lecture on content + in-class assignments	100% (45 contact hours) of allocated time	26.7% (12 contact hours) of allocated time
Small group meeting/seminar (PBL supervision)	Not mandatory	Mandatory: 40- 46.67% of allocated time (18-21 contact hours)
PBL and practical skill workshop	No	26.7% (12 contact hours) of allocated time
Project presentation	No	Mandatory
Peer & self-assessment	No	Mandatory
Oral examination	No	Mandatory
First draft submission	Yes	Yes
Report of the project report (final draft submission)	Yes	Yes

Table 11: A comparison of Writing 3 syllabi: before and after PBL implementation

The PBL practice in this case is called *'Embedding PBL into a research project'*. The following steps were applied in reconstructing the course.

1. Learning outcomes of PBL subjects and the research project were first clarified. In this case, course objectives originally existed; however, when integrating PBL, course objectives

and learning outcomes are revised (modified) to also give importance to the learning process, not just the learning product.

2. Lectures should be interactive, supported by stimulus activities, and serve the research project.

3. Research themes must be open-ended and lead to innovative learning. The themes must be presented at the very beginning of the semester, by the PBL supervisor team.

4. Research topics and research questions must be within the premise of real-life problems, meaningful to learners, and relevant to the content of the PBL subjects. They must be formulated by students.

5. The research topics must allow multiple research methods and multiple findings.

6. The PBL process requires feedback and deadline.

7. Students are also required to acquire peer and self- assessment skills by attending an intensive workshop.

The following figure (19) also illustrates the relevant elements to be considered when designing and implementing PBL in this particular context.
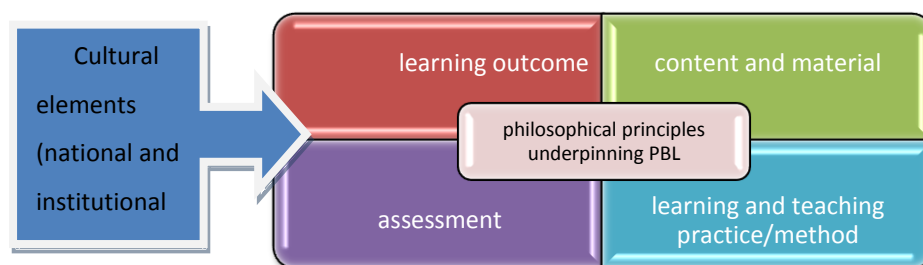
Figure 19: Elements influence PBL syllabus and curriculum design

The objectives of the course are re-formulated based on the elements presented in Figure18 and 19, details as follows:

- Developing concepts of conducting a research project.
- Practicing the research process by locating resources and efficiently utilizing those resources, formulating research questions, investigating the research topic and processing drafts and revisions of research papers.

- Practicing the PBL process by contributing to collaborative learning, autonomous learning, peer and self-assessment in order to complete the research project.
- Writing an effective abstract and academic paper.
- Developing editing skills.
- Developing oral presentation and communication skills.

The new approach to Writing 3 also involves redistribution of time allocation in the course. The major change is that lecture time is minimized to 15 hours over a semester or 1/3 (total 45 hours) of total allocated contact hours, as compared to the previous course which gave all 45 contact hours to lecture time. The balance of time in the new approach was allocated to active hands-on workshops (12 hours) which required students to actively practice and share knowledge and skills. Supervision time (18-21 hours) was also allocated and separated into two types. The first type was two formal seminar-supervisions which required every team and every section to function in the same manner. Each formal seminar-supervision lasted approximately an hour per team and five percent of the total score, based on the assigned rubric, was given to each formal supervision. The second type was informal meetings which were initiated by students and depended on the needs of each team. Team formulation and teamwork on the research project started in the very first week of the study. As for problem formulation, it was students who initiated the topic and content to be explored and they eventually developed the problems into a research project. Through this research project they learned subject content. The following figure illustrates the activities and time allocation of the redesigned syllabus.

Lecture 1; 6 hours	Team formulation + problem formulation	Lecture 2: 6 hours		Team presentation+ individual examination+ final draft submission
	Supervision total 18-21 contact hours			
	Workshop 1,2: 6 hours.		Workshop 3,4: 6 hours	

Week1, 2………………………...8……………………………...............12………………...............15
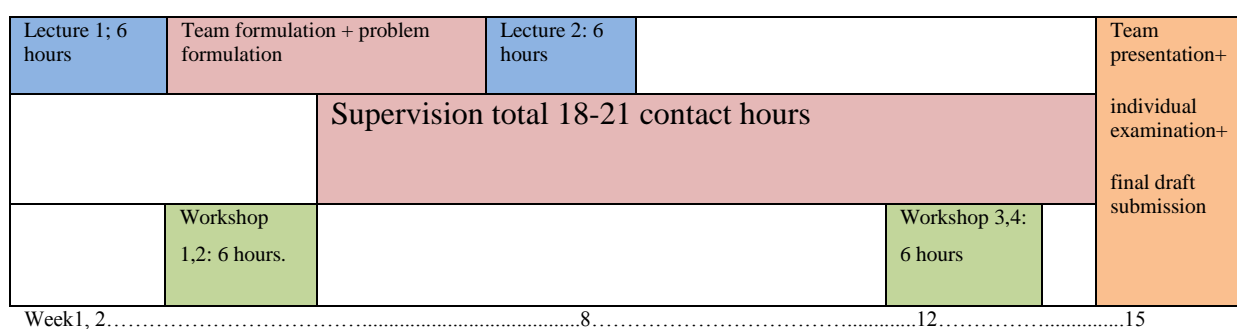
Figure 20: Activities and time allocation for the reconstructed PBL course

The actual redesigned PBL syllabus for Writing 3 is presented in Appendix M.

In fulfilling the objectives of the new re-designed syllabus, teachers of the course had to put extra time and effort into designing new learning materials especially for the workshop sessions. The subject matter content remained the same for the most part and was delivered in

a form of interactive lectures and external reading. Four topics were covered in the workshops. The first two workshops, which took six contact hours, emphasized orientation to the PBL process which involved project and team management, peer and self-assessment. The design and practice of PBL in this case really gave importance to the PBL process for the very first week of the study. Allowing 18-21 contact hours for PBL supervision time allocation was also a big change in learning and teaching this course. However, due to cultural sensitivity, it was agreed to conduct the supervision sessions with a system of checks and balances for student attendance, participation, and learning progress. Peer and self-assessments played a crucial element in monitoring student contributions to teamwork as well as their progress in collaborative learning. I played three roles within the implementation process of this context: as a teacher who taught and practiced PBL, as well as worked with other two teachers to utilize the PBL design for the course; as a course designer, who bridged the design abstract and the practice and involved the other two teachers in the implementation process (An on-going consultancy during the implementation phase was also led by me.);and as a researcher who studied the context of implementation by collecting data from various sources through different research tools.

5.2. Results and analysis of PBL implementation with the English cohort (Writing 3)

In parallel with practicing the new learning and teaching approach to the Writing 3 course, empirical data was collected from different sources in order to assess the impact of the PBL implementation. As explained in the methodology (Chapter Three), a case study was conducted throughout the semester. Empirical data was obtained from both students and teachers through different instruments: pre-survey questionnaires and post-survey questionnaires, observation, reflection notes and interviews, as shown in the following figure.
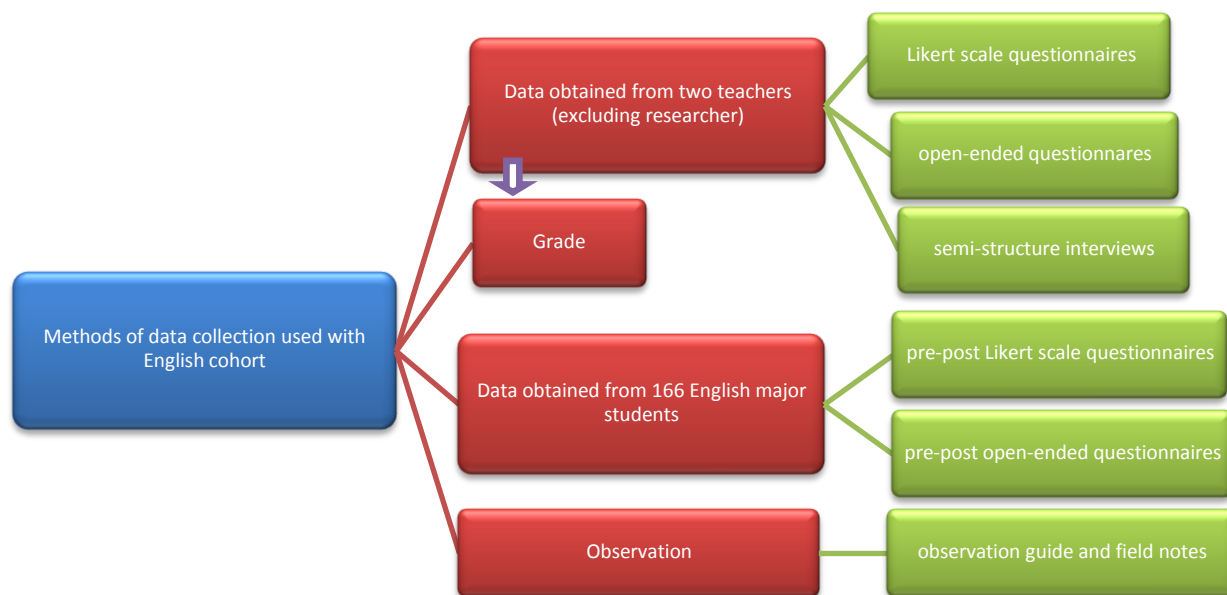
Figure 21: Methods of data collection to assess PBL implementation

The following section presents and reflects on the results and impact of the implementation of PBL according to observations, pre- and post- student survey questionnaires, teacher field notes, and teacher interviews.

5.2.1 Results and analysis of PBL implementation with the English cohort

This section presents a summary of the study of PBL implementation with the English cohort. The research paper, *The Impact of the Implementation of the PBL for EFL Interdisciplinary Study in a Local Thai Context*, was disseminated at the 4th PBL International Symposium at Kuala Lumpur in Malaysia in July 2013 (see full paper in Appendix Q).

[A summary of the study]

The implementation of PBL with the Writing 3 course required collaborative planning and teaching from all three teachers throughout the semester. Collaboration among the teachers began with designing learning activities, materials, and assessment tools, and ended with a collaborative assessment strategy. An approach to data collection involving triangulation of information was central to this study. Data came from different sources and through different tools, details of the process of data collections are as follows.

1) Pre-survey questionnaires and post-survey questionnaires which consisted of Likert and open-ended questions.

2) Teacher questionnaires which consisted of Likert scale (assessing student performance and learning outcomes) and open-ended questions (reflecting on the practice of PBL in their context).

3) Teacher interviews in the form of individual semi-structured interviews.

4) Student grades (based on a scale from 1- 100%, the range from A-F was also used to confirm student performances regarding the objectives and the grading criteria of the course.

A summary of the quantitative data from pre- and post-student survey questionnaires shows both teachers and students greatly appreciated the PBL process because it helped them discover their learning potential and gain values and benefits from concrete to abstract elements as learners. The pre- and post-student survey questionnaires consisted of 25 items which were categorized into six clusters. This quantitative data set was also analyzed using inferential statistics: a paired t-test. The seven clusters were tested for reliability using Cronbach's alpha and results are presented in the following table.

Six clusters (from 25 items)	α
1.The motivation cluster consisted of 3 items (1,14,25)	0.669
2. The collaboration cluster consisted of 4 items (2,4,7,12)	0.696
3. The PBL process cluster consisted of 7 items (3,5,10,19,20,21,22)	0.850
4. The self-directed learning cluster consisted of 6 items (6,8,9,11,13,15)	0.889
5. The communication cluster consisted of 3 items (16,17,18)	0.905
6. The peer assessment cluster consisted of 2 items (23, 24)	0.923

Table 12: Cronbach's alpha of the six clusters

The skills and values gained by students assessed in this study were motivation, collaboration skills, self-directed learning skills, communication skills, including both oral and written, and critical thinking and problem-solving skills. Peer assessment was also perceived as a very important element in implementing PBL successfully in this context. The following table presents a comparison of pre- and post-surveys according to the frequency, mean, and standard deviation of the seven clusters, which are the results of the PBL practice.

Clusters	ty pe	Frequency					Mean	SD	Sig. (2-tailed)
		1	2	3	4	5			
1. Motivation	Pre-	2.0	19.6	83.6	47	13.6	3.3052	.61454	
	Post-	1.33	6	57	72	29.67	3.7390	.69447	.000
2. Collaboration	Pre-	2	18.5	61.25	64.75	19.5	3.4895	.62967	
	Post-	2.5	5.5	44.75	64.75	48.5	3.9111	.83258	.000
3. PBL process	Pre-	.57	14.29	74.72	61.14	15.28	3.4596	.57145	
	Post-	.71	4.43	41.43	82.86	36.57	3.9045	.70818	.000
4. SDL	Pre-	1.8	22	61.1	54.1	27	3.4930	.66321	
	Post-	2.5	14	43	55.83	50.67	3.8323	.83252	.000
5. Communication	Pre-	9	50.33	75	28.67	3	2.7972	.77048	
	Post-	2	11.33	46.33	72.66	33.66	3.7510	.84939	.000
6. Peer Assessment	Pre-	.5	16	75	66	8.5	3.3976	.71461	
	Post-	0	5.5	47	74.5	39	3.8855	.76406	.000
7. Critical thinking (later discovered)	Pre-	0	15	79	66	6	3.38	.701	
	Post-	0	4	45	79	38	3.91	.769	.000

Table 13: A comparison of frequency, mean, standard deviation and significant differences of the seven clusters

From Table 13, it can be seen that students gained motivation in learning and professional skills after they had gone through the PBL process. Moreover, they also had a positive attitude towards PBL practice in their context. The following figure shows the improvement in how students rated the values gained before and after going through the PBL process, based on means of pre- and post-survey questionnaires.
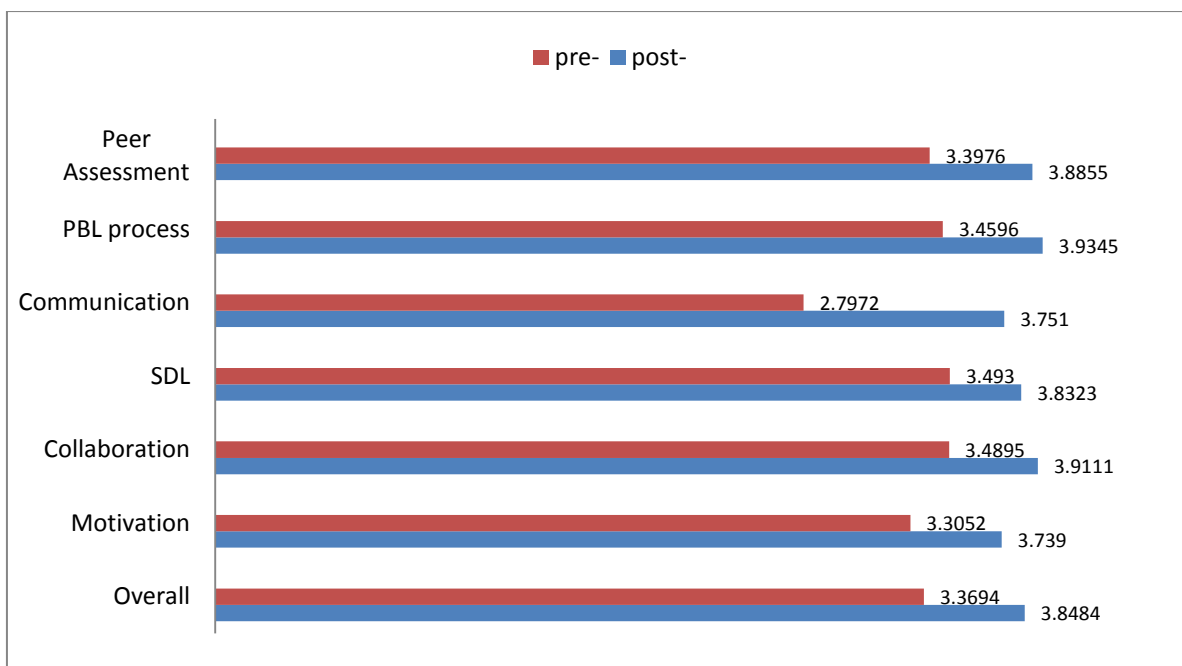
Figure 22: Comparing means of pre- and post- survey results from 166 students

Comparison of the pre- and the post-tests shows that there are significant differences of means for all clusters at level < .01. This indicates that students perceived improvements in all categories after they had gone through the PBL process. The analysis by paired t-test of the overall 25 items and the 7 clusters can be seen in detail in the conference paper presented in Appendix Q. An overall interpretation based on the analysis of inferential statistics indicates that there is a significant difference between the pre-survey and the post-survey in all items and in all seven clusters. This means student motivation for learning, collaboration skills, self-directed learning skills, communication skills, and critical thinking skills increased after going through the PBL process. Students also perceived that the PBL process was incorporated in teaching and learning of Writing3 throughout the semester. Students further indicated that they took part in peer and self-assessment which is considered one of the major elements included in the PBL process. In order to illustrate the significant difference between pre- and post-surveys, two selected categories are presented graphically to show the significant improvement rate as seen in the overall survey (25 items) and the most significant cluster which is communication. The following graph distributions are based on the mean and standard deviation.

Mean and SD of overall 25 items

Pre-M 3.3694 Pre-SD .14658

Post-M 3.8484; Post-SD .15244

Pre

Post

Mean and SD of communication cluster

Pre-M 2.7972 Pre-SD .15980

Post- M3.7540; Post-SD .16593

Pre
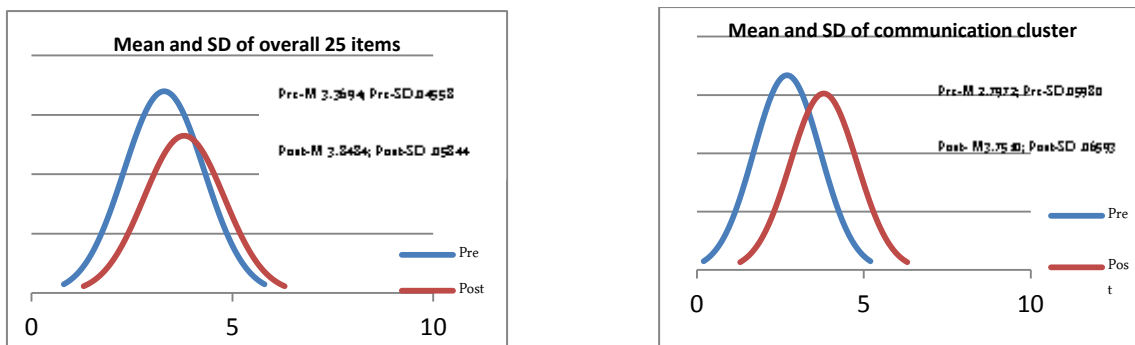
Post

Figure 23: Significant difference between pre- and post-surveys

From the two graphs, Figure 22, it can be seen that students perceived that they had made a significant improvement in their learning in general after going through the PBL process. The most significant improvement was in communication skills. Even though the content of the course emphasizes writing skills, verbal skills were also incorporated as communication skills in this case.

In addition to the analysis of quantitative data from 166 students, qualitative data obtained from students' written responses was also analyzed by qualitative content analysis. These written field notes are excerpts from student responses to the open-ended questionnaire which were annexed to the pre- and post-scale survey questionnaires. The qualitative content analysis of this part is also comparable in terms of how students perceived their learning experience before and after PBL implementation. After receiving all questionnaires from 166 students, the written responses were read through. Keywords, phrases, or sentences in response to each question were abstracted and the frequency of each keyword, phrase, or sentence counted in order to categorize the answer patterns. Some sentences were highlighted and used as quotations to support other data sets. Based on the answers or responses to the open-ended questions, themes or categories emerged, as in the following scheme, see Appendix G.

5.2.2. Results and analysis of observation during the supervision sessions

Observation was used to gather data about the interaction dynamic between students and teachers during the supervision periods. The observations conducted with the English group were direct observations where the researcher observed interactions, the process of PBL facilitation, and behavior of the subjects as it occurred. An observation guide and field notes were used as the means of collecting observation data. The observations were conducted in weeks 6-13 during the supervision sessions in which two teachers, excluding the researcher and her students, discussed work progress with each team. The supervision of each

team lasted approximately an hour. Six teams of students were observed while discussing their project's progress with their teachers. Based on the field notes, a summary of the results of the observations is presented in the following table.

Points to be observed (observation guides)	Results from filed notes in accordance with observation guidelines

1.Dynamics
 	
1.1 How the meeting started
 	
1.2 Interaction between teacher and students
 	
1.3 Interaction among students (group dynamics)
	General comment: Sessions supervised by both English teachers had similar dynamics. In the formal meetings/facilitations, the teachers started the conversations by asking what the students had done in the past weeks. 1-2 students who seemed to be the leaders of the teams started to report their part. The next students took turns to report their roles. After all students had finished reporting their work progress, the teachers asked many questions to check student content knowledge acquisition and their work progress related to the research project management issues.
	
	    Observer comment: The first supervision session of all six teams tended to be a bit unnatural because students seemed to be very nervous, maybe because they had to speak in English. Most prepared scripts for their parts. Both teachers appeared to be quite patient with students when they got stuck and tried to assist them to make the discussion flow by asking questions.
	
	    General comment: The supervision sessions were quite active after the first 5-10 minutes. Students were aware of their roles and had planned their participation. Every member presented in the formal meetings, but 1-2 members were absent in the informal meetings. Most team included 1-2 students who tended to dominate the discussion and demonstrated clear leadership of the others. These particular students also acted as moderators of the discussions.
	
	     Observer comment: In every team there were 1-2 passive students who only presented their part but did not make an effort to comment or ask reflective or useful questions of the others for the sake of their future work. Surprisingly, the teachers made no comment on this. I personally think that the teachers should raise student awareness of this issue so that they can try to make an improvement next time.

2. How the meeting ended: results of the meeting session.	General comment: Both teachers focused on student awareness of their work process. Much discussion about problems confronted during the working period and possibilities to solve those problems began towards the end of each meeting. Meetings usually ended with some thoughts or comments the teachers

	wanted students to explore or study more in the next step of their learning. Observer comment: Only 1-2 students were able to contribute to this in-depth discussion (the dominant ones). Teachers should begin to think of a strategy to deal with passive team members.
3.Additional problems/issues that arose during the session	Observer comment: Teachers need to be aware of and must deal with passive students in the team. While one or two were too dominant, the others seemed passive. Proper comments from teachers on both types of behaviors may help stimulate a more lively discussion next time.

Table 14: Observation results from the English cohort

It can be seen that all six teams followed the same pattern in starting and ending their discussion. Both teachers commented on student work, both product and process, spontaneously. It was obvious that students had planned their presentations; this was to make sure that every member had something to say in order to gain points. Once the discussions moved into greater detail about the problem or situation analysis of the current work phase, the dynamics of the group discussion changed to some extent. There were 1-2 students who were actually able to follow and contribute further to the next step of the discussion while others tended to be quiet. The ideal supervision session was designed to run in a panel discussion format where students would be the ones who initiated the discussion. The teacher was there to first observe the discussion and later facilitate their work progress by questioning and suggesting possibilities for handling their work. When students appeared unable to contribute to the discussion equally once the teachers asked questions, this brought up an issue related to team work in this context, involving sharing knowledge and workload and how to minimize free riders.

5.2.3. Results and analysis of data from two English teachers

In addition to data obtained from 166 students, this following section presents qualitative data from two English teachers and its analysis. The first data set obtained from the English teachers comes from scale questionnaires which aimed to compare their views of student learning progress. The second set of data was from open-ended questionnaires which allowed teachers to elaborate on students learning behavior and the results of learning through practicing PBL. These two teachers took part as PBL practitioners and participants of the study which was conducted to investigate the impact of PBL implementation in the local context. Data from the two teachers may not appear to be statistically significant, but it was

used to support other sets of data from students and from observations by the researcher. The qualitative data from these two teachers is insightful information which can help the researcher gain a deeper understanding of what works and what does not work in the study context, so that the next round of implementation can be improved. Data analysis of this part took the form of qualitative content analysis based on the questions posed; both teachers were given the same question scheme after completion of the implementation. The answers from scale questionnaires demonstrate whether the two teachers agreed on, or conflicted with one another over particular issues related to student learning and performance through PBL practice. Based on twenty questionnaire items (see Appendix B) the teachers were asked to assess student learning and performance by rating student knowledge, skills, and the quality of their final product or report. Learning elements assessed by teachers were also matched with the elements in which students assessed themselves: motivation, communication skills (item 18), collaboration skills (item 6), and self-directed learning skills (items 5, 15), and problem-solving and critical thinking skills (item 9). The assessment revealed that the teachers agreed that the PBL process had enhanced content learning and practical skills of the students. They both agreed that students learned more subject/discipline content through the PBL project. Both teachers were satisfied with the development of student learning and the quality of students' final product and performance In addition, the teachers also agreed that the PBL process raised student motivation in learning. Despite this, there was one issue in which the teachers revealed disagreement about how they perceived their students' managed conflicts. One teacher revealed that her students were open about member's conflicting ideas or issues. Her students showed effort in attempting to solve conflicts on their own, with the teacher's acknowledgement and supervision. In contrast, the other teacher revealed that her students either kept their conflict from the teacher or did not have any conflict at all.

The written qualitative data from the open-ended questionnaire was read through. Key words, phrases, or sentences answering each question were abstracted in order to categorize the answer patterns. Some sentences were highlighted and used as quotations to support other data sets. Themes or categories emerged based on the answers to the guided questions. The procedure of content analysis used with written data from the open-ended questionnaire was the same procedure used with the transcribed interview data. In fact, the questions asked in the open-ended questionnaire were similar to the interview questions so as to have data from the two sources that could be compared and contrasted for validity of the results and analysis. Details of steps in the emerging themes from the written data are presented in the following

scheme which can be seen in Appendix I. From the emerging theme, conclusions about the content analysis of the teachers' field notes can be described as follows.

1. PBL implemented in this context started with problem formulation by the students. Students were encouraged to think about problems that related to their lives and to form questions and these questions led them to a topic of their interest, to be studied that semester. The research project, which was done in teams, and the research process were used to drive student learning processes. The research project was initiated by students and derived from student interests which allowed for student collaboration in learning.

2. The major challenge for the teachers in implementing PBL in this context was that they had difficulty in maintaining balanced roles. During the PBL process, when students encountered obstacles; they were often confused, frustrated, and lost. Teachers were faced with making a decision about how to handle these situations; when to intervene and when to let the situations be. This balancing act could produce an effect on student learning curves.

3. The best learning experience from embracing the PBL process in the teaching and learning of the Writing 3 course was that students had become autonomous and collaborative learners (from teacher perspectives). Teachers also realized that they had learned new things from students through PBL process.

4. An overview from teachers who were taking part in PBL implementation within the English cohort was that they believed that PBL process could increase student motivation in learning. The concepts and practices of PBL are new to the Thai context, therefore, they believed that PBL implementation is possible but adaptation is needed in the local context.

5.2.4. Results and analysis of student grades

The strategy used to analyze the impact of PBL implementation on student achievement was in this case to compare and contrast the grade distributions from this writing course over five semesters. The course is usually offered once per academic year, except in 2008 when it was offered twice due to a curriculum revision which mainly re-organized the schedule of courses in each semester. The data presented shows that the course was offered twice in that academic year, but a different group of students took the course. Details of grade distribution over the five semesters are presented as follows.

Grade/Semester	1/2007		1/2008		2/2008		2009		2012	
A	4	4.3%	1	0.75%	4	3.13%	0	0%	0	0%
B+	7	7.53%	12	8.96%	7	5.47%	1	0.6%	16	8.97%
B	17	18.28%	41	30.6%	16	12.5%	23	14.47%	32	17.58%
C+	8	8.6%	29	21.64%	21	16.41%	24	15.09%	54	29.67%
C	19	20.43%	30	22.39%	28	21.88%	35	22.01%	48	26.37%
D+	9	9.68%	3	2.24%	20	15.63%	20	12.58%	24	13.19%
D	19	20.43%	7	5.22%	16	12.5%	41	25.79%	7	3.85%
F	7	7.53%	5	3.73%	7	5.47%	14	8.8%	1	0.55%
W	0	0%	6	4.48%	9	7.03%	1	0.6%	0	0%
Total students	93		134		128		159		182	

Table15: Student grade data, comparing five semesters

The data from Table 12 shows that implementing PBL lowered the failing grade (F) and the lowest grade (D), as well as lowering the withdrawal rate (W). In order to present the impact on grade distribution explicitly, the following chart also shows the differences in grade distribution over the five semesters.
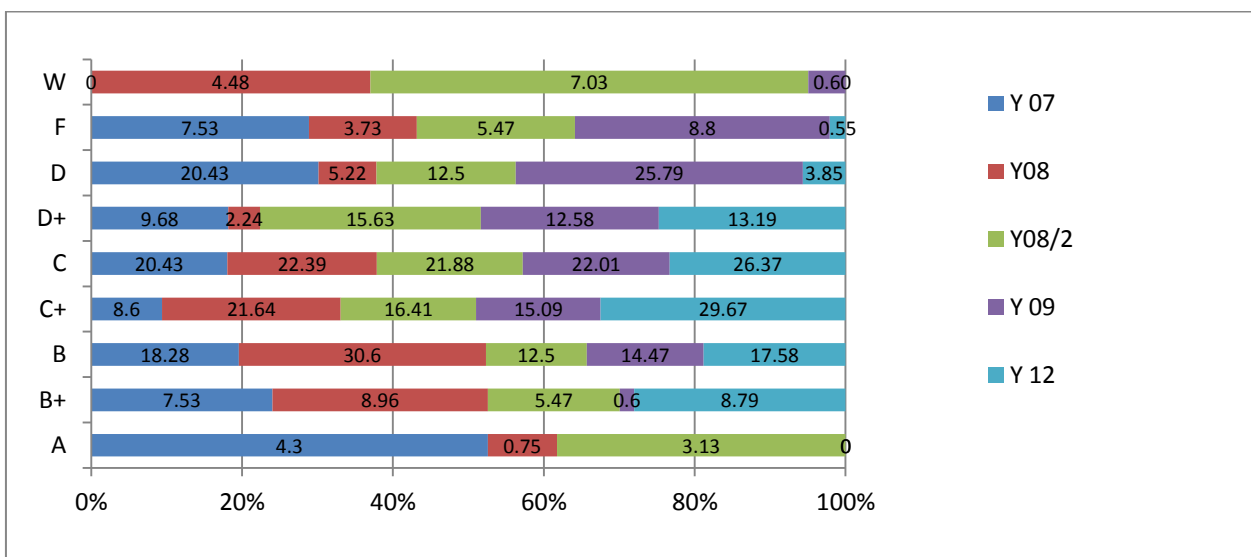
Figure 24: Comparing grade distribution of five different semesters

Implementing PBL could be one of the factors reducing the failing grade (F), the lowest grade (D), and the withdrawal rate (W), Figure 24 also shows that in the semester that PBL was implemented (2012), student grades rose to an average grade of C+. Changing course objectives, learning outcomes, and grading criteria for PBL (in 2012) affected student grades. The PBL process allows an emphasis on the value of teamwork or collaboration among students. This collaboration may affect the grade distribution in minimizing failing and low grades. Collaborative learning and working combined with increased motivation had allowed weak students to have an opportunity to learn from their peers and consequently raised their achievement to the average grade. In this case it is evident that the PBL process helped weak

students learn better and that the PBL process also encourages strong students to take on a more challenging role in peer teaching.

5.3. Summary

Based on the results and analyses presented in this chapter, it can be concluded that implementing PBL in language education (the English cohort), particularly implementing PBL in an English writing course taught in an EFL setting, yields many benefits to both learners and teachers. It can also be concluded that implementing PBL in this case has been a positive direction because the implementation results show that PBL enhanced the positive learning experiences of both students and teachers. Both teachers and students appreciated the PBL process as it contributed greatly to their learning process. Despite a more demanding and time-consuming workload, both teachers and students showed an inclination to give strong support to the continuance of implementing PBL in the English program. The results of the implementation also showed that the learning environment of this PBL for the writing course appeared to be more active than the learning environment of the course in the past. Another positive impact of implementation was that students gained work experience; many practical skills were enhanced, such as management skills, communication skills, collaboration skills, thinking and research skills. Even though it was agreed among teachers that the concepts and the practices of PBL were new to Thai students, they also agreed that the PBL process can really excite students and make learning meaningful to them.

As well as advocating the positive impact of implementing PBL in this study context, there were also some concerns to be discussed. One of the big challenges of implementing PBL in this context was time management of PBL activities in a large class which required necessary adaptations. All teachers seemed to agree that PBL would work perfectly for a small class size because it encouraged students to optimize their learning but in a big class it could be quite a burden for the teachers. As one teacher pointed out, the PBL process was time consuming. Facilitating or guiding students to acquire knowledge and skills requires a lot of time.

CHAPTER SIX

PBL IMPLEMENTATION WITHIN THE IT COHORT: IMPLEMENTATION AND RETROSPECTIVE ANALYSIS PHASES OF DBR (Study 2)

As already mentioned in Chapter Four, the IT curriculum was not part of the PBL design in this PhD project, but the change of the curriculum to PBL and its practice took place in parallel with this research project and also with the PBL implementation with the English cohort. The design of the PBL curriculum for the IT School was based on another training session with Aalborg University. Consequently, I had the opportunity to collect data from PBL implementation with the IT cohort. There were two groups of teachers who worked together in implementing PBL in the School of Information Technology. The first group was the planning/leading team who redesigned the curriculum and conducted research during the implementation period. The research was conducted as evidence to advocate changing the whole curriculum to PBL. Some of the designers and researchers did not teach PBL courses that particular semester. The second group was the teachers or PBL practitioners who put the plan into action. They acted as the PBL practitioners and the participants in the education research project conducted by the first group. I worked with the first group to facilitate the second group's practice by supporting them through consultancy and workshops involving their needs and PBL issues. I therefore had a quite different role in managing the implementation and collecting data from this IT cohort, compared to implementation with the English cohort.

This section recounts explicitly how PBL was practiced with a cohort of IT students and teachers. PBL practice here was integrated in three subjects using a term project as the common platform to link the content of the three subjects. The practice of PBL in the IT school is based on the Project Oriented Problem-based Learning of Aalborg University (POPBL). The IT school revised its existing curriculum to be PBL oriented for two major purposes: 1) to reduce student workloads in dealing with the many small projects for each subject in one semester; 2) to work with and serve the job demands of external IT companies. The IT School re-structured and re-modified its student study plan as an IT-PBL Package for students from Year One to Year Four by integrating some subjects in order to allow space for one project per semester, rather than many mini projects.

6.1. The PBL design and practice of the IT cohort

The PBL curriculum design and practice of the IT cohort also concerns the implementation of PBL with an existing curriculum, but combines three subjects and is called the PBL package. The guidelines for PBL, integrated with a semester project report mode as explained in Chapter Four, was utilized in redesigning the negotiated mode of practice. The preliminary plan of selecting subjects to take part in PBL implementing in each semester and each year is presented in the following table.

Year	Semester	Major IT	Major SE	Major CS
1	1	Computer Programming + IT Concepts + Workshop 1	Computer Programming + IT Concepts + Workshop 1	NO PBL Package
	2	OOP + HCI + Selected Topic 1	OOP + HCI + Selected Topic 1	NO PBL Package
2	1	Workshop 2	OOAD + Independent Workshop	Selected Topic 2 + Advanced Programming
	2	Database	Database	Database
3	1	SAD+ Web Programming+ Selected Topic 2	MIS+ Web Programming+ Enterprise Workshop	SAD+OOAD
	2	Senior Project 1	Senior Project 1	Senior Project 1
4	1	Senior Project 2	Senior Project 2	Senior Project 2
	2	Cooperative Study (internship)	Cooperative Study (internship)	Cooperative Study (internship)

Table16: Structure of IT-PBL Package Study Plan (a 4 year plan)

The characteristics of PBL will also be explained in this section, and how it was practiced with 160 first year students in the IT School. The PBL package to be studied as a part of this research project was designed for the first year, which combined three subjects: Computer Programming, IT Concepts, and Workshop. The basis of combining the subjects is an overlapping of contents of those subjects. The theme of the semester project which students worked on as a team emerged from and served the overlapping contents of the three subjects. The challenge of PBL design for IT students was integrating three contents subjects (PBL subjects) for each team to produce one project per semester and to reorganize the time allocation of each subject so that there was also time for PBL supervision. Redistributed time and assessment of these three subjects as PBL oriented courses was not an easy task because the original structure of time allocation for each subject did not involve the same distribution. At the same time, dealing with many teachers from three different subjects was even more complicated because some felt that the content of their subjects should not be reduced and compromised. The management team therefore came up with a solution to change one subject called 'Workshop', which is worth one credit or 15 contact hours per semester, to function as the PBL learning space subject. The content of this subject is devoted to training students' soft skills, and to facilitation time which took 7 hours or the first half of the semester. The

next subject was 'Computer Programming'; the content of this subject remained the same, but its time allocation was modified by giving 15 out of 45 hours to the PBL facilitation process. The last subject was 'IT Concepts' which originally consisted of lectures and labs. Nothing changed for this subject, in either content or time allocation. The table below compares the situation before and after modification of class time allocation of the three subjects in operating PBL package.

Subject	Before PBL		Becoming PBL			
	Hours of lecture	Hours of lab	Hours of lecture	Hours of lab	Hours of PBL activities	
Computer Programming	45	0	30	0	15	** According to IT-PBL package 30 out of 105 hours were given to PBL activities
Workshop 1 (devoted to PBL practice)	Did not exist, newly created for PBL space purpose		7 hours before midterm were used for soft skills training	8 hours used for PBL supervision		
IT Concept	30	15	30	15	0	

Table17: Comparison of time allocation before and after becoming PBL

More detail of how each subject operated in one semester (15 weeks) is shown in the figure below: a demonstration of time management for lectures and PBL facilitation of the three subjects in which students produce the semester project.
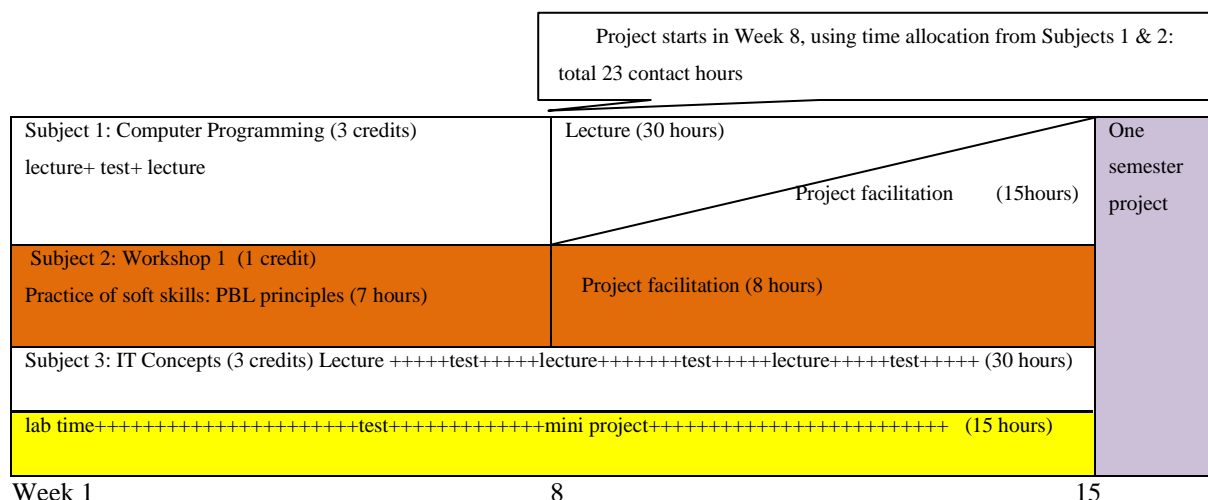
Figure 25: Time allocation for lecture and PBL process implemented with the IT cohort.

For this particular semester, the content of the subject 'Computer programming' used as the core in designing 'the problem case' for the semester project. As for the subject 'IT Concepts', all the elements of the subject in terms of content, lecture, lab, and test remained the same. This subject joined the PBL mode with only two subjects being assessed. The subject allocated 10% of grading criteria to the semester project. Each subject assessment totaled 100% (100 points), but the score distribution for each subject was not equal; detail of assessment of the three subjects, which comprised both individual subject assessment and PBL joint subject assessment, are as follows.

Subject	Individual subject assessment based on the individual's ability		PBL joint subject assessment based on one final product		Total score
Computer Programming (3 credits)	70 %	Individual exams and tests	30%	Team assessment based on one final product	100%
Workshop 1 (1 credit)	50 %		50%		100%
IT Concept (3 credits)	90%		10%		100%

Table18: Assessment strategy of the three subjects

Implementation in the IT School followed a top-down approach which means a team of school leaders designed the syllabi, determined grading or assessment criteria, and enforced the practice of PBL with some of the staff members who taught the selected subjects. The content of the courses remained the same, but in the second half of the semester the teachers emphasized the projects and allowed time for students to work on these projects. The IT leader team provided teaching assistants to help facilitate both teachers and students. These assistants also functioned as research assistants who performed data collection for both leaders and teachers in order to support their professional development in producing research papers. PBL practice in the IT School involved 158 first year students and 3 teachers. There were three subjects integrated as PBL subjects: Computer Programming, IT Concepts, and Workshop 1. A semester team project was used to foster students' content learning and practical skills. One of the subjects, 'Workshop1', was treated as additional time and space for preparing students to cope with team projects and for the actual PBL supervision sessions, as well as for students to complete their project. PBL practice in this case required teachers to give students problematic cases related to the content of the two PBL subjects: Computer Programming and IT Concepts. In the first half of the semester, content learning was emphasized through a lecture-based approach to teaching and learning. The PBL process, which was in the form of a team project, was practiced in the second half of the semester.

Supervision was based on student needs and there was no check and balance system over student contributions to teamwork. Scores for contributions were given based on the quality of the product. The assessment of student learning outcomes was based on two major elements: 1) score form tests and exams on subject content; 2) scores based on the final product students developed. Students were required to present their product orally and turned in the product for a grade, but they were not required to submit a written report about their project.

6.2. Results of PBL implementation with the IT group

The approach to implementing PBL with the IT cohort was quite different from that with the English cohort. When implementing PBL with the IT cohort, the researcher worked only with teachers and curriculum designers, not with students, and it was beyond the researcher's ability to make changes to the PBL process or practice. For instance, decisions about the design, redesign, and practice of PBL with the IT cohort, as well as data collection from students were not made by the researcher. Consequently, the PBL process and data collection was not in the exact pattern used with the English cohort. However, the instruments used for data collection, including student scale questionnaires (post-surveys used only), teacher questionnaires and teacher interviews were the same as those used with the English cohort. Due to mis-distributing pre-survey questionnaires to the IT cohort, the analysis of student questionnaires was performed in a different statistical program. Descriptive statistics was used to analyze (post-) student questionnaires. However, the analysis of descriptive statistics can be compared to the English cohort to some extent.

6.2.1. Results from student survey questionnaires: descriptive statistics

Survey questionnaires were distributed to 158 students of the IT cohort, only at the end of the semester; after students had been through the PBL process. The same set of questionnaires administrated to the English students was also administrated to IT students; however, this data collection was carried out by the IT research team, rather than myself. The results and descriptive statistical analysis of the student survey questionnaire were sent to me by the IT research team. Due to the complication of the body of students who participated in the PBL package and in the research study, data collection and analysis was divided into two sets: 1) results from the Information Technology group (IT1), which consisted of 75 students; and 2) results from the Software Engineering group (SE1) which consisted of 83 students. A summary of the statistical results, based on 25 items, is presented in the following tables.

	Statements	Analysis of IT 1 group (N=58)				Analysis of SE1 group (N= 77)			
		Min	Max	Ave rage	Interpr etation	Min	Max	Avera ge	Interpr etation
1	In past semesters I was motivated to prepare for the lessons before coming to lectures. (M)	1	5	3.16	Neutral	1	5	2.96	Neutral
2	I always participated in teaching and learning activities in the past semesters. (COL)	2	5	4.07	Agree	1	5	4.27	Agree
3	Previous learning activities allowed students to be active learners. (PBL process)	2	5	3.62	Agree	1	5	3.75	Agree
4	I enjoy working in a team with other people. (COL)	3	5	4.33	Agree	1	5	4.12	Agree
5	The past learning activities allowed me to tackle unfamiliar problems. (PBL process)	2	5	3.93	Agree	1	5	3.94	Agree
6	I learn a lot by reading books on my own. (SDL)	1	5	3.76	Agree	1	5	3.29	Neutral
7	In past semesters I participated in peer teaching of team learning activities. (COL)	2	5	3.41	Neutral	2	5	4.26	Agree
8	In past semesters, learning activities allowed me to find information libraries. (SDL)	1	5	3.55	Agree	1	5	3.49	Neutral
9	In past semesters, learning activities allowed me to find information on the internet. (SDL)	2	5	4.21	Agree	2	5	3.92	Agree
10	Information and materials needed for the past project or assignments were provided by my teachers. (SDL)	2	5	4.16	Agree	1	5	4.22	Agree
11	In past semesters I had managed my time effectively. (SDL)	1	5	2.84	Neutral	2	5	3.12	Neutral
12	I perceive that teamwork/learning has helped me in learning academic content of the program I chose for my study. (COL)	2	5	3.78	Agree	1	5	4.09	Agree
13	In previous semesters, I developed many useful strategies to help me in my learning. (SDL)	1	5	3.67	Agree	2	5	3.69	Agree
14	The learning environment in past semesters raised my interest and motivation in learning. (M)	2	5	3.50	Neutral	2	5	3.83	Agree
15	I can identify my learning goals without depending on my teachers or advisors. (SDL)	1	5	3.03	Neutral	1	5	3.04	Neutral
16	I am good at writing reports/ essays. (COM)	1	5	2.90	Neutral	1	4	2.60	Neutral
17	I speak well in front of a group (informal setting).(COM)	2	5	3.05	Neutral	1	5	2.91	Neutral
18	I can formally present my work well in front of audience. (COM)	1	5	2.69	Neutral	1	5	2.88	Neutral

19	When working on previous projects I received regular feedback from my teacher on how I was doing with my project. (PBL process)	1	5	2.86	Neutral	1	5	3.70	Agree
20	When working on previous projects I was able to get help from my teacher whenever I need it. (PBL process)	1	5	2.72	Neutral	1	5	3.87	Agree
21	Previous learning activities helped shape me to be good at thinking things through. (PBL process)	1	5	3.21	Neutral	1	5	3.45	Neutral
22	Previous learning activities enhanced my self-directed learning skills. (PBL process)	2	5	3.79	Agree	1	5	3.62	Agree
23	In previous semesters, I took part in peer and self-assessment. (PS assess)	1	5	3.67	Agree	1	5	3.03	Neutral
24	Peer and self-assessment is a valuable tool for the learning process. (PS assess)	1	5	3.33	Neutral	1	5	3.78	Agree
25	Previous learning activities motivated me to investigate the content of my study more deeply. (M)	1	5	3.48	Neutral	1	5	3.73	Agree

Table19: A summary of the statistical analysis of the student questionnaire

Based on the 25 items, the statistical analysis of the 5 clusters is presented in the following table.

Clusters	Mean (IT :N=58)	interpretation	Mean (SE1:N=77)	interpretation
Motivation (item 1, 14, 25)	3.38	Neutral	3.5	Neutral
Collaboration (item 2,4,7,12)	3.94	Agree	4.19	Agree
Communication (item 16, 17,18)	2.88	Neutral	2.8	Neutral
Self-directed learning (item 6, 8, 9, 10, 13,15)	3.84	Agree	3.54	Agree
PBL process (item 3,5,19, 20, 21, 22)	3.47	Agree	3.72	Agree
Peer assessment (item 23, 24)	3.5	Agree	3.4	Agree

Table 20: A summary of the statistical analysis of five clusters of student questionnaires

The following graph presents of the way 135 out 158 students rated themselves in the clusters of motivation, self-directed learning, collaboration, communication, peer assessment, and the PBL process. In addition, the graph also compares the results between IT 1 group (N=58) and SE1 group (N=77).
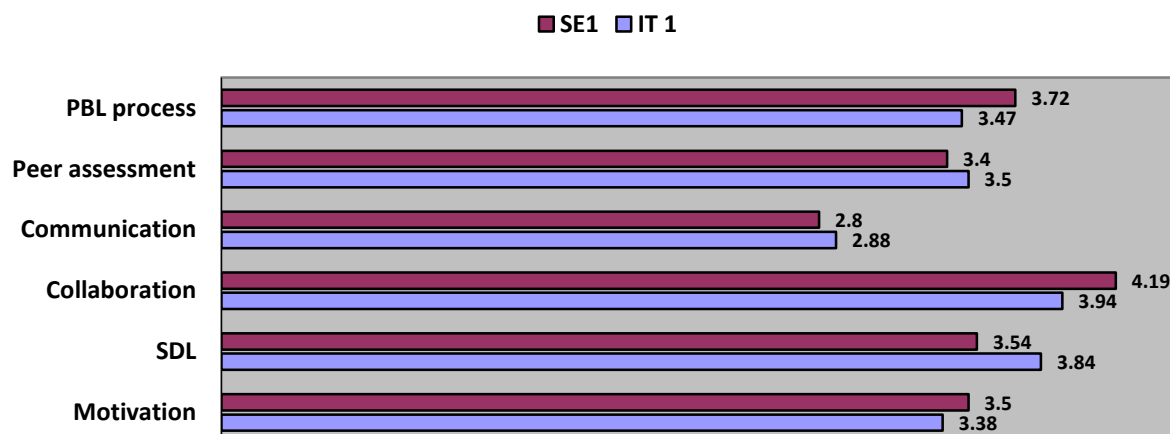
Figure 26: Mean of student self-rating on six clustered values gained from PBL practice

From the results, it can be seen that the two groups of students from the IT School perceived that how they learned and what they had gained from PBL practice were more or less about the same. The skill that both groups rated themselves the highest in was collaboration, and the lowest was communication. The cohort of Software Engineering students (SE1) assessed themselves at a higher level than the cohort of Information Technology students for motivation, collaboration, and the PBL process. On the other hand, the cohort of Information Technology students assessed themselves at a higher level than the cohort of Software Engineering students in self-directed learning, communication skills, and involvement in peer assessment.

6.2.2. Results and analysis of scale questionnaires from 3 IT teachers

The same set of questionnaires distributed to two English teachers was also distributed to three IT teachers. Based on twenty questionnaire items (see Appendix B), teachers were asked to assess student learning and performance by rating student motivation, knowledge, skills, and the quality of their final product or report. Interestingly, the results showed that all three IT teachers tended to rate their students in the same direction in all items. In addition, if compared to how the English teachers rated their students, it was found that the IT teachers rated their students' learning processes and products as similar to the English teachers to some extent, but there were also some items in which the two cohorts of teachers rated their students differently. The results from this set of questionnaires first revealed that the IT teachers agreed that the PBL process had enhanced students' practical skills (item 20); especially, their self-directed learning skills (item 5, 15). They were all satisfied (scale 4, the

same as the English teachers rated their students) with the development of student learning and the quality of students' final products and performance (item 12, 16, 17). Moreover, they all agreed that their students had exhibited the characteristic of being a disciplined learner by always submitting their work on time (item 11). In contrast to how the English teacher rated their students on motivation, the IT teachers perceived that their students were not so enthusiastic during the facilitation or discussion sessions (item 14). Consequently, three of them also rated their students at an unsatisfactory level (scale 2) in their presentation skill or communication skill (item 18). The final issue on which the IT teachers rated their students differently than the English teachers was problem-solving skills. The IT teachers perceived that their students could not solve problems effectively during their working period (item 9). Their students tended to fall back on the teachers to solve problems; they did not even make an attempt to first solve the problems on their own (item 8).

6.2.3. Results from IT teacher interviews

Based on teacher interviews, feedback from teachers indicated both positive and negative effects of PBL on the learning environment and learning process. Despite several challenges in implementing PBL this time, two teachers were quite positive about PBL implementation. They explained that the PBL process had absolutely helped the students improve their performance, especially in soft skills or practical skills, as seen in their statements:

"PBL process stimulates students' thinking"

"Students got to work on the project of their interests and got to exercise their communication, collaboration, and management skills."

"Students gained work experience. Many practical skills are enhanced, such as management skills, collaboration skills, thinking and research skills."

In opposition to the two PBL supporters, there was one teacher who did not think the PBL process was applicable to the course he was responsible for. He believed he had done PBL on a project basis, within lab periods and it worked better than integrating PBL with the other two subjects. He further explained that he did not like the idea of having supervision time :*"I have over a hundred students and I don't have time for this kind of activity"*. The two teachers who supported PBL implementation also pointed out some negative impacts of PBL implementation in their context. They said that PBL resulted in more work and took a lot of time from both students and teachers, from the planning stage and throughout the process.

One teacher expressed his concern about the planning stage of PBL implementation: *"It can be a disaster if the teachers did not plan well and work well in team (teaching) in terms of problem crafting"*. When planning for PBL implementation, the lack of a properly designed system of checks and balance for group work can have a very negative impact. Moreover, the issue of teamwork was also a concern, as one teacher stated that *"Group work can result in free riders"*. The issue was the way that teachers could minimize unequal work contributions.

6.3. Summary

PBL implementation with the IT group appeared to be less thorough in the facilitation process; especially in enforcing an equal contribution to teamwork of students compared with the English group. However, the implementation of PBL at IT School is considered very ambitious and challenging because they have stepped beyond implementing PBL within a single subject; this is more PBL as an education strategy. Due to the nature of the discipline which has more advantages in involving external organizations to give problems or criteria for product development as the starting point to drive students' learning and performance, PBL practice in the IT school can be developed into a very effective education strategy. What has been happening at the IT School since introducing PBL into the operation of learning and teaching is: 1) raising an awareness of faculty members about a paradigm shift in higher education; 2) stimulating collaborative learning and teaching among the faculty members; and 3) enhancing the research capacity in parallel with their teaching excellence. Moreover, it is evident that PBL practice within the IT group has at least helped students improve their soft skills and reduce redundant and extra workloads of mini projects in each subject they took in that particular semester. The following table presents a summary, comparing and contrasting, of the practices of PBL in the English and the IT cohorts.

1.Description of PBL practice/PBL facilitation in terms of problem formulation - summarized from reflection notes and interviews	
English cohort	**IT cohort**
1.1 Existing and potential problems were used as the first step to drive student learning. Students were encouraged to be aware of those problems. Students were the ones who formulated problems in order to make a proposal for their research project. Together as a team, students planned and went through the research process and the PBL process. They began to	1.1 Teachers provided problems or cases. Students worked in small teams of 2-5 members to solve problems and develop a product (application). Students were required to work on a project in teams after the midterm examination. Student projects aimed to produce an end-product which must respond to the theme of the problem defined by teachers from 3

look for ways to deal with the problems by searching knowledge/information to help them cope with the problems. Along the way students learned new knowledge from the subject content itself (lectures) and from their working process. In the process, practical skills, such as analytical thinking, problem-solving, reading, note taking, communication, collaboration, and evaluating information and their own learning, were practiced. Consequently, they learned about themselves, as well as they learned to solve the problems.

1.2 Students chose team members on their own based on common interests and personal friendship. Team size was in the range of 2- 6 members.

1.3 The PBL process started from week 3-4 of the semester after completing an individual proposal, then students formed a team within the workshop period.

subjects (Computer Programming, IT Concepts and Workshop 1).

1.2 The teacher was the one who assigned team members because they wanted to make sure that each team consisted of both weak and strong students in terms of their academic ability.

1.3 Even though soft skills were practiced during the first eight weeks, the practices were separated from the team project which started after week 8 or after the midterm examination.

2.Time and content management based on 15 weeks or 45 contact hours

English Group (1 subject mode, operating with PBL embedding in research project)	**IT Group (integrating 3 subjects, operating with a problem oriented project based learning)**
2.1 Lecture time reduced to twelve hours; therefore, content of lecture was selective and was supplemented by extensive reading.	2.1 Content and lecture of the two subjects remained the same, but one subject, Workshop 1, was devoted to the PBL process.
2.2 PBL principles were introduced to students in the form of a workshop in weeks 3 and 4 of the semester and this took six contact hours.	2.2 Soft skills (communication and project management) were practiced in the first eight weeks (8 contact hours) under time allocated to the subject 'Workshop 1'.
2.3 Eighteen hours were allocated to face to face supervision between the PBL facilitator and each team and ran throughout the semester. In additional to the 18 hours of supervision, students also needed to manage their own self-study time to work on their research project: 6 hours per week.	2.3 Time allocation for team work on the project and supervision were taken from two subjects, totaling 23 contact hours. However, facilitation was totally based on student needs and initiation, no monitoring system was yet developed.
2.4 Some of practical skills required by the discipline were learned and practiced through a workshop which conducted in weeks 11 and 12.	2.4 Lectures and small tests continued to dominate the two subjects' pedagogical approach, except Workshop 1: Computer Programming which used 30 hours of lectures + tests out of a total allocated 45

	hours, and IT Basics which used 30 hours of lectures + 15 hours for lab. However, Workshop 1 devoted all 15 hours to PBL activities and process.
3. PBL facilitation strategy	
English Group	**IT Group**
3.1 Students started their team research project in week 3-4. Supervision sessions were strongly emphasized and mandatory; therefore, PBL facilitators were required to document students' learning progress and the project's progress. Points (20% of the final grade) were assigned as one of the assessment tools to monitor the progress of student learning in each supervision period. 3.2 Written report which also consisted to the explanation of how the approach their research project was required.	3.1 Students started to work on team projects after the midterm exam (week 8). Meetings with the supervisor were informal and were not mandatory. One or two representatives of the team dropped by the supervisor's office if there was a question or an issue to clarify. 3.2 Written reports were not required, but submission of a product which met the product requirements was necessary.
4.Additional comments on implementing PBL in your context	
English Group	**IT Group**
The concepts and practices of PBL are new to Thai students; therefore, it will be more fruitful if they understand what PBL is from the very beginning. However, the PBL process can really excite students. They were anxious to figure out ways to solve problems and wanted to know the results of their work. PBL would work perfectly with a small class size because it encouraged students to optimize their learning. The PBL principle is fascinating; however, it is a big challenge to implement PBL with a big class. Some adaptations are necessary for particular circumstances.	All teachers who were involved in practicing PBL need to share a similar teaching philosophy and understand the concepts of PBL. As for the practice, they must also care about student learning and be willing to spend time with students.

Table 21: Summary and comparison of PBL practice with the English and the IT cohorts

CHAPTER SEVEN

THE IMPLEMENTATION OF PBL ACADEMIC STAFF DEVELOPMENT: THE IMPLEMENTATION AND RETROSPECTIVE ANALYSIS PHASES OF DBR (Study 3)

PBL academic staff development at MFU consisted of two major parts in practice. The first part was the PBL introductory workshop, which was offered to all faculty members. The second part of PBL academic staff development was the on-going consultancy conducted with the teachers who were involved in PBL implementation of the two modes practiced with the English cohort and the IT cohort. In this chapter, the description of PBL academic staff training in the form of the PBL workshop initiative is first presented. After the description of the workshop, results and data analysis of the retrospective analysis of the workshop are also presented. In the second part of the chapter, the description of an on-going PBL consultancy is first presented. After presenting the description, based on the observation data, content analysis is employed. In addition the chapter further discusses the retrospective analysis of the on-going PBL consultancy activity.

7.1. Description of PBL workshop initiative

From the initial formation of the PhD research project, PBL staff development has always been a major and crucial element of the implementation process of PBL at Mae Fah Luang University. Regarding the staff training design framework in Chapter 4, a PBL introductory workshop run by an external expert was utilized as the starting point in stimulating and motivating prospective PBL practitioners. When it came to the actual implementation period, two initial PBL workshops facilitated by a PBL expert from Aalborg University were conducted on March 7th and 8th, 2012. The first day workshop focused on general information about PBL, such as PBL principles, PBL characteristics, and PBL processes. The pre-workshop activities stimulated participants to reflect on their current pedagogical practices and identified both strengths and weaknesses in their current practices, emphasizing what they wanted to improve in their pedagogical practice and their in-class learning environment. The activities during the workshop session fostered participants' understanding of PBL principles and practices and further deliberated the possibility of implementing PBL in their context. After the workshop had ended that day, participants were asked to reflect on what

they had learned and whether or not the workshop had changed their concept about learning and teaching. Moreover, they were asked to identify both strengths and weaknesses of the workshop. The next day, a second one-day workshop was conducted for English teachers only, on the 8th of March 2012. This workshop focused more specifically on redesigning the PBL syllabi with existing English major courses and roles of teachers and students in a PBL environment. In this workshop the English teachers experienced PBL by undertaking an activity called 'PBL simulation'. As a team, they were faced with hypothetical problematic scenarios of the PBL facilitation process. They then brainstormed the plot of the situation which involved problems and also had to come up with a solution to the problematic situation.

7.2. Data collection from the PBL workshop initiative

Running simultaneously with the PBL staff training workshops, the research process of data collection began, in order to study the impact of the PBL staff development model (detail of the design is in Chapter 4). The objectives of this empirical study were: 1) understand the participants' attitudes and mentalities in implementing PBL in their context; 2) evaluate the outcomes of the staff training workshops. The instruments used with data collection were: 1) a Likert scale survey questionnaire to measure attitudes towards the workshop; 2) pre- and post-reflection notes to measure knowledge and skills gained from the workshops. Pre- and post-reflection notes abstracted from their answers to the open-ended questionnaire consisted of two sets of questions; one set was distributed before participating in the workshop and another set was distributed after participating in the workshop (see Appendix C).

Analysis of data from the PBL workshop initiative was therefore in two forms. First a qualitative content analysis was used with the written qualitative data obtained from the reflection notes. Data analysis was in the form of a qualitative content analysis in which all the reflection notes were first read through. Keywords in the notes were then highlighted in order to categorize themes and meanings of what had happened in the sessions. The second part of data analysis was in the form of a descriptive statistical analysis which was used with the five point Likert scale questionnaire.

7.3. Results and analysis of PBL workshop initiative

The results of the PBL workshop initiative are divided into two parts: pre-/post-reflection notes and 18 returned scale questionnaires; the detail is as follows.

7.3.1. Qualitative data from pre- and post-reflection notes

Qualitative data obtained from participant reflection notes consisted of a series of questions to elicit insights and experiences from participants in relation to the benefits of the PBL workshop initiative. A summary of the qualitative data of the pre-reflection notes is as follows. From the reflection notes, it can be seen that 7 participants had experienced PBL to some extent while the other 6 participants had never experienced PBL before; 3 participants did not report on this item. Participants were then asked to identify their current teaching approach. The answers can be grouped into three categories: 1) teacher-centered approach or lecture-based instruction by 7 (38.89%) participants; 2) student-centered approach, by 2 (11.11%) participants; and a mixed approach by 9 (50%) participants. Participants conveyed their preference about classroom environment. All eighteen participants preferred an active learning environment: a lively atmosphere and smaller class size.

After completion of the workshop, participants were asked to complete post-reflection notes. The issues they reflected on were as follows. 1) They were asked to identify strengths and weaknesses of the workshop. They all explained that they really appreciated being able to learn directly from an expert in the field of PBL. They appreciated that they could comprehend PBL concepts by doing PBL for themselves. On the other hand they thought that the learning process was a very compressed length of time. They could not digest all the advanced content in a short period of time; 2) participants were asked to express their need for assistance in implementing PBL in their context. They explained that they needed support from four groups of people: top managers, curriculum developers, co-teachers, and students. In addition to these people, they also need on-going training. Data from reflection notes written by participants after the completion of the workshop also revealed that the PBL workshop had helped them shape their concept of learning (knowledge) more towards constructivism and teaching as guidance: *"I just realized that teaching and learning need teachers to step back and allow open floor for students"*. The participants also revealed that the workshop helped them understand more clearly than before about the differences between project-based and problem-based learning (PBL). The workshop also helped them realize that PBL can be viewed at different levels and also constitute some flexible and diverse elements.

When identifying strengths of the workshop, participants said that:

"The speaker is an expert in the field and has an open mind."
"The learning strategy of the workshop allows participants to comprehend PBL concepts by

themselves."

"Group discussion allows participants to exchange teaching experiences."

Based on the participants' insights, it can be seen that offering the potential PBL practitioners opportunities to interact and share knowledge with PBL experts can be a great stimulant for them, especially at the beginning of the planning and implementation period. Even though meeting with experts can be costly for an institute, it is necessary to have them meet with practitioners in once a while as a source of inspiration and connection with other networks who share common interests.

7.3.2. Results of questionnaire (N=18)

The questionnaire (see detail in Appendix C) was distributed to participants of the two workshops conducted on March 7th and 8th, 2012. Data from a survey questionnaire to elicit the participant attitudes towards the following aspects of the workshop is presented in the following table.

Statement:	N=18				
The numbers indicate: 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree	1	2	3	4	5
1. Content of the workshop lives up to its description	1	0	2	9	6
2. Content of the workshop meets my expectations in terms of teaching and learning	0	1	4	9	4
3. Activities of the workshop stimulate participant involvement.	1	0	2	9	6
4. After participating in the workshop, I have gained knowledge, understanding, and skills of PBL at a satisfactory level.	0	1	3	9	5
5. The workshop has given me tools to cope with the PBL facilitation process.	0	1	7	9	1
6. I have more confidence to implement PBL effectively in my educational context after attending this workshop.	0	0	6	10	2
7. This workshop helped me reflect on my role and my commitment as a teacher.	0	0	3	11	4
8. This workshop raised my awareness about learning and teaching.	0	2	2	7	7
9. This workshop helped me see that learning occurs through knowledge construction, not knowledge delivery.	0	1	5	6	6
10. This workshop is beneficial to teachers who want to improve their teaching and facilitation skills for an active learning environment.	0	2	1	7	8
11. I would highly recommend this workshop to my colleagues.	0	1	3	7	7

Table 22: The questionnaire result of PBL workshop for staff

The 11 items were clustered into 4 categories: 1) Quality of content and activities of the workshop (1,2,4)- the results show that the majority of participants (77.77%) rate agreed that content and activities of the workshop were at a satisfactory level; 2) acquiring skills, confidence and, awareness of gained competence in fostering active learning (6, 7, 8, and 9) - the results show that the majority of participants (73.61%) rate agreed that after attending the workshop they have gained skills, confidence, and awareness for implementing PBL in their context; 3) seeing how valuable and beneficial the workshop is for prospective practitioners and being therefore willing to recommend it to others (10, 11) - the result shows that 80.55% of participants agreed that that workshop was valuable and beneficial and worth recommending to others; 4) perceiving that the workshop encourages active dynamics among participants (3, 5) - the result shows that 69.44% agreed that the workshop had an active dynamic. More details of the results are presented in Appendix L. The statistical result of the 4 categories, based on 18 participants, can be summarized as presented in the following figure.
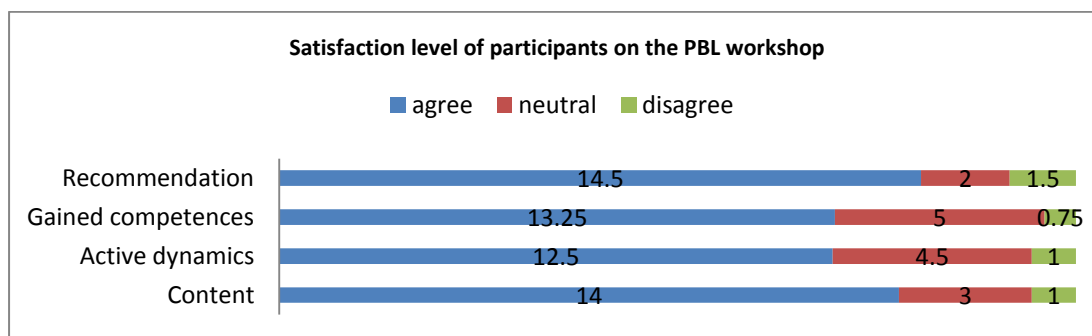
Figure 27: Results of questionnaire assessing satisfaction levels on clustered categories

The results obtained from the scale questionnaire indicated that the majority of the participants believed that the PBL workshop initiative is necessary for those who would like to practice PBL and that it is also beneficial for future PBL practitioners. However, it can clearly be seen from the results that there is one participant who appeared to be against PBL staff development activities which may indicate that the person is not supportive of PBL implementation at MFU.

7.4. Description of on-going PBL consultancy sessions

After the initial workshops held on March 7th and 8th 2012, two cohorts of teachers continued to work with the researcher in designing the details of the content and assessment elements of the two particular PBL modes to be practiced at MFU. This approach is

considered a productive strategy in forming a PBL community of practice initiated by the practitioners (bottom-up approach). The English teacher cohort held a meeting/consultancy every other week to reflect on our practice and ways to deal with the immediate problematic situations. All the teachers were thus expected to be on the same page in their practice. These meetings became a quality assurance tool to ensure the standard practice of each teacher within the English cohort. In May 2012, this teacher group met to finalize selection of the content, layout of activities, and the assessment tools used with this course. In June 2012, courses started and each teacher handled their own sections in terms of lectures (2 sections for each teacher, each section had 30-31 students). In weeks 3 and 4 these teachers worked collaboratively to run PBL workshops with students in order to prepare them for effective team work, peer and self-assessment, and problem formulation. Consequently, these teachers were in a constant mode of communication in preparing and reflecting on their practice. This kind of working format was practiced throughout the semester for the English cohort. Collaboration among teachers became stronger towards the end of the semester because the assessment strategy used in assessing students' learning required a very strong collaboration among teachers. Therefore, they met for discussion quite often in the last four weeks before the semester ended.

On-going PBL mentoring practiced with a cohort of IT teachers took a more formal and more structured format than the English cohort. As a researcher and consultant, I was invited to be a part of the PBL mentoring process with the IT teacher team, in which I had to act in two functions. I acted as a facilitator and advisor to the lead PBL team who were responsible for curriculum and staff development in their School, and some of whom were not teaching. I met with this lead team more often than the practitioner team, once a month. In each meeting with the lead team, the discussion was about management strategy to facilitate the professional and personal development of individual staff and the department. I also acted as a speaker to and commentator on the PBL practitioners in the ad-hoc workshops and seminars arranged by the management team, three times per semester. The first seminar with these practitioners focused on how to handle the change in their teaching practice to being PBL oriented. The second seminar focused on PBL assessment as well as integrating research with their teaching practice for the sake of professional development. The last seminar of the semester was focused on the reporting of and reflection on practice throughout the semester, followed by lessons learned from the previous practice, in order to plan for the upcoming semester. I met with these PBL practitioners in the IT School in a more formal setting than

the English team and also met with them less frequently than the English team. There was no empirical data collection during this period as the researcher was already overwhelmed with data collection from the teachers and students who were practicing the PBL process throughout the semester.

7.5. Results and analysis of qualitative data from observation field notes

Data for this stage came from the observation notes (field notes) of the researcher. Two cohorts of teachers (English and IT) continued to be a part of on-going PBL practice consultancy activities. These two cohorts also consisted of five PBL practitioners who implemented PBL with their course and program and had an on-going discussion with me as a part of their reflection on practice throughout the semester. These on-going discussion and reflection activities helped these teachers to be on the same page in handling lessons and the PBL process. They often shared both positive and negative experiences which consequently led to adapting strategies in dealing with difficult cases or problems regarding their practice. The researcher participated in these on-going discussions with both teams of PBL practitioners. This observation was in the form of participant-observation in which note taking was used as the tool to collect data. Categorized data from the observations of each meeting can be seen in Appendix M.

When comparing and contrasting the dynamics and reactions of teachers in the English and IT groups, the analysis is as follows. I, as researcher and designer, had more influence and control in the design and practice of the English group than that of the IT group. Consequently, the issue of subjectivity in data collection and analysis was taken seriously. In order to avoid bias in collecting and presenting data, the researcher excluded her own viewpoints from the data collection process. Moreover, to ensure sure that data collection and analysis from the English cohort was valid, this came from multiple sources. An interpretation of the observation data is that the collaboration between the English teachers appeared to be less problematic than between the IT teachers. The level of collaboration between teachers also influenced the PBL assessment strategies in the two cohorts. Particularly in the enactment of peer assessment and process based assessment, the English cohort employed a more complex form of assessment which also required more time, effort, and collaboration among teachers. Consequently, the collaborative learning and assessments employed among the English teachers resulted in a higher satisfactory level of teachers in assessing their students' performance and learning progress, based on scale questionnaires, interviews, and reflection notes.

7.6. Summary

Conducting a PBL workshop initiative run by a high profile PBL expert is considered an effective strategy to stimulate faculty members' interest and gain creditability from those who are still ambivalent about PBL implementation in this context. Even though this type of workshop does not appear to be sustainable for staff development and in some cases is costly, it can be a powerful drive to begin building up a strategy for the change process. Being in contact and sharing learning and teaching experiences with an expert in the field can also help to build the self-esteem and confidence of staff members. Working or training with an expert in the field also assures future practitioners receive direct and reliable knowledge and skills. However, a one-time only workshop with an expert is not a wonder drug for PBL implementation because alone it cannot make the implementation successful. When working along with the expert, there must be change agents who are local and devoted to studying in-depth, as researchers and trainers. These local trainers or change agents must be ready to take part as co-trainers with the high profile PBL experts in the PBL training workshop. The aforementioned strategy (high profile PBL experts + local PBL trainers) used in this PBL staff training context slowly bears fruit. The short term generic PBL workshop run by a high profile PBL expert and assisted by local co-trainers was highly successful because it indicated the seriousness of the institute's determination to implement PBL as an education strategy. The direction and the assurance of the implementation is now clear, but there needs to be more facilitation of staff development in PBL practice and research in a more sustainable way, which will be discussed in the next section.

The overall rating of the workshop by participants was highly satisfactory in all aspects. However, it should also be noted that there will never be anything or anyone who can obtain 100 % support when proposing any kind of change process. The empirical data revealed that one out of eighteen participants in the PBL workshop initiative rated the benefit of the workshop as low; however, there was no qualitative explanation from the participant criticizing why the workshop did not appear to be beneficial for them. The focus of future improvements to the workshop needs to be based on the qualitative data from the 17 participants who rated the benefits of the workshop highly.

There was criticism that the workshop was too generic and was run in a very compressed length of time. Some participants suggested a more customized PBL with a focus group from the same discipline. I strongly agree with these two comments. The first element of the PBL workshop initiative that needs to be improved is extending its time. A one day workshop (5-6

hours) is not enough for new teachers who have never known or experienced PBL. A one-day workshop may cover the theory, but PBL is about learning by doing; therefore; the PBL workshop initiative requires more time for participants to practice. Consequently, it is more logical to propose that the PBL workshop initiative needs to be a three day workshop rather than a one day workshop, so that participants can learn by doing and further reflect on their doing as workshop participants. The second element that needs to be improved is the maintenance of PBL practice. Achieving this goal requires a more systematic approach to staff development/training. In addition to offering a short term generic PBL workshop which should last three days, there is also a need to offer on-going and customized PBL workshops for focus groups in different disciplines. These customized PBL workshops should be run throughout the academic year.

CHAPTER EIGHT

DISCUSSION AND CONCLUSION

This chapter outlines a discussion based on the main research question and four subsidiary questions which were first posed in Chapter One. In order to make the discussion of the main research question robust, with a logical sequence of results which feeds the answer to the main research question, the answers to the four subsidiary questions are first discussed. Based on the answers to the four subsidiary research questions and one main research question, discussions on the accountability and generalizability, limitations, and contributions of the study are presented. Finally the chapter presents the overall summary of the whole research project by reflecting on the journey of implementing PBL and recommending possibilities for future research.

8.1. The answer to the first subsidiary question: *What are the essential elements in designing PBL-EFL interdisciplinary curriculum?*

The case study conducted at Aalborg University in the first phase of the PhD research project, the preparation phrase of DBR, combined with the literature review on PBL curriculum design has helped the researcher gain an in-depth understanding of PBL functions. Getting the curriculum and staff ready are the basic requirements of changing to PBL. Barrett (2005) points out that when designing a PBL curriculum there are four components that must be aligned: PBL curriculum design, PBL tutorials, PBL compatible assessments, and the philosophical principles underpinning PBL. Similarly, Kolmos *et al*. (2008) also state that when designing a PBL curriculum in general, cohesion between all elements is essential. Those elements are the objectives, content, learning methods, assessment, teachers and students, and contextual factors. In developing a PBL curriculum, the alignment of all curriculum elements must be prioritized, but in practice PBL does not have a fixed formula. To support this argument, Savin-Beden (2000) points out that PBL should be seen as an approach to learning characterized by flexibility and diversity; therefore, PBL can be implemented in a variety of ways, in different disciplines and in diverse contexts. In support of the arguments of Savin-Baden about the flexibility and diversity of PBL, data from the case study and its analysis also revealed that PBL practice in a PBL institution is diverse in terms of problem formulation and types of project work, management of PBL

supervision time, and the physical set up of work space. These differences depend more on the nature of the fields/disciplines studied. The fields that deal with more concrete elements in project work and depend on experiments and external organizations are treated differently than the fields that deal with more abstract elements.

Inspired by Savin-Baden's PBL models and the Aalborg PBL model, the researcher has taken into consideration differences in the context of institutes, students, and the nature of individual disciplines when designing and implementing PBL in the Thai context. Firstly, during the planning period constraints and opportunities in implementing PBL in a Thai university context are identified. The constraints and possibilities in this context involve the motivation of all agents, the cultural dimension, the existing curriculum and course structure, the administrative and registration system, and resources and facilities. An overall assessment is that there is a strong possibility to implement PBL with this particular context; however, the major agent of change must be willing to put in tremendous effort and compromise to make it happen. The second step is grounding the designs for both curriculum and academic staff development in PBL. The alignment of a new PBL curriculum or course is based on the seven elements of PBL curriculum alignment in a problem and project-based curriculum used at AAU (Kolmos *et al*., 2009) which are: 1) objectives and knowledge; 2) types of problems, types of projects and lectures; 3) progression, size of team, and duration of each project; 4) student learning outcomes; 5) academic staff and facilitation; 6) space and organization; and lastly 7) assessment and evaluation. Based on the research results, it is found that type of the project and the lectures depended very much on the course objectives and learning outcomes of the course or the program, rather than solely on the discipline. In the other words, it can be concluded that the study context, course objectives and learning outcomes determine the rest of the curriculum components such as size of team, duration of the project, facilitation approach, space and assessment. In the design of the PBL academic staff development implemented in the study context, data obtained from reviewing literature, interviewing PBL experts, and eliciting opinions and insights from PBL workshop trainees have given valuable insight in terms of: 1) how important a PBL staff development program is in order to initiate the PBL implementation; and 2) the factors and elements that are needed in designing and establishing a PBL staff development program. Analysis of data from different sources all suggest that in order to initiate effective PBL implementation at least a year preparing academic staff is required. Three major elements that must be enacted when preparing academic staff: a PBL of community practice, a systematic training program, and formal

support from executive managers in terms of policy and financial issues, from the very beginning.

8.2. The answer to the second subsidiary question: *What skills and competences are needed by the academic staff in order to manage and supervise PBL-EFL interdisciplinary studies?*

Without a doubt, academic staff are one of the central elements in implementing a PBL initiative as well as maintaining the PBL implementation. The issues that will be discussed here are: 1) What must teachers acquire in order to implement PBL effectively? 2) How should teachers be prepared for implementation? The results of interviewing three different cohorts of PBL practitioners and PBL experts, conducted over three different periods of time (see papers 2, 3, 4) revealed that PBL facilitators/teachers must possess communication and social skills, and a genuine interest in student learning. More specifically, they must possess questioning skills, which can guide students to solve problems. Most practitioners think that experience in the field is important in some cases. Some said that if they had content knowledge in the field of the project they supervised it would make the supervision more effective: *'I will help students learn more'*.

The next issue is how these teachers acquire such skills and competences. The analysis of data from the three studies all pointed to establishing a PBL development/training program. The results and analysis of the study on **'**Identifying the need to develop a PBL staff development program' revealed that at least a year of preparing academic staff is required in order to start a PBL implementation initiative. The preparation of academic staff for the PBL implementation initiative must involve three major functions: a PBL of community practice, a systematic training program, and formal support from executive managers in terms of policy and financial issues. A systematic PBL training program should comprise short term workshops hosted by high profile PBL experts and a series of long-term workshops which can be hosted by internal PBL change agents who have experienced PBL from various angles. The establishment of a systematic PBL training program must take place in parallel with the establishment of community practice. These two major functions will be a platform for staff to gain in-depth understanding and competences in both the theory and practice of PBL. At the same time these two functions must be accompanied by support from top managers in both policy and finance. If an institute can manage to establish and stabilize

these three functions, the PBL implementation initiative and the maintenance of PBL practice will be productive, without any doubt.

8.3. The answer to the third subsidiary question: *What values and competences does PBL for EFL interdisciplinary studies contribute to student learning outcomes?*

Despite differences in cultural contexts and in approaches to the PBL implementation of the three case studies, one conducted in Denmark and two conducted in Thailand, the analysis of data from the three cases resulted in very similar assessments in implementing PBL. The overall assessment of students in both case studies revealed that PBL fostered active learning dynamics which consequently enhanced the following clusters of competence gained by students: motivation, collaboration skills, communication skills, problem-solving skills, critical thinking skills and self-directed or autonomous learning skills.

The discussion will pinpoint the values and competences gained by students in the Thai context who participated in the implementation of PBL for EFL interdisciplinary studies. First, let's look at the assessments of 166 students. Both quantitative data which was analyzed through SPSS, and qualitative data, revealed a positive impact on student learning outcomes. An comparison of pre- and post-survey questionnaires using the SPSS program's paired t-test, indicated that there were significant differences in all items and clusters at the level of $p <0.01$. This means students felt that after they had gone through the PBL process they had gained and improved in the following skills: motivation, collaboration skills, communication skills, problem solving skills, self-directed or autonomous learning skills, and critical thinking skills. Qualitative data also supported the idea that PBL yielded the best learning experiences in teamwork, independent learning, peer-teaching, and practicing communication skills. The students testified that teamwork fostered a new way of learning for them. Through peer-teaching, they were able to share knowledge and opinions. The actual field/work of their research project also fostered content learning and research skills. They wrote that they liked how the activities enhanced their management skills, thinking and problem-solving skills, as well as their communication skills. Data from teacher assessments of student learning outcomes also confirmed that the PBL process had raised student motivation for learning through working on the research project collaboratively. According to the teachers' observation, students had made progress in the development of collaborative skills and self-directed learning skills. The teachers further added that students exhibited the development of

their communication skills which including both English writing and speaking, or presentation skills.

8.4. The answer to the forth subsidiary question: *What do PBL organized studies contribute to the teachers' experience?*

The results and analyses of two case studies partially investigated the teachers' experience in practicing PBL. Regardless of the differences in the cultural contexts of the two case studies, teacher assessments of their experience yielded very similar results. Teachers who were PBL practitioners indicated that PBL practice prevailed active learning dynamics and that they were satisfied with student learning and performance. The following section will further discuss the values that PBL contributed to teacher experiences in the Thai context.

In the Thai context PBL for EFL interdisciplinary studies, teachers conveyed that students were allowed and encouraged to see their own potential; they were able to maximize their learning. They learned through self-discovery and hands-on experience. PBL is a realistic learning approach and students learned to work with others. Teachers learned about the strengths and weakness of each individual student, and gained new knowledge from working alongside students, through practicing PBL. Despite the challenges each teacher faced during the implementation period, they strongly recommended PBL be used as an approach to learning as much as possible in their discipline. They recognized several difficulties in implementing PBL with their students, such as: 1) difficulty in maintaining and balancing an appropriate role as a PBL supervisor; not to over-control student work, and know when to step in; 2) difficulty in monitoring student work processes in terms of being fair and equal in their team contributions; 3) implementing PBL as an additional component of the program leading to extra workloads for both teacher and student because PBL is time demanding. However, these teachers showed true satisfaction with student's performance and their own learning progress. For instance, one teacher said that *"I realized that being a PBL facilitator requires more than academic and teaching skills."*

8.5. The answer to the main research question: *What is the impact of implementing PBL in the context of a Thai University?*

The answers to the four subsidiary research questions comprise a summary of the impact of implementing PBL with EFL interdisciplinary studies. Measuring the impact of PBL implementation in this case relies on the triangulation method of assessing student and teacher experiences and perceptions of gained value and competences, in which PBL has

contributed to their learning experience. The analysis of the triangulated method of assessments suggested that PBL implementation in this context led to significant improvement in active learning dynamics and consequently enhanced student motivation, collaboration skills, communication skills, problem solving skills, self-directed or autonomous learning skills, and critical thinking skills.

From the overall study, it can be concluded that PBL practice with the English cohort and the IT cohort involves differences in problem formulation, time and content management, facilitation strategy, and assessment strategy. PBL practice with the English cohort focused on the PBL process and in corporate peer assessment (10% of overall grading criteria). Introducing the PBL process with Writing 3 affected the change of subject content in which PBL activities were used for inductive content learning. Facilitation was central to the new learning dynamics. It was decided that the facilitation sessions must be carried out in two formats: structured and informal. The structured or formal facilitations allowed teachers to assess student learning individually and in detail. In addition, the informal facilitations allowed students to access teachers' advice on the basis of their specific needs. All in all, it can be said that facilitation sessions were essential and took substantial time from both teachers and students of the English cohort. Student research projects were approached in the form of a project in which students formulated their own problems and suggested what they wanted to investigate. This process allowed interdisciplinary content to emerge. There was no predetermined end-product.

The focus of PBL practice with the IT cohort was a bit different from that of the English cohort. Due to difficulty and complexity in integrating the contents of the three subjects, the end product of the project work was more likely to be emphasized. The type of project that the cohort of IT students worked on was in the form of assignments and disciplinary projects in which teachers predetermined the output. Merging subject contents which allowed students to learn content through the PBL process was a huge challenge for the IT teachers and emphasized the need for a very high degree of collaboration among them. Due to unsettled content selection, PBL facilitation and assessments comprised different forms of utilization within the English cohort. Facilitation sessions were informal, based on student needs and the teacher of one subject did not take part in the facilitation at all. Peer assessment was introduced to students but not enacted. Due to differences in the PBL process and types of projects students worked on, the way students perceived their learning progress may be affected. The following graph shows and compares the three groups of students' assessments

of themselves in six clustered categories after the completion of PBL implementation; based on results of the post-questionnaires from two major cohorts of students (English and IT, and the IT cohort had two sub-groups which were IT1 and SE1).
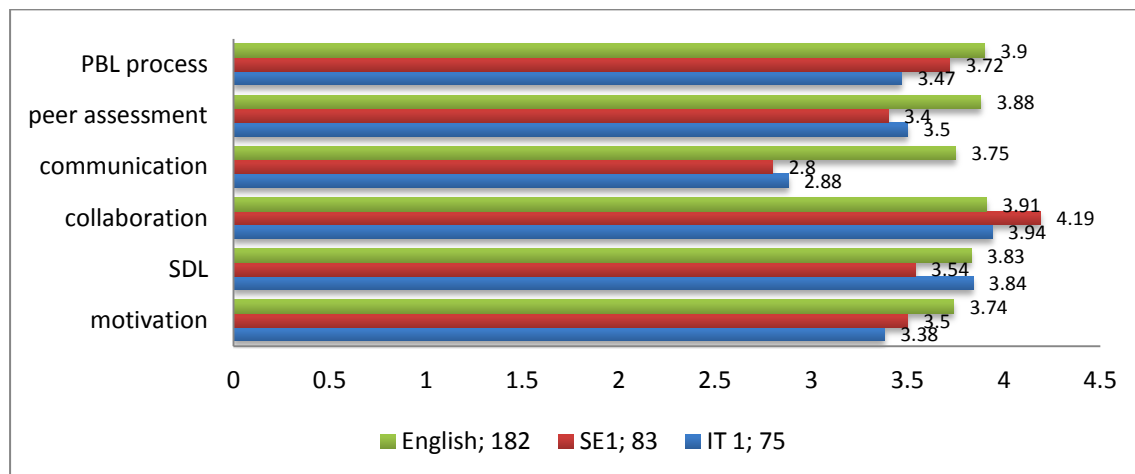
Figure 28: Self-assessment of learning (acquired skills) after the PBL process by three groups of student

From the graph, it can be seen that the English students rated themselves more highly than the information technology and software engineering students in four categories, which were motivation, communication, peer assessment and the PBL process. The software engineering students perceived that they were highly collaborative in their project work, higher than the English and Information Technology students. The most significant difference in student self-assessment is in the communication cluster where both information technology and software engineering rated themselves as quite low (below average) while English students rated themselves much more highly than the two groups. Based on the descriptions of PBL practice presented and the results of the practice (implementation), some lessons can be pointed out. What is learned from the curriculum design process is that even though the frameworks of two models of a PBL curriculum in EFL interdisciplinary studies and guidelines of PBL practice modes had been predesigned, negotiation and modification was continued as an on-going process. Therefore, what actually could be done in the MFU context, implementing PBL with the existing syllabus and curriculum and the alternation of designs, continued even throughout the practice period. In addition, when it came to the actual practice, each discipline also ended up modifying their practice in accordance with their needs and limitations. Despite differences in the approaches used in implementing PBL in MFU context, most of the teachers involved were satisfied with their students' learning progress and outcomes. Only one teacher seemed to be unhappy about the subject he taught. He said that it was time consuming and that he had a huge class size. He did not think that

PBL could be effective in this context. As for the impact on student learning outcomes, the English team, both students and teachers, rated their satisfaction with learning outcomes more highly than the IT team.

In addition to the benefits yielded to student learning experiences, PBL implementation also led to collaborative teaching and learning among teachers. New roles as PBL facilitators encouraged these teachers to become more reflective teachers; as they constantly reflect on their pedagogical stance as they progress through the PBL process throughout the semester. The results from teacher interviews and reflection notes confirm that PBL practice also had a positive impact on teachers' teaching and learning experiences. Other significant impacts of implementing PBL in this context was the formation of a PBL community of practice, and cross-discipline collaboration among these PBL practitioners. The collaboration between PBL practitioners in designing the curriculum, sharing experiences, and collecting data made it possible for the researcher to obtain a great amount of data. In exchange, the IT teachers also gained benefits in terms of research skills, particularly in educational research. This research project may end, but our collaboration in practicing and researching PBL issues will continue. As it stands now at MFU, more faculties have invited me to take part in curriculum development for their programs because they want to implement PBL, suggesting that more teachers are open to learning about PBL.

8.6. Accountability and generalization of the designs and practices

This section discusses and demonstrates how the overall study, employing DBR as the research methodology and consisting of case studies, has been used as a means of data collection for the PhD research project, generating knowledge that is transferable and has external validity. This PhD research project has taken very thorough steps from both a scientific research perspective and educational development perspective. Steps taken in approaching this whole PhD research project have lived up to the requirement of DBR as a research methodology, as described by Brown (1992) and Collins (1992). Throughout the process of employing DBR as a research methodology, this PhD research project has addressed problems and needs in the use of PBL in a Thai university. During the preparation phase of DBR a committed collaboration between the researcher, local practitioners and participants was established, as well as integrating learning theory and design principles with new plausible design solutions. By following the DBR protocols, PBL modes of practice to be implemented within the study context were developed, practiced, and assessed in the form of a retrospective analysis. From an educational development perspective, the importance of a

PBL curriculum development has been emphasized equally alongside PBL staff development because these two elements are strongly interrelated when it comes to educational intervention. This study involved the design, development, practice, and retrospective analysis of both elements, which were running simultaneously. In order to investigate the impact of the implementation of the designs, case studies were conducted during the implementation phase of DBR. The results and analysis of all case studies conducted to answer the research questions of this project allowed triangulated information to ensure reliability and generalizability in transferring knowledge to other similar contexts.

8.7. Contribution of the study

This PhD research project has made several contributions to the theoretical and the practical aspects of higher education learning principles. It has introduced and demonstrated the possibility of developing and practicing PBL with language studies and interdisciplinary studies. Based on the impact of PBL implementation in the study context, it is evident that the PBL process fostered interdisciplinary learning and language learning at the same time. PBL learners achieved more than just content knowledge, they have gained other professional competence as well. Moreover, this PhD research project has demonstrated that in order to create a suitable educational design in any context, thorough planning, which requires a sufficient amount of time, strong collaboration with practitioners, and a scientific approach to producing a design must take place in the preparation phase of DBR. The DBR preparation phase of this study functioned as a strong foundation for the implementation phase which allowed the practice during the implementation phase to have a meaningful impact on the perspectives of both practitioners and the researcher. This means that the DBR methodology has to be contextualized, and also means that when designing and implementing PBL as the education intervention in any given context, the existing elements within that educational context cannot be ignored; instead, those existing elements, whether they are constraints or possibilities, must be dealt with in a proper manner. Embracing the principles of diversity and flexibility of PBL practice has made the implementation of PBL possible in the Thai context. It can be concluded that this PhD study also advocates the ways that DBR can be utilized as a valid and reliable research methodology. The importance of the preparation phase of DBR is particularly emphasized.

In addition to making a theoretical contribution, this research project has also made a tremendous contribution to the practical element of education practice; particularly in promoting active learning through the implementation of PBL. A close collaboration between

researchers, teachers (practitioners), and other change agents made the learning experience of all involved parties purposeful and meaningful. Through the genuine collaboration of these change agents, who share a similar vision of learning and teaching, a PBL community of practice was formed, whose aim is to make a difference in educational practice. This is perhaps the most satisfying outcome of the study, for me as a developer and a pragmatist. The strong collaboration between the researcher and teachers also contributed to a positive learning experience for students and teacher.

8.8. Limitations of the study

From the viewpoint of approaching a real-life project to initiate the change process, I found it very satisfying that during the implementation period, being available to work with and empower the practitioners really made the implementation real to them, rather than just a fad. Much of my time in the one-year period of the implementation was given to consultancy with the teams interested in PBL. I have made a great deal to connect people together as PBL practitioners regardless of their disciplines. As well as being a designer and a researcher, I also had to function as the leader of the change agents and help them to be positive, supportive, and innovative in what needed to be done to facilitate the initiation and maintenance of the PBL implementation. All these tasks and duties sometimes created conflicts between the research world view and the project world view. For example, from a research perspective, a researcher should not be involved or participate during period of the implementing and testing the design and its impact in order to avoid bias in data collection. That was the issue I had to balance, and for which I had to be able to defend my position, which I explained in the methodology chapter. However, in the project's world view, the researcher's involvement is very necessary because it assures that both the top-down and the bottom-up teams take the implementation seriously, believing that the research has brought a systematic scientific approach to the change process. There are also other limitations to this research, from a research world view, which are listed as follows.

First, the implementation and assessment of designs can only be undertaken in one cycle with the same cohort of participants and the same subjects, or the same cohort of subjects. This is a limitation caused by the existing curriculum structure in which the subjects are offered only once a year. The life cycle of the PhD research project and the real life project (educational intervention) do not match or align well in terms of a time frame. Consequently, to assess the retention of knowledge is not applicable in this case. The second cycle of the implementation and assessment of the redesigned PBL curriculum of Writing 3 and IT-PBL

will therefore have to be enacted again in the next academic year (2013), when the PhD research project will have ended. The real life project will go on, however, and the research elements will also be maintained under the support and supervision of the researcher.

The second limitation is that the assessment of PBL practice in the English Department and the IT School cannot really be compared because their approaches to PBL were different and the emphasis on peer and self-assessment is also not of the same weight. Although we might be able to compare the general perceptions of teachers and students towards PBL implementation within their programs, the true effects may be difficult to assess and compare. For example, data collection of student perceptions towards PBL implementation and their learning was not done in the same sequence and style. The English team did both pre- and post-survey questionnaires and acted on their own without assistance from supervisors or research assistants, while the IT team only posted survey questionnaires and acted with assistance from the research assistants.

The third limitation is that the selection of PBL practitioners in the English team had an advantage over the IT team because the researcher requested or influenced the selection which comprises highly motivated and professional teachers. The researcher had no influence on the selection of PBL practitioners in the IT team; consequently PBL implementation among the IT team was resisted by some participants. In the interview, one teacher expressed that he was unhappy about being forced to participate as one of the PBL teachers. He continued to teach his course exactly the same way that he had always done. He was not happy with students learning through PBL practice within the IT School. This resistance to being a part of the team obviously had an effect, at least on the collaborative teaching. The way collaboration between teachers affects the PBL process and student learning has not yet been covered in this research, however.

8.9. Reflection on the journey of implementing PBL and researching this process at the same time

Being a DBR researcher and a change agent at the same time put me under pressure on several occasions. Nevertheless, I can say that these roles and duties helped me define my learning objectives throughout these three years. I have learned so much about life and professional skills by embracing problem-based learning myself; I live problem-based learning, and eventually acquired an in depth content knowledge from my PhD study. With a

mixture of frustration and determination to learn about PBL, I eventually came to enjoy the process and cherish the fruits of its efforts.

The significant progress made, and impact of PBL implementation in my study context, is that we have built a cross-disciplinary PBL community of practice, and will stabilize and expand it in the near future. The rationale behind this operation is to better the quality of learning in MFU citizens, which will therefore make a mark on, and raise the quality of, the university's profile. The success was not through the researcher alone, but is the success of the team's effort. It is collaboration that takes us to our destination. As most of these PBL practitioners are willing to step out of their comfort zone to share a similar vision and goal in improving the quality of active learning in their classroom context, the formation of a community of practice is now taking a more stable shape.

Another point on which I want to reflect is the issue of learning which occurs through the PBL process. What have we learned or gained in practicing PBL? Overall results have convinced me that PBL can stimulate both teachers and students to be thinkers and to be active learners. The PBL process allows learners to see knowledge from a different perspective and see that learning can occur outside the classroom and that peers can be as influential as teachers in terms of knowledge and skill acquisition. With proper planning and a suitable design for each particular situation, PBL can maximize our learning experience and influence us to be humble in how we view ourselves, whether as learners or teachers.

The last point on which to reflect is the extent to which PBL is applicable to Thai higher education. As mentioned earlier, there are both constraints and possibilities in implementing PBL in a Thai context. The possibilities require a strong effort and collaboration from both top-down and bottom-up teams to facilitate the implementation of PBL. Based on triangulated analyses, there are two further points on which to reflect.

8.9.1. *What works in implementing PBL in the two contexts: English and IT?*

Even though PBL practice in the School of Information Technology and in the English Department appeared to emphasize different PBL elements, and took different steps in approaching lectures and PBL facilitation, empirical data collected from both cohorts of PBL practitioners revealed that implementing PBL in both situations worked in terms of fostering a more active learning environment. The majority of both teachers and students reflected that PBL practice resulted in a positive impact on their learning development, such as the

enhancement of motivation, communication skills, collaboration/participant-directed skills, problem-solving and critical thinking skills, as well as self-directed/ autonomous learning skills.

The PBL process practiced with the English group worked quite well. As a result of dealing with only one subject, the English group was very fortunate in being able to thoroughly emphasize the PBL facilitation process. A major revision was made to the course syllabus of the PBL English writing subject (Writing 3), involving course objectives, lessons and materials, learning and teaching approach, and assessment tools. As for the actual PBL practice, reorganizing allocated time by reducing lecture time and formally establishing small group facilitation time encouraged a more active and personalized learning dynamic. Moreover, modification of the assessment tools used in student learning was also one of the most important elements in changing the traditional syllabus to a PBL syllabus. Peer assessment plays a crucial role in driving the dynamics of teamwork. As well as evaluating the students' written reports, assessing student learning through oral presentation and oral examination of the research project also become effective tools to motivate students' content learning and the acquisition of other practical skills.

8.9.2. What does not work and could be done to improve the future implementation of PBL in the study context?

Even though there was a very high degree of satisfaction about student learning outcomes and the complete process of PBL facilitation, there were some issues of concern in practicing PBL with the English team. The following is what needed to be improved in implementing PBL with the English team. Designing new and additional lessons and activities, which relied on the researcher in this case, needed more time for material planning, and the planning stage also needed improvement in collaboration among teachers. A system of monitoring the student team work process needs to be emphasized in order to minimize unequal contributions to team work and plagiarism. If teachers are not thorough with the PBL process, these two issues would continue to be problematic and result in a negative rather a positive impact on student learning.

There were a few issues in PBL implementation with the IT group that need to be addressed for an improvement in future re-implementation. The selection of teachers who will participate in the PBL implementation must start with those who are on board with PBL principles and philosophy, as well as those who have a similar pedagogical stance which

emphasizes learners and learning. PBL subjects need to be more integrated in all elements when designing the syllabi. All curriculum elements need to be aligned: objectives, content, teaching and learning methods, and assessment. The assessment of the project should be a balance between process-based and product-based. Moreover, assessments and course objectives/learning outcomes need be aligned when redesigning the PBL subject course syllabi. The PBL process needs to be more thorough and more systematic in order to minimize free riders. A more systematic facilitation could help PBL facilitators identify problems or issues of concern about project management , if there are any, early enough to assist students in working out the issues.

All in all it can be concluded that implementing PBL in the MFU context (two cohorts) yielded more advantages than disadvantages to both students and teachers. The PBL process obviously stimulates a more active learning environment; most teachers and students were alert in their learning process and appreciated the consequences of the process. Because they were practicing PBL through a more structured and thorough process, the English group, which consisted of 166 students and 3 teachers, assessed the positive effects of PBL process more highly than did the IT group, which consisted of 135 students and 3 teachers. This could be due to the selection of teachers who took part in the implementation. The strength of the English group was that all three teachers were open-minded about the change process, which also affected the modification of their pedagogical stance. It was found through interviews that there was a conflict of interest among teachers in the IT group and that resulted some resistance of PBL implementation within the IT cohort. The interview further revealed that here was no negativity in student reactions to the process of PBL implementation. The negative response from students was that here could have been complaints against some team members about an equal contribution to teamwork. Both quantitative data and qualitative data revealed that students believed that the PBL process had helped them tremendously in acquiring both content knowledge and practical skills. However, the implementation of PBL in both schools continues to be far from perfect because there is a need to stabilize the sub-designs of each discipline, the standard of the process, and support from all levels. Once again what I would like to emphasize is that in order to implement PBL successfully in the MFU context there are two most necessary elements that require being absolutely on board with the idea. If the mindset of academic staff; is stuck in the way they were brought up, and they do not want to step out of their comfort zone, then implementing PBL will be nothing more than a label. In addition to a mind-set that welcomes the change process, they also need

to be well equipped with professional competences for learning and teaching in a PBL environment.

The second necessary element is strong support from top managers. The implementation of PBL at MFU currently has generous support from most top managers. I believe that in principle most of them support the implementation of PBL at the institutional level, but those who are in charge of the institute's learning and teaching need to have a deeper understanding of the change process. As well as possessing understanding, they must also seek ways to create a strong community of practice and a network of PBL practitioners for the purpose of sustainable implementation. They must support PBL staff development, so that the academic staff can step beyond classroom practice, and their research skills can also be enriched.

8.10. Recommendations for future research

Data collected throughout the research process has given input for continuous improvements of the PBL curriculum design and PBL implementation. In addition, the study also has revealed some topics that urgently need some more research. According to the study, qualitative data collected from teachers revealed mixed results about how students exhibited confusion and anxiety at the beginning of the PBL process and how they handled or developed strategies to deal with the confusion and the anxiety as the PBL process continued to progress. The effectiveness of PBL implementation and PBL assessments therefore needs further research. For the effectiveness of PBL implementation, focus should be placed on how PBL affects knowledge acquisition and the retention of knowledge acquisition. Moreover, in relation to studying the effectiveness of PBL, dysfunctional teams in the PBL learning environment should also be addressed. In the case study conducted with the English cohort, each teacher supervised 12-16 teams. Each of these teachers pointed out that in every section there were 1-2 dysfunctional teams. Tensions between members of the dysfunctional teams is an important PBL-related issue for further research, for instance, research into the cause of the tensions between team members, and research into how a supervisor from a different contextual situation, facilitates the dysfunctional teams. PBL assessment, especially of discipline knowledge acquisition, continues to be a challenging topic for PBL practitioners and curriculum designers, as my team and I also experienced. The assessment methods used with a PBL curriculum therefore need to be studied further. Perspectives on the change process to a PBL learning environment also requires further research. This topic should be followed by research to identify potential constraints to the change process.

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APPENDIX A
Student Survey Questionnaires

1) Pre-survey questionnaire of student perceptions towards their learning approach before going through the PBL process

A) Likert Scale Questionnaire

Instruction: Please mark one answer that fits your perception of your past learning approach/environment before working on your research project. The numbers indicate:

1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1	2	3	4	5
1. In previous semesters I was motivated to prepare for the lessons before coming to lectures. (M)					
2. I always participated in teaching and learning activities in previous semesters. (COL)					
3. Previous learning activities allowed students to be active learners. (PBL process)					
4. I enjoy working in a team with other people. (COL)					
5. Previous learning activities allowed me to tackle unfamiliar problems. (PBL process)					
6. I learn a lot by reading books on my own. (SDL)					
7. In previous semesters I participated in peer teaching of team learning activities. (COL)					
8. In previous semesters, learning activities allowed me to find information libraries. (SDL)					
9. In previous semesters, learning activities allowed me to find information on the internet. (SDL)					
10. Information and materials needed for the past projects or assignments were provided by my teachers. (SDL)					
11. In previous t semesters I managed my time effectively. (SDL)					
12. I perceive that teamwork/learning has helped me in learning the academic content of the program I chose for my study. (COL)					
13. In previous semesters, I developed many useful strategies to help me in my learning. (SDL)					
14. The learning environment in previous semesters raised my interest and motivation in learning. (M)					
15. I can identify my learning goals without depending on my teachers or advisors. (SDL)					
16. I am good at writing reports/ essays. (COM)					
17. I speak well in front of a group (informal setting).(COM)					
18. I can formally present my work well in front of audience. (COM)					
19. When working on previous projects I received regular feedback from my teacher on how I was doing with my project. (PBL process)					
20. When working on previous projects I was able to get help from my teacher whenever I need it. (PBL process)					
21. Previous learning activities helped shape me to be good at thinking things through. (PBL process)					
22. Previous learning activities enhanced my self-directed learning skills. (PBL process)					
23. In previous semesters, I took part in peer and self-assessment. (PS assess)					
24. Peer and self-assessment is a valuable tool for the learning process. (PS assess)					
25. Previous learning activities motivated me to investigate the content of my study more deeply. (M)					

B) Open-ended questions (qualitative data)

Describe your learning environment and activities in previous semesters.

_____

_____

_____

_____

_____

What is your best experience from previous learning environments?

_____

_____

_____

_____

What is your most negative experience from previous learning environments?

_____

_____

_____

_____

_____

What is your preference in managing teaching and learning at the university level?

_____

_____

_____

_____

2) Post-survey questionnaire of student perceptions towards their learning approach after going through the PBL process (Post-test)

A) Likert Scale questionnaire:

Instruction: Please mark one answer that fits your perception of your learning approach during the period working on your research project. The numbers indicate:

1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1	2	3	4	5
1. I have been motivated to prepare for the lessons/activities before coming to each session. (M)					
2. I have always participated in teaching and learning activities throughout the semester. (COL)					
3. The activities of each session have allowed me to be an active learner. (PBL process)					
4. I enjoy working in a team with other people. (COL)					
5. The activities of each session have allowed me to tackle unfamiliar problems. (PBL process)					
6. I learn the content of the subject by reading books on my own. (SDL)					
7. I participated in peer teaching/discussion of team learning activities. (COL)					
8. Learning activities have allowed me to find information in libraries. (SDL)					
9. Learning activities have allowed me to find information on the internet. (SDL)					
10. Information and materials needed for the research project are guided by my supervisor. (PBL process)					
11. During this semester, I have managed my time effectively. (SDL)					
12. I perceive that teamwork/learning has helped me in learning the academic content of the subject. (COL)					
13. Working on a research project in a team has helped me develop many useful strategies to enhance my learning. (SDL)					
14. Learning through doing a research project has raised my interest and motivation in learning. (M)					
15. By working on the research project I can identify my learning goals without depending on my supervisor. (SDL)					
16. I am good at writing reports/essays. (COM)					
17. I speak/communicate well with the team members (informal setting). (COM)					
18. I can formally present my work well in front of audience (formal setting). (COM)					
19. When working on the research project I received regular feedback from my supervisor on how I was doing with my project. (PBL process)					
20. When working on the research project I was able to get help from my teacher whenever I need it. (PBL process)					
21. The learning activities of this course have helped shape me to be good at thinking things through. (PBL process)					
22. The learning activities of this course enhanced my self-directed learning skills. (PBL process)					
23. In working on the research project, I took part in peer and self-assessment. (PS assess)					
24. Peer and self-assessment is a valuable tool for learning process. (PS assess)					
25. The past learning activities motivated me to investigate the content of my study more deeply. (M)					

B) Open-ended questions (qualitative data)

Describe your learning environment and activities for the Writing 3 course.

_____

_____

_____

_____

What was your best experience in the learning environment of the Writing 3 course?

_____

_____

_____

_____

What was your most negative experience in the learning environment of the Writing 3 course?

_____

_____

_____

_____

What is your preference in managing the teaching and learning of the research project?

_____

_____

_____

_____

APPENDIX B
Teacher Survey Questionnaire

A) Likert Scale questionnaire of teacher perceptions of student learning in the PBL environment

Direction: Please mark one answer that fits your perception for each category. The numbers indicate:1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1	2	3	4	5
1. At the beginning, students seemed confused about the process of their project.					
2. From the beginning students exhibited a high level of responsibility about their learning.					
3. From the beginning students were able to identify their own learning goals.					
4. Students exhibited their independence in searching for information and learning from the beginning of the semester.					
5. As the semester progresses, students have exhibited a progression on their self-directed learning skills.					
6. As the semester progressed, students exhibited the ability to work well together as a team.					
7. Every group had problems in working as a team at the beginning					
8. When problems occurred, students would make an attempt to solve them on their own first.					
9. I saw that my students could solve problems effectively during their working period.					
10. I saw that my students could work effectively on their research project.					
11. My students always meet the assignment deadlines.					
12. My students learned more about the content of the subject by working on their projects.					
13 My students exhibited enthusiasm in working on their research projects.					
14. My students were motivated to participate in discussion during the facilitation periods.					
15. As the semester progressed my students exhibited more independence in searching for information and learning.					
16. Overall, I am satisfied with my students' learning development throughout the semester.					
17. Overall, I am satisfied with the quality of my students' projects.					
18. As the semester progressed I was satisfied with the developments of my students' presentation skills.					
19. I can see that PBL has enhanced my students' depth of content learning.					
20. I can see that PBL has enhanced my students' practical skills.					

B) Reflection notes of PBL facilitators (to complete at the end of the semester)

Direction: Please provide information for each item as accurately as possible.

Name: **Department and Faculty:**

Teaching experience: _____years _____months

   1) From your experience of implementing PBL, please describe the PBL process and PBL practice of your context.

_____
_____
_____
_____
_____

   2) From your experience of implementing PBL, what are challenges or difficulties you have encountered?

_____
_____
_____
_____

   3) What is the best experience (advantages) you and your students have got in terms of teaching and learning, from using PBL approach?

_____
_____
_____
_____
_____

   4) Other comments you wish to make in relation to PBL principles and practice.

_____
_____
_____

APPENDIX C

PBL Workshop Trainee Questionnaire & Reflection Notes

A) Likert scale questionnaire about improvement in the PBL Staff Development Program (usefulness of the workshop in trainees' perspective)

Direction: Please mark one answer that fits your perception for each category. The numbers indicate:

1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1	2	3	4	5
1. Content of the workshop lived up to its description					
2. Content of the workshop met my expectations in terms of teaching and learning					
3. Activities during the workshop stimulated participant involvement.					
4. After participating in the workshop, I have gained knowledge, understanding, and skills in PBL at a satisfactory level.					
5. The workshop has given me tools to cope with the PBL facilitation process.					
6. I could implement PBL effectively within my educational context without this PBL training.					
7. I have more confidence about implementing PBL effectively within my educational context after attending this workshop.					
8. This workshop helped me reflect on my role and commitment as a teacher.					
9. This workshop raised my awareness about learning and teaching.					
10. This workshop helped me see that learning occurs through knowledge construction, not knowledge delivery.					
11. This workshop is beneficial for teachers who want to improve their teaching and facilitation skills in an active learning environment.					
12. I would strongly recommend this workshop to my colleagues.					

B) Reflection notes of pre-workshop (for trainees)

Direction: Please provide information for each item as accurately as possible

Name: Department:

Faculty: Position:

Teaching experience: _____years _____months

1. What methods do you currently use in your teaching? Please give a description of your current teaching method and the learning environment of your classroom.

2. What are the advantages and the disadvantages of theyour current teaching method?

Advantages:

Disadvantages:

3. What are the difficulties and challenges of your current teaching method?

4. What do you want to change (if anything) in your current teaching practice and learning environment? Please elaborate on how you want these changed.

5. Have you had any previous experience with Problem-Based Learning (PBL)? If yes, please explain.

6. What is your concept of teaching and learning in general?

7. What is your concept of PBL?

8. What I expect from this PBL workshop/program is ……..

C) Reflection notes post-workshop

Direction: Please provide information on each item as accurately as possible

Name: Department:

Faculty: Position:

Teaching experience: _____years _____months

1. Has your concept of teaching and learning changed after attending the PBL workshop? If yes, please explain how.

2. What is your concept of PBL after attending the PBL workshop? Please state the differences in your understanding of PBL before and after attending the PBL workshop.

3. What did you find most valuable about the PBL workshop?

4. What have you learned from attending the PBL workshop?

5. What did you find least helpful about the PBL workshop?

6. What would you have preferred to be done differently in the workshop?

7. What are strengths of the PBL workshop?

8. What are weaknesses of the PBL workshop?

9. What do you need in order to implement PBL in your context?

APPENDIX D
Interview Guide

Interview guide for PBL facilitators (after one semester of implementing PBL)

1. Department: _____ 2. School: _____

3. Teaching experience: _____months _____year(s)

4. PBL supervision experience: _____months _____year(s)

5. Supervision of the semester project:

Supervising _____ group(s) per semester; each group consisted of _____members

Time spent on group supervision _____ hours per group per week or semester

Frequency of meeting with each group _____times per semester

6. In your opinion, what are the essential characteristics of PBL?

_____
_____
_____

7. What do you see as PBL's main advantages?

_____
_____
_____

8. What do you see as PBL's main disadvantages?

_____
_____
_____
_____

9. In your opinion, what makes a good PBL supervisor (qualification and training)?

_____
_____

APPENDIX E
Observation Scheme

PBL process observation form (each group will be observed twice)

Name of facilitator:	School and department of students:
Semester and academic year:	Year and major of students:
Date of 1st observation:	Date of 2nd observation:
PBL facilitation session 1 (informal)	
Dynamics between: -facilitator and students -group discussion	
Initiative of problem/project or issue formulation: - How is the problem/project or issue of discussion formulated? - How do the facilitators' questions facilitate student exploration of the problem, enabling students to specify learning issues and strategies to respond to the problem? - How does the facilitator work to help students think critically and evaluate what they understand about the problem and generate their own learning issues.	
Summary of the result(s) of the session:	
Additional issues arising during the session:	
PBL facilitation session 2 (formal)	
Dynamics between: -facilitator and students - group discussion	
Project progression strategies: -How does the facilitator check on student progress? - What strategy does the facilitator use to help students to connect their ideas, and encourage them to think more critically about their work?	
Summary of student development in project management skills and the progression of the project: - How their discussion and progress reflected their content knowledge or discipline knowledge.	
Summary of the result (s) of the session:	
Additional issues that arose during the session:	

APPENDIX F
Data Summary

Part 1) A summary of quantitative data from pre- and post-student survey questionnaires

Question	type	Frequency					Mean	Median	Mode	SD
		1	2	3	4	5				
1	Pre-	4	29	105	25	3	2.96	3.00	3	.704
	Post-	3	7	69	66	21	3.57	4.00	3	.834
2	Pre-	0	26	70	60	10	3.33	3.00	3	.811
	Post-	0	7	47	62	50	3.93	4.00	4	.868
3	Pre-	1	11	65	66	23	3.60	4.00	4	.831
	Post-	0	8	41	74	43	3.92	4.00	4	.834
4	Pre-	3	16	40	71	36	3.73	4.00	4	.956
	Post-	5	7	45	68	41	3.80	4.00	4	.961
5	Pre-	1	11	93	54	7	3.33	3.00	3	.691
	Post-	0	1	47	98	20	3.83	4.00	4	.632
6	Pre-	4	32	68	54	8	3.18	3.00	3	.883
	Post-	6	22	62	66	10	3.31	3.00	4	.907
7	Pre-	3	20	70	61	12	3.36	3.00	3	.853
	Post-	1	2	40	63	60	4.08	4.00	4	.838
8	Pre-	1	18	46	60	41	3.73	4.00	4	.973
	Post-	3	9	31	52	71	4.08	4.00	5	.997
9	Pre-	1	1	18	53	93	4.42	5.00	5	.757
	Post-	1	4	12	39	110	4.52	5.00	5	.784
10	Pre-	1	17	70	60	18	3.46	3.00	3	.843
	Post-	2	5	35	89	35	3.90	4.00	4	.803

11	Pre-	3	32	80	43	8	3.13	3.00	3	.840
	Post-	3	27	44	48	44	3.62	4.00	4	1.098
12	Pre-	2	12	65	67	20	3.55	4.00	4	.842
	Post-	4	6	47	66	43	3.83	4.00	4	.938
13	Pre-	0	13	74	74	7	3.43	3.00	3	.681
	Post-	0	5	43	71	47	3.96	4.00	4	.816
14	Pre-	1	17	76	59	13	3.40	3.00	3	.801
	Post-	1	5	62	71	27	3.71	4.00	4	.794
15	Pre-	2	36	82	41	5	3.07	3.00	3	.795
	Post-	2	17	66	59	22	3.49	3.00	3	.893
16	Pre-	18	57	68	21	2	2.59	3.00	3	.888
	Post-	2	8	39	74	43	3.89	4.00	4	.888
17	Pre-	5	43	85	27	6	2.92	3.00	3	.827
	Post-	1	12	51	68	34	3.73	4.00	4	.889
18	Pre-	4	51	72	38	1	2.89	3.00	3	.805
	Post-	3	14	49	76	24	3.63	4.00	4	.897
19	Pre-	0	17	74	63	12	3.42	3.00	3	.773
	Post-	2	2	40	85	37	3.92	4.00	4	.786
20	Pre-	1	18	59	57	31	3.60	4.00	3	.934
	Post-	1	6	32	79	48	4.01	4.00	4	.828
21	Pre-	0	15	79	66	6	3.38	3.00	3	.701
	Post-	0	4	45	79	38	3.91	4.00	4	.769
22	Pre-	0	11	83	62	10	3.43	3.00	3	.708
	Post-	0	5	50	76	35	3.85	4.00	4	.783
23	Pre-	0	21	75	66	4	3.32	3.00	3	.722
	Post-	0	3	40	77	46	4.00	4.00	4	.771

24	Pre-	1	11	75	66	13	3.48	3.00	3	.760
	Post-	0	8	54	72	32	3.77	4.00	4	.814
25	Pre-	1	13	70	57	25	3.55	3.00	3	.863
	Post-	0	6	40	79	41	3.93	4.00	4	.795

Part 2) A summary of clustered categories of quantitative data from pre- and post-student survey questionnaires

Clusters	Type	Frequency					Mean	SD
		1	2	3	4	5		
1. Motivation	Pre-	2.0	19.6	83.6	47	13.6	3.3052	.61454
	Post-	1.33	6	57	72	29.67	3.7390	.69447
2. Collaboration	Pre-	2	18.5	61.25	64.75	19.5	3.4895	.62967
	Post-	2.5	5.5	44.75	64.75	48.5	3.9111	.83258
3. PBL process	Pre-	.57	14.29	74.72	61.14	15.28	3.4596	.57145
	Post-	.71	4.43	41.43	82.86	36.57	3.9045	.70818
4. SDL	Pre-	1.8	22	61.1	54.1	27	3.4930	.66321
	Post-	2.5	14	43	55.83	50.67	3.8323	.83252
5.Communication	Pre-	9	50.33	75	28.67	3	2.7972	.77048
	Post-	2	11.33	46.33	72.66	33.66	3.7510	.84939
6. Peer assessment	Pre-	.5	16	75	66	8.5	3.3976	.71461
	Post-	0	5.5	47	74.5	39	3.8855	.76406
7.Critical thinking	Pre-	0	15	79	66	6	3.38	.701
	Post-	0	4	45	79	38	3.91	.769

APPENDIX G

Qualitative Data from Student Notes/Open-Ended Questionnaires: Before and After Implementation (N=166)

Statement	Response type 1	Response type 2	Response type3
1a. Report on previous learning environment (before implementing PBL process)	44 students reported that some subjects allowed a semi-active learning environment involving, for example, some group discussion, asking and answering questions to get points.	39 students reported that most courses they attended were passive, focusing on lectures, test taking, and scores or letter grades. Students were required to follow the teachers' instructions only.	59 students did not respond and 24 students gave irrelevant answers which cannot categorize whether the learning environment was active or passive.
1b. Report on the learning environment of Writing 3 (after implementing PBL process)	123 students reported that the content of Writing 3 was very academic and difficult; however, they were motivated and enjoyed the learning process. The lessons and activities of the course encouraged active dynamics among learners; they therefore agreed that they became motivated to participate in the learning process. Consequently, they became self-directed and collaborative learners.	16 students reported that they liked the course and its approach because teachers and colleagues were friendly and supportive.	10 students reported that there was no difference between this course and the others. 6 students reported that the course was too difficult and boring. 11 students gave no opinion on this item.
2a. Best experience from the previous learning environment (before implementing PBL process).	Nice friends and teachers (49)	Liked some activities which allowed a) self-study (7); b) group work (29); c) off campus (3); oral presentation (9); use of peer teaching (10); d) improving communication skills (17);	35 students did not respond.

		passing all courses and getting love points (7)	
2b. Best experience in the team research project (after implementing PBL process).	111 students reported that the best experience they had was the good teamwork which fostered a new way of learning through peer-teaching and sharing knowledge and opinions.	11 students reported that their best experience was that they had become autonomous or self-directed learners.	25 students reported that their best experience was doing the actual field work to foster content learning and research skills.
			17 students reported that they liked how the activities enhanced their management skills, thinking and problem-solving skills, and communication skills.
			2 students gave irrelevant answers: the teacher was the best or complaining about the team.
3a. Most negative experience from the previous learning environment (before implementing PBL process).	51 students reported that the teachers, contents, and activities contributed to their negative learning experiences.	48 students reported that peers or themselves contributed to their negative learning experiences.	15 students reported that other conditions contributed to their negative learning experiences, such as weather, noise, not enough chairs for students.
3b. Challenges and difficulties students confronted during the period they worked on the research project (after PBL implementation)	37 students reported that the most negative experience was time management in team meetings.	55 students reported that the most negative experience was difficulty with the content and process of the research project.	5 students gave no opinion on this item.
	23 students reported that the most negative experience was that they were unable to control	46 students reported that the most negative experience was compromising different	

	equal workload or team contribution.	ideas	
4a. Preference in their learning environments - ideal learning environment (before implementing PBL process).	102 students preferred to have a more active classroom dynamic, for example, providing opportunities for students to share knowledge and learning experience in class while teachers should be available for students to seek advice, having meaningful self-study activities and practicing teamwork and time management (should start from the first year). 4 students suggested that some subjects should be revised because of the overlapping of the contents. These students also stated that they needed more time to learn and practice each lesson. 2 students preferred the traditional learning approach which focused on lecturing and test taking only.	42 students did not give an opinion on this item.	
4b. Did they have collaboration problems? What were the problems and how did they handle the problems? (after PBL implementation)	111 students reported that their team had collaboration problems which could be separated into: a) a problem in distributing and completing equal	55 students reported that they had no problems in collaboration.	

	workload (41); b) compromising conflicts of time and ideas (70)		
5. The frequency and description of their meeting with the supervisors, utilizing the PBL process. (after PBL implementation)	Regarding the design of the course's assessment strategy, each team was required to hold two formal meetings which took the form of a panel discussion. Each meeting lasted 1 hour for each team.	In addition to two formal meetings, students initiated informal meetings with their supervisors. Number of times and length of times of these informal meetings varied depending on the needs of each team. From student responses, it can be summarized that 1) 30 students reported that their team met informally with their supervisors once a month to consult and report on the progress; 2) 136 students reported that they met informally with their supervisors often, as needed. They further explained that their supervisors always made time necessary consultations.	

APPENDIX H
Interview Data Transcription (From 2 English Teachers)

Issues of discussion	Interviewee 1	Interviewee 2	Emergent theme
What are the essential characteristics of PBL in your understanding?	Problem (mf1) first, what are the problems (mf 1), what are the existing problems (mf 2). It involves a lot of thinking and planning (kw misc) to tackle the problems (mf1). It doesn't have to be in a research form but it can be a project (kw misc) that based on the existing problems (mf2) and allow students to find out how to solve the problems (mf 1).	PBL is involved student-oriented, student engagement, teacher as facilitator, teamwork, self-management, thinking and problem solving, (kw misc) and higher level skills.	Linking ideas and merging into one major theme and two sub themes: Major theme: PBL first focus on problem(s) formulated by students based on existing problems Sub-theme1: PBL also includes the project (in this context) but the project should derive from the existing problems Sub theme 2: PBL involves teamwork with facilitation from teachers to help students acquire thinking and planning skills, self-management, and problem solving.
Describe how your students form teams.	My students grouped themselves (mf 1) more likely based on friendship (mf 2). Having common interest is not the priority. But there are some groups (mf 1) which consist of six members and they are from different years..year 3, 4, and 5..these students	A criterion of grouping (mf 1) is depending on student's preference. I don't limit size of team, smaller is better. If students want to work alone I will let them. Students mostly grouped themselves (mf1) based on personal relationship (mf2). I think it based on culture; Thai people	Linking ideas and merging into one major theme: Students group themselves (in this context) based on friendship as the priority preference and based on common interests as the secondary preference.

	grouped themselves (mf1)based on the similarity of the problems they want to work on. Most students said they prefer to work with their friends (mf 2) because they are used to each other working styles.	don't separate between personal (mf 2) and work (professional).	
Describe how problems are formulated.	Students are encouraged from the very beginning of the semester to think about problems or situations related to themselves (mf1)that they want to investigate and find out the answers. They first did that individually (mf2) and then they discussed with their classmates and tried to merge the topic of their interests.	First, students were taught how to conduct a research and then the individual student (mf2) was asked to choose the topic of his/her interest. Based on their topic, then they were asked to think about problems they wanted to work on. (mf 1) After that they formed groups and negotiated and selected the problems that the team wanted to work on.	Linking ideas and merging into one major theme: Problems were formulated by individual students at first, later students merged or selected the problems/ ideas, in some cases, to form the starting point of their learning.
Describe the PBL process and your facilitation.	I supervise 13 groups and group sizes are varied from 4-6 members. I spend 50 minutes to one hour with each group. Regarding the supervision guideline, we supposed to spend 30 minutes pre group, but in real practice it took longer in order to us to get into a more quality and satisfied advice and seeing	I supervise 16 groups and group sizes are varied from 2-5. Time spent on supervising my students is uncountable. It actually depends on the stage of their work and their needs. I spent more time than the actual allocated time required by the course structure.	Linking ideas and merging into one major theme: Most allocated class time was given to the facilitation process where students learned from one another, getting feedback and guidance from teachers.

	students' learning progress.		
What is the advantage of doing PBL in your context?	They can really learned by themselves (mf1) with some guidelines (kw misc) so that that they are not too lost. In what I am seeing is that students are learning from 2 channels. First they learned from the frame of the course objectives provided by teachers, Second they learned from their own experience (mf 1) in coping with their research project. Students still need guideline in Thai context.	It has a lot of advantages because the task is from students' initiation (mf1) and that makes them become motivated (mf 2). Students are motivated (mf2) in doing their project. The process of PBL is very important (kw misc) because students learn a lot by going through the process.	Linking ideas and merging into two major themes: 1. PBL makes students motivated to learn by themselves because they initiated the works and learning. 2. PBL process allows students to learn from their experience with guidance from teachers.
What is the disadvantage of doing PBL in your context?	Working in group (2) for those who do not work, they won't learn. They could waste their time (2). Some students might not learn because they depend on their peers (2). However, in our context the majority of Thai students are ready for this approach, but the teachers who use this approach must be clear about what they are going to implement (1). We don't have to be western people to do PBL. PBL in my view is also that students can do	I believe in student's potential, but doing PBL can be a disaster if teachers ignore the process (1). Students will suffer and learn nothing if the teachers still only give lectures, assign and just dump works to students with no facilitation process in between and just grade the final product. Teachers and students must be prepared and ready for PBL process (1). I emphasize that 'process is very important more than the	Linking ideas and merging into two major themes: 1. Teachers can have a negative impact by ignoring the PBL process. 2. Group work without proper monitoring system can cause problems and result in no learning and wasting time.

	a project based on the problems occur within the discipline.	product'.	
Describe the good characteristics of PBL a facilitator.	PBL teachers have to be <u>open-minded to changes</u> in their roles and student's ideas when they proposed problems or issues they wanted to study. They have to be <u>spontaneous in their feedback or responses</u> to students while facilitating their learning.	PBL supervisor should <u>not be too active and too passive.</u> Too active teachers tend to control and impose their ideas upon students' work. The focus then is more one the product not the process. Passive teachers tend to let students to be on their own, do whatever, and no feedback on the progress.	Linking ideas and merging into one major theme and one sub theme: Major theme: PBL teachers must be open-minded to their new roles and to student's new roles. Sub-theme: PBL teachers should be spontaneous in giving feedback in which requires interdisciplinary knowledge and skills.

APPENDIX I
Transcribed Data from Open-Ended Questionnaire

Reflected issues	Extracted notes/Teacher 1	Extracted notes/Teacher 2	Emergent themes
1. Please describe PBL as practiced in your context.	Existing problems (mf1) and potential problems (mf1) were used as the first step to drive students' learning. Students were encouraged to be aware of those problems (mf1). Students formulated problems (mf1) in order to make a proposal of their research project (mf 2). Later, they work in team and went through the research process (mf 2) and the PBL process (mf1). They began to look for ways to deal with the problems (mf 1) by searching knowledge/information to help them cope with the problems (mf1). Along the way they learn new knowledge from the subject content and from their working process. They then learned about themselves and learned to solve the problems.	My class focused on the students' interest and collaboration. (sup info) First, the students were taught about how to conduct a research project. After that individual students were asked to think about a problem (mf1) related to their context, then they laid out the research plan (mf 2) and after that they formed groups of 4-5, sharing each member's topic and selecting a topic for their group to be the term project (mf 2). Each group was required to make their project (mf2) plan together and followed each stage of research process (mf 2).	Linking ideas and merging into two major themes: Theme 1: Problem formulation was done by students and used as the starting point to approach learning. Theme 2: The research project and research process was used to drive the learning process. The research project was derived from student interests and must allow student collaboration.
2. What were challenges and difficulties encountered during the PBL implementation period?	Students were confused in the beginning. They did not have a clear direction in their learning. They seemed to be frustrated with managing ideas and information. However, after	First, it is challenging to maintain my role, not to be too intervening and domineering when I saw that students seemed to be lost sometimes. Second, monitoring everyone in	Linking ideas and merging one major theme and one sub-theme: Major theme: Maintaining balanced roles; when to intervene

	a few meetings or consultations they began to be able to shape up their ideas and directions in learning. By mid of the semester, they seemed to be clear with their work and its process.	group works and make sure they worked fairly and equally is also challenging.	when students encountered obstacles. Sub-theme: Confused, frustrated, and lost students are challenging for teachers to handle.
3. What was the best experience or advantage gained by you and your students?	PBL allows students to see their own potentials (mf1). I, as a teacher (mf2), also have learned new things (mf2) from working alongside with students as well. "I feel that students were proud of themselves(mf1) after realizing that they can learn by themselves(mf1), tackled problems by themselves (mf1), and gained new knowledge by themselves.(mf1)"	Students can maximize their learning (mf1). They learned (mf1) through self-discovery (mf1) and hands-on experience on their own design. Students learned to work with others (mf1). I, as a teacher (mf2), also had a chance to work closely (mf2) with the students.	Linking ideas and merging two major themes: Theme1: Student learning experiences became positive; being autonomous and collaborative learners. Theme 2: Teachers also learned as same as students ddi.
4. Additional comments on implementing PBL in your context.	The concepts and practices of PBL are new to Thai students; therefore, it will be more fruitful if they understand what PBL is from the very beginning. However, PBL process can really excite students.(mf1) They were anxious to figure out ways to solve problems and wanted to know the results of their works.	PBL would work perfectly in encouraging the students to optimize their learning (mf 1) in a small class size. The PBL principle itself is quite fascinating (mf1). However, in bigger class size, PBL may need to be adapted to meet the circumstance.	Linking ideas and merging one major theme and one sub-theme: Major theme: PBL can increase student motivation in learning. Sub-theme: PBL is new in the Thai context, so adaptation is needed when implementing.

APPENDIX J
Results of Teacher Questionnaire (Likert Scale)

Result of teacher perceptions of their students' learning development when implementing PBL: (N= 5 (English 2, IT 3))

The numbers indicate:1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1		2		3		4		5	
	E	IT	E	IT	E	IT	E	IT	E	IT
1. At the beginning of the semester, students were confused about the PBL process.	0	0	0	1	1	0	1	2	0	0
2. From the beginning students exhibited a high level of responsibility to their learning.	0	0	0	1	1	0	1	2	0	0
3. From the beginning students could identify their own learning goals.	0	0	0	1	2	2	0	0	0	
4. Students exhibited their independence in searching for information and learning from the beginning of the semester.	0	0	0	0	1	0	1	3	0	0
5. As the semester progressed, students exhibited progression in their self-directed learning skills.	0	0	0	0	0	0	2	2	1	0
6. As the semester progressed, students exhibited the ability to work well together as a team.	0	0	0	0	0	2	1	1	1	0
7.Every group had problems in working as a team at the beginning	0	0	1	0	0	0	1	3	0	0
8. When problems occurred, students would make an attempt to solve their problems first.	0	0	0	2	0	1	1	0	1	0
9. I can see that my students can solve problems effectively.	0	0	0	0	0	3	2	0	0	0
10. I can see that my students can work on their project effectively.	0	0	0	0	0	3	2	0	0	0
11. My students always met the assignment deadlines.	0	0	0	0	0	0	2	2	0	1
12. My students learned more about the contents of the subjects by working on their projects.	0	0	0	0	0	0	2	2	0	1
13 My students exhibited enthusiasm in working on their projects.	0	0	0	0	0	0	1	3	1	0
14. My students were motivated to participate in discussion during the facilitation periods.	0	0	0	0	0	2	2	1	0	0
15. As the semester progressed my students exhibited more independence in searching for information and learning.	0	0	0	0	0	0	0	3	2	0
16. Overall, I am satisfied with my students' learning development throughout the semester.	0	0	0	0	0	0	2	3	0	0
17. Overall, I am satisfied with the quality of my students' projects.	0	0	0	0	0	0	2	2	0	1
18. As the semester progressed I was satisfied with the development of my students' presentation skills.	0	0	0	2	0	1	2	0	0	0
19. I can see that PBL has enhanced the depth of my students' content learning.	0	0	0	0	0	2	2	1	0	0
20. I can see that PBL has enhanced my students' practical skills.	0	0	0	0	0	0	1	2	1	1

Remark: Teachers from both schools tended to rate their students' performance on both learning progress and learning product in the same direction (agree and strongly agree) in the following items: 5, 11, 12, 13, 15, 16, 17 and 20. In contrast, the teachers seemed to be conflicted in rating item 7, in the way they perceived the dynamics of teamwork among their students. One English teacher felt that her students had difficulties in working as a team at the beginning of the project, however, as time progressed she felt that her students had made a tremendous improvement in collaborative work. On the other hand, the other teachers did not recognize conflicts that occurred while students worked in team. Whether they recognized conflicts in students' collaborative work at the beginning or not, at the end of the semester they all agreed that PBL had helped their students work well together, as a team. It was very interesting to see that there were two items (9 and 10) that English teachers and IT teachers disagreed upon. Both English teachers perceived that their students were able to solve problems on their own effectively and consequently students' learning progress in approaching their projects was also effective or satisfactory. In contrast, all three IT teachers were not sure whether their students had exhibited these two elements.

APPENDIX K
Questionnaire Data from the IT Cohort

A) Analysis of 58 returned questionnaires from IT1 cohort

	Statements	Analysis			
		Min	Max	Average	Mean
1	In previous semesters I was motivated to prepare for lessons before coming to lectures. (M)	1	5	3.16	Neutral
2	I always participated in teaching and learning activities in previous semesters. (COL)	2	5	4.07	Agree
3	Previous learning activities allowed students to be active learners. (PBL process)	2	5	3.62	Agree
4	I enjoy working in a team with other people. (COL)	3	5	4.33	Agree
5	Previous learning activities allowed me to tackle unfamiliar problems. (PBL process)	2	5	3.93	Agree
6	I learn a lot by reading books on my own. (SDL)	1	5	3.76	Agree
7	In previous semesters I participated in peer teaching of team learning activities. (COL)	2	5	3.41	Neutral
8	In previous semesters, learning activities allowed me to find information libraries. (SDL)	1	5	3.55	Agree
9	In previous semesters, learning activities allowed me to find information on the internet. (SDL)	2	5	4.21	Agree
10	Information and materials needed for previous projects or assignments are provided by my teachers. (SDL)	2	5	4.16	Agree
11	In previous semesters I managed my time effectively. (SDL)	1	5	2.84	Neutral
12	I perceive that teamwork/learning has helped me learn academic content in the program I chose for my study. (COL)	2	5	3.78	Agree
13	In previous semesters, I developed many useful strategies to help me in my learning. (SDL)	1	5	3.67	Agree
14	The learning environment of previous semesters raised my interest and motivation in learning. (M)	2	5	3.50	Neutral
15	I can identify my learning goals without depending on my teachers or advisors. (SDL)	1	5	3.03	Neutral
16	I am good at writing reports/ essays. (COM)	1	5	2.90	Neutral

17	I speak well in front of a group (informal setting). (COM)	2	5	3.05	Neutral
18	I can formally present my work well in front of an audience. (COM)	1	5	2.69	Neutral
19	When working on the previous project I received regular feedback from my teacher on how I was doing with my project. (PBL process)	1	5	2.86	Neutral
20	When working on previous projects I was able to get help from my teacher whenever I need it. (PBL process)	1	5	2.72	Neutral
21	Previous learning activities helped shape me to be good at thinking things through. (PBL process)	1	5	3.21	Neutral
22	Previous learning activities enhanced my self-directed learning skills. (PBL process)	2	5	3.79	Agree
23	In previous semesters, I took part in peer and self-assessment. (PS assess)	1	5	3.67	Agree
24	Peer and self-assessment is a valuable tool in the learning process. (PS assess)	1	5	3.33	Neutral
25	Previous learning activities motivated me to investigate the content of my study in more depth. (M)	1	5	3.48	Neutral

Analysis of clustered items: N=58

Clusters	Mean	Interpretation
Motivation (item 1, 14, 25)	3.38	Neutral
Collaboration (item 2,4,7,12)	3.94	Agree
Communication (item 16, 17,18)	2.88	Neutral
Self-directed learning (item 6, 8, 9, 10, 13,15)	3.84	Agree
PBL process (item 3,5,19, 20, 21, 22)	3.47	Agree
Peer assessment (item 23, 24)	3.5	Agree

B) Analysis of 77 returned questionnaires from SE1 cohort

	Statement	Min	Max	Average	Mean
1	In previous semesters I was motivated to prepare for lessons before coming to lectures. (M)	1	5	2.96	Neutral
2	I always participated in teaching and learning activities in previous semesters. (COL)	1	5	4.27	Agree
3	Previous learning activities allowed students to be active learners. (PBL process)	1	5	3.75	Agree
4	I enjoy working in a team with other people. (COL)	1	5	4.12	Agree
5	Previous learning activities allowed me to tackle unfamiliar problems. (PBL process)	1	5	3.94	Agree
6	I learn a lot by reading books on my own. (SDL)	1	5	3.29	Neutral
7	In previous semesters I participated in peer teaching of team learning activities. (COL)	2	5	4.26	Agree
8	In the past semesters, learning activities allow me to find information libraries. (SDL)	1	5	3.49	Neutral
9	In previous semesters, learning activities allowed me to find information on the internet. (SDL)	2	5	3.92	Agree
10	Information and materials needed for the past project or assignments are provided by my teachers. (SDL)	1	5	4.22	Agree
11	In previous semesters I managed my time effectively. (SDL)	2	5	3.12	Neutral
12	I perceive that teamwork/learning has helped me with the academic content of the program I chose for my study. (COL)	1	5	4.09	Agree
13	In previous semesters, I developed many useful strategies to help me in my learning. (SDL)	2	5	3.69	Agree
14	The learning environment in previous semesters raised my interest and motivation in learning. (M)	2	5	3.82	Agree
15	I can identify my learning goals without depending on my teachers or advisors. (SDL)	1	5	3.04	Neutral
16	I am good at writing reports/ essays. (COM)	1	4	2.60	Neutral
17	I speak well in front of a group (informal setting). (COM)	1	5	2.91	Neutral
18	I can formally present my work well in front of audience. (COM)	1	5	2.88	Neutral
19	When working on previous projects I received regular feedback from my teacher on how I was doing with my project. (PBL process)	1	5	3.70	Agree
20	When working on previous projects I was able to get help from my teacher whenever I need it. (PBL process)	1	5	3.87	Agree
21	Previous learning activities helped shape me to be good at thinking things through. (PBL process)	1	5	3.45	Neutral

22	Previous learning activities enhanced my self-directed learning skills. (PBL process)	1	5	3.62	Agree
23	In previous semesters, I took part in peer and self-assessment. (PS assess)	1	5	3.03	Neutral
24	Peer and self-assessment is a valuable tool for the learning process. (PS assess)	1	5	3.78	Agree
25	Previous learning activities motivated me to investigate the content of my study more deeply. (M)	1	5	3.73	Agree

Analysis of clustered items N=77

Clusters	Mean	interpretation
Motivation (item 1, 14, 25)	3.5	Neutral
Collaboration (item 2,4,7,12)	4.19	Agree
Communication (item 16, 17,18)	2.8	Neutral
Self-directed learning (item 6, 8, 9, 10, 13,15)	3.54	Agree
PBL process (item 3,5,19, 20, 21, 22)	3.72	Agree
Peer assessment (item 23, 24)	3.4	Agree

APPENDIX L
Questionnaire Data from 18 Participants of the PBL Workshop Initiative

A) Questionnaire about improvement in the PBL staff development program (usefulness of the workshop from trainee perspectives).

The numbers indicate: 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Statement	1	2	3	4	5
1. Content of the workshop lived up to its description	1	0	2	9	6
2. Content of the workshop met my expectations in terms of teaching and learning	0	1	4	9	4
3. Activities of the workshop stimulated participants' involvement.	1	0	2	9	6
4. After participating in the workshop, I have gained knowledge, understanding, and skills of PBL at a satisfactory level.	0	1	3	9	5
5. The workshop has given me tools to cope with the PBL facilitation process.	0	1	7	9	1
6. I have more confidence about implementing PBL effectively in my educational context after attending this workshop.	0	0	6	10	2
7. This workshop helped me reflect on my role and my commitment as a teacher.	0	0	3	11	4
8. This workshop raised my awareness about learning and teaching.	0	2	2	7	7
9. This workshop helped me see that learning occurs through knowledge construction, not knowledge delivery.	0	1	5	6	6
10. This workshop is beneficial to teachers who want to improve their teaching and facilitation skills in an active learning environment.	0	2	1	7	8
11. I would strongly recommend this workshop to my colleagues.	0	1	3	7	7

Remark: Of 18 participants there was one participant who responded very negatively to the workshop. Their rating can be interpreted that they think the workshop is worthless. They gained nothing from attending the workshop. They think that PBL implementation could be carried out effectively without training or the workshop. They also declined to recommend the workshop to anyone.

B) The questionnaire of improvement in the PBL staff development program, clustered items into 4 categories:

1. Quality of content and activities of the workshop, which consists of items 1,2,5

2. Competence gained after attending the workshop, which consists of items 4,6,7,8,9

3. The workshop has an active dynamic, which consists of item 3

4. Recommendation to others, which consists of items 10,11

Clusters	Disagree		Neutral		Agree	
	N	%	N	%	N	%
Quality of content and activities of the workshop which consists of items 1,2,5	1	5.5%	4.3	23.88%	12.7	70.55%
Competence gained after attending the workshop which consists of items 4,6,7,8,9	0.8	4.44%	3.8	21.11%	13.4	74.44%
The workshop has an active dynamic which consists of item 3	1	5.55%	4	11.11%	15	83.33%
Recommendation to others which consists of items 10,11	1.5	8.33%	2	11.11%	14.5	77.77%

APPENDIX M
Observation Data from On-Going Consultancy Sessions

Consultancy sessions with the English team		Consultancy sessions with the IT team	
May 2012	**Topic of discussion: How should the course be redesigned to become PBL oriented?** GC1: Both teachers came to the meeting seemingly with full interest and expressed that they would both cooperate with me in this new approach to teaching and learning. Most of the activities in the course outline will mainly be based on my input. All regulations in how to run the course were agreed in this meeting. I tried to get them both to give more input on the modification of the content; however, they mostly agreed with my proposals. GC2: In this context, I played many roles as a designer, a course coordinator, a teacher, and a researcher. My role as coordinator may have influenced these teachers to expect that I must be the one who was responsible for all redesigned elements. GC3: Cooperation from both teachers was excellent, but I expected more involvement in the design process from them. However, there are many different factors that may shape the design process in the way it is now, such as workload, time allocation, and some cultural elements about showing respect to the stakeholder of the idea.	**June 2012**	**Topic of discussion: What is PBL and why should we undertake PBL?** GC1: This was a more formal meeting with 8-10 teachers to introduce them to with the teaching and learning this coming semester. Prior to this meeting, I had already had 2-3 meetings with the IT team's manager and the manager herself had already had some meetings with her members. My role today was to support PBL implementation with the IT cohort. I explained and emphasized the PBL process, and the manger discussed the content of the discipline. It cannot be denied that we both did a lot of preparatory talk about why PBL should be implemented. It seemed that all teachers had agreed beforehand about how the content of their subject would be handled this coming semester. GC2: It was interesting to see that most teachers on the PBL team are considered quite new, having been teaching here 2 years or less. These new teachers seemed to be more enthusiastic to the PBL approach more than the older teachers.

June 2012	**Topic of discussion: PBL workshop for students** GC: For this meeting, I have already planned the activities for the coming 2 workshops which will be provided to students in weeks 3 and 4. In the meeting I gave them an overview of how workshop will be run. They have no objection to the workshop activities, but give support and cooperation in running the workshop. They both prefer that I run the workshop and they will help in checking student work during the workshop sessions.	**August 2012**	**Topic of discussion: PBL Assessment** GC: The focus of this meeting was to discuss what type of assessment should be used in assessing student learning. At first, the management team were more concerned about how to collect data so that they can present a sufficient report on their implementation. Later, the focus shifted to assessment of student learning. They agreed that they must modify the assessment criteria to be more process based and try to make use of self and peer-assessment. Despite supporting peer assessment, the IT team agreed that they are not yet ready to enforce peer assessment the way the English cohort have agreed to do this semester. Therefore, they continue to give scores for attendance and participation which is judged by the teachers. Their concern in utilizing peer assessment is the students' ability to assess their peers and their honesty in giving scores. Consequently, they would like to put the enactment of peer assessment on hold.
August 2012	**Topic of discussion: PBL Assessment** GC: The focus of this meeting was to debate the use of peer assessment with the Writing 3 course. We agreed to enact peer assessment which means we will give the ownership of 10% of grading criteria to our students. However, we will define the rules for their assessment of their peer's work contribution. The English teachers have a different	**October 2012**	**Topic of discussion: PBL community of practice: teaching, learning, research, and publication.** GC: At this meeting the discussion was more focused on the teachers' experience with PBL and how they can put their PBL experience into a research format. The manager of the IT team and I also tried to help these teachers link their PBL practice to their professional

	perspective of their students' ability in assessing their peers and their honesty in giving scores to their peers.		development. The concrete examples of possibility in developing learning, teaching, personal growth and professional growth at the same time were shown to these teachers.
October 2012	**Topic of discussion: A reflection on PBL practice this semester** GC: Both teachers strongly supported the implementation of PBL, but they believed that it is necessary to train both teachers and students to truly understand the rationale behind the practice, otherwise it could be a disaster. They both were happy with their students' learning progress, as well as their learning product. However, they also pointed out some challenges in implementing PBL in their context. They said that PBL demands a great deal of time from teachers and students, but especially PBL teachers who are required to be competent in both content and process skills, so that they can facilitate students effectively.	**March 2013**	**Topic of discussion: A reflection on our practice this semester and how to synchronize classroom research with our PBL implementation** GC1: This meeting was quite formal and there non-PBL teachers also participated this time. At this meeting I also had a chance to speak with some teachers who are not in a favor of implementing PBL. The PBL practitioners of this semester reported on their PBL experience, reflecting on both the pros and the cons of their practice. Most students enjoyed team work and were motivated to do their project, but teachers were unable to identify free riders, so they decided to give scores for attendance to all students and give grades based on product not process. GC2: I noticed there was tension between IT teachers who were for and against PBL implementation. This was more or less a political issue, rather than an issue of the content and application of PBL within the discipline. The only criticism towards PBL was that it is very demanding in time and effort from both teachers and students

APPENDIX N
Conference Paper 1

INTEGRATING PBL PEDAGOGY WITH EFL COURSES TAUGHT IN TANDEM:
REFLECTIONS ON BENEFITS AND CHALLENGES

Coffin, P. (2011). Integrating PBL pedagogy with EFL courses taught in tandem:

Reflections on benefits and challenges. In C. Prachalias (Ed.), *International*

Conference on Education. Paper presented at the 7th ICE Samos 2011, Samos,

Greece, 7-9 July (pp. 223-229). Greece, National and Kapodistrian University of

Athens.

Abstract. This study describes an educational management experience which integrates an innovative pedagogy called Problem-Based Learning (PBL) into language education where English is taught as a foreign language in a traditional educational environment. Despite difficulties and complexity in the integration process, PBL was adapted and used as an instructional strategy with two major required courses in the English Program at Mae Fah Luang University in Thailand in the academic year 2009. The study involved 109 students and 16 teachers from the English Department. A course syllabus was designed which merged the two courses to be taught in tandem and integrated PBL into the teaching/learning process. Throughout the semester, teaching/learning was done through project work which was derived from student interests. Students participated in their projects in small groups of 6-7 members, and were facilitated by advisors. At the end of the semester, two sets of the questionnaire were distributed to both teachers and students in order to get feedback and reflections on teaching and learning through this new PBL approach. In-depth interviews with cohorts of students and teachers were also conducted to document their perceptions of the teaching/learning approach used with the two courses. The results indicated that participants perceived and reflected positively on the use of PBL instructional strategy. The paper also discusses the advantages and disadvantages of PBL used in the traditional educational environment, problems that arose during the operational period, lessons learned from the PBL integration into the existing syllabi, and possible solutions suggested for future implementation of PBL.

Key words: Problem-Based Learning, Project Work, English as a Foreign Language,

1 Introduction

Problem Based Learning (PBL) is recognized at two levels: as pedagogical strategy and educational/curriculum method. PBL is also practiced in many different ways, depending on the context of the educational environment. In the decades since its initiative PBL has been implemented successfully in several academic disciplines, particularly in the fields of medicine, science and engineering. There are several studies demonstrating that PBL enhances self-directed learning, problem solving skills, communication skills, and also fosters in depth content learning through team work (Barrows & Tamblyn, 1980; Hmelo-Silver, 2004; Hung, Jonassen, & Lui, 2010). Although PBL has made progress in the fields of medicine, science and engineering, it is still in the beginning stage in the field of language studies, particularly in the foreign language learning environment. As a language teacher, the researcher has recognized some common features of learning outcomes presented in both PBL and language learning principles. In the field of language teaching/learning, the introduction of Communicative Language Teaching (CLT) in the 1970s brought a major paradigm shift. The focus of learning outcomes was on producing learners with language competence or communicative competence

which fostered language students to be able to function or apply knowledge and skills beyond the classroom context. The term describing this kind of learning outcome is 'communicative competence' (Hymes, 1972). Later Canale and Swain (1980) divided communicative competence into four dimensions: linguistic/grammatical competence, sociolinguistic competence, discourse competence, and strategic competence. The common learning outcomes shared between PBL and language learning are:

Communication skills= Discourse competence+ Sociolinguistic competence

Problem-solving skills= Strategic competence+ Discourse competence+ Sociolinguistic competence

As well as addressing the common values gained between PBL and CLT, the goal of the case study was also to demonstrate that PBL encourages self-directed learning and collaborative learning/working among students. This study describes an educational management experience which integrates PBL strategy into two English courses taught in tandem. The study involved 109 students and 16 teachers from the English Department. Learning was done through project work which was derived from student interests. Students participated in their projects in small groups of 6-7 members, and were facilitated by advisors. Empirical data was collected through questionnaires and interviews. The qualitative results indicated that participants perceived and reflected positively towards the use of PBL instructional strategy. Discussion focuses on the advantages and disadvantages of PBL used in the traditional educational environment, problems and lessons learned from PBL integration into the existing syllabi, and possible solutions suggested for the future implementation of PBL.

2 A description of the PBL organized model

Elements of the two courses before integrating PBL are shown in Table 1.

Course Name	Senior Project	Seminar on Contemporary Issues
Course Code	1006498	1006499
Amount of credit earned	3(3-0-6) The course involves 3 credit hours. Traditionally, the course is run for 15 weeks (45 hours of class time). Each week requires 3 hours of lecture time, no lab, and 6 hours of students' self-study time.	3(3-0-6) The course involves 3 credit hours. Traditionally, the course is run for 15 weeks (45 hours of class time). Each week requires 3 hours of lecture time, no lab, and 6 hours of students' self-study time.
Course description (original)	An independent study of the selected topic under the close supervision of an advisor which requires objective setting, hypothesizing, literature reviewing, researching, and analysis, culminating in a paper and oral presentation.	The study of a selected contemporary issue, with logical analysis of the aspects under study, culminating in a seminar involving oral and paper presentations.
Type of course	Major Required	Major Required
Grading method	S/U S = satisfactory at 70% + U= unsatisfactory at 69% or less	S/U S = satisfactory at 70% + U= unsatisfactory at 69% or less

Table 1: Elements of the courses before integrating PBL

2.1 New Elements of the two courses

The committee of the English program later agreed about setting the objectives, details of course outlines, a teaching method by which to conduct these two classes, and details of assessment.

Objectives of the Senior Project Course set by the English Department committee are:

1) Students are expected to apply knowledge from their English major studies and research skills in producing a selected project.
2) Students are expected to give oral presentations on the process of their project.
3) Students are expected to display their project work in paper and oral presentations for the public.

Objectives of Seminar on Contemporary Issues course set by the English Department committee are:

1) Students are expected to explore the topic of interest and engage in seminars on various issues.
2) Students are expected to give oral presentations on the selected topic.
3) Students are expected to display learned knowledge in the form of a paper presentation.

The two courses were merged and taught in tandem, but were graded separately. Learning was done through project work which covered 3 fields and 16 themes: Literature (3 themes), Linguistics (5 themes), and Education & ESP (8 themes)
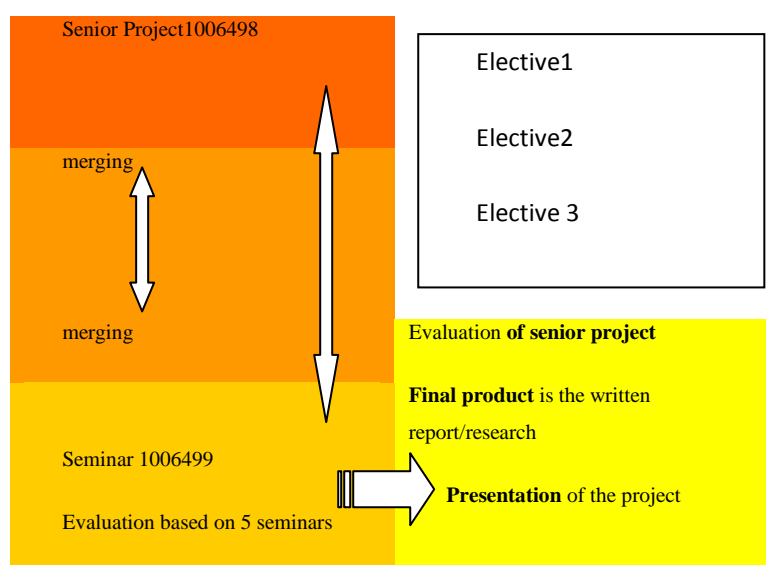
Figure 1: Integrated PBL Model

A Semester Plan was designed and agreed by both teachers and students. Details are as presented in Table 2.

Week 1	- Orientation on how these two courses will be run throughout the semester and a clarification of teacher and learner roles - Theme selection	
Week 2-5	Meeting advisors + theme overview (lecture) Brainstorming a topic/research question(s) Library search	Seminar1
Week 6-7	Writing a formal proposal	Seminar 2
Week 8-9	Methodology: designing instrument(s)	Seminar 3
Week 10-11	Data collection	Seminar 4
Week 12-13	Data analysis Finish up the report	Seminar 5
Week 14-15	Presentation= Exhibition Paper report due	

Table 2: Schedule and Semester Plan

2.2 Assessment Strategy

Although the two courses were combined in terms of the content of the project and teaching/learning practice, the evaluations of the two courses were separate. Each student was assessed individually, but their working/learning strategy was in small group format. Details of grading are shown in Table 3.

Senior Project (1006498)		Seminar (1006499)	
Final Product 30% (Evaluated by the advisor 15% and co-advisor 15%) Learning Progression 20% (Evaluated by the advisor)		Seminar1 20% Seminar2 20% Seminar3 20% Seminar4 20% Seminar5 20%	

Presentation/Exhibition   50% :
  -    Advisor 20%
  -    Co-evaluator from the related field   20%
  -    Public 10%
		*for each seminar, there will be 2 evaluators (the group advisor and an invited lecture in the related field)	

Total points for advisor	55%	Total points for advisor	50%
Total points from external evaluator	45%	Total points from external evaluator	50%
Grand Total	**100%**	**Grand Total**	**100%**
S - 70 U - less than 70		S - 70 U - less than 70	

Table 3: Grading Criteria of the Two Courses

In running these two courses in tandem, we combined the two courses in terms of time management and topic/theme selection in producing a project. Students worked together in small groups of 6-7 members, under the same theme. Students chose the theme by themselves and worked under the guidance of one supervisor. In parallel with the project work, they were also required to hold 5 formal seminars. Each seminar was required to operate in the format of a panel discussion where all members must be actively involved in presenting the progress of their works, asking constructive questions and offering possible answers in order to help develop the project. Each seminar was evaluated by 2 evaluators (the supervisor and an external evaluator). The main purpose of the seminars was to evaluate student learning progress through their project work. Students and advisors were expected to progress their learning /teaching according to the schedule given in the semester plan. Students and supervisors were expected to work together to set up their own schedule for lecturing and advisory periods, including the place and time to meet. Each group knew that they got 6 hours per week from their advisors for their project supervision.

3 Methodologies

In order to gather the perceptions of both students and teachers of integrating the Project Organized and PBL strategy with the two courses, questionnaire surveys and interviews were used to collect empirical data.

3.1 The Questionnaire Surveys

There were two sets of questionnaire, one for students and one for teachers, distributed to 109 students and 16 teachers at the end of the semester (after the exhibition of the students' project work). The purpose of the two sets of questionnaire was to:

1) Check on the teaching method, whether or not the teachers followed the given guidelines.
2) Detect student perceptions of their own learning process and learning outcome.
3) Detect student perceptions of their advisor's facilitation process and quality.
4) Detect teachers' perceptions of the integration of PBL educational strategy.

3.2 The Interviews

In order to obtain more open-ended opinions and reflections, interviews with both teachers and students were conducted randomly. The interview questions dealt with their open-ended opinions on the positive and negative points of conducting teaching/learning with two courses this way (PBL instructional strategy).

4 Results

4.1 The results from the questionnaire survey from students (Item 1-10)

1) 66 students participated in the questionnaire survey: 21 students from the Linguistics Theme; 16 students from the Literature Theme; and 29 students from the Education and ESP Theme.
2) Of 66 students, 60 students reported that their group held 5 seminars; 2 reported the group held only 1 seminar; 2 reported the group held 3 seminars; and 2 reported the group held more than 5 seminars.
3) Of 66 students, 50 students reported that there were 2 evaluators at each seminar; 7 reported that there was only 1 evaluator at each seminar; and 4 that there were more than 2 evaluators at each seminar.
4) Of 66 students, 31 students reported they had more than 3 meetings with their advisors before each actual seminar; 7 students had 3 meetings before each formal seminar; 11 had 2 meetings before each formal seminar; and 13 had only 1 meeting before each seminar. There were 4 students who didn't report on this item.
5) Of 66 students, 30 students reported spending more than 3 hours per week on self-study related to their project; 13 reported spending 3 hours per week; 13 reported spending 2 hours per week; 3 reported spending 1 hour per week, and 7 did not report on this item.
6) 66 students reported on their perceptions of knowledge gained; detail is shown below.

Statement	none	very little	fair		good		excellent	
I have gained knowledge from doing the project work.	-	-	8	12.12%	32	48.48%	26	39.39%

7-10) 66 students reported on their perceptions on their satisfactory level of the advisory, quality of

their final product, their learning process and their collaborative skills; detail is shown below.

Statement	poor		below average		average		above average		excellent	
I am satisfied with my advisor's supervision.	-		2	3.03%	13	19.70%	21	31.82%	30	45.45%
My perception of the quality of my final product.	1	1.52%	2	3.03%	26	39.39%	24	36.36%	7	10.61%
My perception of my learning process.	-		-		15	22.73%	38	57.58%	13	19.70%
I worked well with the team.	-		-		15	22.73%	38	57.58%	13	19.70%

4.2 The results from the questionnaire survey from teachers are the followings:

1) 16 teachers participated in this study: 3 from the field of literature; 5 from the field of linguistics; and 8 from the field of education and ESP.
2) Questionnaire item 2 was to obtain information about whether or not the teachers had complied with the agreement for a number of hours spent on advisory time, the requirement was 6 hours per week. 9 teachers reported that they spent 6+ hours per week with students as required; 1 teacher reported spending 4 hours; 5 teachers reported spending 3 hours, and 1 teacher reported spending 2 hours.

3) Each study group and the advisor are guided to hold 5 seminars to report and discuss the progress of the project work. One teacher reported holding only one seminar and the other 15 reported holding 5 seminars as required by the guidelines.

4) Guidelines state that there must be a co-evaluator for each seminar. It was preferable that the co-evaluator should be the same person for all five seminars. The intention was for teachers to develop their collaborative teaching and to improve the student learning process. 12 teachers reported having the same co-evaluator throughout the five seminars and 4 teachers reported having different co-evaluators for the seminars.

5-8) The next three items reported on teacher perception of student learning.

Statement	Poor		Below average	Average	Above average	Excellent
My students' presentation and communication skills.	-		6.25%	18.75%	43.75%	31.25%
My students' self-directed learning.	-		18.75%	12.50%	31.25%	37.50%
My students' team work skills (collaborative skills)	-		6.25%	25.0%	18.75%	50.0%
Quality of my students' final product.	-		6.25%	56.25%	31.25%	6.25%

9) Teacher perceptions of the improvement in their students' learning.

N/A	No improvement	Very little improvement		Satisfactory level of improvement		Significant improvement	
-	-	3	18.75%	9	56.25%	4	25.0%

4.3 The interview results from students

All sixteen students responded that they liked learning through this method because they had become responsible for their own learning and gained teamwork skills. A group of 6 students who worked together designing basic English communicative lessons said that it was harder and more demanding for them to work on the project than learning in the class by listening to lectures and completing exercises, but they had learned a lot from working on the project together (personal interview, 2009). The second group did their project work on the same theme, but decided to work on their own individual mini-research. They explained that they liked how the two courses were conducted. They could work independently and manage their own schedule. They however regretted that they didn't really get to work fully as a team because each worked on their individual mini-research. One student explained that although they worked under the same theme, they tended to work individually on their part, therefore, they did not benefit as much as they could have during the seminar sessions. Four more students were not working under the same theme. Each was the representative of a different theme group. They all responded positively about the way the two courses were conducted. They liked the way they got to manage their own working time and could be self-directed during their project work period. However, these four students also expressed some negativity regarding their project work. Two students said that they didn't have freedom to initiate what they really wanted to do in their project. They said that their advisor controlled what and how the project should be done. These students expressed a low level of satisfaction with their advisors. One student also had problems with their advisor, regarding the advisory process. This seemed to be because of unclear and miscommunication between them. One last student gave a very insightful remarks and

comments on the teaching/learning strategy used. The student first explained that the way we conducted the two classes could be very beneficial to some groups of students, but could also hurt some students. The student was concerned with the standard of supervision. This student noticed that some groups were very happy with their learning progress and their products, however, some groups were not happy and not sure if they had gained anything in terms of content knowledge and even collaborative skills. The student further explained these things all depended on their advisors. One common skill all students seemed to gain was in self-directed study, including time management.

4.4 The interview results from teachers

All four teachers explained that conducting the two courses this way was very challenging for both teachers and students. In general they were happy with the results in terms of students' learning and the final products/reports. However, they all agreed that there was still a great deal to improve in terms of standard procedures in conducting the two courses and the grading method used with these two courses. For instance, it was noticed by both teachers and students that some teachers did not spend the proper amount of time on advising and lecturing. Some teachers were too controlling of student projects, not allowing student initiative in their own projects. Some teachers allowed some projects that were not correlated; therefore, students did not learn from one another and they did not get to work collaboratively. The four teachers also addressed the grading issue. They agreed that using the S and U grading method for these two courses was unfair on the hard working students and also allowed a lot of free riders. The grading factor could contribute to the discouragement of students and had high potential to produce mediocre project work because they could not see the difference in the rewards for their effort and the quality of their work, as the passing grade had a very wide range, 70-100 points. This issue of course is something we need to reflect on and must improve.

5 Discussions

Sixty six out of 109 students (60.55%) returned and completed the questionnaire. 90.91% (of 66 students) reported that they and their advisors had held 5 seminars regarding the course agreement. It can be concluded that there were some groups that did not comply with the agreement (9.09%). The report from the teachers on the same item showed consistency of their responses. 15 teachers (93.75%) reported that they held all five seminars. Only one teacher (6.25%) reported holding only one seminar. The next agreement was that each group would have 6 hours per week of consultancy from their advisors. 46.97 % of students reported that their advisor spent 6 hours or more per week with them, 10.61% reported they spent 5 hours per week, 16.67 % reported they spent 4 hours per week, 19.70 reported they spent 3 hours per week. No advisor spent less than 3 hours on the advisory time, as reported by students. It is very interesting to see that the report of the teachers themselves showed similar results to that of the students. The results of this item agreed with the student report. Another item which showed a similar result was on advisory time.
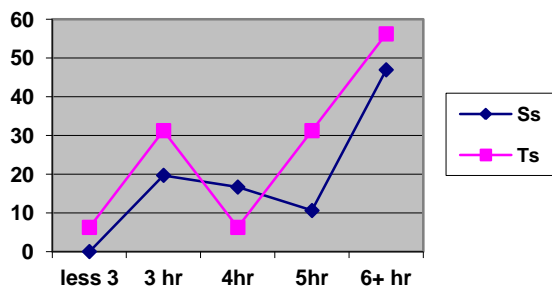
Figure 2 : Student and teacher reports of advisory time

Item 2 reported the agreement of having co-evaluator for each seminar. This item showed a conflict between student and teacher reports. It was agreed that each seminar should have at least 2 evaluators. All 16 teachers reported that there were 2 evaluators at each seminar. 12 teachers (75%) also reported that they had the same co-evaluator at each seminar so as to be consistent in commenting and following through with students' learning progress. However, the student reports of this item found that 75.76% of students reported that their group had two evaluators at each seminar as agreed and 6.06% report that they had more than 2 evaluators at each seminar. It can be concluded that were there some groups who did not comply with agreement #2 because 18.18% of students reported that they had only one evaluator at each seminar, which was their own advisor.

Most important were the reports on the student learning process and the final product of the project work from both teachers and students. The results showed an agreement in teacher and student perceptions as showed in the graphs below.
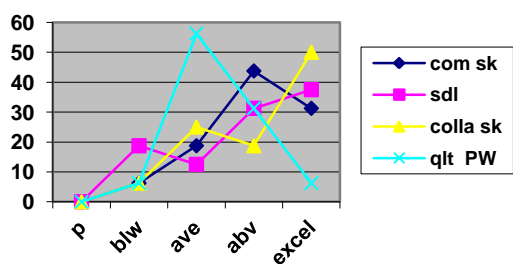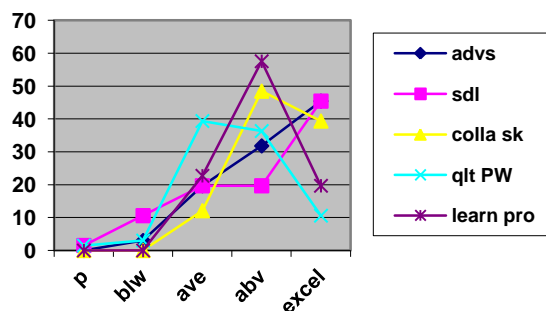

Figure 3: Teacher Perceptions (%)

Figure 4: Student Perceptions (%)

It can be concluded from the graphs that most students were very happy with their advisors and thought that the advice/supervision was at an excellent level. Furthermore, both teachers and students had very similar perceptions of the values gained during their learning process which included communication skills,

collaborative skills, and self-directed learning. They also viewed the quality of the final product of their project work similarly.

Reflections and Conclusion

The practice of PBL through project work by students and teachers from the English Department at MFU is what Kolmos (1996) called the 'subject project, combined with an 'assignment-based project'. Through this practice, the problems, subjects, and the method were to some extent chosen beforehand by teachers. Most students however had free choice to work on problems/themes within the subjects and a free choice of method was also allowed with some groups. Even though this practice may appear to be a teacher-controlled project to some extent; the crucial point here is that MFU is willing to initiate change in its education paradigm. We realize that there is always room for development of both student and teacher learning. Learning and teaching in higher education must now be concerned with motivation, involvement, self-directed process, and life-long learning. If our educational aim here is to produce competent holistic students, PBL gives the advantages of fostering the development of learning dimensions that will prepare our students for the changing world. The advantages of integrating PBL in this case were that students were strongly engaged in the interactive process. They communicated and exchanged ideas. They felt a responsibility for their own learning and also for their peer's learning. Disadvantages in this case were the workloads and time limitations, because project work demands more time from both teachers and students. This was also true in this case and we had to work around the existing curriculum structure; there were 4-5 other subjects that students also had to take in the same semester. These individual subjects also required 15 weeks of in-class study and had several tests and exams. This of course made it very stressful for our students to manage their time and to fulfill each subject's requirements. Because of time constraints, some information may not have been shared or discussed properly.

Another point I would like to reflect on is the issue of supervision. It was obvious that the reason some teachers were not on the same page in their supervision was because they lacked proper training. Some did not have a deep understanding of what PBL and project work was all about and with time constraints, they therefore encountered some criticism about their supervisions. How can we improve the situation? The obvious answer is to first train teachers before taking part in PBL and project work. Finally, it can be concluded that PBL, used as an instructional strategy in this particular study context, received good responses and positive acceptance from both teachers and students. All participants agreed that conducting the two courses this way definitely provided and encouraged an active learning process. Learning through working on a project, enhanced student communication skills, management skills, teamwork skills, self-directed learning and autonomous learning, and problem-solving skills. PBL emphasizes producing learners who will be able to solve problems in their field of study and continue to pursue new learning throughout their lives, and thus allows them to be more holistic as human beings. This is why PBL is viewed as one of the most effective pedagogical strategies, fostering student-centered and active learning.

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APPENDIX O
Conference Paper 2

REFLECTIONS ON PROBLEM-BASED LEARNING PRACTICE AT AALBORG UNIVERSITY

Coffin, P. (2011). Reflections on problem-based learning practice at Aalborg

University. In J. Davies, E. de Graaff, A. Kolmos (Eds.), *PBL Across the*

Disciplines: Research into Best Practice. Paper presented at the 3rd International

Research Symposium in PBL 2011, Coventry, the UK, 17-18 November (pp. 17-

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ABSTRACT

This study was conducted to develop an understanding of the range of differences in practicing problem-based learning (PBL) at Aalborg University (AAU). In order to gain a deeper understanding of PBL practices at AAU, the study investigates the academic perceptions and learning experiences of both students and supervisors from two faculties and four disciplines where PBL is used as an educational strategy. The study was carried out as a case study supported by observations, interviews and questionnaires. Reflections on a variety of PBL practices and results from the case study will be an inspiration and provide guidelines for the researcher to further develop a framework for designing and implementing PBL within the English as a Foreign Language (EFL) interdisciplinary program in a traditional education environment where English is used as the medium of instruction.

INTRODUCTION

Problem-based learning (PBL) has gained a reputation for producing students with comprehensive abilities which prepare them for the changing world in the globalization era. PBL has also been widely implemented into education systems worldwide because it is perceived as a pedagogical strategy which combines theoretical subject knowledge with practical skills (Amador et al., 2006; Poikela & Poikela, 2005; Schwartz et at., 2001). It can also be seen that the practices and   implementations of PBL vary across groups, disciplines, and institutions. Despite these differences in practice, all PBL models and practices share the same theoretical principles of learning. All PBL models apply the principles and characteristics of student-centered pedagogy or systems using problems that are identified as

the basis for the learning process early on (Barrows, 1984) and consequently promote active learning and lifelong learning. Savin-Baden (2000) points out that PBL should be seen as an approach to learning characterized by flexibility and diversity; therefore, PBL can be implemented in a variety of ways, in different disciplines and in diverse contexts, although these differences all share one common factor in having the focus of learning organized around problem scenarios rather than subject matter. This case study intends to bring together the characteristics and practices of PBL at Aalborg University (AAU) to inspire a newly designed PBL curriculum for a more structured and traditional education environment. Based on the argument that PBL is an approach to learning with characteristics of flexibility and diversity, which are supported by the practices at AAU, the study will support PBL curriculum developers to study the diversity and flexibility of PBL before integrating or implementing PBL in a new educational context.

REVIEW OF THE LITERATURE

PBL Curriculum

It is important for teachers who want to implement PBL to be aware of the differences between PBL used at course level and at system level. This literature review will focus on PBL at system level, or what is called the PBL curriculum. Savin-Badin and Major (2004) explain how the problem-based learning curriculum can be put in practice and what elements must be considered when designing a PBL curriculum. They point out that institutional, cultural, and disciplinary constraints can affect the design of PBL curricula. They further emphasize that all PBL curricula are designed on the basis of the learning theory of constructivism, where students construct knowledge for themselves. Barrett (2005) points out that when viewing PBL as a total education strategy, the four components of PBL must be aligned: PBL curriculum design, PBL tutorials, PBL compatible assessments, and the philosophical principles underpinning PBL. Barrett further emphasizes that the focus of the PBL curriculum should be on students' learning, not teachers' teaching; therefore, clarifying the learning outcomes of the curriculum is an essential stage of curriculum design. According to Kolmos et al. (2008), when designing a PBL curriculum in general, cohesion between all elements of the curriculum is essential. Those elements are the objectives, content, learning methods, assessment, teachers and students, and contextual factors. Inspired by Savin-Baden's PBL models, Kolmos et al. (2009) developed a new model for more specific PBL curriculum alignment with a problem and project-based curriculum used

at AAU. The seven elements to be aligned were: 1) objectives and knowledge; 2) types of problems, projects and lectures; 3) progression, size and duration; 4) student learning; 5) academic staff and facilitation; 6) space and organization; and lastly 7) assessment and evaluation. It is further emphasized that when changing one element in this model, the other elements will be influenced and changed as well.

The Aalborg PBL model and its practice variations

PBL has been practiced since the 1970s in the Danish educational system by two new universities, Roskilde University and Aalborg University. In 1974 Aalborg University was founded, based on a new educational model - the problem-based and project-organized model, also known as problem-based project work. An overview of the way this AAU-PBL model works is that students work together in groups on their project, one project per semester, to analyze and define problems within the interdisciplinary or subject/theme frame. Students are furthermore expected to submit a group project report and then participate in a joint examination, but obtaining individual marks. In the core of learning principles for the Aalborg PBL model, the focus is upon the problem, the content, and the team (Graaff & Kolmos, 2003). In terms of time frame and learning management, in each semester students are expected to spend 50% of their time on the project (team dynamic) and spend another 50% on traditional lectures. Each group has a group room as space for their study and has a supervisor to guide them through their project. In each semester, each program formulates a theme which covers a variety of problems and learning objectives; therefore, student projects and courses (lecture based) must comply with or relate to the theme of that particular semester. Students are expected to apply knowledge from course lectures when working on their project. In practice, depending on the programs, the Aalborg model varies in terms of themes and choices of project work, definition of a problem, relationship between courses and the project, methods of supervision, resources, and group size.

Cancino (2004) reports that every department in the Faculty of Humanities implements PBL through project work from the first semester, but the practice of different departments is still in different forms. Project work in the Foreign Language Study Programs covers a wide range of topics or themes, such as linguistics, applied linguistics, sociolinguistics, intercultural communication, literary studies, social history and so forth. Cancino further explains that student projects in the foreign studies programs are in a form of themes or

topics relating to different foreign language countries. Students are expected to work with theoretical problems in a foreign language. In the first semester groups are formed for students through the administrative system, of 4-6 members. In this department, students are required to attend lectures which help them deal with project work and project methods. In one semester, students are expected to attend lectures from subject courses which run throughout the semester and to attend a project course which is about 8 weeks in duration. For the project courses at the Foreign Language Study Programs, students have choices to make about which course they want to work on in each particular semester; students choose one project course in each semester. The subject courses are evaluated by individual exams, but the project course is evaluated through the group project. Evaluations of subject courses can be in the form of open-book exam, essay, or portfolio. Actual work on the project starts after the project course's lecture period ends, around week 8. For their project evaluation, students are required to submit a written report of a minimum of 20 pages per student (2800 key strokes per page) and also take an oral examination at the end of the semester.

Variety and differences in the practice of PBL in the Faculty of Engineering and Science are significant, as compared to the Faculty of Humanities. Rønsholdt (2004) states that the first year curriculum for engineering and science students has a flexible framework. The general semester curriculum structure of this faculty has two parts: 1) general courses for the entire program with individual assessments; and 2) the project unit consisting of the project itself and the project courses which are assessed simultaneously through oral group examination. The faculty also emphasizes coherence between study elements within the semester. These three elements are theme, projects, and courses which are organized by students. It is also important for curriculum developers or semester planners to be aware of the coherence between the three elements and to ensure that the theme and project of each semester is ideally derived from real problems occurring in society. The courses should be delivered to support the semester project, should be flexible in content, and are subject to frequent changes depending on the type of projects. In the engineering program, time spent on courses is 50% (for both courses related to the project and fundamental subjects), and another 50% is spent on project work and preparation for examinations. Evaluation of the project is based on the group's written report handed in prior to the oral examination, and an oral presentation on the examination day (Knudstrup, 2004). It is further noted that the learning process for students on the engineering program involves external organizations or

companies. These organizations are involved from the very beginning of the projects. Because these organizations often have specific problems they would like put into a new perspective co-operation via research and development contracts between the departments and the companies continues (Søgaard, 2004).

METHODOLOGY

A case study over a one semester period with four groups of students from four different disciplines at AAU was conducted in order to describe and analyze the AAU-PBL model in practice. Throughout the process of data collection, observations of lectures and supervisions, interviews, and questionnaires were used to collect empirical data. Results from the empirical data reflect the actual practice of PBL at AAU and the perceptions of both students and supervisors on the advantages and disadvantages of practicing PBL at the institutional level. The four groups can be divided into: 2 groups from the Faculty of Humanities and 2 groups from the Faculty of Engineering and Science, details as shown in Table 1. The methods used in this study began with observing lecture periods and then observing supervision periods. Around week 12 to 16 of the semester, interviews with students were conducted and questionnaires were completed. Interviews with students took the form of group interviews. Seventeen students participated in interviews and questionnaire administration. Lastly, interviews with 2 individual supervisors were conducted separately, one supervisor from the Faculty of Humanities and one from the Faculty of Engineering and Science. An illustration of the research methods used with students is given in Table1.

| Faculty and groups	Discipline	Lecture Observation	Supervision Observation	Interview	Questionnaire
Engineering and Science G1) Biotechnology (BIOT)	Science	√	√	√	√
G2) Global Business Engineering (GBE)	Engineering				
Humanities G3) English and International Studies	Language	√	√	√	√
G4) Information Technology (IT)	Art & technology				

Table 1: Matrix of research methods

RESULTS

Observation Results

For both lecture sessions under the Faculty of Science and Engineering and the Faculty of Humanities, class size was between 30-50 students. Both were conducted in the form of teacher-centered approach, most time was spent on delivering and explaining content knowledge via power point presentations and the blackboard. The lecture period lasted 2-3 hours with a 10-15 minute break. This format applied to both faculties. Student attendance was not checked. The student participation rate was not high and it was observed that the same 3-4 students participated in sharing opinions in class. The dynamic of the lecture session for both faculties appeared to be the same. The language of instruction was Danish, except in the English group which used the English language for instruction. Group size for the supervision sessions varied from 3-7 members at the Bachelor's level. It appeared that students submitted the agenda and details of what needed to be discussed to the supervisor before coming to the meeting. Supervisors of the two Faculty of Engineering and Science groups came to the students' room for the supervisions. In contrast, the two Faculty of Humanities groups went to see supervisors in their office for supervisions. Each supervision session lasted 1 hour for all groups. In every group, it appears that 1-2 students were passive and did not contribute to the group discussion. However, none of the supervisors raised the issue or asked questions about participation; the issue appeared to be ignored. Furthermore, it appeared that there was one particular student in every group who took a role of leader, spoke up the most during discussion, and seemed to be most in control of the project work.

Interview results

It was found that time spent on the lecture periods and the project work periods of the PBL model in practice at AAU could be divided into two models, illustrated in the following two figures.

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Lecture  3 courses15 ECTS


                              Project Work

                               15 ECTS
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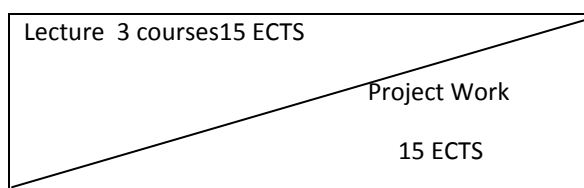
Week1,2,3..week18

Figure 1: Time spent on lecture and project [Model 1]: used by BIOT, GBE and IT groups

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Lecture 3 courses for 15 ECTS


Lecture project courses    | Project Work 15 ECTS
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Week1,2,3......................................8..week18

Figure 2: Time spent on lecture and project [Model 2]: used by the English group

Students reported that the 3 subject courses (5 ECTS each) had their own assessment in various forms, such as open-book exam, portfolio, and essay. Some courses used a pass/fail scale grading system, and some courses graded on a 7 scale format. Students reported that each project group was expected to turn in one final written report which must consist of a contribution of 15 pages per member. On exam day, students are expected to present their project orally and then each individual is examined orally alone. Results of the student interviews,   regarding student perspectives of PBL practice at AAU can be summed up as shown in Table 2.

Interviewed Issues	Result Summary
1. Challenges/difficulties in studying through the AAU-PBL Model.	- Self-discipline in attending classes and working on the project. -Be focused when working as a team.- Self/group adjustment - 'everyone is different and we have adjusted ourselves to one another'. - Time restriction - 'we need more time to complete all given tasks'. - Some members do not contribute to team work sufficiently and were late to the meetings.
2. Best experiences in studying through AAU-PBL Model.	- Working in groups allows students to learn from each other. - Students become independent/self-directed learners.
3. Group formation	All groups reported that students formed groups on their own according to interest, attitude, and personality of the individuals.
4. Dynamics of meeting with supervisors.	All groups reported that students are the ones who initiate each meeting. Numbers of meetings with supervisors vary group by group, but there are approximately between 5-10 per semester.

5.Physical learning space	Two groups from the Faculty of Engineering and Science have a private group room where they meet regularly to work on their project. The group from the IT discipline has a group room, but they share with other 4-5 groups, total 18 students. The group from the language discipline does not have a group room of their own, but they can book a room for a meeting when they need it.
6. Project descriptions and project phases.	Every group reported that they were aware of the project theme from the very beginning of the semester. The themes posted allow open-ended type of project work. At the beginning of the semester, students are presented with cases from a real world context. They then choose the case they want to work on. In this way students indirectly form a group to work on the project of their interest. After that they meet with supervisor(s) and go through the process of doing the project which has procedures in the same way as doing research. After analyzing and specifying criteria for solution(s) students write up a group report, submit the report, and then take an oral examination.

Table 2: Student perspectives of PBL

Data was collected via interview from two supervisors who supervised two of the four groups in this study. One supervisor was from the Faculty of Humanities and the other was from the Faculty of Engineering and Science. Supervisor perspectives of PBL, which emphasize four major issues, can be summed up as follows.

PBL issues interviewed	Results from Supervisor 1	Results from Supervisor 2
1. What are the essential characteristics of PBL?	- A practical problem which allows actual potential usage in the particular field, and is not too wide in definition. - Working on a project where they initially define the problem by themselves. -Connect with research problem that cannot only be addressed by theory. - There should be some aspect of reflection on the learning process.	- Be able to identify problems in a particular context. -Identify ways to frame and limit the problem in that particular context and identify how knowledge can be utilized for this particular problem and context. -PBL matches theory learning with practicality. It helps students to handle problems in a real working situation. - PBL is not class teaching. The problems must not have a predefined solution. Students must work through the process to solve the problem. There is no recipe on how to work on the problem
2. What are the advantages of PBL?	- Motivation: students are motivated in both learning and employment because	- Ability to work in teams and work with real life problems.

	they chose their own problem.	- Students are able to negotiate and interact with real life organizations.
	- Quality of teaching is high because teachers get to work in-depth with students.	- be more humble about the theories and tools learned at university, they don't always work. PBL allows a more pragmatic approach to learning.
3. What are the disadvantages of PBL?	- It is expensive to do PBL effectively.	- Wasting a tremendous amount of time during the process due to being confused.
4. What makes a good PBL supervisor?	- Listening skills -Using all the time allocated to students, don't cheat. - Having experience in the field can make the supervision more effective because 'I will help students learn more'.	- At least have some time available for students and being engaged/committed to helping students. - Having experience in the field is also important to make supervision more effective.

Table 3: Supervisor perspectives of PBL

Questionnaire results

Questionnaires surveyed student perceptions of their capabilities and the PBL methods used at AAU. The questions required students to evaluate 5 major aspects/values gained when implementing PBL: motivation, self-directed learning (SDL), collaborative skills, communication skills, and appreciation/satisfaction with the learning and teaching process. A summary of detail from the questionnaire and the results from 17 students are shown in Table 4.

1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree

Values and statements	1	2	3	4	5
1. Motivation					
1.1 I am studying in the field that really interests me.	0	0	0	4	13
1.2 I enjoy learning at AAU because of the use of PBL approach.	0	0	2	9	6
1.3 The AAU learning environment raises my interest and motivation in learning.	0	1	4	7	5
Average	0	0.33	2	6.67	8
Percentage	**0**	**1.94**	**11.76**	**39.24**	**47.06**

2. SDL and time management					
2.1 I learn a lot by reading books.	0	0	7	6	4
2.2. I am good at finding information in libraries.	0	2	6	9	1
2.3 I am good at finding information on the internet.	0	0	1	14	2
2.4 I manage my time effectively.	1	1	5	9	1
2.5 I can identify my learning goals without depending on my supervisor.	0	1	6	7	3
2.6 I am a self-directed learner and I take responsibility for my own learning.	0	0	0	8	9
Average	0.16	0.66	4.16	8.83	3.33
Percentage	**0.9**	**3.88**	**24.47**	**51.94**	**19.59**
3. Collaborative skills					
3.1 I work well in a team with other people.	0	0	1	10	6
3.2 Working as a team has helped me in learning the academic content of the program I chose for my study.	0	1	2	8	6
Average	0	0.5	1.5	9	6
Percentage	**0**	**2.94**	**5.97**	**52.94**	**35.29**
4. Communication skills					
4.1 I am good at writing reports/essays.	0	0	4	10	3
4.2 I speak well in front of a group.	0	0	6	5	6
Average	0	0	5	7.5	4.5
Percentage	**0**	**0**	**29.41**	**44.12**	**26.47**
5. Appreciation and satisfaction level with the PBL approach					
5.1. I like tackling unfamiliar problems.	0	0	4	8	5
5.2 In the AAU learning environment, I have developed many useful strategies to help me in my learning.	0	2	3	8	4
5.3 My supervisor gives me regular feedback on how I am doing with my project.	0	0	4	10	3
5.4 I am able to get help from my supervisor whenever I need it.	0	1	2	8	6
5.5 The AAU learning environment helps shape me to be good at thinking things through.	0	0	3	9	5

5.6 I am satisfied with courses in this program and the supervisors I have for each project.	0	0	4	8	5
Average	0	0.5	3.33	8.5	4.67
Percentage	**0**	**2.94**	**19.59**	**50**	**27.47**

Table 4: Student perceptions of their learning through the PBL-AAU model

DISCUSSION

The results from both observations and interviews confirms that there is no difference in any aspect of the lecture sessions in the four disciplines. However, the results demonstrate that there are differences in the supervision sessions, types of projects, and the physical set-up of working space for students at AAU. These differences depend more on the nature of study fields/disciplines. The fields that deal with more concrete elements of doing project work and depending on experiments and external organizations are treated differently to the fields that deal with more abstract elements. Despite differences in practice, both students and supervisors expressed a strong appreciation towards PBL used at AAU. They further explained that PBL also fostered many positive aspects of learning in both students and supervisors, especially motivation to learn and work on their project, because students feel ownership of the project. Results from the questionnaire strongly support the claim that PBL fosters motivation, self-directed learning (SDL), and collaborative and communicative skills, as shown in Figure 3.
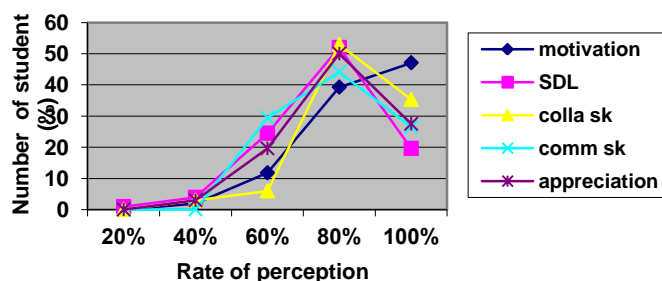

Figure 3: Student perceptions

Results from Table 2 and Figure 3 (graph) indicate that student reports of motivation is the most significant factor contributed by PBL at AAU. 47.06 % of students (the highest number) perceived that they were 100% motivated to study at AAU as a result of the field of study and the environment. Students were positive about their own learning in the environment of the PBL system. Most students agreed that they felt they had obtained SDL, collaborative skills, communication skills, and appreciation levels at an 80% level. It can be concluded that the AAU-PBL model has flexibility and diversity, but that each practice shares and produces the same learning principles and outcomes. Both students and supervisors in different fields at AAU practice PBL differently, but they perceive values gained from PBL practice in the same way.

CONCLUSION

PBL has expanded the horizons of its implementation to many educational fields at different levels throughout the world. Even though there is ongoing debate about the definition and practice of PBL, academics and PBL practitioners respond to the concepts of flexibility and diversity of PBL, as proposed by Savin-Baden (2000). The case study conducted at Aalborg University supports the flexibility and diversity of PBL practice, as the results showed that different disciplines practice PBL differently. Despite differences in practice, all disciplines have utilized common characteristics of PBL and also share common goals and objectives in learning outcomes. The findings of the case study have inspired the researcher to take into consideration the differences in contexts of institutes and students, and differences in nature of individual disciplines must be carefully taken into account when designing and implementing PBL under any circumstance. It is important for PBL curriculum developers to be critical of alignments between different curriculum elements and PBL components and principles. When PBL is to be implemented in different contexts, a redefinition of what PBL is for in that particular context may be necessary. Moreover, sensitivity to cultural and institutional needs must be included when designing a PBL curriculum for different contexts. It can therefore be concluded that the principle of flexibility and diversity best describes current PBL practices.

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APPENDIX P
Journal Paper

Identifying needs to develop a PBL staff development program

Abstract: Staff development is a crucial element for educational intervention. Recognizing the importance of staff development, this study aims to pinpoint suitable methodologies in developing a Problem-Based Learning (PBL) academic staff development program for a higher education institute where PBL has become an intervention alternative. The study aims to answer the following research questions: 1) how can university academic staff be assisted to acquire pedagogical competences for an initiative of the implementation of PBL curriculum? and 2) What kinds of support do university academic staff need in order to maintain PBL implementation? Through the combination of a literature review, interviews with six PBL experts which emphasize the importance of PBL facilitators, and documenting analysis of reflection notes from 18 trainees at a PBL workshop, this study will produce guidelines for developing a PBL Academic Staff Development Program for an institute that wishes to implement and retain PBL as an education strategy.

Introduction

This paper is the result of the preparation phase of design based research which is a part of my PhD research project. The overall PhD research project aims to design, implement, and evaluate a new model for a Problem-Based Learning (PBL) curriculum for English interdisciplinary studies, which is designed for a traditional learning environment in Thailand. Implementing PBL in the traditional education environment is considered a big change on many levels. Changing to PBL will involve changing or reshaping the mindset and practice of teachers toward educational pedagogy, the education system, and educational paradigm. Savin-Baden and Murray (2000) point out that when changing to PBL one of the key elements which contribute to a successful implementation of PBL in any context is staff development. PBL staff development or training is very important because it provides individual teachers with opportunities and support to improve their academic practice and

will consequently enhance student learning. Academic staff are considered the very first component that needs to be developed if a university decides to implement PBL.

This paper aims to explore the existing theories and practices of PBL staff development programs from the literature, to reflect on perspectives of PBL experts on the importance of PBL staff training, and to reflect on the voices of PBL trainees from a Thai university. Based on data from various sources, the paper discusses and outlines guidelines for developing a suitable PBL Academic Staff Development Program for a higher education institute. The qualitative empirical data is collected through document analysis from literature and the reflection notes of PBL trainees and from interviews with six PBL experts. Two research questions are formulated in order to accomplish the objectives of the study.

1. How can university academic staff be assisted to acquire pedagogical competences for an initiative implementing a PBL curriculum?
2. What kinds of support do university academic staff need in order to maintain PBL implementation in their context?

Methodology

Overview

The study comprises a review and analysis of PBL staff development from the literature along with empirical studies. Qualitative data was collected from two sources:1) semi-structured interviews; and 2) reflection notes of PBL workshop trainees. The interviews with six PBL experts at Aalborg University and Coventry University were in the form of semi-structured interviews where each expert was interviewed separately, face to face, using the same interview guide. The interviews were recorded. Another set of qualitative data was from the reflection notes of eighteen PBL workshop trainees who participated in a one-day PBL workshop conducted at Mae Fah Luang University in Thailand. The analysis of data from three different sources is in the form of content analysis.

Definitions:

PBL experts in the context of this study refer to PBL academics divided into two categories: 1) practitioners who have been involved in supervising learners for over two years; and 2) researchers and trainers who have been involved in researching and training new PBL practitioners. Interviews were conducted with six PBL experts.

Competences in this study refer to pedagogical competences which involve knowledge, skills, awareness, engagement, and personal commitment.

Setting and participants

Data collection was done in two stages. The first set of empirical data was from semi-structured interviews which were conducted individually with five PBL experts from Aalborg University and one PBL expert from Coventry University in the UK. These participants were experienced professors and researchers in the field of PBL. The second set of data was from reflection notes collected from eighteen PBL workshop trainees at Mae Fah Luang University in Thailand. The participants of the second group are lecturers at Mae Fah Luang University from different disciplines.

Result of Literature Review

Literature review is part of the methodology of this study. This review aimed to provide an overview and analysis of the existing literature on PBL staff development. The review focused on two aspects: 1) The importance of PBL staff development when introducing PBL as an education strategy or intervention; 2) a summary of forms and content of PBL staff development from different contexts. This review of literature consisted of two steps. The first step was searching and screening the relevant literatures online by using the following key words: PBL staff development, PBL staff training, PBL faculty development, PBL tutor training. In addition, Chapter 10 of the book 'Foundation of Problem-Based Learning' by Savin-Baden and Major (2004) was used as the basis of the review and as a guideline in searching relevant literature. The second step involved analysis and synthesis of the selected papers. The framework used in analyzing and synthesizing the relevant literature was inspired by the work of Webster and Watson (2002), known as the 'concept matrix'.

The importance of PBL staff development

Implementing PBL at any level requires changes in learning and teaching methods. Dalrymple et al. (2006) advocated that when major pedagogical or curricular change takes place, there is really a need for an institution to embark on faculty development for better understanding of teaching and learning associated with the change. They described the occasion when the University of Southern California School of Dentistry (USCSD) went through two major curricular reforms in initiating PBL with the dental curriculum (D.D.S) in 1995 as a small pilot program, and in 2001 on a large scale with the entire school, both times

required the initiation of faculty development programs. In the 2001 curricular change, a PBL faculty development program "was identified as a component in the school's Strategic Plan for education and Learning" (p. 949). In order to maintain the implementation of PBL school-wide, USCSD emphasized the importance of PBL faculty development by establishing a subcommittee for Faculty Development, Mentoring, and Evaluation (FDME). Members of FDME were responsible for developing a program based on educational theories to accomplish the faculty development necessary for the implementation of PBL school wide.

Aldred (2003) addressed the needs and challenges associated with PBL implementation and staff development at Central Queensland University (CQU). He took part as CQU's Problem-Based Learning coordinator, responsible for formulating a coordinated plan for PBL staff development. As CQU recognized that changing to PBL affected changing the learning paradigm, changing the design of courses and curricula, and changing learning and teaching methods, the CQU PBL team spent over a year (2001-2002) preparing staff and materials for PBL implementation. The CQU-PBL Unit is working to support the further development of academic staff by ensuring that they have concrete and secure models, and guiding their staff to implement PBL in their own context whether with new, or by modifying existing courses or programs. To enhance the advance and quality of staff development, CQU incorporates the use of technology, and web-based activities for PBL staff development, as an alternative.

Bouhuijs (2011) points out that faculty development is an important tool for the success of PBL implementation. He further states that PBL cannot be viewed as simply the application of a teaching method which can be transferred directly to any context without making changes. Changing PBL cannot be done overnight; it is a long process which requires a thorough preparation of change agents, and faculty development is the tool for that. Teachers and staff are the major change agents who play a significant role in making the implementation of PBL successful. Implementing PBL at any level requires teachers to acquire educational skills which are different from traditional teaching skills. When introducing change to PBL, it is necessary to have teachers on board with the idea because it is necessary to have their collaboration in the change process. Consequently, teachers themselves first need to be well equipped with current knowledge and skills in order to prepare and involve students in a PBL environment. For this reason, staff development has become an important means to prepare lecturers for the implementation of PBL. Bouhuijs also explains in his article that PBL staff development has been mandatory at the medical school in Maastricht since 1982. It can be concluded that the medical school in Maastricht

has given tremendous importance to PBL faculty development as a key factor in implementing PBL successfully. Bouhuijs further explains that in addition to initial training over several days, the continuation of monitoring and support for teachers are part and parcel of the success of PBL implementation.

Zaidi et al. (2010) describe the importance of initiating PBL faculty development, in the form of a two-day training workshop in their case study, when the Foundation University Medical College (FUMC) introduced PBL into the medical curriculum in 2008. Even though the experience of PBL faculty training in Pakistan is limited, the FUMC managed to offer PBL training workshops at minimal cost to its faculty members in order to facilitate PBL implementation in the medical school .The evaluation of PBL training workshops in the FUMC context notes that they have a positive influence on the faculty members' attitude towards PBL in terms of understanding and appreciation. Zaidi et al. further emphasize that the PBL training workshop is essential to the introduction of PBL in the curriculum because it helps faculty members understand PBL, and it also allows them an opportunity to practice their PBL facilitation skills.

Form and contents of academic staff development in PBL

Savin-Baden and Murray (2000) state that in the field of PBL, staff development is perceived as the key to success of PBL implementation. Kolmos et al. (2008) also pointed out that PBL staff development take various forms, such as workshops, short courses, seminars, and long term pedagogical training programs; they all, however, share the same goal, which is to assist individual lecturers acquires complex teaching competences which involve knowledge, skills, engagement and personal commitment.

At McMaster University, the facilitators' role is viewed as very important in PBL development and self-directed learning. Facilitator needs are therefore identified in order to provide ongoing support and training. Saarinen-Rahiika and Binkley (1997) describe the PBL staff development program in the Physical Therapist faculty as involving workshops, independent reading, and faculty discussion. In addition, Saarinen-Rahiika and Binkley further explain that pairing inexperienced and experienced tutors for training, meeting regularly with the unit chair to discuss unit objectives, and receiving evaluations from students are important sources for the development of tutoring skills. Furthermore, Jung et al. (2005) explain that there is a comprehensive training system which serves staff needs in the PBL facilitation process at McMaster. The training system comprises an orientation meeting,

small-group tutorial observation, workshops, weekly tutorial meeting, monitoring unit, and yearly update workshops.

In the Medical School at Maastricht University, PBL staff training has been compulsory since 1982. The training program is a mixture of pre-service and in-service activities in order to prepare and equip teachers for the PBL environment. Workshops and seminars are provided as a platform to shape new learning and teaching behavior. During the work shop sessions, new faculty members confront different scenarios of expectations about teaching and learning, and in coping with the scenarios they experience PBL in action as learners and facilitators at the same time (Bouhuijs, 2011).

At Aalborg University, in order to assist new assistant professors to become more competent in their roles as PBL supervisors a program called 'University Pedagogy for assistant Professors' is provided as part of the professional development program. Krogh (2010) explains that the teacher training course for assistant professors aims to ensure that assistant professors obtain knowledge of basic university pedagogy and education theory. This program consists of three modules which comprise a series of workshops to help sharpen teaching skills and competences. Within these three modules, which last 15 months, there are PBL workshops which train faculty members to be adequately prepared to supervise students in the PBL environment. The course is mandatory in order to obtain a position as associate professor. The course is estimated to involve workloads of approximately 175 working hours within 15 months or 3 semesters.

PBL faculty development in Australia has been documented as follows. Brodie and Jolly (2010) report that a PBL staff training program at the University of Southern Queensland is offered through a one day workshop and online up-to-date library of reference works. Similarly, Aldred (2003) describes the PBL faculty development program at Central Queensland University (CQU) as comprising faculty-based seminars and workshops and web-based or online courses for academic staff.

At the University of Southern California School of Dentistry (USCSD), the PBL faculty development program is run under the subcommittee for Faculty Development, Mentoring, and Evaluation (FDME). The program also comprises a series of sequential workshops called the PBL core skills workshops. The series of workshops is as follows: 1) the PBL process workshop; 2) the facilitation of learning workshop; 3) the assessment and feedback workshop; and 4) the PBL in the clinical environment workshop. Participants of the

workshops have an opportunity to perform role-playing with subsequent criteria-based feedback from the entire workshop group. In addition to the workshops, short introductory seminars and scenario-based discussions are used as follow-up activities (Dalrymple et al., 2006)

Result of the Interviews

Six PBL experts were interviewed on topics related to the application of PBL, the skills and competences of PBL facilitators, and the importance of PBL staff training. Three PBL experts are categorized as PBL practitioners (Pp) who have been teaching and supervising at Aalborg for two or more years. The other three PBL experts are categorized as PBL trainers (Pt) who have been teaching, supervising, researching and training others for five years or more. Data from the interviews is presented in two formats. The first answer category involves exact quotes from the interviewees. The second answer category paraphrases the interviewee statements. Paraphrasing was when the answers were too long and some statements may not exactly answer the questions. The interviewer therefore asked the questions again and may have added additional context to clarify the meaning of the questions. However, in paraphrasing the interviewee statements, the main ideas remain the same and the wording used in paraphrasing was from the interviewees themselves. The following table contains the results of the interviews.

Table 1: Answers from PBL experts associated with PBL facilitators and PBL staff training necessity

Interview Questions	PBL practitioners (Pp)	PBL trainers or researchers (Pt)
1) Do you think PBL can be implemented in any field?	Pp1: "Yes, it can be implemented successfully in any field, but needs to bend depending on what level of education." Pp2: "Yes, but may depend on the contexts. However, it can be difficult for some fields that require a lot of literature through lecturing." Pp3: "It can be applied with none science fields. I don't see myself in a technical field. We are based in Humanities; for instance, we	Pt1: I would rather use the term PBL inspired innovative pedagogy. Contextualization of student learning should be focused in order to make changes or to make learning and teaching better. In some cases we should not label the practice or the philosophy of learning and teaching.(paraphrase) Pt2: "Yes and no, one form of PBL cannot apply to all. Each context, each discipline needs a different kind of PBL."

	study problem solving in human development through IT."	Pt3: "Yes, it can expand in most fields, but may be difficult in pure math. Implementation is about mind set of staff. They have to be creative to use PBL with different areas."
2) What types of skills and competences is it necessary for PBL facilitators to acquire in order to make their supervision successful?	Pp1: They need to have an awareness of their communication skills, social or emotional intelligence in a relation to problem posing. They should be able to share the atmosphere of research with students and help them gain competences to deal with the research process. (paraphrase) Pp2: "Having listening skills, trying to understand students rather than have students understand you. Having an interest in students and their works. And also having experience and knowledge of literature in the field is also important." Pp3: "Being enthusiastic and inspiring. Also, being communicative - having dialogue with students."	Pt1: Depends on contexts- who are the students and who are the teachers? It also depends on whether they (teachers) care about student learning, if so they will develop ways to teach better. (paraphrase) Pt2: "Having abilities to see and decode students. Having an interest in students' needs." Pt3: "Roles of facilitators change, depending on stages of where students are in the curriculum. At the beginning stage, facilitators need to be supportive and a bit more directive. As students make progress, they need to step back and trust their students to take risks."
3) Will it be more beneficial to students if the PBL facilitators have background knowledge in the field they supervise?	Pp1: "At the beginning the facilitators should be more skillful in facilitation process which focuses on process and methods of the research. As the project evolves, the facilitators need to be more knowledgeable in the field. Or at least students should have access to a person who can give advice on content as well" Pp2: "Yes and no, the negative of the facilitators have background knowledge in the field is that they can be too directive. And if they don't have background knowledge in the field, if can be difficult for them to challenge students. However, being too directive can be changed or modified through the reflection process." Pp3: "Not necessary. Because PBL is interdisciplinary, so ideally the facilitators need to be knowledgeable in more than one	Pt1: " It can be important in some cases" Pt2: "Should have both types. Some issues can be better seen by the ones who are in the field. For myself, I will be reluctant to supervise students from other fields." Pt3: "From research, there is no conclusive result. But it also depends on disciplines. To me, it isn't about the subject experts, but it is more about being a good facilitator, is the issue." A good facilitator must be able to ask questions to guide students to solve problems. (paraphrase)

	field. It also important that the supervisors dare to refuse to supervise the project that they don't feel they can supervise effectively"	
4) To what extent is staff training necessary for the PBL classrooms or institutes?	Pp1: "Staff need to have training of some kind and they also need to have support all the way through from the faculty or the university. It could take up to 5-10 years if consider institutional change. Institutions need to be tolerant with uncertainty with the learning process and the outcomes of change" Pp2: "Yes, new staff will need some training." Training can help raise the awareness of facilitators to help students build a strong argument about what they are doing and why they are doing it, and being aware that they should not direct students too much. Otherwise, there is a risk that students will end up doing assignments rather doing problem-based projects. (paraphrase) Pp3: "Yes, it is important, especially if you want to transform from a non- PBL university to a PBL university."	Pt1: "Training is important for new teaching staff. It is a systematic way to institutionalize the teaching method. Institutions have to support to make the change in teaching and learning method happen" Pt2: "It is very necessary, even for someone who has been in the system before. Because when they become facilitators, the contexts then change. So, they need training to help them see things in different perspectives." Pt3: "You need at least a year of preparation before implement ing PBL curriculum if you want staff on board properly."
5) What difficulties or challenges might exist for PBL facilitators?	Pp1: "Teachers may have a hard time realizing that teaching is not equal to learning. They also may have a hard time to admit that they don't know and have a hard time to get students involve in the learning process. And sometimes they don't see that both teachers and students must share responsibility in learning." Pp2: "Teachers may have difficulties to understand your roles in practice as PBL facilitators. The role of PBL facilitators is to help students learn by focusing on how to help students work rather than focusing on the result of a good project. Pp3: "It is hard to write good problems and it is hard to know all the approaches to cope with the projects." However, this type of difficulty can put supervisors in an ongoing learning mode with students, and consequently, supervisors will have to work hard to catch up with new knowledge all the time. (paraphrase)	Pt1: "For me, the difficulty I have faced as a supervisor is to get Danish students to work with international students to develop intercultural competences." The difficulty I face as a trainer of university staff is to get them to actually change in their perception and practice of learning and teaching. (paraphrase) Pt2: "Difficulty in facilitating students is that it is hard to make them feel secure enough to be independent in decision making because they tend to work on you to get a recipe. And it is hard to know when to step in when they can't make progress and just continue to be frustrated. As a trainer, the difficulties are: 1) It is hard to make them reflect by combine theory and practice. 2) It is hard for new staff to believe that students can take responsibility of their learning." Furthermore, supervisors should not just give answers or knowledge to students because what seems to be good for students at the beginning will not be good for them in the long run. (paraphrase) Pt3: For new teachers beginning to

		implement PBL, the challenge can be how they see themselves as teachers. It is very much about who you are as the teacher, and how you see knowledge. (paraphrase)
6) How can university lecturers be assisted to acquire pedagogical competences for effective implementation of a PBL curriculum?	Pp1: "Try out for themselves and also have training of some kind. Having a team of teachers who share ideas and a mission to support one another. These teachers should get support all the way through, from the university or the faculty." Pp2: "Besides having support from the system, teachers who have the same interest can also form a group of their own to exchange ideas and experience. Pp3: Having support from top managers for the ongoing process of practice is a key factor in success. (paraphrase)	Pt1: Training is important to new teaching staff. Institutions have to give support in order to make the change happen. Training can be done in many different ways, for instance, inviting external experts to give workshops or sending staff to learn about the new system. Financial support is an important issue. (paraphrase) Pt2: "Starting with actual practice along with training. During the process, it is important to be a reflective facilitator, so having a team of teachers work together to discuss pedagogical issues is also necessary. Moreover, a training program should be mandatory; the manager level needs to send a signal that they take this seriously". Pt3: The implementation of PBL very much depends on the mind-set of staff. Before the actual implementation, they need to be trained in order to be on board properly. It will need at least a year for the preparation phase before the actual implementation takes place. (paraphrase)

The answers of the six participants can be analyzed as follows:

1) The PBL experts explicitly stated that PBL can be implemented with nearly every discipline, but adjustment or modification is required depending on each context.
2) The PBL experts all agreed that PBL facilitators must possess communication and social skills, and genuine interest in students' learning.
3) The PBL experts all agreed that during the PBL process students must have access to a supervisor who can give advice on content but more importantly PBL supervisors must possess questioning skills which can guide students to solve problems.
4) All six PBL experts agreed that PBL staff training is very necessary for the initiation of PBL implementation. The training should be viewed as an on-going developmental process for staff which requires thorough support of various aspects from the university.
5) The PBL experts pointed out, from their experience, that the biggest challenge and difficulty of becoming a PBL facilitator is the way teachers truly

understand and practice their roles and functions appropriately in accordance with student learning.

6) Staff are one of the major factors that contribute to the effective initiation and maintenance of PBL practice. Consequently, the support they need can be divided into three elements. First they need a community of practice which comprises peers who have a similar mind-set and interest associated with learning and knowledge. Second, they need systematic training which fosters the advancement of their practice. And third, they need long term and systematic support from the top managers at the university.

Results from PBL workshop trainees' reflection notes

After attending the general PBL workshop conducted for faculty members of Mae Fah Luang University from various disciplines, participants were asked to reflect on what they have learned after attending the workshop, and what they need to assist the PBL implementation in their context, by completing the post-reflection notes. Reflections from participants can be an indicator of how useful this type of workshop is to the PBL implementation initiative and what else they need in order to initiate and retain the PBL implementation. The results are presented using a concept matrix to categorize the reflection notes.

Item 1, the participants were asked to identify whether or not their concept of learning and teaching had changed after attending the PBL workshop hosted by the PBL expert.

The answers can be grouped into three categories:

Category 1, the answer was yes; their concept of learning and teaching had changed. Three teachers explained that their concept of learning and teaching had changed completely from the idea that the teacher controlled everything to allowing student participation, as they just realized that "teaching and learning need teachers to step back and allow open floor for students".

Category 2, the answer was no, their concept of learning and teaching had not changed. Five teachers reported that their concept had not changed.

Category 3, no answer for this question from two teachers and one teacher said "not sure".

Item 2, the participants were asked to identify the concept of PBL and state the differences (if any) of their concept of PBL before and after attending the workshop.

The answers can be grouped into three categories:

Category 1, their concept of PBL had changed after attending the workshop. Three teachers stated that they have just realized that "PBL is not project based"; "PBL emphasizes process, not just giving problem(s) to students"; and "PBL emphasizes an open floor for students to learn by themselves".

Category 2, four teachers reported that their concept of PBL had not changed after attending the workshop, but they understood PBL principles and practices better than before attending the workshop.

 Category 3, no answer; four teachers omitted this item.

Item 3, the participants were asked to explain the value of the workshop in their perspective; what do you find most valuable about the workshop? The answers are as follows:

 "Knowing that PBL has different levels"; "PBL can be used as a motivation drive in learning";

  "getting ideas and tips to put PBL into practice"; "sharing experience"; and "increased confidence for teachers in implementing PBL".

In Item 4, the participants were asked to identify what they learned from the workshop.

The answers are as follows:

Definition of 'problem' in PBL approach (2 teachers); team aspect is considered important element of PBL (1 teacher); How to apply the theory of PBL (4 teachers); PBL has limitations in some subjects (2 teachers); roles of teachers and students in PBL environment (1 teacher); PBL will be effective if the facilitator understands the concept of PBL and has some expertise in taught subjects (1 teacher).

In Item 5, the participants were asked to identify strengths of the workshop. The answers were as follows.

 "The speaker is an expert in the field and has an open-mind";

"Learning strategy of the workshop allows participants comprehend PBL concepts by themselves";

"Group discussion allows participants to exchange teaching experience".

In Item 6, the participants were asked to identify weaknesses of the workshop. The answers were as follows.

"Some content is too advance and complex"; "The workshop is too short, workshop is held during the

    Holiday"; "There are many passive participant"

In Item 7, the participants were asked to convey what they need in order to implement PBL in their context. The answers were as follows.

 Seven teachers conveyed that they "need support and collaboration from top managers, curriculum designers, and colleagues".   One teacher said that she "needed students to understand why teachers don't give as many lectures as   before". Two teachers explained that they need "PBL template and more training". One teacher did not respond on   this item.

Discussion

   It is a huge challenge to transform a traditional teaching and learning environment into an innovative learner-centered environment, particularly through what is called the Problem-Based Learning system (PBL). There are so many factors that need to be taken into consideration in order to make the transformation effective. One of the key factors in transforming to a PBL system is staff training or staff development. This study aims to design the framework of a new PBL staff training program for a higher education institution. Data collection, by reviewing literature, interviewing PBL experts, and eliciting opinions and insights from PBL workshop trainees, indeed give a valuable insight for designing a framework of PBL staff development program. Data from different sources all point out that in order to initiate effective PBL implementation, at least a year of preparing academic staff is required. In preparing the academic staff, a PBL of community practice, a systematic training program, and formal support from executive managers in terms of policy and financial issues are also required from the very beginning. The establishment of a systematic PBL training program and community practice will be the platform for staff to gain in-depth understanding and competences in both the theory and practice of PBL. The reflections from different studies, from the literature, the PBL experts, and the PBL trainees, together inspire the proposed framework for a new systematic PBL staff development program for a higher education institution. The proposed program consists of two major elements: 1) a sequential staff training activities and 2) PBL community practice. The figure below demonstrates the parameters needed for a framework of PBL staff development programs (initiative).
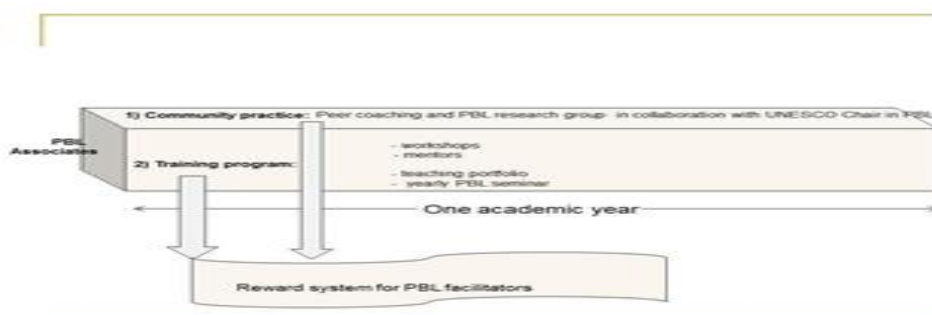

Figure 1: A Framework for a PBL Staff Development Program

As shown in Figure 1, in order to implement PBL effectively, a unit of PBL associates should be established. Two major functions that PBL associates can provide are:

1. Providing a sequential training program for staff which consists of four elements (mandatory).

a) A series of PBL hands-on workshops which will be offered throughout an academic year.

b) PBL mentors who would help PBL practitioners reflect on both PBL theory and practice via meetings and portfolios. At the very beginning the mentors can be external and after a year of training the organization can slowly assemble its internal mentors.

c) Portfolio as a tool to reflect on the actual practice of each practitioner approved and assessed by mentors.

d) A yearly PBL seminar as a platform to present and share experience.

2. Providing a PBL community of practice as a platform for staff to support one another informally (optional). PBL community practice consists of two elements.

a) Peer coaching which can be initiated and managed by the practitioners themselves.

b) PBL research groups which will be mentored by and collaborate with the PBL Network with support from the UNESCO Chair in PBL. This PBL research group can be a platform to support PBL practitioners to build their research skills and connect with other PBL practitioner networks around the world.

One more important issue that needs to be included in this discussion is a reward system for PBL practitioners. Going through a change process without proper support can be very frustrating and easily result in failure., especially since the change process of implementing PBL will require a long period to see significant results. This long process will require a vision in life-long learning, strong leadership and support, a commitment from both staff and executive managers, and a tolerance for the long term process. Teachers who participate in the change process will particularly have to contribute time, energy, and intelligence throughout the process. They therefore also need concrete and structured support from their institution.

Conclusion

This paper demonstrates that staff development is one of the central elements in implementing a PBL initiative as well as maintaining the PBL implementation. PBL staff development needs to be put into an action plan from the very beginning when a higher education institution wants to implement PBL. Without doubt, it is hard work for all agents when it comes to change of any kind. Therefore, having strong support from all levels in the organization is important and valuable. Making a change to an education system is a long process which requires support, commitment, creativity, and tolerance from all agents. As recommended by PBL experts, preparation of the staff alone can take at least a year before the actual implementation; therefore, having a well prepared staff to begin with is a good alternative. Well prepared staff can indeed come in the form of a PBL staff development program. In most cases PBL staff training has been done mainly through a short workshop format; however, this study proposes adding more systematic long term training and support elements which will not only make for a strong PBL implementation initiative, but will also maintain the PBL practice of the institution. PBL should not be viewed as an add-on teaching approach; it should be embedded in the system. Therefore, the PBL staff development program should also be embedded in the staff evaluation system (reward system). It is recommended that establishing a sequential PBL training program along with PBL community practice can be a sustainable strategy for implementing and maintaining PBL practice because these two units will be platforms for PBL practitioners to share ideas and experiences, as well as support one another in their pedagogical stance.

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APPENDIX Q
Conference Paper 3

Impact of the Implementation of PBL for EFL Interdisciplinary Study in a Local Thai Context

Abstract

Can Problem-Based Learning (PBL) principles and practices be applied to language education, especially within an academic writing course? The answer to this question remains ambivalent to many language teachers and educators. This study describes how PBL principles are used as the fundamental basis of restructuring an English as a Foreign Language (EFL) writing course, called Writing3, at a Thai university. The study also examines student and teacher perceptions as related to their learning experiences. The case study involves 182 English major students and 3 English teachers who participated in the learning and teaching of an EFL academic writing course (Writing 3) in the first semester of the academic year 2012. Pre- and post-survey questionnaires (N=166) were used and the results are analyzed through a paired samples t-test to compare whether there is a significant difference in student perceptions of the benefits gained in their learning experience from the PBL process. The benefits gained in this case are motivation in learning, communication skills, collaborative skills, critical thinking, problem-solving and self-directed learning skills. Furthermore, triangulation between teacher perceptions of student learning, which was obtained from questionnaires, interviews, and students' final grade, also confirms that the PBL process used with the Writing 3 course had a positive impact on both student and teacher learning experiences.

1. Introduction

Implementing Problem-Based Learning (PBL) has spread widely across many different educational fields and across many different cultures and countries. The reason most practitioners and scholars have given to why PBL has spread quickly is similar; because of a paradigm shift has occurred in education where learners are at the center of learning. The teaching environment and classroom dynamic must be active and PBL provides opportunities to achieve this. The implementation of PBL varies in form and level depending on local contexts. Whether PBL is incorporated at a component level or in the entire curriculum, they are grounded in the same principles: cognitive learning, content learning, and social learning

(Graaff & Kolmos, 2007). This study is one of many examples that advocate the positive impact of PBL implementation in a challenging local context. After a long journey in cultivating relevant knowledge and experience in the form of design based research, the result of this case study is the final indication needed to deliberate the impact of PBL implantation with language education in a Thai context. The paper describes how the course syllabus was reconstructed in order to allow spaces of PBL practice with 182 English major students and three English teachers. This particular case study aims to answer the following major research question and two subsidiary research questions:

Main question: What is the impact of implementing PBL with EFL interdisciplinary study in a Thai university context?

Sub-question 1: What values and competences do the design and practice of PBL in EFL interdisciplinary study contribute to student learning outcomes?
Sub-question 2: What values do the practice of PBL organized studies contribute to the teacher experiences?

2.Literature Review

2.1. PBL implementation in the field of English as Foreign Language learning (EFL)

The main purpose of teaching and learning a second and a foreign language has been shifted to assisting learners to achieve communicative competence (Hymes, 1972; Canale &Swain 1980). Acquiring and achieving communicative competence means to be able to function or apply knowledge and skills beyond the classroom context and this requires knowledge, skills, and a positive attitude in learners. Recently, PBL has been implemented with the English as a Second Language (ESL) and English as Foreign Language (EFL) classrooms because its commonly expected learning outcomes synchronize with language learning: communication skills, collaborative and problem-solving skills, in depth content learning and autonomous learning. Studies indicate that PBL aligns with language learning principles in which learners learn the target language by using it in a way that is meaningful to them. Previous studies of implementing PBL with ESL and EFL classes claim positive effects on both learners and teachers in terms of motivation, content learning, and practical skills (Mathews-Aydinli, 2007; Jiriyasin, 2011; Ng Chin Leng, 2009; Othman & Shah, 2007; Yusef, 2010). However, the studies were mostly conducted on a small scale which involved 10-80 participants. There are a few bigger scales (over one hundred participants) of study in implementing PBL in an EFL context. The results of these studies also confirm positive effects on both teachers' and students' learning experiences; however, it is also emphasized that a large scale PBL implementation cannot be accomplished without encountering many obstacles (Forrester & Chau, 1999; Hallingger, Blackwood, & Tannathai, n.d.).

2.2. Design elements of PBL syllabus: in consideration of local contexts

The implementation of PBL has been done in different disciplines, at different levels, in different countries or cultural contexts, and in different forms or modes. A variety of PBL implementation has been accepted due to the sensitivity of curriculum designers and researchers towards the diversity of the existing local cultures. This is because there is a belief that culture strongly influences curriculum design, teaching and learning practices. Many PBL experts seem to agree that one form of PBL does not work in all contexts, but it must be modified and redesigned to suit each particular context (Kolmos, Graaff, & Du, 2009; Savin-Baden & Major, 2004; Barrett, 2005). Savin-Baden and Major (2004) recommend that there are many elements and levels of the local cultural aspect to consider when implementing PBL (change), ranging from national, institutional, disciplinary, and individual cultures. As well as the cultural issue, an alignment between the philosophical principles underpinning PBL and four major elements of curriculum design (learning outcome, content and material, learning and teaching method, and assessment) must be considered when redesigning a PBL course or curriculum. These elements were taken into

serious consideration in restructuring the PBL syllabus for Writing 3 course which was offered in the first semester of the academic year 2012.

3. Restructuring an EFL Writing Course (Writing 3)

Individual writing activities have been preferred and popularly used as a part of teaching and learning writing for many years, especially in an EFL context. Writing 3 is compulsory for English major students at Mae Fah Luang University. In previous semesters writing activities were individually based and focused on a final product, which was an academic paper. Although the writing process has been used to foster students' learning, complaints from both teachers and students regarding the correlation of the final grade and learning process have continuously been issues of concern. The aim of implementing PBL into this learning scenario is to at least minimize these concerns and further enhance students' academic knowledge and practical skills. As a result, the course syllabus of Writing 3 was redesigned, based on alignments between the PBL principles, the local cultural context and the existing syllabus, which included learning outcome, content and material, learning and teaching method, and assessment. Furthermore, in reconstructing the course, three major pillars (English communicative competence, PBL process, and discipline content) are placed in consideration for revising the new course objectives of the modified PBL semester module for the EFL Interdisciplinary Study. The PBL practice in this case is called embedding PBL into a research project. The following steps were applied in reconstructing the course.

1. Learning outcomes of PBL subjects and the research project must first be clarified.
2. Lectures should be interactive, supported by stimulus activities, and serve the research project.
3. Research themes must be open-ended and lead to innovative learning. The themes must be posed at the very beginning of the semester, by the PBL supervisor team.
4. Research topics and research questions must be within the premise of real-life problems, meaningful to learners, and relevant to the content of the PBL subjects. They must be formulated by students.
5. The research topics must allow multiple research methods and multiple findings.
6. The PBL process requires feedback and deadline.
7. Students are also required to acquire peer and self-assessment skills by attending an intensive workshop and continuing to practice peer and self-assessment throughout the semester.

The following figure also illustrates the relevant elements to be considered when designing and implementing PBL.
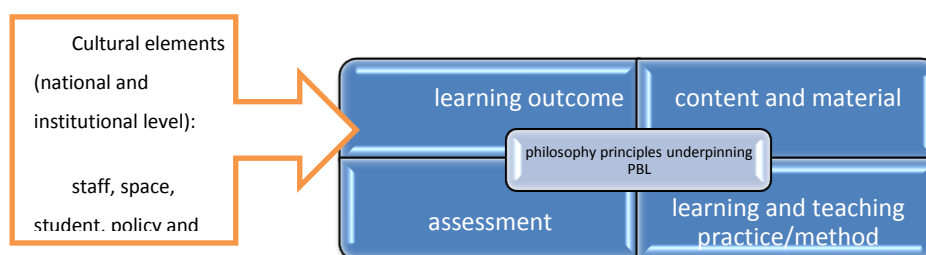

Figure 1: Elements influencing the design of the PBL syllabus

The objectives of the course are reformulated based on the elements presented in Figure 1, with details as follows:

- Developing concepts of conducting a research project.

- Practicing the research process by locating resources and efficiently utilizing the resources, formulating research questions, investigating the research topic and processing drafts and revisions of research papers.
- Practicing the PBL process by contributing through collaborative learning, autonomous learning, peer and self-assessment in order to complete the research project.
- Writing an effective abstract and an academic paper.
- Developing editing skills.
- Developing oral presentation and communication skills.

The new approach to learning Writing 3 also involves redistribution of the following elements of the course: content and learning activities, time allocation, and assessment. First, there must be modification and redistribution of the course content, learning activities, and learning materials focusing on the process of academic writing rather than the product. In addition to the content of academic writing, PBL principles and processes are introduced to students in the form of workshops. Consequently, lecture time is reduced and is made to be interactive by emphasizing content discussion and knowledge sharing among learners. Before the lecture sessions, students are required to study materials so that they can question what they do not understand and share what they do understand during the sessions. The second element is the modification and redistribution of allocated time for different learning activities. The major change is that lecture time is minimized to 15 hours over a semester or 1/3 (total 45 hours) of total allocated contact hours, as compared to the previous course time which allocated all 45 contact hours to lecture time alone. The remaining lecture time of the new approach was allocated to active hands-on workshops (12 hours) which require students to actively practice and share knowledge and skills. Supervision time (18 hours) was also allocated and separated into two types. The first type is two formal seminar-supervisions which require every team and every section to function in the same manner. Each formal seminar-supervision lasted about one hour per team and five percent of the total score was given based on the assigned rubric. The second type was informal meetings which were initiated by students, depending on the need of each team. Thirdly, learning assessment required modification and redistribution. Forty percent of the total score is allocated to the PBL process which involves a supervision and panel discussion (20%), PBL workshop (10%), and peer and self-assessment (10%). The other sixty percent is distributed to the academic writing products which involve written proposals (15%), two written drafts (35%), and a written abstract (10%). The figure below illustrates the redistributed time allocation of course activities in one semester.

Lecture1 6 hours	Team formulation + problem formulation	Lecture 2 6 hours		Team presentation +Individual examination +Final draft submission
	Supervision time: total 18 contact hours			
	Workshop 1: 6 hrs.		Workshop 2: 6hrs	

Week1,2…………………………….............................8…………………………..12…………….....................15
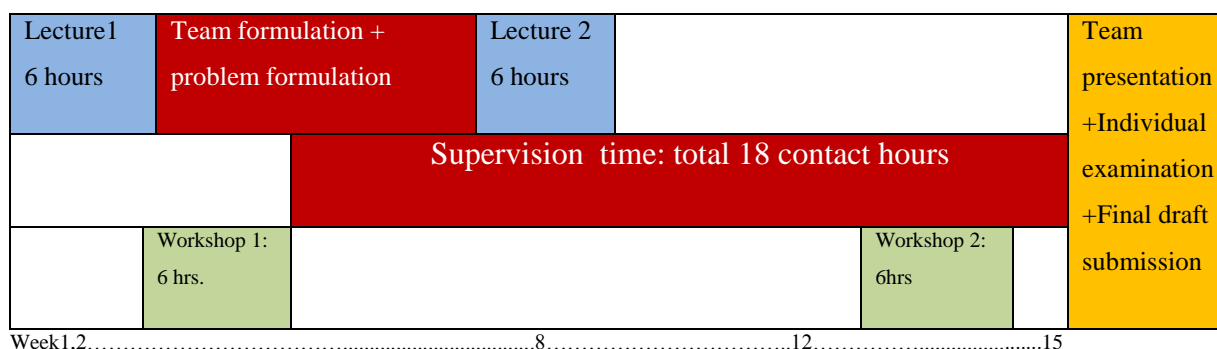
Figure 2: Activities and time allocation for the reconstructed course

4. Methodology

4.1 Participants and the setting

The newly designed PBL writing syllabus was implemented with 182 students and three teachers, including the researcher. The period of implementation was June 2012-October 2012. However, data collected from pre- and post-surveys was from 166 students. Twelve students were absent on the days the pre-survey was administrated; therefore, the post-survey was also collected only from those students who took the pre-survey in June 2012. Qualitative data was collected from two teachers via individual semi-structured interviews. It is noted that even though the researcher took part in facilitating the learning process, the interview data excluded the researcher for the purpose of subjectivity.

4.2 Instruments and procedure

For the purpose of the validity of the assessments of the impact of implementing the PBL semester module for the EFL Interdisciplinary Study, in which PBL was embedded into a research project, the use of triangulation information is central to this study. Therefore, instruments used for data collection for this case study consisted of the following:

1. Student questionnaire which consisted of a Likert scale survey in the form of pre- and post-surveys (25 items) and open-ended questions (5 items).
2. Teacher questionnaire which consisted of 1) Likert scale (20 items) for the teachers to assess student learning, and 2) open-ended questions for the teachers to reflect on the practice of PBL in their context (5 items).
3. Teacher interview in the form of an individual semi-structured interview.
4. Student grades (based on 100 points), the range for A-F grades, were also used to assess student performance in accordance with the objectives and grading criteria of the course.

5. Findings and Analysis

The analysis of data from different sources is based on 1) A paired samples t-test to compare the results of pre- and post-surveys from students' self-assessment (N=166); 2) content analysis is used with qualitative data; and 3) a summary of teacher perceptions of their students' learning from Linkert scale questionnaires, and a summary of individual semi-structured interviews from two teachers; and 4) students' final grades. The findings and the analysis of each element are as follows.

5.1 Results of pre- and post-survey questionnaire from 25 items of the student questionnaire

A paired samples t-test was conducted to compare the before and after self-rating of students on: 1) the overall self-assessment of the overall learning outcomes; 2) level of motivation; 3) level of collaboration; 4) level of PBL process in practice; 5) level of self-directed learning; 6) level of communication skills; 7) level of utilization of peer assessment; and 8) level of critical thinking skill.

Table1. Statistical result from paired samples t-test

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	AVERPRE	3.3694	166	.58723	.04558
	AVERPOST	3.8484	166	.75289	.05844
Pair 2	MOTIPRE	3.3052	166	.61454	.04770
	MOTIPOST	3.7390	166	.69447	.05390
Pair 3	COLLPRE	3.4895	166	.62967	.04887
	COLLPOST	3.9111	166	.83258	.06462
Pair 4	PBLPRE	3.4596	166	.57145	.04435
	PBLPOST	3.9045	166	.70818	.05497
Pair 5	SDLPRE	3.4930	166	.66321	.05148
	SDLPOST	3.8323	166	.83252	.06462
Pair 6	COMPRE	2.7972	166	.77048	.05980
	COMPOST	3.7510	166	.84939	.06593
Pair 7	PEERPRE	3.3976	166	.71461	.05546
	PEERPOST	3.8855	166	.76406	.05930
Pair 8	PRE21	3.38	166	.701	.054
	POST21	3.91	166	.769	.060

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	AVERPRE - AVERPOST	-.4790	.78268	.06075	-.5990	-.3591	-7.886	165	.000
Pair 2	MOTIPRE - MOTIPOST	-.4337	.55106	.04277	-.5182	-.3493	-10.141	165	.000
Pair 3	COLLPRE - COLLPOST	-.4217	.87423	.06785	-.5557	-.2877	-6.215	165	.000
Pair 4	PBLPRE - PBLPOST	-.4449	.82124	.06374	-.5708	-.3191	-6.980	165	.000
Pair 5	SDLPRE - SDLPOST	-.3394	.82957	.06439	-.4665	-.2122	-5.271	165	.000
Pair 6	COMPRE - COMPOST	-.9538	1.06547	.08270	-1.1171	-.7905	-11.534	165	.000
Pair 7	PEERPRE - PEERPOST	-.4880	.97383	.07558	-.6372	-.3387	-6.456	165	.000
Pair 8	PRE21 - POST21	-.53	.977	.076	-.68	-.38	-6.994	165	.000

The statistical results of the SPSS analysis can be interpreted and analyzed as follows:

1. Pair1 compares the average of all 25 items of pre-test (M=3.3694, SD=.58723) and post-test (M=3.8484, SD=.75289); t (165) = -7.886, p= .000 indicates that there is a significant difference between the overall result of the pre-test and the post-test.

2. Pair2 compares the average of the clustered motivation items (1, 14, 25). The results of pre-test (M=3.3052, SD=.61454) and post-test (M=3.7390, SD= .69447); t (165) = -10.141, p= .000 indicate that there is a significant difference between the pre-test and the post-test under the cluster of student motivation. This means student motivation in learning has increased after going through the PBL process.

3. Pair3 compares the average of the clustered collaboration skill items (2, 4, 7, 12). The results of pre-test (M=3.4895, SD=.62967) and post-test (M=3.9111, SD=.83258); t(165) = -6.215, p= .000 indicate that there is a significant difference between the pre-test and the post-test under the cluster of collaboration skill. This means student collaboration skills have increased after going through the PBL process.

4. Pair4 compares the average of the clustered PBL process items (3, 5, 10, 19, 20, 21, 22). The results of pre-test (M=3.4596,SD=.57145) and post-test (M=3.9045, SD=.70818); t (165)= -6.980, p= .000 indicate that there is a significant difference between the pre-test and the post-test under the cluster of PBL process. This means the PBL process is incorporated in the teaching and learning of Writing3.

5. Pair5 compares the average of the clustered self-directed leaning skill items (6, 8, 9, 11, 13, 15). The result of pre-test (M= 3.4930, SD=.66321) and post-test (M=3.8323, SD=.83252);t (165)= -5.271,p= .000 indicates that there is a significant difference between

the pre-test and the post-test under the cluster of self-directed learning skill. This means student self-directed learning skills have increased after going through the PBL process.

6. Pair6 compares the average of the clustered communication skill items (16, 17, 18). The results of pre-test (M=2.7972, SD=.77048) and post-test (M=3.7510,SD=.84939); t(165)= -11.534, p= .000 indicate that there is a significant difference between the pre-test and the post-test under the cluster of communication skill. This means student communication skills have increased after going through the PBL process.

7. Pair7 compares the average of the clustered peer and self-assessment items (23,24). The results of pre-test (M=3.3976, SD=.71461) and post-test (M=3.8855, SD=.76406); t (165) = -6.456, p= .000 indicate that there is a significant difference between the pre-test and the post-test under the cluster of peer and self-assessment. This means students have taken part well in peer and self-assessment, as stated in the course objective.

8. Pair8 compares student critical thinking skills. The results of pre-test (M=3.38, SD=.701) and post-test (M=3.91, SD= .769); t (165) = -.6.994, p= .000 indicate that there is a significant difference between the pre-test and the post-test in student critical thinking skills. This means students perceive that the PBL process used with the Writing 3 course has encouraged and increased their critical thinking skills.

5.2 Results of teacher assessment of student learning

The teachers' perception towards their students' learning development, rating Likert scale, can be summarized as follows.

1. Both teachers agreed that their "students have made progress in the development of collaborative skills and self-directed learning skills" once the PBL process was incorporated into their teaching and learning contexts. This indicates that the PBL process has raised their motivation for learning through working on the research project collaboratively.
2. Both teachers also agreed that practicing PBL has helped their "students exhibit the development of their commutation skills which including both English writing and speaking or presentation skills."
3. Both teachers also agree that PBL implemented in their classroom contexts "has enhanced their students' (deep) learning content."

5.3 *Qualitative data from two teachers who completed open-ended questionnaire*

questions (reflection notes)

These results come from the response to reflective questions by two English teachers. Item 1 asked teachers to give a description of PBL practice in their contexts. Teacher 1 stated that existing problems and potential problems were used as the first step to drive students' learning. Students were encouraged to be aware of those problems. Then students began to look for ways to deal with the problems by searching knowledge/information. Along the way students learned new knowledge from the subject content itself (lectures) and from their working process. Consequently, they learned about themselves, as well as learning to solve the problems. Similarly Teacher 2 stated that the focus of student research projects, which emphasized the PBL process, was on student interests and collaboration. First, students were asked to think about a problem or a concern related to their context. Students chose team members on their own. Together they planned and went through the research process and the PBL process. Along the process, practical skills were practiced, such as analytical thinking, problem-solving, reading, note taking, communication, collaboration, and evaluating

information and their own learning. Item 2 asked teachers to share and point out challenges and difficulties that they or their students encountered during the implementation period. Teacher 1 explained that her students were confused in the beginning. *"They did not have a clear direction in their learning and they seemed to be frustrated with managing ideas and information."* However, after a few meetings or consultations they began to be able to shape up their ideas and directions in learning *"by mid-semester, they seemed to be clear in their work and its process."* Teacher 2 responded that *"it is difficult to maintain and balance an appropriate role as a PBL supervisor; when not to control students' work and when to step in. The second challenge was how to monitor students' work process in terms of being fair and equal in their team contribution. Lastly, time demands were a big issue because the PBL process requires a lot of time. I realized that being a PBL facilitator requires more that academic and teaching skills."* The last item on the open-ended questionnaire asked teachers to share the best experience or the advantages of implementing PBL in their context. Teacher 1 explained that *"I feel that students were proud of themselves after realizing that they can learn by themselves, tackle problems by themselves, and gain new knowledge by themselves."* She further pointed out that *"this approach allows students to see their own potential and I have also learned new things from working alongside the students."* Teacher 2 also responded similarly on this item, as she stated that *"the best experience was that students got to maximize their learning. They learned through self-discovery and hands-on experience. It is a realistic learning approach and students learned to work with other. As a teacher, I also learned about the strengths and weakness of each individual student."*

5.4 Results of teacher interviews

In the first semester of academic year 2012, these two interviewees fully participated in the PBL process used with the Writing 3 course. The PBL process started when from the first week of the semester students began to formulate their thoughts and the topic of their interests. Lectures of necessary content were given during Weeks 1-8 along with 2 workshops which focused on the PBL process and team management. In Weeks 4-5 most teams had team proposals in place. The supervisions began from Week 5. There were 6 sections and every section followed the same protocol of learning and facilitating. Supervision sessions were essential in the context of the Writing 3 course. Two formal supervisions were mandatory where every member must take an active role in presenting their part and asking questions that were useful for their research projects. The interview data revealed that both English teachers had sufficient teaching experience. The first teacher had eleven years of teaching experience and had been involved in project-based learning, if not problem-based learning. The second teacher had twenty years of teaching experience and claimed that PBL principles have been used with some of her master's students because the master's project used the research process to facilitate student learning, but students worked individually. First, both teachers were asked to describe the essential characteristics and process of PBL. The first teacher stated that *"in my opinion, PBL must start with problems first. Students will learn from two channels which are the content of the course and from their own experience."* In terms of team formulation, both teachers stated that their students chose their own team members based on common interests and personal friendships. Team size was in the range of 2-6 members. The second teacher explained that *"I prefer very small team because smaller is better in terms of team management and collaboration"*. In the next question, both teachers were asked to give opinions on the advantages of PBL implementation in their context. They both agreed that PBL helps students learn content in a way that is meaningful to them because the topics of their study are from their own interests. Their practical skills have also improved in communication, collaboration, and autonomous learning, as one teacher stated: *"in PBL process students learn by themselves with guidelines"*. The third question asked the teachers to give opinions on the disadvantages of PBL implementation in their context. One teacher said that "Both teachers and students must be ready for the change, otherwise it can go wrong." The other teacher stated that "Group work, which is a part f PBL process, can result in free riders". The last question asked the teachers to give opinions on good

characteristics of PBL supervisors. Both agreed that having academic quality and knowing your discipline is very important. In addition, PBL supervisors must be open-minded to problems and students. One teacher further stated that PBL facilitation is more than just going to the classroom and giving lectures, but being a PBL supervisor "requires devotion of time, effort and patience".

5.5 Results: students' final grades

Table2. The final grades of 182 students

Section	#Ss	A	B+	B	C+	C	D+	D	F	I	M
1 Prarthana	28	-	2	5	10	8	3	-	-	-	-
2 Prarthana	22	-	-	5	8	7	2	-	-	-	-
3 Jintana	31	-	3	6	9	8	3	1	-	-	1
4 Sasima	35	-	1	7	10	8	7	2	-	-	-
5 Jintana	34	-	10	5	6	9	2	2	-	-	-
6Sasima	32	-	-	4	11	8	6	2	0	1	-
Total	**182**	**0**	**16**	**32**	**54**	**48**	**23**	**7**	**0**	**1**	**1**

The result of the students' final grades reflects the effectiveness of student learning to some extent. Grade distribution in each section shows results in the same direction. Grade distributions of the six sections indicate the consistency of the assessments used with the course's learning activities. The teachers of this course all agree and advocate that the overall grade distribution reflects the actual quality of student performance and product required by the course objectives. It is also assured that the grade distribution of the whole course, which consists of six different sections, reflects the actual performance of students at the same standard because these teachers are considered highly professional and are the strictest teachers in the department. The way these teachers worked closely together (collaborative teaching) in facilitating and assessing their students' learning throughout the semester also contributed to the quality assurance of grading in this academic writing course.

5. Discussion and Conclusion

The overall result of this study indicates that implementing PBL with language education, particularly in an EFL setting, yields many benefits to both learners and teachers. The results from different sources, and the triangulation method, show that both teachers and

students greatly appreciate the PBL process because it helped them to discover their learning potential and gain values and benefits from concrete to abstract elements as learners. Students explained that their motivation, knowledge and skills have tremendously improved. To support the student perspective, teachers also rated their satisfaction level with student learning progress and performance as high. The obvious values gained in this case study are communication skills, including both oral and written, and in both their target language and native language (language benefit). Moreover, collaborative learning, self-directed learning, motivation and critical thinking skills are also obviously enhanced. It can be claimed that implementing PBL in this context was quite successful in terms of enhancing the learning experiences of both students and teachers positively and effectively. Despite benefits gained, it is also acknowledged that the PBL process has brought frustration and more hard work to both students and teachers. Although the majority of students appreciated the new approach to learning and gained benefits in this case study, there is still a concern that some students may be left behind. Having a strategy ready in hand to deal with this situation is highly recommended. The challenges of being a PBL facilitator is that it requires much more work and professionalism from the teachers; they must be actively involved in the learning process and perform beyond just giving lectures in front of the class. PBL facilitators are put into new roles and are in constant learning mode; therefore, having a mindset for change and openness to changes in learning philosophy, the roles of each agent, and educational goals, are also huge challenges for teachers. The experience of assisting the whole process of PBL implementation in this case has confirmed that PBL with a suitable modification for each local context is a viable alternative educational strategy to transform a passive learning environment into an active learning environment.

Acknowledgements

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APPENDIX R
The Existing Four Year Study Plan for English Majors

A) Four year study plan for English majors

Year One							
Semester 1				**Semester 2**			
Subject	credit	type	prereq	Subject	credit	type	prereq
Environment and development	2(2-0-4)	GE	no	Cultural Studies	2(2-0-4)	GE	no
Thai Language skills	2(2-0-4)	GE	no	Logical Thinking	2(1-2-3)	GE	no
Intensive English	no	remedial	no	Thai Writing Practice	3(3-0-6)	BR	no
Listening & Speaking 1 (LS1)	3(3-0-6)	MR	no	Intro. Eng. Linguistics	3(3-0-6)	MR	
Academic English 1 (AE1)	3(2-3-5)	GE	no	CALL	3(2-2-5)	BR	
Intro. Info.Techno	3(2-2-5)	GE	no	Listening & Speaking 2 (LS 2)	3(3-0-6)	MR	LS1
				Academic English 2 (AE 2)	3(2-3-5)	GE	AE1
Year Two							
Semester 1				**Semester 2**			
Subject	credit	type	prereq	Subject	credit	type	prereq
Man & Society	2(2-0-4)	GE	no	English Literature 1 (Lit 1)	3(3-0-6)	MR	
Sport for Well Being	1(0-2-1)	GE	no	English Syntax	3(3-0-6)	MR	
World Community	2(2-0-4)	GE	no	Writing 2	3(3-0-6)	MR	Writing1
Academic English 3	3(2-3-5)	GE	AE2	Reading 2	3(3-0-6)	MR	Reading1
Writing 1	3(3-0-6)	MR		Major Elect 1	3(3-0-6)	ME	no
Reading 1	3(3-0-6)	MR		Science for Life	3(3-0-6)	GE	no
English Phonetics	3(3-0-6)	MR		Legal Principles	3(3-0-6)	BR	no
Math for Life	3(3-0-6)	GE					
Year Three							
Semester 1				**Semester 2**			
Subject	credit	type	prereq	Subject	credit	type	prereq
Writing3	3(3-0-6)	MR	Writing 2	Principles of Translation	3(3-0-6)	MR	
Compare Thai/English	3(3-0-6)	MR		Cross-Cultural Communication	3(3-0-6)	MR	
English Literature 2 (Lit2)	3(3-0-6)	MR	Lit 1	Major Elective 4	3(3-0-6)	ME	
Major Elect 2	3(3-0-6)	ME		Organization behavior	3(3-0-6)	BR	
Major Elect 3	3(3-0-6)	ME		Office management	3(2-2-5)	BR	
Organization Management	2(2-0-4)	GE					
Electronic Commerce	3(3-0-6)	BR					
In the summer it is required that third year students take an apprenticeship (1 subject)							
Professional Experience (internship)				3(0-40-3)			
Year Four							
Semester 1				Semester 2			
Major Elective 5	3(3-0-6)			Senior project	3(3-0-6)	MR	Writing 3, Lit2, Comp T /E
Major Elective 6	3(3-0-6)			Seminar	3(3-0-6)	MR	
Intro. to Economics	3(3-0-6)	BR		Major Elective 7	3(3-0-6)	ME	
Free Elective1	3(3-0-6)	FE					
Free Elective 2	3(3-0-6)	FE					

B) Example of a typical weekly fixed schedule for a student in one semester (lecture time only)

Day/ Time	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16
Mon			1203141 (s1) @C3 101			1301383 (s2) @C5 301		
Tue			1006398 (s3) @ C5 416			1006394 (s4) @ C1 217		
Wed			1006397 (s5) @C5 321			1006202 (s6) @ C2 208		
Thur	1006394 (s4) @ C1 217		1006398 (s 3) @ C2 304			1006291 (s7) @ C1 218		
Fri	1006300 (s8) @C5 415					1006397(s5) @ C5 321		

APPENDIX S
The Redesigned PBL Syllabus for a Writing Course

Course Syllabus   1/2012

Program: English   School of Liberal Arts

Course Code: 1006395   Course Name: Writing III

Credit: 3(3-0-6)   Type of Course: Major Requirement

Evaluation: [√] Grade (A, B+, B, C+, C, D+, D, F)

Course Description:

Practice in writing research proposals, official reports, means of locating and collecting data from various sources; methods of compiling, collecting data, referencing, editing, and using a library for the writing of a finished report.

Course Objectives:

The course aims to help students develop processes appropriate for academic writing which emphasize writing a research paper. The PBL process is used and practiced as a drive for learning and researching the issues of interest and related disciplines.

After finishing this course students are expected to obtain the following learning outcomes:

- Developing concepts of conducting research
- Practicing the research process by locating resources and efficiently utilizing resources, formulating research questions, investigating the research topic and processing drafts and revisions of research papers.
- Practicing the PBL process by contributing through collaborative learning, autonomous learning, peer and self-assessment in order to complete the research project.
- Writing an effective abstract and an academic paper.
- Developing editing skills.
- Developing oral presentation and communication skills.

Course Materials:

1. Writing III Course Pack prepared by Aj. Prarthana Coffin
2. Class handouts.

Course Content:

NO	WEEK	TOPIC	# OF HOURS		BRIEF CONTENT
			Lec.	Lab	
1	1,2	Introduction to research paper **[Lecture 1]** Assignment 1: individual research proposal (5%)	6	0	-Characteristics, types, and elements of research - Research proposal and research questions -Research process
2	3,4	**Workshop1/1**: self and peer assessment **Workshop1/2**: research project management	6	0	-Assessing peer proposals and research process **[hand in individual proposal before Workshop 1]** - Teaming up for a research project
3	5,6	Literature review, research methodologies, and research results and analysis **[Lecture 2]** Assignment 2: team research proposal with potential references (10%)	6	0	- Searching and selecting related literatures - Documenting and referencing sources (APA) - Independent library research and reading -Developing your research methods and instruments - How to interpret the obtained data for data collection.
4	7,8,9	On-going supervision and required Supervision 1	9	0	**-** Hand in team proposal [10%] prior the supervision period - Discuss work progress and the proposal [5%]
5	10	MIDTERM EXAMINATION WEEK (no exam for this course)			
6	11,12	Workshop 2/1: Writing abstract Workshop 2/2: Polishing research paper	6		- Drafting an abstract based on the current research paper, first write individually and then merge into one proposal for each team (draft, comment, and revise: **10%**) - Commenting and revising full paper
7	13,14	Required Supervision 2	6		- Students submit an agenda and the complete section(s) of the paper to be discussed (submission of rough draft, **10%**) prior supervision period - Discussion of research progress, using peer assessment [5%]
8	15,16	**Presentation and oral examination (10%)** **Peer and self- assessment (10%)**	6		**Final draft (25%) due on Sep. 21**
		FINAL EXAMINATION WEEK (no final exam for this course)			
			45	0	

Note: The frequency of supervisions depends on student needs, students and the supervisor are encouraged to set up meetings informally. However, the two supervision periods stated in the courses content are mandatory.

Grading Criteria:

Individual research proposal   5

Team research proposal +5 references   10

Abstract of the research paper   10

Research project supervision process and workshop participation	20
Rough draft	10
The final research paper	25
Presentation and oral examination	10
Peer and self-assessment	10
	Total: 100

Grading Scale:

Scores	Grades	Definition
85-100	A	Perfect or nearly perfect
80-84	B+	Very good
75-79	B	Good
70-74	C+	Above average
65-69	C	Average
60-64	D+	Below average
55-59	D	Poor
0-54	F	Inadequate

APPENDIX T
Consent Form

CONSENT TO PARTICIPATE IN RESEARCH PROJECT

Title of the research project: The Impact of Implementing Problem-Based Learning into Language Education: EFL Interdisciplinary Studies at Mae Fah Luang University

You are asked to participate in a research study conducted by Prarthana Coffin**,** from the Department of Planning at Aalborg University and in collaboration with the English Department at Mae Fah Luang University.

Objectives of the study:

7) Developing a suitable PBL curriculum (module) for EFL interdisciplinary studies.
8) Developing a suitable PBL academic staff training program for MFU.
9) Researching PBL practice in an EFL learning environment.
10) Detecting values gained from practicing PBL in an EFL learning environment.
11) Establishing a community of PBL practitioners at MFU, in Thailand.

I …………………………………………….hereby consent to take part in the research. I understand that as a participant of the study, I will be asked to complete questionnaires, be observed and be interviewed by the researcher. I understand that the information provided by me will be treated as anonymous and kept confidential. I also understand that the information gained during the research project may be published in the form of a report or a journal article. The data will be retained and may be used for future research project, subject to ethics committee approval if for a different purpose to that of the original study.

Singed…………………………………………….Date………………………………

I, Prarthana Coffin, certify that I have explained the nature and the procedures of the research project to the participants and believe that they understand what is involved.

Signed……………………………………………….. Date…………………………

"Education is not the learning of facts,

but the training of mind to think"

Albert Einstein