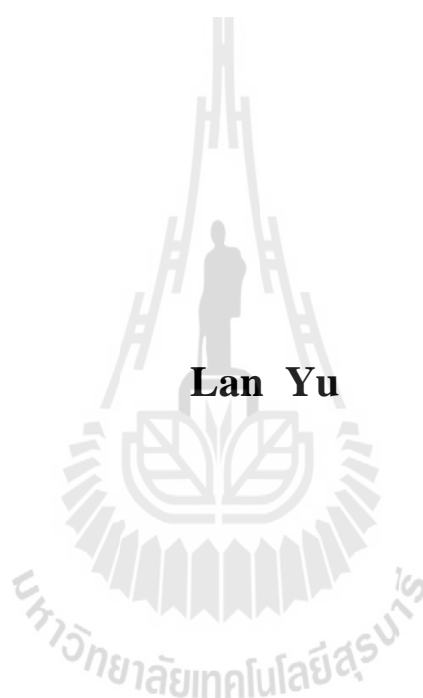


แนวการสอนโดยใช้ปัญหาเป็นฐานสำหรับการเรียน  
ภาษาอังกฤษทางการแพทย์



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต  
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**A PROBLEM-BASED APPROACH FOR LEARNING  
MEDICAL ENGLISH**



**A Thesis Submitted in Partial Fulfillment of the Requirements for  
the Degree of Doctor of Philosophy in English Language Studies**

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เพื่อการแพทย์ งานวิจัยในครั้งนี้มีวัตถุประสงค์ 2 ประการคือ 1) เพื่อบันทึกประเด็นปัญหาต่างๆ ที่  
เกิดขึ้นระหว่างกระบวนการออกแบบและพัฒนาเอกสารการสอนโดยใช้ปัญหาเป็นฐาน และ 2)  
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นักศึกษาในด้านการอภิปรายกลุ่ม การวิจัยในครั้งนี้ใช้รูปแบบวิธีวิจัยแบบผสมวิธี โดยใช้เครื่องมือ  
ในการเก็บข้อมูลดังนี้ บันทึกผู้วิจัย การสอบพูดแบบอภิปรายก่อนเรียนและหลังเรียน บันทึกของ  
นักเรียน การบันทึกเทปการอภิปรายกลุ่มและการสัมภาษณ์แบบกึ่งรูปแบบ สถิติเชิงพรรณนาและ  
paired sample t-test ถูกนำมาใช้ในการวิเคราะห์ข้อมูลเชิงปริมาณ ส่วนการวิเคราะห์เนื้อหาและ  
สัมพันธสารถูกนำมาใช้ในการวิเคราะห์ข้อมูลเชิงคุณภาพ ทั้งนี้มีผู้รับการวิจัยทั้งสิ้นจำนวน 48 คน  
ซึ่งเป็นนักศึกษาคณะแพทยศาสตร์ชั้นปีที่ 3 ที่ลงทะเบียนวิชาภาษาอังกฤษเพื่อการแพทย์ที่  
มหาวิทยาลัยกู้ย็องเมคคอลล ประเทศสาธารณรัฐประชาชนจีน

ผลการวิจัยพบว่า จากประเด็นปัญหาต่างๆที่เกิดขึ้นในขั้นตอนแรกนั้น สามารถสรุปประเด็น  
ที่สำคัญ 4 ประการที่มีผลต่อความสำเร็จของการออกแบบและพัฒนาเอกสารการสอนภาษาอังกฤษ  
เพื่อการแพทย์โดยใช้ปัญหาเป็นฐานคือ 1) ผู้พัฒนาบทเรียนต้องมีข้อมูลเกี่ยวกับความสามารถด้าน  
ภาษาและด้านเนื้อหาทางการแพทย์ของนักศึกษา 2) ผู้พัฒนาบทเรียนต้องมีความรู้เกี่ยวกับข้อจำกัด  
ของบริบทการเรียนการสอนของตน 3) ความร่วมมืออย่างใกล้ชิดระหว่างครูด้านภาษาและ  
ผู้เชี่ยวชาญด้านเนื้อหาทางการแพทย์มีความจำเป็นอย่างยิ่งโดยเฉพาะในส่วนของการคัดเลือกเนื้อหา  
ทางการแพทย์ที่เหมาะสมและ 4) ผู้พัฒนาบทเรียนต้องมีความเข้าใจในความซับซ้อนของ  
กระบวนการพัฒนาบทเรียนและข้อจำกัดด้านเวลา ส่วนในขั้นตอนที่สองพบว่าผลของการ  
ทดสอบพูดแสดงให้เห็นว่าผู้รับการวิจัยทั้งสามกลุ่ม (เก่ง กลางและอ่อน) มีการพัฒนาด้านการ  
อภิปรายกลุ่มอย่างมีนัยสำคัญ ทั้งเรื่องของการมีส่วนร่วม การใช้คำศัพท์ทางการแพทย์และการใช้  
กลยุทธ์ด้านการอภิปรายกลุ่มอย่างเหมาะสม นอกจากนี้ยังพบว่า ผู้รับการวิจัยจำนวน 96%  
มีทัศนคติที่ดีต่อการเรียนภาษาอังกฤษเพื่อการแพทย์โดยการ ใช้ปัญหาเป็นฐาน เนื่องจากวิธีการสอน  
และเอกสารการสอนดังกล่าวมีโครงสร้างเป็นแบบกึ่งควบคุมและให้ความช่วยเหลือในแต่ละ  
ขั้นตอนอย่างชัดเจน นอกจากนี้ยังชอบกิจกรรมนอกชั้นเรียนที่ต้องศึกษาค้นคว้าเอง เอกสาร

การเรียนรู้เป็นสิ่งที่จะต้องอ่านจริง ปัญหาที่ต้องอภิปรายเป็นเรื่องที่เกิดขึ้นจริง กระบวนการเรียนรู้แบบเน้นการปฏิสัมพันธ์และผลลัพธ์เชิงประจักษ์ และรู้สึกว่าสิ่งที่เรียนสามารถตอบสนองความต้องการในอนาคตของผู้รับการวิจัย แต่อย่างไรก็ตามความกังวลที่มีต่อการสอบและความเคยชินกับการสอนแบบบรรยายทำให้ผู้รับการวิจัยบางกลุ่มแสดงความคิดเห็นด้านลบต่อกระบวนการสอน โดยใช้ปัญหาเป็นฐาน โดยสรุปการสอนภาษาอังกฤษเพื่อการแพทย์โดยใช้ปัญหาเป็นฐานนั้นมีความเป็นไปได้สูงและควรค่าที่จะมีการนำไปทดลองใช้กับวิชาอื่นๆ ถึงแม้ว่ากระบวนการในการออกแบบและสร้างแบบเรียนจะมีความยุ่งยากอยู่บ้าง



LAN YU : A PROBLEM-BASED APPROACH FOR LEARNING MEDICAL ENGLISH. THESIS ADVISOR : SIRINTHORN SEEPHO, Ph.D., 311 PP.

PROBLEM-BASED LEARNING/MEDICAL ENGLISH COURSE/ENGLISH FOR SPECIFIC PURPOSES/CONTENT-BASED INSTRUCTION

The present study consisted of two main phases: Problem-based Learning (PBL) materials design and development for a medical English course and their implementation. It aims to 1) document the issues and challenges during the materials development process and 2) to examine the effects of PBL approach and materials on medical students' speaking English ability in group discussions. To achieve the research purposes, a mixed methods research design was employed. Five research instruments including the researcher's journal, pre and post-speaking tests, student's logs, recorded group discussions, and semi-structured interviews were used to collect data during the 18-week instruction. Paired sample T-test, descriptive statistics were used to analyze quantitative data while content and discourse analyses were employed to analyze qualitative data. The participants of the study included forty-eight third-year medical students who took a medical English course at Guizhou Medical University in China.

The findings revealed that, first, the challenges encountered in phase I led to the conclusion that there were four major issues needed to be taken into consideration when designing and developing PBL materials. They were 1) the course developer should know the students' medical content knowledge and language background

knowledge; 2) the course developer should be aware of institutional teaching and learning constraints; 3) a close collaboration between a language teacher and a content expert was required; and 4) the developer should understand the complex and reiterative nature of materials design and development process especially time constraint. These issues played a key role to the success of the materials design and development. Second, for phase II – the test results showed that the speaking abilities in group discussions of all three groups of students (high, medium, and low) significantly improved after involving with the PBL lessons. Through the discussion analyses, more active group participation, frequent use of medical vocabulary and appropriate use of conversation strategies in group discussions were found. In addition, 96% students had positive perceptions of the PBL lessons on their medical English course. The students stated that they benefited a lot from the scaffolded and semi-controlled structure of the PBL lessons. The positive perceptions were due to the self-directed outside class activities, authentic materials and real-life medical problems, interactive learning process, and concrete learning outcomes. More importantly, these lessons were relevant to their future needs. However, some participants who worried about the national tests and were familiar with lecture-based teaching revealed some negative opinions. In conclusion, it is highly feasible and worthwhile for implementing PBL approach in medical English studies and other disciplines though the PBL materials design and development were challenging.

School of Foreign Languages

Student's Signature \_\_\_\_\_

Academic Year 2014

Advisor's Signature \_\_\_\_\_

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Lan Yu

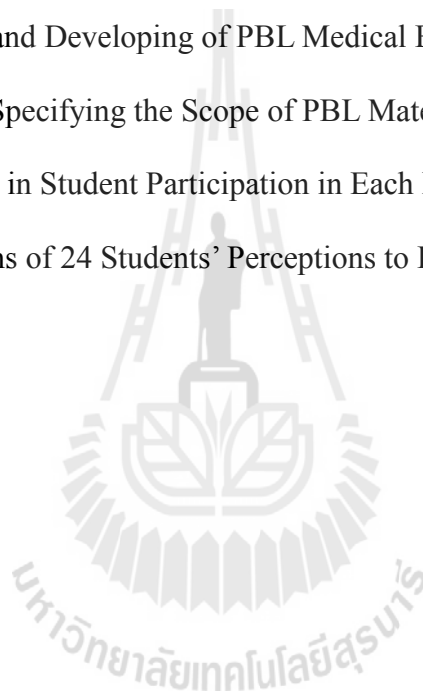


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## LIST OF ABBREVIATIONS

CET	College English Test
CET-SET	College English Test – Spoken English Test
CL	Cooperative Learning
CLIL	Content and Language Integrated Learning
EAP	English for Academic Purposes
EFL	English as a Foreign Language
ESP	English for Specific Purposes
F	Female
G	Group
GMU	Guizhou Medical University (China)
HSL	High Speaking Level
ISL	Intermediate Speaking Level
L2	The Second Language
LSL	Low Speaking Level
M	Male
NMPE	National Medical Practitioner Exam (China)
PBL	Problem-based Learning

# CHAPTER 1

## INTRODUCTION

This chapter focuses on a description of background of the study, statement of the problem, rationale, research purposes, and research questions. Following that, the significance of the present study and the operational definitions of some key terms applied in this study are described and defined.

### 1.1 Background of the Study

With the reform and opening of China in the past thirty years, English has become an essential tool for university students to meet the challenges and to seize the opportunities in society. In China, all the students taking tertiary education have to learn English. At the very end of this level, the undergraduates are required to pass College English Test (CET) 4, and the post-graduates should pass CET 6. These are official English tests for university students, set with the purpose of helping them to use English communicatively and to advance themselves in the particular fields they specialize in. Besides, the acquisition of English will help them obtain desirable jobs after graduation (Liu & Zhao, 2008). Therefore, to English teachers in the universities, helping students develop their English proficiency within the period of university study has become an important task. However, it remains a serious problem and challenges the teachers at all times as to how to satisfy the students'

needs in English learning and how to enable them to acquire English in English for Foreign Learners (EFL) context. To find solutions to this problem, some educational reforms have been carried out. One of the approaches in the field of English teaching in China which has been the focus of some heated discussions is what Nunan refers to in his paper in 1999. This is the issue of whether English teaching and learning can be shifted from the approach of knowledge-centeredness, test-centeredness and teacher-centeredness to that of skill-centeredness, communication-centeredness and learner-centeredness. With this view as a guideline, a national syllabus for College English, *The New College English Curriculum Requirements*, has been introduced into College English teaching in China. The syllabus was approved by the Ministry of Education in the People's Republic of China and published for the first time in 2006 and then revised in 2010. It has clearly accentuated the importance of developing students' communicative competence and defined autonomous learning, learning strategies and intercultural communication skills (*The New College English Curriculum Requirements*, Ministry of Education of P. R. China, 2010).

One feature of this newly issued syllabus is that it emphasizes the development of communicative competence and gives priority to the learning of spoken English, a practical skill for social communication, apart from the importance of linguistic knowledge of vocabulary, grammar, reading, and writing. This has undoubtedly enhanced the need for all teachers of the English language in China to develop their students' communicative abilities. In language teaching, a practical way to improve learners' speaking ability is to stimulate their interest in practice, so that they can

develop their speaking skills effectively and acquire sophistication in social communication.

Up to the first decade of the 21<sup>st</sup> century, a number of Chinese English teachers (Wang, 2006; Li, 2007) have pointed out that the teaching of spoken English in most universities in China continued to be teacher-centered. According to Wang (2006), the teaching focus is on mechanical pattern drills rather than on meaning-oriented communicative conversation. Most of the spoken activities are repetition exercises, pattern drills, and strictly-controlled question-answer dialogues (Li, 2007). It is obvious that this strategy would not provide the students with an opportunity for natural exposure to English even in oral work, nor would they be involved in sufficient language practice of natural conversational interaction in class. Foster and Skehan (1999) pointed out that English learners cannot use English successfully for social communication which gives grounds for concern. They ask “Why have learners’ inter-language skills not been well developed even though they have learned English for a long period of time?” In fact, this is a paradox in the teaching of English in China. Although the majority of English teachers hold the view that learner-centered and task-based learning focusing on communication will be of most benefit for learners and teachers, the prevailing method of teaching spoken English is still dominated by a teacher-centered approach, with the result that English proficiency for most learners remains low (Zhang, 2002).

To develop students' ability for specific communication, there has been introduced another type of English course in universities, named English for Specific Purposes (ESP). Currently, there is a proposal put forward by the Ministry of Education in China that there should be a reform of College English teaching. In line with this change, it is recommended that College English teaching in future should be gradually shifted from the teaching of general English to specialized English (Tong, 2006). Cunningsworth (1995) thinks ESP is an approach to language teaching in which all decisions as to content and method are based on learners' motivation. It aims at teaching ESP based on students' development of general English language, for example, English for Medicine, English for Business, English for Tourism, English for Finance and Economics, English for Sports Science, and English for Aviation. This means that the university students in China will be encouraged to learn general English by themselves and learn ESP under a teachers' guidance in class. If this actually occurs, the English teachers will have to shoulder the responsibility of helping students learn specialized English based on their majors which is directly related to their academic needs.

At present, some teachers who teach ESP lack the necessary content knowledge in specific areas. Therefore, it is hard for them to achieve the expected teaching outcomes in the end (Zhao, 2008). Hence, it is suggested that English teachers should cooperate with the content teachers in a given area, if they hope to make ESP teaching successful, or they should try to find some new approach that can lead to good results. In this situation, the teaching of ESP will naturally replace the current College English

teaching, especially for those universities which teach specific subjects. For example, students at medical universities will need to study for a total of five academic years before obtaining a Bachelor's degree, of which the first four years is set for course study and the last year is for clinical practice in the hospital. At present, medical undergraduates learn general English normally for about two academic years. Then they shift to Medical English (English for Medicine), a compulsory English course for students when they start their third academic year.

## **1.2 Statement of the Problem**

For the present study, the focus is on the teaching of ESP to university medical students. ESP teaching and research, of which medical English is an important component, started late in China, but has developed quickly over the past few years (Zhang & Wang, 2006). For the majority of medical professionals, communication skills in English are of vital importance if they want to get a professional promotion. In such a situation, ESP courses become necessary either for long-term programs or for short-term ones. As previously mentioned, medical English courses are specialized at university level. They aim to provide students with sufficient medical English terminology to help them develop the communication skills necessary for conversing with English-speaking doctors and patients, and to acquire important academic knowledge for their future careers.



In China, almost all undergraduate students have learned English for approximately 8-10 years before they begin their studies at university. Yet, most of them cannot communicate in English (Li & Ming, 2010). Therefore, they should enhance their English speaking skills to raise the levels of their ability in English communication (Kang & Lu, 2006). Currently, although English teaching is developing quickly in China, the English speaking and communicative skills of undergraduates are still not satisfactory. In fact, it is high time for the universities to find a new approach to English teaching for medical students, so as to satisfy the students' needs in their studies.

Guizhou Medical University (GMU) has been teaching medical English to medical students for 15 years. At the beginning, when this program was first put into practice, it was established only for students who were majoring in their third year of medical studies, as a compulsory course after they had learned general English for two years at the university. The classes were given two hours a week with a total of 36 hours (18 weeks) in one semester. There are two semesters in one academic year, so in fact there were 72 hours of classroom teaching in the whole year. The course syllabus is composed of four parts: pronunciation, vocabulary, reading and speaking. The students are expected to know the phonetic symbols and how to pronounce words correctly. Moreover, they should acquire 1000 medical words with affixation and root flexion, and be able to read 800-word medical-science articles. Furthermore, they should be able to communicate in medical English about their daily work in the relevant situations at the hospital by the end of their English studies at university.

The course syllabus remains unchanged up to now, and the teacher-centered and lecture-centered teaching approach is still dominant. The students have almost no time and no chance to practice speaking in class, because of the traditional view of the importance of instruction for explicit knowledge. Therefore, English teachers at GMU are facing the problem of how to develop students' speaking ability for communication, and how to foster their cooperative learning ability in general English and medical English. To solve this problem, the present study endeavors to apply a Problem-based Learning (PBL) approach or PBL at GMU. PBL class learns the content and develops their language skills in the process of solving real problems. The problems in a PBL approach provide opportunities for students to use English and to speak in discussions. If combined with the medical English course at university level, the PBL approach can be employed to design speaking activities. Meanwhile, it can bring the students the valuable resource of teaching tutorials and learning materials.

### **1.3 Theoretical Rationale of the Study**

The theoretical rationale of the study is divided into four parts: the PBL approach, the importance of English speaking, the theories and principles of a PBL approach and its implementation in language teaching and learning.

#### **1.3.1 PBL Approach**

PBL originated in the 1950s and the 1960s. Since its development in medical education in the mid-1960s, it has been developed and implemented in an increasing

number of other subject-matter domains, such as business, education, psychology, economics, architecture, law, engineering, and social work (Barrows, 1992). According to Schmidt and Loyens (2007), the PBL approach consists of the following features. First, it provides small groups of students with a collection of carefully constructed “problems”, which usually consist of a description of observable phenomena or events that are to be understood in terms of their underlying theoretical explanation. Second, these problems are sometimes derived from professional practice (the problems in this study use medical cases which are related to the students’ future careers).

The PBL approach can serve as a precursor in education for a fundamental paradigm shift. The process of each PBL is dependent on a variety of factors such as subject compatibility, subject interrelationships, duration of each delivery session and time suitability for the type of PBL discussion (Savin-Baden & Major, 2004). Any PBL process should be related to the content and complexity of real life problems, and the way that students need to access problem information, group interaction, and well-structured learning resources. On the one hand, it is an optional approach to increase the frequency of the spoken language and to enhance the students’ communicative ability. On the other hand, it can be a supplement to what conventional teaching methods in specific English cannot provide learners with. In order to fulfill the aims of the teaching syllabus of medical English at GMU, it was proposed to provide PBL materials (the Problems) specifically related to medicine for teaching. Moreover, the teaching should correspond to the needs of students’ medical knowledge. Based on a

review of the advantages of the PBL approach and its features, it is a possible method for the teaching of English courses for medicine, particularly in order to cultivate the students' motivation to learn medical English and to provide them with the opportunity to practice their spoken English and expand their knowledge. So the PBL approach is a suitable choice for the present study to encourage the reform of the current teaching methodology.

### **1.3.2 The Importance of English Speaking**

Of all the four macro English skills, speaking seems to be the most important skill required for communication (Zaremba, 2006). There are some factors related to speaking skills which should be considered for effective English speaking performance. First, pronunciation, vocabulary, and collocations are singled out as important factors to be emphasized in building fluency for EFL speakers. When learners practice speaking English, they should be instructed to pay attention to both meanings and forms of the language in order to achieve fluency, accuracy and complexity of linguistic performance. Chinese university students who study English as a foreign language (EFL) usually have limited opportunities to speak English in and out of the classroom and also limited exposure to English speakers of the international community (Zhang, 2009). Because of the significant role of speaking in communication, Bailey (2005) and Goh (2007) detail how to enhance the development of speaking by means of syllabus design, principles of teaching, types of materials, and speaking assessment. Therefore, teachers should provide more situations and activities for students in order to strengthen their students' speaking competence.

### **1.3.3 The Theories and Principles for PBL Approach**

The PBL approach is based on two theories and two principles. The former refer to constructivism and Vygotsky's Zone of Proximal Development (ZPD); while the latter are the integration of materials with language and content using collaborative learning.

#### **1.3.3.1 Constructivism and Zone of Proximal Development (ZPD)**

Based on the view of cognitive psychology, learning tasks should be embedded in the target context and require the kind of thinking that would be used in real life (Lave & Wenger, 1991). Constructivism is a branch of cognitive theory and a theory about knowledge and learning. It focuses on the relationship between learners and content (Weimer, 2002). As a description of human cognition, it is often associated with pedagogic approaches that promote active learning, that is, learning by doing. In line with the principles of constructivism, people cannot separate knowledge from interaction in certain contexts. Based on this principle, in PBL, an emphasis is placed on the contextualization of the learning scenario and learning through reflection is also an important aspect. In addition, PBL involves the complexity of cognition and behavior interaction.

With regard to the Zone of Proximal Development (ZPD), Lev Vygotsky introduced the notion of social interaction learning and the cognitive ZPD, which is part of his social constructivism theory. ZPD defines skills and abilities that are part of the process of development, but can be accomplished with the help of a competent

individual. In PBL teaching, students develop new cognitive abilities when a teacher leads them through problem-solving-oriented interaction. The goal of PBL is to make students do as much as they can on their own, and to intervene and provide assistance when necessary. The implementation of the PBL approach in language teaching concerns individual learning and group learning. Its shared learning approach hinges particularly on the interactional dynamics of the learner. Students can also improve their critical thinking, problem-solving ability and achieve the result of dynamic changes through learning with relevant knowledge, lifelong skills and continuous improvement in the future.

### **1.3.3.2 Integration of Language and Content**

According to Swain (1996), a successful integration of language and content in a classroom should explicitly integrate language goals and content goals and provide opportunities for both language development and content learning. It is believed that language proficiency and content knowledge should be developed simultaneously. Language is a medium for content learning, and content is a resource for language learning. The focus of the second language classroom should be on meaningful input, such as academic content. The modification of the target language facilitates language acquisition and makes academic content accessible to second language learners. Integrated language and content teaching offers a means by which students can continue their academic or cognitive development in EFL, while they are also developing their language proficiency. Furthermore, the content and language is

taught through a foreign language with dual-focused aims, namely the learning of content and the simultaneous learning of a foreign language. Content and Language Integrated Learning (CLIL) can be taught by the English teacher using cross-curricular content or the subject teacher using English as the language of instruction. Both methods result in the simultaneous learning of content and English.

According to the nature of language teaching and the PBL approach, cooperative learning is also based on constructivism. Cooperative learning takes many forms and has many definitions, but most cooperative approaches to the teaching of the spoken language involve small, heterogeneous teams. It is the instructional use of small groups that helps students work together to achieve shared goals. It is the organized group learning activities that make it possible for learning to depend on the socially structured exchange of information between learners in a group, in which each learner is held accountable for his or her own learning and is motivated to increase the learning of others (Olsen & Kagan, 1992).

#### **1.4 Purpose of the Study**

There are three purposes of the present study which are presented below:

(1) To explore and to document the issues of PBL lessons development for Medical English course. This will allow EFL teachers to understand the nature of ESP content materials development, and the possible issues embedded in the construction of PBL lessons for the teaching of medical English.

(2) To investigate the effects of the PBL approach on the development of medical students' English speaking ability, especially in group discussion and, therefore, to verify whether PBL can enhance students' English speaking ability.

(3) To examine the medical students' perceptions of the PBL approach for the teaching and learning of medical English.

### **1.5 Research Questions**

In order to achieve the above-mentioned research purposes of this study, three Research Questions have been formulated:

RQ1: What are the issues encountered by an EFL teacher who develops PBL lessons for Medical English course?

RQ2: What are the effects of the PBL lessons on the development of the students' speaking ability?

RQ3: What are the students' perceptions on the implementation of PBL lessons in the Medical English course?

### **1.6 Operational Terms in the Study**

To understand the present research better, it is necessary to define and explain some key terms used in this study.

#### **Medical English**

In general, medical English is also called English for Medical Purposes or English for Medicine. Medical English can be classified as a branch of ESP, and is



defined as a comprehensive but specialized subset of English related broadly to medicine. It includes the “plain” language used for daily communication in real medical situations (Hutchinson & Waters, 1987). Medical English includes the use of English related to any aspect of medicine, and to the language required for academic purposes, and needed by doctors and related medical practitioners for conversations, prescriptions, and working communication, etc. (Glendinning & Holmström, 2005).

For the purposes of this study, Medical English is embedded in a compulsory English course offered by English teachers at Guizhou Medical University to students majoring in medicine.

#### **Problem-based Learning (PBL)**

PBL is related to curriculum development and a delivery system that recognizes the need to develop problem solving skills as well as the necessity of helping students to acquire necessary knowledge and skills (Boud & Feletti, 1991).

For this study, PBL is a teaching approach applied to medical English course, which includes teaching design, tutoring, classroom learning and assessment. This approach is combined with the use of learning materials based on medical content, and carried out through organizing active learning in small groups, with real clinical problems used as the stimulus for students to learn Medical English. The PBL approach is effective in the acquisition of language and medical knowledge for learners who have already acquired some basic English and some academic knowledge of medicine.

### **Speaking Ability**

Speaking is an activity used by someone to communicate with other(s). According to Argawati, Ningtyas and Orilina (2014), people interact and use the language to express their ideas, feeling and thought when speaks. They also shares information with other(s) through communication.

For this study, speaking ability refers to the students' ability to discuss given topics in groups. The key competence that the students are expected to develop includes: sub-skills that plan to develop, such as conversation strategies use (conjunctions use, agreeing or disagreeing with others ideas, giving opinions, fillers use), verbal involvements and their usages of medical vocabulary. These should be the criteria when assessing students' speaking.

### **1.7 Significance of the Study**

The present study consists of two parts: the development of PBL lessons and their implementation in medical English teaching. The findings are hoped to contribute to EFL and ESP teaching and learning with regard to its theoretical and practical significance, which are as follows:

Theoretically, the present study is an integration of PBL and medical English learning based mainly on Piaget's cognitive constructivist theory (1972) and Vygotsky's social constructivist theory (1978). The research findings provide evidence that further verifies and strengthens PBL theory and PBL approach. From another

perspective, the researchers (the teachers) may be able to better understand how they conceive of teaching and how they understand pedagogy in PBL lessons. In addition, they adopt a PBL approach of teaching involving both explicit and implicit commitments. Explicit commitments could be described in terms of particular stages used in design and development of lessons and their implementation, roles of students and teachers, formation of activities, adoption of particular assessment methods, and so on. Implicit commitments include what counts as knowledge, and views about the goals of teaching and where learning occurs. The researcher in these PBL lessons' setting treated students as the center, focusing on what each student brings to the PBL process, and allowing greater control by the students in terms of the direction and content of learning. This study helps raising an awareness of the constructivist philosophical underpinnings, not because it gives researchers' a prescriptive approach to teaching but because it provides a reference in analyzing this approach.

Students acquiring language and content simultaneously has been advocated by this study. They construct knowledge. The effectiveness of the comprehensive and practical PBL lessons would methodologically and practically guide language teachers in helping students. This study is an attempt to move away from common classroom procedures so as to guide and enable medical students to improve their language proficiency in speaking and professional skills in solving practical problems, thinking process, collaborative learning and self-directed learning. The theories concerning PBL may be further enriched and developed.

Second, there is not much research, up to now, about the EFL teacher as a developer of a PBL medical English course. This study documents the issues of PBL lessons development from the English language teacher's perspective. It may be useful for other developers who are interested in this type of materials and who intend to learn how to design materials step by step. Furthermore, it also helps them avoid difficulties encountered during the developmental process. There are few empirical studies on the implementation of PBL approach in medical English teaching and learning. Although it has been applied in education for many years in some disciplines, it is unfamiliar to English teachers in the medical English context. In this way, the research results are useful for PBL materials development.

Third, there are few studies which have investigated students' speaking skills in an EFL context using the PBL approach and medical content materials. The research findings may be beneficial to other researchers aiming at the development of students' L2 speaking ability and exploration of the development of PBL lessons. The data collected may enrich the PBL approach in the EFL context and pave the way for its implementation in the teaching of college medical English. In addition, a significant effect of the research on PBL approach is found, particularly in the area of ESP teaching and learning in medical universities. In addition, the practical framework for medical English course would help Chinese medical students improve their language proficiency, especially their speaking ability.

Fourth, the present study, as a forerunner in the reform of general college English and in the introduction of ESP teaching, may be helpful to the reform of college

general English teaching and learning to college ESP teaching and learning. This study explores the possibility of a shift away from general English instruction, which still dominates the EFL classrooms, to the new PBL trend in ESP teaching and learning. PBL medical English lessons afford other medical universities valuable experience, whereby perhaps deepening College English teaching reform. The research findings can be taken as a model not only for ESP teaching in the Chinese EFL context, but also for other courses with the same objectives.

In summary, the research findings of this empirical research may contribute pedagogically to the study of both second language acquisition and ESP teaching to EFL learners.

## **1.8 Summary**

This chapter provides a description of the background to the present study, a statement of the problem, theoretical rationale and research purposes, together with an explanation of the operational terms applied in this study, and the significance of the study. In addition, the research questions are also described.

In the following chapter, a review of the relevant literature on the PBL approach, the theories related to this study, and previous studies conducted in this area will be described, expounded and discussed.

## **CHAPTER 2**

### **LITERATURE REVIEW**

This chapter presents a review of the literature related to the present study. It is composed of three parts. The first part highlights the theoretical framework of the Problem-based Learning approach and describes the PBL approach in detail. In the second part, the process of PBL lessons development is explained. In the last part, theories on the teaching of speaking activities and Cooperative Learning (CL) are discussed.

#### **2.1 Overview of Problem-Based Learning**

In this part, firstly the origin and introduction of PBL is discussed, then the theoretical framework of PBL is explained, followed by a detailed description of the features of PBL.

##### **2.1.1 Origin of PBL**

The origin of PBL can be traced back to John Dewey in 1919. Dewey believed that students should have experiential, hands-on, direct learning. It is generally accepted that students learn best by doing and thinking through problems. The PBL approach originated in the medical schools at Case Western Reserve University in the United States in the 1950s and McMaster University in Canada in the 1960s (Schmidt, 1983).

These schools questioned how well traditional preclinical science courses trained physicians to be problem solvers and lifelong learners. Traditional information-laden lectures, given by content experts to large student audiences, seemed disconnected from the practice of medicine that required integration of knowledge, decision making, working with others, and communication with patients (Amos & White, 1998).

The PBL approach was used to shift teaching in medical schools from a collection of subjects representing individual disciplines to an integrative program of study engaging students in problem formulation and solving. Three other medical schools followed the McMaster example and adopted variations of the McMaster model for teaching medicine. They were the University of Limburg at Maastricht in the Netherlands, the University of New Mexico in the United States, and the University of Newcastle in Australia. Since the 1970s, PBL has spread worldwide and moved from medical education into other disciplines (Boud & Feletti, 1991; Barrows & Myers, 1993; Duffy & Savery, 1994).

### **2.1.2 An Introduction to PBL**

The PBL approach is a curriculum development and delivery system that recognizes the need to develop problem solving skills as well as the necessity of helping students to acquire necessary knowledge and skills (Boud & Feletti, 1991). The PBL approach has been implemented as an alternative and it appears to bridge the gap between theory and practice, because when teaching is carried out using the PBL approach, students work in teams, and are assigned a medical practitioner who acts as

a facilitator. This practice is consistent with the assumption that learning occurs not in the “heads of individual speakers” but in the fields of social interaction (Lave & Wenger, 1991, p. 17). PBL is an instructional system that develops both problem-solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem-solvers faced with an “ill-structured problem” that mirrors real world problems (Gooding, 2001).

At a general educational level, the PBL approach has been found to enhance specific learning skills, such as knowledge construction and reasoning (Albanese & Mitchell, 1993); to build positive study attitudes (Kaufman & Mann, 1996) and to transfer and integrate concepts for new problems (Norman & Schmidt, 2000). The goal of PBL involves content-learning, acquisition of process skills and problem-solving skills, and lifelong learning (Tan, 2003). As these characteristics have a positive effect on teaching and learning, Kanet and Barut (2003) believe that PBL can be applied in other subject-matter domains, such as language teaching, rather than just in medical teaching.

According to Barrows (1992), the educational goal of PBL is the development of students’ thinking or reasoning skills (problem-solving, meta-cognition, and critical-thinking). PBL helps students to be independent and self-directed learners.

### **2.1.3 General Objectives of PBL**

PBL shares the same educational goals stated by Barrows (1992), that is the development of students’ thinking or reasoning skills (problem solving, meta-cognition,



critical thinking), then helping students to be independent and self-directed, for example, learning-to-learn skills, learning management skills, etc.

The purpose of the PBL approach is to produce students who will (Uden & Beaumont, 2006):

- (1) Engage a challenge with initiative and enthusiasm;
- (2) Be able to reason accurately, effectively, and creatively from an integrated, usable, and flexible knowledge base;
- (3) Be able to address their own perceived inadequacies in knowledge and skills;
- (4) Collaborate effectively as a team member; and monitor and assess their own learning to achieve the desired outcome.

In addition to the above, other objectives of PBL approach (Graaf & Kolmos, 2003) include:

- (1) Develop skills to identify a problem and design an appropriate solution for it.
- (2) Develop an ability to identify issues that warrant further discussion and self-study within the context of a problem and cultivate skills necessary to become a self-directed learner.
- (3) Recognize, develop, and maintain personal characteristics and attitudes necessary for a career as a medical professional, including: an awareness of personal assets, limitations, and emotional reactions; responsibility and dependability; an ability to relate to and show concern for other individuals; an ability to evaluate personal progress.

#### **2.1.4 PBL and Theory of Constructivism**

The foundation of modern constructivism is believed to have been laid by Piaget, who is considered to be the father of constructivism. Piaget (1972) holds that individuals construct their knowledge about the external world gradually via interaction with the environment, resulting in the development of their cognitive structure. The factors determining cognitive development are neither external nor internal factors, but the interaction between the individual and the environment. Two basic processes are involved in the interaction between the individual and the environment, which are assimilation and accommodation.

Constructivism is a branch of cognitive theory, a theory about knowledge and learning. Constructivism describes both the nature of knowledge and the process of acquiring knowledge. Theoretically, knowledge is temporary, developmental, non-objective, internally constructed, and a combination of social and cultural elements, while learning is constructed as an interpretive, recursive building process by active learners interacting with the physical and social world (Fosnot, 1996). Instead of “characterizing the structures and stages of thought or isolating behaviors learned through reinforcement”, the learning theory of constructivism describes “how structures and deeper conceptual understanding come about” (Fosnot, 1996, p. 30). A large number of research studies have been conducted by constructivists (Brooks, 1993; Gergen, 1995; Glasersfeld, 1995; Fosnot, 1996).

PBL is a constructivist learning model, based on some of the central tenets of constructivism (Savery & Duffy, 1995), which include:

- (1) Construction is in our interaction with the environment. Understanding is an individual construction based upon our experience with content, context, and the learner's goals. It is impossible to separate the knowledge domain from interaction in that domain.
- (2) Cognitive conflict or puzzlement stimulates learning. The goal of the learner is central in considering what is learned. It is not only the stimulus for learning, but also a primary factor in determining what the learner attends to, and what prior experience the learner brings to bear in constructing an understanding.
- (3) Understanding is influenced through the social negotiation of meaning. Knowledge does not represent some ultimate truth, but is simply the most viable interpretation of our experiential world. Social negotiation of meaning and understanding is based on viability.

There is an emphasis on contextualization of the learning scenario and learning though reflection is an important aspect of PBL. It is typically conducted in a small group-based approach, reflecting the constructivist principle of collaborative construction of knowledge by learners as well as the negotiation of meaning. Unlike conventional learning methods, PBL uses an integrated approach to learning based on the requirements of the problem(s) as perceived by learners.

PBL uses authentic, complex problem(s) as the impetus for learning. It features the acquisition of both disciplinary knowledge and problem-solving skills. An open-

ended problem is usually given to students and the problem is the same as the students would face in the workplace. PBL encourages students to develop a context-rich knowledge base and the skills needed to apply that knowledge. Learning in PBL is achieved in an authentic context where students learn how to apply knowledge to real problem(s). Moreover, the collaborative nature of problem-solving in PBL supports the social view of learning, the real-life problem-solving activities give students the opportunity to collaborate and generate speech, so a constructivist approach challenges teachers to design activities in which language learners can be engaged in collaborative problem solving.

PBL involves the complexity of cognition and behavioral interaction. PBL is like action science. Reflection is central to the activity of learning. It refers to the type of disciplined thinking about an experience relevant to managerial problem-solving (Bridges, 1992). Reflection is a key component of PBL, which seeks to promote a continual experimentation with possibility, and it is an ongoing challenge to existing answers and a constant creation of assumptions that guide actors in their complex problem-solving process.

Because of the basic principles of constructivism, it can be regarded as putting an emphasis on the learners because they can learn to a better level if they construct their own learning. The PBL approach to language teaching can provide such opportunities for students to engage in language learning and enhance their language ability.

### 2.1.5 PBL and Vygotsky's Social Constructivism

The notions of social interaction learning and the cognitive Zone of Proximal Development were introduced by Vygotsky, a Soviet psychologist who developed social constructivism. In his theory, children's learning must be guided and supported by adult modeling and corrective feedback (Byrnes, 2001).

Vygotsky's Social Constructivism Theory of Learning (1978) points out that human intelligence stems from the culture in which we live, human cognition occurs firstly in interaction with other human beings on a social level, and then appears within the individual. He proposes that social interaction plays a fundamental role in the development of cognition, and argues further that learning is not simply the assimilation and accommodation of new knowledge by the learners, but the process by which learners are integrated into a knowledge community. Based on his analysis, an individual's knowledge of the world is bound to personal experience and is mediated through interactions with others.

According to Vygotsky's theory, problem solving and other skills are placed into the following categories:

- (1) Those performed independently by the student;
- (2) Those that cannot be performed even with help;
- (3) Those that fall between the two extremes, namely, tasks that can be performed with help from others.

The third category is what Vygotsky calls the Zone of Proximal Development (ZPD), the domain in which the student is ready to grow. Children are always learning new things, and the ZPD changes as new skills are acquired. Referring to ZPD, Jaramillo describes it as:

“...that area between what a learner can do independently (mastery level) and what can be accomplished with the assistance of a competent adult or peer (instructional level). Teachers activate this zone when they teach students concepts that are just above their current skills and knowledge level, which motivates them to excel beyond their current skills level.”

Jaramillo (1996, p. 138)

Students are guided and supported through learning activities that serve as interactive bridges to get them to the next level. Thus, the learner develops or constructs new understanding by elaborating on their prior knowledge through the support provided by individuals that are more capable (Raymond & Fletcher, 2001). Studies have actually shown that in the absence of guided learning experiences and social interaction, learning and development are hindered (Bransford, 2000).

In PBL, learning depends on various factors. Teachers will lend various levels of assistance over various interactions leading to problem-solving completion. The goal is to allow students to do as much as they can on their own, and then to intervene and provide assistance to them when it is needed. Vygotsky stresses that students need to engage in challenging tasks that they can successfully complete with appropriate help.

### **2.1.6 PBL as the Condition for Second Language Acquisition**

Research on second language acquisition has long recognized that language is best learnt through natural, contextualized use, that is, when it is utilized to perform authentic tasks. This belief has led to the development of a variety of task-based, project-based and content-based approaches in which students are given the opportunity to learn the target language by using it, rather than being presented with predetermined language structures and then practicing them (e.g., Short, Harste, & Burke, 1996; Willis, 1996; Skehan, 1998; Lee, 2002; Ellis, 2003; Alan & Stoller, 2005; Garner & Borg, 2005; Rodgers, 2006; Kohonen, et al, 2014). The PBL approach can allow learners to explore and assess issues while working on authentic, real-life tasks.

Second language acquisition is the process by which people learn a new language other than their native language(s) inside or outside the classroom. According to second language acquisition theory, not all learners acquire language in the same way or for the same purposes (Klein, 1986). The conditions learners need for acquiring a language include a propensity for language learning, language faculty, and access to the target language. In other words, the second language learning process requires a psychological tendency for language learning. Krashen (1981) formulated a theory called the Monitor Model that aroused widespread interest during the 1970s. He has drawn attention to the problems of language learning, i.e. whether or not the more intuitive and less deliberate learning methods are effective. Spolsky (1989) points out four conditions which support optimal language learning. Although there may be other

conditions, these four are the most widely researched and supported in the literature and make up a general model of conditions for optimal language learning environments.

Egbert (2004) summarizes these four conditions in brief:

Condition 1: Opportunities for learners to interact and negotiate meaning with an authentic audience;

Condition 2: Learners involved in authentic tasks, which promote exposure to and production of varied and creative language;

Condition 3: Learners have opportunities to formulate ideas and thoughts and promote intentional cognition;

Condition 4: An atmosphere with ideal stress/anxiety level in a learner-centered classroom.

In terms of the four learning conditions, learning is essentially interaction between learners and others (Ahmad & Corbett, 1985). Learners should work cooperatively together to help each other (Johnson, 1985). As learning is such a social process, social interaction is necessary for it (Vygotsky, 1978). These four learning conditions comply with Schmidt's view of the aim of education, that is, education should help students in activating relevant prior knowledge, provide a context that resembles the future professional context as closely as possible, and stimulate them to elaborate on their knowledge (Schmidt, 1983).

Meanwhile, language learners must be involved in purposeful interaction. Pica (1987) says learner involvement in authentic social interaction in the target language



with a knowledgeable source (e.g., the teacher, another learner, and a technology) facilitates language acquisition. Johnson (1991) explains that an authentic task must provide learners with a reason to share ideas and information, preferably within a system that allows problem-solving tasks rather than with other activities. Learners must be given the opportunity to reflect on and communicate their ideas under guidance either from their peers or others. During the learning process, learners must also be mindfully engaged and willing to communicate and share their ideas. PBL supplies such an opportunity to learners.

### **2.1.7 Characteristics of PBL**

As a teaching approach, the PBL approach involves some factors which make it different to conventional teaching methods. The seven general characteristics are as follows (De Graaff & Kolmos, 2003):

- (1) PBL should be student-centered;
- (2) Learning occurs in small student groups under the guidance of a tutor;
- (3) Tutors or teachers act as facilitators or guiders compared to traditional teaching methods;
- (4) Authentic problems are primarily encountered in the learning sequence, before any preparation or study has occurred;
- (5) The problems encountered are used as a tool to achieve the required knowledge and the problem-solving skills necessary to solve the problem eventually;
- (6) New information needs to be acquired through self-directed learning;

(7) Essential for PBL is that students learn by analyzing and solving representative problems.

In the PBL approach, what is most important is that PBL programs should be discussed in the context of real world problems, the way that students can access problem information, the nature of problem-based group interaction, and the type and specificity of the learning resources provided for content-based materials. Evaluating the impact of these structural variations in PBL is complicated by the intervening role of self-directed learning processes (Albanese & Mitchell, 1993). The assessment of the application of knowledge when solving problems is the core of the issue. Therefore, test items require examinees to apply their knowledge to commonly occurring and important problem-solving situations (Segers & Dochy, 1999).

#### **2.1.8 The Problem in PBL**

In the PBL approach, the problem is crucial to its implementation. Teachers or tutors need to strive to construct problems that can serve as the necessary impetus to begin the process of learning. Problems should be adapted to the knowledge level of the students. They should engage students' interests, motivate them to search for more knowledge independently, and allow them to relate the new concepts being introduced to previous knowledge (Suh, 2004). Problems are vehicles by which students obtain knowledge in a variety of disciplines. They play key roles in the learning process because the preliminary discussion about these problems in the small group will help students mobilize whatever knowledge is already available to them. Then, students can

actively construct explanatory models based on their prior knowledge, which in turn facilitate the processing and comprehension of new information.

Furthermore, Savin-Baden and Major (2004, p. 17) mention that the quality of problems in PBL should have the following aspects:

- (1) The problems are clearly stated;
- (2) The problems are suitable for applying a systematic work procedure;
- (3) The problems can sufficiently stimulate group discussion;
- (4) The problems can give sufficient opportunities to formulate learning goals;
- (5) The problems can sufficiently stimulate self-directed learning.

In theory, there are two kinds of “problems” in the PBL approach: ill-structured problems and well-structured problems. At the initial stage of tackling a problem in PBL, it will generally be ill-structured, because when the students first encounter the problem, there is insufficient information for them to understand or solve it well. The problem will often be ambiguous, incomplete, confusing or conflicting, and additional information will be needed (Wee, 2004a). There are always alternative methods of solving a problem through inquiry. Students have to clarify or justify reasons and to integrate their previous knowledge with their new knowledge.

A well-structured problem in PBL means that the information required to solve the problems is provided. There is usually a prescribed way to proceed in solving the problem (Wee, 2004b). Wee stated (2004a, p. 35) “a well-structured problem is not appropriate for promoting problem-solving skills”, because it is not challenging, not

good for generating ideas, and cannot lead to free inquiry, cannot be practiced and even developed.

The problems should promote the acquisition of knowledge and the development of skills and accommodate a variety of teaching and learning strategies and style. The difficulty lies in finding a plausible context for the problem. During the inquiry process that learners go through to develop solutions, they need to use language to obtain and communicate information, express opinions, and negotiate, as they would in occupational domains. As they document discussions and make decisions, or consult reference materials, talk to others, and present findings, they learn to listen, speak, read, and write effectively. They develop vocabulary, learn rules of grammar and conventions of social language use, and integrate the use of different sign systems.

In short, in order to construct an understanding of a problem related to language learning as it is used in real world contexts, students must go beyond textbooks to pursue knowledge in other resources in their group work. PBL is more and more widely applied in academic settings and interdisciplinary contexts of study. Students with such ingrained skills are well prepared for occupations which rarely have a supervisor who has the time, inclination or knowledge to tell them what to do. They are also well prepared for the overwhelming amount of unprocessed information that is so intimidating for the beginner, but reflects the reality of a knowledge society.

The present study used ill-structured problems which focus on stimulating students' attention to learning. The researcher constructed problems for teaching

materials from real-medical cases in clinical situations which are a complicated medium in order to make it challenging for the students.

### **2.1.9 Group Work in PBL**

Group work in PBL is assumed to be a cooperative learning experience and it has positive effects on learning (Willis, Jones, & Canaan, 2002). Several studies provide empirical evidence that group work stimulates cognitive effects and leads to the restructuring of knowledge and enhances intrinsic interest in learning (Sobral, 1994; Hmelo, 1998; Maudsley, 1999; Albion & Gibson, 2000; Maudsley & Strivens, 2000; Dolmans, et al, 2001; Ngeow & Kong, 2001; Songhori, 2008).

First, group work helps to distribute the cognitive load among the members of a group and allows the group as a whole to tackle problems that necessitate access to knowledge beyond that possessed by any individual group member (Pea, 1993; Salomon & Perkins, 1998). Second, cooperative learning helps students become united in particular topics. Third, group discussion encourages individuals to coordinate different points of view, to enhance reasoning and improve high order thinking skills, all of which can promote shared knowledge construction (Brown & Eisenhardt, 1995; Goldman & Hasselbring, 1997).

In the present study the PBL approach used in medical language lessons, the students were divided into eight groups of six in each group, and the teacher who acted as a facilitator not a deliverer of information in teaching.

### **2.1.10 Thinking Process in PBL**

Thinking process has been the focus of several current implementations in educational settings. Thinking is based on relating and drawing conclusions on notions and events, and involves a variety of different cognitive processes such as implicating, problem solving, examining, reflecting and criticizing. It is necessary to examine these notions objectively, scrutinize on the contents of these skills, and elaborate on the ways to equip individuals with such skills. Problem solving involves cognitive, sensory and psychomotor domains which helps instructors to resort to a large variety of contexts and materials. However, it was maintained that the most valid and reliable way to equip individuals with problem solving skills is to integrate it with creative thinking and decision making (Ulusoy et al., 2012).

According to Brookfield's survey(2009) some researchers insist that there is no standard approach to facilitating thinking process, while others advocate the use of specific strategies. However, many teachers (Margetson, 1991; Duch et al., 2001; Dolmans et al., 2005; Bosuwon & Woodrow, 2009) think that among educational strategies, PBL is thought to promote thinking process and it delivers education through the traditional lecture format, on the other hand, it puts emphasis on the learner's learning to think critically.

PBL actually stimulates and enhances students' thinking process skills. Problem-based learning enables students to analyze situations or problems critically and to find meaningful solutions (Rideout & Carpio, 2001). These students clarified the

issues in the scenarios, assessed the need for further information, determined, and detected the intended and actual inferential relationships among the concepts. In small-group discussions, students shared the newly acquired information, generated a number of possible hypotheses to explain the situation, debated the issues related to the situation, derived the general principles from particular instances, considered the alternative solutions, and assessed the probability and strength of the conclusions. In contrast, as Yuan et al. (2008) points out students in the lecture group rarely had opportunities to experience problem-solving activities and small-group discussion. Based on the study results of Klunklin et al. (2011), in PBL lessons, the teachers analyzed the situation, determined the significance, interpreted the meaning, detected possible inferential relationships, and then used the existing information to draw a general conclusion of reasoning process. That is why the students in the lecture group had less practice in the thinking skills of analysis and induction. Consequently, the PBL students' thinking process reflected greater improvement.

In the present study, the students had more opportunities to speak in group discussion using the PBL approach. The focus of thinking process in PBL can be compared with PBL courses in other disciplines; thus, the PBL approach can also have effects on the students' thinking process in the context of medical English.

#### **2.1.11 Teacher's Role and Student's Role in PBL**

According to Barrow (2001), teachers should be active designers of the curriculum and facilitators of learning in PBL. As a curriculum designer, the typical

teacher's role changes from implementing externally made curriculum decisions to being an active decision maker in the curriculum planning process.

As a PBL tutor, the teacher's role changes from that of a disseminator of information to a facilitator of learning (Barrows, 2001). In a PBL class, teachers should act as meta-cognitive coaches, serving as models (Stepien & Gallagher, 1993). So teachers in PBL lessons should:

(1) Prompt students to use questions, such as "What is going on here? What do we need to know more about? What should we do to solve the problem?"

(2) Provide feedback so as to help students achieve a satisfying group discussion result.

Norman and Schmidt (2000) suggest that students benefit from immediate feedback from instructors so that misconceptions can be clarified promptly. Over a period of time, students will become self-directed learners and then teachers will fade into the background when helping students' with their learning (Stepien & Gallagher, 1993).

(3) A qualified language teacher in PBL must prepare and adjust to the changes that come with the implementation of PBL in lessons. Some researchers, Schmitt and Zimmerman (2002), Barrows, Wee, and Neo (2007) strongly suggest that teachers should provide unstructured time in the class in order for students to assemble their teams, work with resources, contact and meet with people who may be helpful to their thinking, and accomplish other tasks necessary for finding solutions to the problem. Hence, Creedy, Horsfall, and Hand (1995) think each lesson-delivery setting needs to be carefully planned in order to provide specific learning objectives for the enhancement of the overall learning process (cited in Wee, 2004a, p. 690).



In the process of implementation of the PBL approach in language teaching, students should:

- (1) Be a problem solver, try to overcome the barriers of switching over from conventional learning to PBL teaching, and understand the concept thoroughly by having interaction with tutors and peers.
- (2) Be a resources person, as it is necessary for students to understand the trigger or problem, and to be mentally ready to meet the problem confidently. Next, they should search for information through student-centered learning and gain personal self-learning ability.
- (3) Be one of a team, collaborate, try to practice their communication skills, solidarity and cooperate with others through problem solving.

With regard to these points, a research study conducted by Schmitt (1998) reveals that sometimes students may not fully achieve these learning aims initially with the implementation of the PBL approach, but students will be able to retain more than their traditionally educated counterparts. What is more, they can acquire life-long, self-directed learning skills to a greater degree than other students.

#### **2.1.12 Advantages of PBL in Education**

According to Hutchinson and Waters (1987), and Wee (2004a), PBL has a number of advantages, such as the following:

- (1) It helps students practice brainstorming about relevant issues and discuss practical solutions.

- (2) It shows the students that language learning is most effective when they are actively involved and learn in a context where knowledge is to be used for a specific purpose.
- (3) It shifts the emphasis on language learning activity from teachers to students. It can also help students become autonomous learners who will transfer the skills learned in the classroom to their lives outside the classroom.
- (4) It will encourage students to work at a high level of analysis, synthesis and evaluation. As a teaching approach, it has both linguistic benefits, on the role of natural, meaning-focused classroom interaction in language learning and affective benefits in the form of raising students' motivation and promoting autonomy.
- (5) It promotes meaningful interaction in the classroom, which occurs while students are dealing with real-world problems that are more authentic in meaning than interaction produced during other types of activities.
- (6) It encourages focused-learning based on relevance to the student's identified objectives, ensuring that the process of knowledge acquisition is effective and efficient.
- (7) It has the function of activating students to interact with each other in listening and speaking. While students are focusing on problem solving, they will try to overcome linguistic obstacles, retrieve prior knowledge of the language and attempt to use the language to suit a specific situation. Finally they will become more skillful language users.

- (8) It is an approach which emphasizes learner-centered orientation. It can provide learners with abundant learner-centered tasks so as to involve them in the process of understanding, analyzing and solving problems. Therefore, the learner's performance as well as competence will be developed.
- (9) As regards teachers, they can experience a new teaching approach in teaching and experience the creation of innovations in their teaching.

### **2.1.13 Disadvantages of PBL in Education**

In implementing PBL in the language classroom, many problems can be anticipated. Teachers may encounter these problems when conducting PBL lessons (Creedy & Hand, 1995; Dahlgren, Castensson & Dahlgren, 1998; Hendry, Frommer, & Walker, 1999; Dixon, 2000; Farrow & Norman, 2003):

Teachers have to face a tremendous amount of content-knowledge materials involved in fundamentally restructuring a curriculum when they are using the PBL approach. Each lesson-delivery setting needs to be carefully planned in order to provide specific learning objectives for achieving positive results with the overall learning process. Some teachers do not clearly understand how to give good guidance to students in PBL. Some teachers cannot even supply an ill-structured problem with major based knowledge and cannot select proper topics for students to discuss.

At the same time, the students who take part in the PBL lessons may have the following problems: Farrow and Norman (2003) point out that most students have progressed through a typical education system where knowledge is divided into

arbitrary disciplines and taught to them through lectures, so they have difficulty initially adapting to the PBL course and feel frustrated. Students may use their native language rather than English when working in groups on the assigned problem. Furthermore, they may expect the other group members to speak more in group work. Because their language proficiency is not sufficient for the task, so their creativity and enthusiasm will naturally drop. This may lead to frustration and disappointment. That is why PBL may not be appropriate for students at beginners' level whose speaking and reading skills in English are limited.

All in all, the PBL approach remains a potentially useful teaching tool until now. There has been a lot of debate and discussion which have centered on the compatibility of subject matter, students' backgrounds and the effectiveness of the teaching methods.

## **2.2 Process of Problem-based Learning**

Many scholars (Schmidt, 1983; Savery & Duffy, 1995; Barrows, 1994; Savin-Baden, 2000; Mathews-Aydinli, 2007) discuss how the PBL approach can be applied in real classroom teaching. In this study, there are five steps for the application of the PBL approach in classroom teaching as used by Tan (2003) whose methods were adopted in this PBL teaching and learning research study. Tan recommends that (i) the teacher introduces PBL to students, (ii) the students present the problem, (iii) they discover and study related information and resources of the problem, (iv) they present solutions and reflect on the problem-solving approach, and (v) they evaluate the whole learning process. Each of these steps is described in the following section.

### **2.2.1 Introducing PBL at the Beginning of the Lesson**

Introducing PBL to students might initially perhaps cause some chaos and panic, since the the PBL approach might be unfamiliar and make great demands on their ability to carry out both cooperative and independent learning. In this approach, the different role of the teacher and students are very different from the general lecture-centered approach (Wee & Kek, 2002).

At the beginning the teacher will tell students that they have to work in groups and learn to solve problems by themselves. They must learn to share, discuss and express ideas and opinions. They have to respect their group members' opinions and contributions. Furthermore, they need to be trained to be positive and provide constructive feedback to the group members.

The teacher should not interfere in the learning process but try to facilitate the students. During the process of PBL learning the teacher should attain the learning outcomes, such as problem-solving skills, team skills, self-directed learning skills and acquisition of new knowledge, and focus on the procedures of the group. He or she can provide a brief purposeful introduction to the lesson, typically teacher-led, trying to develop a situation to motivate the students' interest in learning and engaging the students to participate in PBL with confidence.

### **2.2.2 Presenting the Problem**

It is important to set specific learning objectives for the problems in PBL teaching, because it helps the students to focus on their learning and know what they

are expected to accomplish. This will provide them with guidelines to achieve their aims in the group work.

In this step, the teacher will give a problem to each of the students and they begin to discover what they already know or understand about the problem. They will realize what they need to do before they can solve a problem. The teacher will monitor, guide and give feedback to help students achieve their learning objectives.

Next, the students will use their own knowledge and skills. They will try to consider what needs to be tackled. They have to make a decision about what information they should look for to solve the problem. Although the students are expected to work independently, various sources of information have to be taken into account. They will be asked to agree on the appropriate resources they will need to use in order to gather further knowledge for the solution of the problem. It is a good opportunity for them to judge what information and resources are useful or not. The information and resources include surveys, research, journals, textbooks, online databases. Then the students will study these and come back with “better-informed explanations of the issues and questions posed” (Tan, 2003, p. 36).

### **2.2.3 Discovering and Studying**

In this step, the students put together and share the information they have discovered individually. Each of them reports their learning discoveries to the group members on the basis of the information they find. It can be said that PBL promotes a peer-teaching stage because the students have an opportunity to practice group

cooperation and communicative skills by sharing and questioning for further information. They can learn new knowledge and apply it to the understanding of the problem in this step (Wee & Kek, 2002). It also creates a link to their existing knowledge through constructivism. Later the students will be able to recall the process of problem-solving and their search for information.

The teacher has to ensure that the key areas to be learned are not overlooked and he/she will also question the students on the accuracy, reliability and validity of the information obtained (Tan, 2003).

#### **2.2.4 Presenting Solutions and Reflecting**

After the step for discovery and study, the students have to report and present their solutions. When they present the solution with regard to the problem scenario, a reflective and evaluative process is conducted. This involves “contextualization and application of knowledge to the situation” (Tan, 2003, p. 37). The students will rephrase and paraphrase the knowledge obtained and illustrate their new knowledge. At this step a questioning approach is encouraged.

The teacher’s responsibility is to help the students clarify doubts or be aware of any gaps in their knowledge or of any misconceptions.

#### **2.2.5 Evaluating Learning Progress**

As mentioned above, the PBL approach focuses on self-directed learning and self-evaluation, which is an essential part of the evaluation. It is viewed as an integral part of learning as well. Each student is encouraged to reflect on the new knowledge he

or she has learned as a result of problem-solving, and assesses the performance of the learning objectives for this lesson. The evaluation can be done with regard to how the students perform as problem solvers, self-directed learners, and as team members.

The students have to be trained to provide and receive criticism. The teacher will also summarize and integrate the major principles and concepts of the whole problem-solving process at this step. Furthermore, each of the students will be involved in individual self-evaluation through the criticism of the student group. All the strengths and weaknesses of the students' performance will be useful for their PBL lessons.

Following the processes of PBL suggested by Tan in 2003, the present study adapted five steps of the PBL lessons, which includes: (1) introducing PBL in class; (2) identifying the problem; (3) learning the resources and searching for information; (4) sharing information and making reflections in groups; and (5) presenting the solutions and evaluation.

### **2.3 Research Studies on PBL and Language Teaching and Learning**

PBL is a teaching approach that develops both problem-solving skills and disciplinary knowledge bases. It requires from students a high level in the learning process, such as analyzing, comparing, explaining and hypothesizing and also applying the outcome of these processes to develop a solution (McAlpine & Clements, 2001). The PBL approach is well-known and widely implemented in medicine, scientific and business teaching pedagogies throughout the world (Duffy, et al, 1993). However, there



has been little evidence and few research studies showing that the PBL approach can be implemented with success in language teaching, and even less in ESP teaching. So it is worth trying to implement PBL as an innovative approach in language teaching to find out whether it can be effective in stimulating students' second language acquisition development.

The following is a presentation of the research studies about the PBL approach to language teaching and learning.

### Research study 1:

Title	Problem-solving and EAP: Themes and issues in a collaborative teaching venture
Author	Colin Barron
Year	2002
Purposes / RQs	<ol style="list-style-type: none"> <li>1. To investigate the collaboration between subject teachers and EAP teachers and the problem of reconciling what appears to be incommensurable discourses.</li> <li>2. To investigate the difference between task-based learning (TBL) and problem-based learning (PBL).</li> </ol>
Participants	68 second-year science students in the English Centre and the Science Faculty at the University of Hong Kong.
Context	<ol style="list-style-type: none"> <li>1. This takes a look at the issues affecting EAP and Science, in particular, functionalism in EAP and realism in Science, the dominant philosophies underpinning these disciplines, and how they affect collaboration.</li> <li>2. It discusses the principles of collaboration to offer a more dynamic alternative than discussions in the EAP literature have suggested.</li> <li>3. It investigates the status of the problem domain within TBL and PBL and offers constructivism as an alternative teaching philosophy to provide a better possibility for collaboration than functionalism.</li> <li>4. It offers experiences with the course to provide a practical illustration of the issues.</li> </ol>
Findings	If the teachers did not perceive their own area as suitable for being taught with another field of study in PBL, there were conflicts between subject teachers and language teachers, although the teaching approach and content taught by the subject and language teacher were appropriate. Task-based learning units did not result in such conflicts.

**Research study 2:**

Title	Just what the doctor ordered
Author	Alistair Wood, Michael Head
Year	2004
Purposes / RQs	<ol style="list-style-type: none"> <li>1. Try to choose an approach, PBL, which was more student-centered and which did not depend to such a great extent on the availability of existing materials, whether in EAP, premedical or medicine.</li> <li>2. Try to characterize PBL as an approach and attempt to indicate the advantages it brought to the implementation situation.</li> </ol>
Participants	12 science students at the University of Brunei Darussalam (case study)
Context	This article describes a case study of an approach to medical education known as problem-based learning, which has been applied to the teaching of a biomedical course. It is suggested that the course fulfills the traditional requirements of an EAP course in tertiary education, but also satisfies the requirements of PBL in being a problem-oriented, group-based, student-centered approach which builds on the interests of the students.
Findings	The PBL approach not only teaches the kinds of processes that are traditionally taught in EAP, but also goes further than this by fostering the kinds of learning and study skills that PBL develops.

**Research study 3:**

Title	The challenges for ESP learners: Alternative assessment of performance and usefulness of class activities
Author	Kavaliauskien, Kaminskien and Anusienė
Year	2007
Purposes / RQs	To investigate learners' perceptions of the usefulness of various class activities in the ESP class, to introduce alternative assessments of performance, and compare learners' reflections on their learning.
Participants	96 students who study English for Specific Purposes at the Faculty of Social Policy, Mykolas Romeris University.
Context	A questionnaire on the usefulness of class activities, statistical treatment of students' responses, and learners' written reflections on learning. Class activities included computer tasks, presentations, summary writing, etc. Traditional testing of learner performance in class by creative assignments, discussions, and activities was replaced by alternative assessments. Student self-evaluation of performance has been submitted either in anonymous or signed form.
Findings	Students' reflections on language learning process and outcomes might be a valuable tool in language classes seeking to increase learners' motivation, enhance self-esteem, improve self-confidence and encourage the mastery of language skills.

**Research study 4:**

Title	Teaching aviation English in the Chinese context: Developing ESP theory in a non-English speaking country
Author	Aiguo Wang
Year	2007
Purposes/ RQs	To explore an appropriate approach to teaching aviation English in the Chinese context from the perspective of ESP curriculum development. It focuses on a contrastive study of aviation language between English and Chinese and aims to present a possible approach to ESP teaching more suitable to the Chinese context.
Participants	The study was about teaching materials design.
Context	<p>The content of the course was based on needs as determined by two professionals experienced as ESP and ELT instructors who designed and delivered a content-based language program in aviation linguistics, in the Civil Aviation University of China, which was an important component of the aviation English course. Perspective of ESP curriculum development in the Chinese context:</p> <ol style="list-style-type: none"> <li>1. Problems with methodology status quo.</li> <li>2. The curriculum of the aviation English course and its proper teaching methodology. <ol style="list-style-type: none"> <li>a. Phonetic contrast.</li> <li>b. Semantic contrast.</li> <li>c. ESP collocation acquired through a contrastive approach.</li> <li>d. Bilingual education with computer-assisted instruction.</li> </ol> </li> <li>3. Time allocation for the teaching of aviation English.</li> <li>4. Some of the challenges in designing ESP courses in the Chinese context.</li> </ol>
Findings	The study describes a contrastive analysis of aviation language between English and Chinese. It aims to offer a possible approach to ESP teaching more suitable to the Chinese context. By teaching aviation linguistics and thereby continuing to develop aviation English courses, we should be able to steadily improve systematic and comprehensive curricula of aviation English with the joint efforts of fellow language practitioners. It is hoped that this study has provided some insight into the challenges facing the ELT instructor acting as an ESP/aviation English curriculum developer.

**Research study 5:**

Title	Problem-based and task-based learning approaches for English writing course
Author	Phanitphim Sojisirikul and Peerasak Siriyothin
Year	2010
Purposes / RQs	<ol style="list-style-type: none"> <li>1. What are the elements and considerations in integrating a PBL unit to improve the writing skills of students in LNG104(A writing course Content-based Language Learning I at King Mongkut's University of Technology Thonburi, Thailand) ?</li> <li>2. Are there any differences in language learning between the PBL and TBL approaches?</li> <li>3. What are the students' attitudes towards language learning through PBL?</li> </ol>

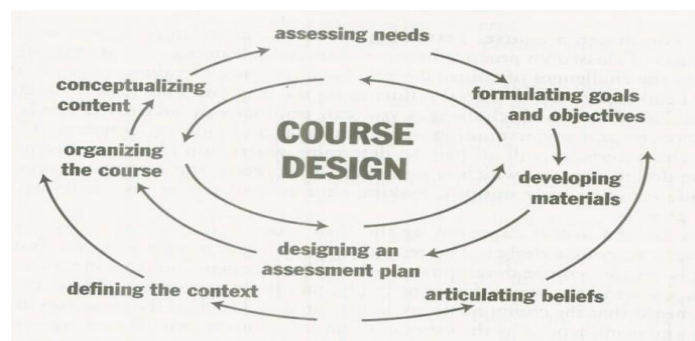
Participants	84 second-year undergraduate students, divided into two classes, who studied in the Faculty of Industrial Education and Technology and the Faculty of Engineering at King Mongkut's University of Technology Thonburi, Thailand.
Context	To integrate a problem-based learning unit into English task-based learning course in order to improve the writing skills of students at KMUTT. The five instruments used were to collect data as follows: 1. Formative assessment of the PBL unit. 2. Students' writing task. 3. Scores of writing task and tests. 4. Questionnaire. 5. Semi-structured interview.
Findings	There were a number of positive aspects promoted by the PBL approach to students' learning. The unit could not only be used to language teaching, but also to develop language proficiency among students. The students had positive attitudes towards this approach. The outcomes of the study are beneficial for schools that want to adapt or adopt PBL for language teaching. The teaching plan of this study is also applicable for further development of course or curriculum design.

From the above review of the relevant literature, we can see that the number of studies is limited. However, the results provide convincing evidence that PBL is worth exploring in the language teaching field. These results offer some useful insights that are applicable to the present study. The positive findings are worth further investigation; the methodologies provide some good ideas for the present study. The previous studies still leave some gaps such as how PBL lessons would be designed in a medical EFL context and how it could be implemented. The present study aims to design PBL course materials and to implement them in a Chinese context. The effectiveness of the PBL approach in stimulating the development of students' speaking ability is rarely mentioned in the previous studies, and it is still not clear how PBL can be well applied in an ESP course to produce the expected results and to what extent. Therefore, it remains a problem as to how effectively the PBL approach can be used in a medical university to improve and accelerate students' speaking ability. All this enhances the

difficulty of the present study, yet highlights the significance and great value such a study could contribute to the development of English teaching in the area of Medical English. From this point of view, it represents a great challenge to the researcher in terms of research design, teaching materials preparation and implementation of the PBL approach.

## 2.4 PBL Teaching Materials Development

Graves (2000) states that teaching materials development means creating, choosing or adapting, and organizing materials and activities so that students can achieve the objectives of the course. The design of teaching materials involves putting teaching principles into practice. A language course design is composed of several parts, including the objectives, the teaching materials and methods, the instruments and criteria of assessment and evaluation, and the methods of data collection and analysis. Graves (2000) provides a framework for the processes of course development in her book, which is illustrated in Figure 2.1:



(Graves, 2000, p. 3)

**Figure 2.1 Framework of Course Development Processes**

According to Graves (2000), there is no hierarchy and sequence in the framework for course development. It can begin anywhere and still make sense wherever it begins. In Phase I of PBL materials development in the present study, the researcher begins with analyzing the content, then moves onto the design and development of materials, and ends with developing teaching plan to organize the course.

Another choice for the design of PBL materials is based on Merchant (1995). Merchant thinks that the design of PBL materials is informed by cognitive theory and that it should include: (i) designing from scratch and converting existing “case problems” into PBL materials; (ii) guiding or consulting practitioners in designing; (iii) getting assistance from colleagues and reviewing publications. PBL materials should either replicate real-world communicative tasks or provide rehearsals for such tasks. The materials incorporate discussion and practice with strategies known to facilitate performance in problem solving (Cotterall, 2000).

In the present study, the materials design adopted Graves’ (2000) main steps and, furthermore, the researcher also took into account the points used by Merchant (1995) because of the particular needs of the PBL approach and the features of an ESP course.

With regard to PBL material design, the essence is that it should incorporate real-world problems, so it should supply authentic problems and related materials. According to Hadley and Terry (1993), authentic material refers to spoken and written texts that are used by native speakers in the real world. In addition, Merchant (1995)

considers that one PBL project requires 6 to 21 hours of inside and/or outside class hours. Therefore in the present study, 10 hours is set for classroom teaching and about 5 hours is arranged for activities outside class with a total of 15 hours for the solution of each problem.

Cunningsworth (1995) suggests that teachers on ESP courses can produce their own materials based on certain specialized texts. Because ESP has real target language usage, it requires a diversity of resources for its information. A variety of resources, such as the internet, newspapers, and magazines can be used for obtaining ESP teaching materials.

Based on the characteristics of the PBL approach and the principles of materials design, the materials development of this study will reflect the following features: (i) to draw on what students know (their experience, their current situation) and to relate the teaching materials to these aspects; (ii) to focus on students' needs outside class; (iii) to allow students to discover, analyze and solve problems; (iv) to help students develop their specific skills and strategies; (v) to help the students use relevant language to develop their communicative skills in the medical field; (vi) to enable students to understand how a text is constructed and learned; and (vii) to enhance their awareness of various types and purposes of teaching materials in Medical English.

The researcher's journal is the core resource to help with the completion of the design of all the materials.

## **2.5 Teaching and Learning Spoken English**

In this section, four aspects of teaching speaking will be discussed: (i) the nature of the interaction in speaking and communication; (ii) the studies of approaches used in teaching spoken English; (iii) the main constraints identified in the teaching of spoken English; and (iv) how to evaluate spoken English.

### **2.5.1 Nature of Spoken Interaction**

Interaction is the key to teaching language for communication, whether in spoken or graphic form. Comprehension and expression of meaning are in constant interaction in real-life communication (Kintsch, 1988). Interaction plays an important role in language-learning situations (Brown, 2001). Adopting interactive language teaching in class will enhance teaching effects (Lei, 2005). Liu (1999) holds that students will gain confidence in using target language in an interactive classroom.

Through interaction, students are able to learn much more from one another in a friendly atmosphere. As more opportunities are provided to each student to use the target language, better results will be achieved with constant practice. Thus, students will be inspired to express their thoughts and their enthusiasm will be kept up all the time.

The interactive nature of spoken language is examined by Bygate (1987, cited in Nunan, 1999). He suggests that learners need to develop skills in the management of interaction and also in the negotiation of meaning. So learners can benefit from practicing interactive activities. According to Nunan (1999, p. 32), successful spoken



communication involves the development of the following:

- “- mastery of stress, rhythm, intonation patterns;
- an acceptable degree of fluency;
- skills in the management of interaction;
- skills in negotiating meaning;
- conversational listening skill (successful conversation requires good listeners as well as good speakers);
- using appropriate conversational formulae and fillers.”

From this point of view, the skill of speaking is the most important aspect in relation to spoken interaction to achieve success in speaking a second or foreign language. This can be evaluated in terms of the ability to carry out interactive activities in language. Teachers can help students achieve the ability to interact freely with others. Interaction in communication includes sending messages, receiving them, interpreting them, and negotiating meaning. Meanwhile, teachers have to design interesting and meaningful activities to motivate students, so that they will participate voluntarily in the activities.

All in all, learning to speak in a second or foreign language will be easier when learners are actively engaged in attempting to communicate. Learners can learn to speak only by speaking. The process of learning how to speak is equal to providing learners with opportunities to speak English more spontaneously and creatively.

### **2.5.2 Approaches to Teaching of Spoken English**

In retrospect, the teaching of spoken English has experienced changes and reforms with the application of different teaching approaches and methods. Changes in teaching approaches have reflected recognition of learners' needs and also reflected

changes in the theories of the nature of language and of language teaching (Richards & Rodgers, 2001).

The direct method holds that language is not knowledge but a skill or habit that cannot be grasped by learning theories. It advocates that the aim of teaching spoken English is to help learners use English as native speakers do. This method was considered effective at that time and it has produced a great impact on the teaching of spoken English.

Then the audio-lingual method came into being in the 1960s, which led to a new stage in the teaching of spoken English. It viewed English learning as the learning of a set of new language behaviors or habits. It suggested that stress should be laid on pattern drills, and learners should imitate the structure, pronunciation and intonation of each sentence from the very beginning. Underlying audio-lingualism is an instructional cycle of presentation, practice, and production (Nunan, 2001). Yet the method seemed to ignore or underestimate the natural spoken language. This method does not often strictly follow the rule system at all levels of structure. In this approach, the role of learners is passive.

Later the communicative approach claims that English teaching must serve students' need to communicate. It leads to an increasing awareness that the starting point of teaching spoken English must be the needs of the students. It advocates the fluency of English and encourages students to express their opinions freely in English from the beginning. This approach is in direct contrast to more traditional methods.

However, it is difficult to identify students' needs, which are the bases of the teaching syllabus. So this approach is considered to be inefficient in most cases (Underwood, 1984).

Another approach lays stress on learners' intelligence in the teaching of spoken English and concentrates on an understanding of linguistic rules so as to train students in oral skills in real life, which is named the cognitive approach and which was popular in the early 1990s. It favors comprehension of English as the premise of its practice and performance. In addition, the approach emphasizes meaningful learning, proposes that the most efficient teaching of English lies in an attempt to associate concrete and individual language items with learners' cognition. This approach asserts that an emphasis on meaningful drills is useful for improving the accuracy and appropriateness of learners' spoken English (Larsen-Freeman, 2000).

New ideas are continually arising, though almost no new approaches have appeared for a long time. Some ideas have a lasting effect on the teaching of spoken English, such as task-based learning instruction and cooperative language learning. However, in spite of different teaching methods, innovation in the teaching of spoken English in the last thirty years (from the 1980s till now) has been stimulated by a special concern for the language learning process (Larsen-Freeman, 2000). Larsen-Freeman (2000) points out that a task-based approach aims to provide learners with a natural context for opportunities to interact. Since learners have to work to understand each other and to express their own meaning, language acquisition is facilitated by such

interaction. However, the teaching of spoken English is somewhat inefficient and unsatisfactory because of the many changes and reforms in the methods used and because of some of the problems that occur when putting this method into practice. As a result, researchers have attempted to carry out more studies on the teaching of spoken English from a constructivist perspective, hoping to solve some of the problems raised in the teaching of English by previous approaches.

### **2.5.3 Main Constraints Identified with the Teaching of Spoken English**

Many college English teachers have implemented different teaching approaches practice. Some research has verified the application value of using new approaches in teaching the spoken language. However, there are some constraints, although these are minor factors compared with the benefits that they bring and the problems they can overcome.

- (1) Classroom management is a key issue given the complex structure of some communication activities. Some teachers claim that group work is difficult to manage and communication breakdowns frequently occur in the classroom. Successful group work, characterized by smooth flow of information and the exchange of ideas, will lead to the exploration and development of ideas through talking while unsuccessful group work will result in an early closure to the discussion or even a quarrel or silence (Yuan, 2003).
- (2) Some studies indicate that in a large group each group member has very little talking time.

- (3) One problem is that there are some students who have a tendency to dominate talking, while others speak very little or not at all (Ur, 1996).
- (4) Rodgers and Nordlinger (1998) find that students will use their native languages to talk since the teacher cannot supervise all the groups all the time in class. Therefore, students who share the same mother tongue may tend to use it rather than speaking in English. Thus, they may frequently slip into their native language.

In the present study, whether such problems will arise and affect students' spoken outcome performance is a problem that needs our attention in the process of implementing PBL medical English lessons. It is expected that solutions will be found through conducting the present research.

#### **2.5.4 Elements in Evaluation of Spoken English**

Spoken English can be evaluated by three criteria of linguistic performance: fluency, accuracy and complexity, which are commonly applied to evaluate learners' speaking ability (Skehan & Foster, 1997).

Fluency concerns "the learner's capacity to produce language in real time without undue pausing or hesitation" (Skehan, 1996, p. 22). The possible ways of measuring fluency involve speech rate, length of run, pause length, silence, false starts, repetitions and reformulations.

Accuracy relates to the extent to which the language produced conforms to the target language norms. Measures of accuracy vary among researchers. Skehan and Forster (1997) have chosen more generalized measures such as percentage of error-free

clauses or error-free T-units (a T-unit is usually defined as an independent clause and its dependent clauses) to measure spoken accuracy. Wigglesworth (1997) examines how accurately specific grammatical features are used, such as “verb forms” in terms of tense, aspect, modality or subject-verb agreement.

Complexity includes “the elaboration or ambition of the language that is produced and reflects learners’ preparedness to take risks and to restructure their inter-languages” (Skehan, 1996, p. 22). Measures of complexity are generally based on the extent to which subordination is evident. Sometimes, lexical complexity is also assessed.

Apart from the three criteria above, appropriacy is also used as a criterion for evaluating oral communicative ability in the context in which oral communication takes place. Appropriacy is judged according to what, how and when a person says something. For example, Yang and Weir (1999) propose a rating scale for CET-SET which comprises: accuracy and range, size and discourse management, flexibility and appropriacy. Appropriacy here is concerned with whether the utterance is suitable or not for the particular situation.

In this study, the researcher used criteria adapted from criteria for CET-SET to analyze group discussions in PBL lessons (see details at 5.2.1.1).

## 2.6 Group Discussion in English

Group discussion means that several students discuss or exchange opinions orally on some topics or questions in English (McCarthy, 1991). Research on collaborative group work in language has shown several benefits of group discussions for classroom learning. A study by Slavin (2004) reveals that collaborative work in the classroom stimulates student learning. There are specific linguistic devices for getting one's turn when one is unable to enter the normal flow of turn-taking or when the setting demands that specific conventions be followed (Gilbert & Dabbagh, 2005). One possible implication of discourse competence in group discussion is that the features (specific cohesive devices, transition signals, etc.) are located more towards the micro-level pole of the continuum, and awareness of the greater context is a necessary condition for creating and maintaining cohesion and coherence across texts (Gee, 2010).

Group discussion offers an opportunity for extended English speaking (and listening) practice by all of the contributors. Group discussion practice and skill development is therefore useful for all students. The dynamics of the interaction in group discussion plays an important role in speaking practice.

There are a number of different sub-skills which students will need to be able to use successfully and effectively in a group discussion. Students need to develop the ability to:

- (1) *Analyze*: This skill can be developed by giving students the topic individually and asking them to brainstorm or mind-map all the possible sub-topics they can speak

about. The students can then swap their notes and assess or analyze the relevance of each of the sub-topics that their partner has included.

- (2) *Persuade*: This skill is useful when students need to make decisions on how to do something.
- (3) *Control Emotions*: This can be practiced by giving the students a fairly controversial topic.
- (4) *Support*: One of the most important things for this skill is to make students learn when it is and when it isn't appropriate to interrupt and how to do it.
- (5) *Use functional language*: Depending on the types of group discussions that you plan to do, it is useful to draw up a list of useful functional language for the students to refer to. This will include phrases for functions such as "Giving reasons", "Giving your opinion", "Agreeing and disagreeing", etc.

(Retrieved from <http://www.teachingenglish.org.uk/articles/group-discussion-skills>)

Additionally, in group discussion, conversation strategies use is the systematic process by which people coordinate their talk in a verbal interaction (Hong-Nam & Leavell, 2006). Its emphasis in the group process has continued in small-group dynamics (McGrath & Kelly, 1984). Parker (1988), Stasser and Taylor (1991) give ideas in simulating group discussion. It is the set of practices and techniques whereby the conversant determines when to speak (once they want to) and when to listen in the interchange of talk, and what happens subsequently in various circumstances.

It is taken for granted that speaking is an integral part of daily life. However, Schmitt (2008) believes that: learning speaking is not that easy whether in a first or second



or other language, because it involves developing subtle and detailed knowledge about why, how and when to communicate, and it needs complex skills for producing and managing interaction, such as asking a question or obtaining a turn. He also argues that conversation analysts are mainly interested in how speakers achieve conversation strategies.

Padilha and Carletta (2002) illustrate the use of conversation strategies and explain how they are best characterized in conversation. In this regard, it is in discussions that pure conversation emerges more easily for extended periods, and in group discussion any number of participants can join in the discussion. Thus, discussions are the best ground to reproduce general conversation strategies use, one where it is employed and displayed continuously (Padilha, 2006), he also mentions that the interaction generated by simulation would correspond more directly to the patterns created in small groups.

As group discussion has many advantages in developing speaking skills, it is the major activity for the PBL lessons in the present study.

## **2.7 Cooperative Learning and Teaching of Spoken English**

Cooperative learning (CL) is popular in many disciplines. The theories of cooperative learning of different subjects are quite different. Johnson and Johnson (1990) state that any assignment in any curriculum for any age of a student can be structured cooperatively if the teacher has the proper training. Concerning the theoretical bases of cooperative learning, cooperative learning derives from constructivism. Oxford (1997)

states that cooperative learning refers to a particular set of classroom techniques that foster learner interdependence as a route to cognitive and social development. Collaborative learning has a “social constructivist” philosophical base, which views learning as the construction of knowledge within a social context and which therefore encourages the acculturation of individuals into a learning community.

As Ghaith and Yaghi (1998) have stated, language acquisition is determined by a complex interaction of a number of critical input, output and context variables, and cooperative learning has a dramatic and positive impact on almost all the variables critical to language acquisition. Furthermore, Johnson and Johnson (2000) maintain that cooperative learning offers three major benefits in language teaching and learning: (i) providing a richness of alternatives to structured interaction among students; (ii) addressing content area learning and language development needs within the same organizational framework; (iii) increasing opportunities for individualized instruction.

Cooperative language learning is the instructional use of small groups so that the students work together to achieve shared goals. It is a group learning activity organized so that learning is dependent on the social and structured exchange of information between learners in a group and in which each learner is held accountable for his or her own learning and is motivated to increase the learning of others (Olsen & Kagan, 1992). It may be used to teach specific content (i.e. medical knowledge in the present study) to ensure the active cognitive processing of information during lectures and to provide long-term support and assistance for academic progress.

Johnson, et al. (1994) reveal that nearly 600 experimental and over 100 correlation studies have been conducted on cooperative, competitive and individualistic efforts to learn since 1898. The multiple outcomes can be classified into three major categories: achievement, positive relationships and psychological health. The research findings clearly indicate that cooperation compared with competitive and individualistic efforts, typically result in higher achievement and greater productivity, more caring, supportive and committed relationships, and greater psychological health, social competence, and self-esteem. The findings revealed that the consistency of the results and the diversity of cooperative learning methods provide strong validation for its effectiveness based on the statistical data in the meta-analysis of 164 studies conducted by Johnson, Johnson and Holubec (1998).

In the present study, the students' speaking performance in group discussions was assessed to demonstrate the effectiveness of the PBL approach in medical English teaching and learning.

## **2.8 Summary**

In summary, PBL offers benefits to college English learning. PBL provides advantages, both for the acquisition of subject knowledge and the development of essential language skills and it also extends specific subject knowledge. Some of its disadvantages in education are mentioned as well.

In PBL, students are able to use a problem as a focus for the study of many different subjects, actively integrating this information into a system that can be applied to the problem at hand and to subsequent problems. The student needs to generate ideas, get information, look for cues, analyze and synthesize the data available, develop a hypothesis and apply reasoning skills to the problem in order to solve it. In particular, students can practice their spoken English in the process of cooperative learning in groups.

In the present study, the PBL approach was implemented in an ESP course, the researcher was a PBL materials developer and a teacher using PBL in teaching; the students tackled problem(s) as a stimulus for their language learning. They practiced discussions in cooperation with their colleagues, motivated themselves to learn medical English through the target problem and practiced spoken English in groups.

In the next chapter, the development and research methodology of the PBL lessons used in this study is discussed.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

This chapter explains the methodology employed in this study and describes how the study was conducted. It begins with the rationale of the research methodology and the methods used. Then it is followed by the research design including the participants, instruments, data collection, and data analysis.

#### **3.1 Rationale of Research Methodology**

The study employed a mixed research method: qualitative and quantitative, with the purposes of examining the process of PBL lessons design, the effects of the lessons on the development of students' spoken English in group discussions, and the students' perceptions of the implementation of PBL approach. Robson (2002) suggested that any research work can be classified according to its purpose as well as its strategies. Any research strategies, methods, and techniques employed must respond appropriately to the research questions of the study. Discussing research methods, Carey (1993) pointed out that quantitative and qualitative techniques are merely tools and a combination of the two allows us to answer questions more substantially. Johnson and Onwuegbuzie (2004) mentioned that the mixed research method is both possible and desirable. If the ultimate goal is to study different aspects of the same phenomenon, it is advisable that

the two approaches should be combined, because a mixed research method can enrich the information about the same phenomenon under study. The mixed method not only has cross-validation and is complementary in the context of research, but also provides grounds for triangulating the data of the research (Sale, Lohfeld, & Brazil, 2002).

For this study, the research design was a two-phase sequential mixed design which was composed of both qualitative and quantitative methods. Research Question 1 applied the qualitative method, while Research Questions 2 and 3 used both the quantitative and qualitative data.

Phase I in this study was a qualitative design.

The researcher documented the issues of the PBL lessons design and development by an EFL teacher and a PBL teaching materials developer. The data were exploratory and descriptive in nature. EFL teachers quite often encounter some problems in designing ESP teaching materials because of their unfamiliarity with the contents implementation stage. So it was essential for the researcher (both as materials developer and teacher) to study the nature of PBL lesson design. Besides, it was crucial to document every challenge that was encountered and the experiences during the process of designing the materials.

In Phase II, the study involved a pre-experimental design.

This research aimed to explore the effects of PBL lessons design in Phase I through the development of students' speaking ability. In Phase II the pre-experimental design was used as the research method. According to Martella, Nelson, and Marchand-

Martella (1999), the pre-experimental design is based on the fact that only one single group is studied, without a comparison between a control group and an experimental group. Pre-experimental designs include: a case study design, a pre-test and post-test design for one group and a static group comparison design (Pica, 1997). The benefits of administering the spoken pretest to all the participants were that it determined baseline scores, which were compared with those in the post-test, so it was clear that if there were changes in the students' spoken outcomes (independent variables) they resulted from the implementation of the PBL lessons and the PBL approach (dependent variables). In this phase, the PBL lessons and approach for medical English lessons were implemented and their effect on the development of students' spoken English in group discussions was examined. In addition, the students' perceptions towards the PBL lessons were focused on. In order to answer Research Question 2, quantitative data were collected from pair of pre-and post-speaking tests, while qualitative data were gathered from semi-structured interviews, students' logs, and recorded group discussions, all with the intention of enriching the quantitative results. Both quantitative and qualitative data were collected to compare and evaluate the development of students' speaking ability in group discussions. Therefore, it was appropriate to apply the mixed method in this study to generate information and collect data.

### 3.2 Participants

Forty-eight students majoring in the Medical Program in the School of Clinical Medicine at GMU, in the People's Republic of China participated in this study. All of them were third-year medical students from one intact class. They were selected by using a purposive sampling method. Maxwell (1997) defined this method as a type of sampling in which, "particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices" (p. 87). The main objective of purposive sampling was to answer the research questions with the greatest effects. The samples being studied represented the student population in the school. So, with the research findings, the researcher hoped to evaluate whether the PBL approach was effective in improving medical English teaching. Therefore, this study focused on the exploration of the nature of the PBL approach and an investigation of why and how the students changed their speaking ability under the PBL approach to teaching.

There were two reasons for selecting the third year medical students for the study: first, they had basic medical knowledge. The students should have some basic medical knowledge in order to understand the medical problems and related information. Second, they had acquired a certain level of English skills which enabled them to participate in group discussions. If this were not the case, it would be rather difficult for them to participate in group discussions in English.



All participants (48 students in the intact class) took the pre-and post-speaking tests. They were divided into eight groups with around six students of mixed in each. Throughout the whole study, one randomly selected group was the target for recorded group discussions in order to investigate the quality of their discussion discourse to support their pre-and post-tests scores. All participants were provided with the same teaching materials and received the same classroom teaching and guidance in keeping students' logs during and after classes. However, only the twenty-four selected students from the four groups participated in the semi-structured interview and only the data from their logs were studied and analyzed in the research.

### **3.3 Variables**

There were two types of variables in this study: independent variables and dependent variables.

The independent variables in this study focused on the PBL lessons and PBL approach, that is, the teaching materials and the teaching method for medical English teaching and learning.

The dependent variables, which could be affected by the independent variables, referred to the participants' speaking ability in group discussions in classes, and their interactions in the discussions. Hence, their English speaking skills in group discussions were studied and scored in the pre-and post-tests with great care. In addition, the students' perceptions towards the PBL approach and the materials were investigated and evaluated.

### 3.4 Research Procedure

In this study, the research procedure included two phases as mentioned previously. Phase I was the development of the PBL lessons, and Phase II was the implementation of the PBL lessons.

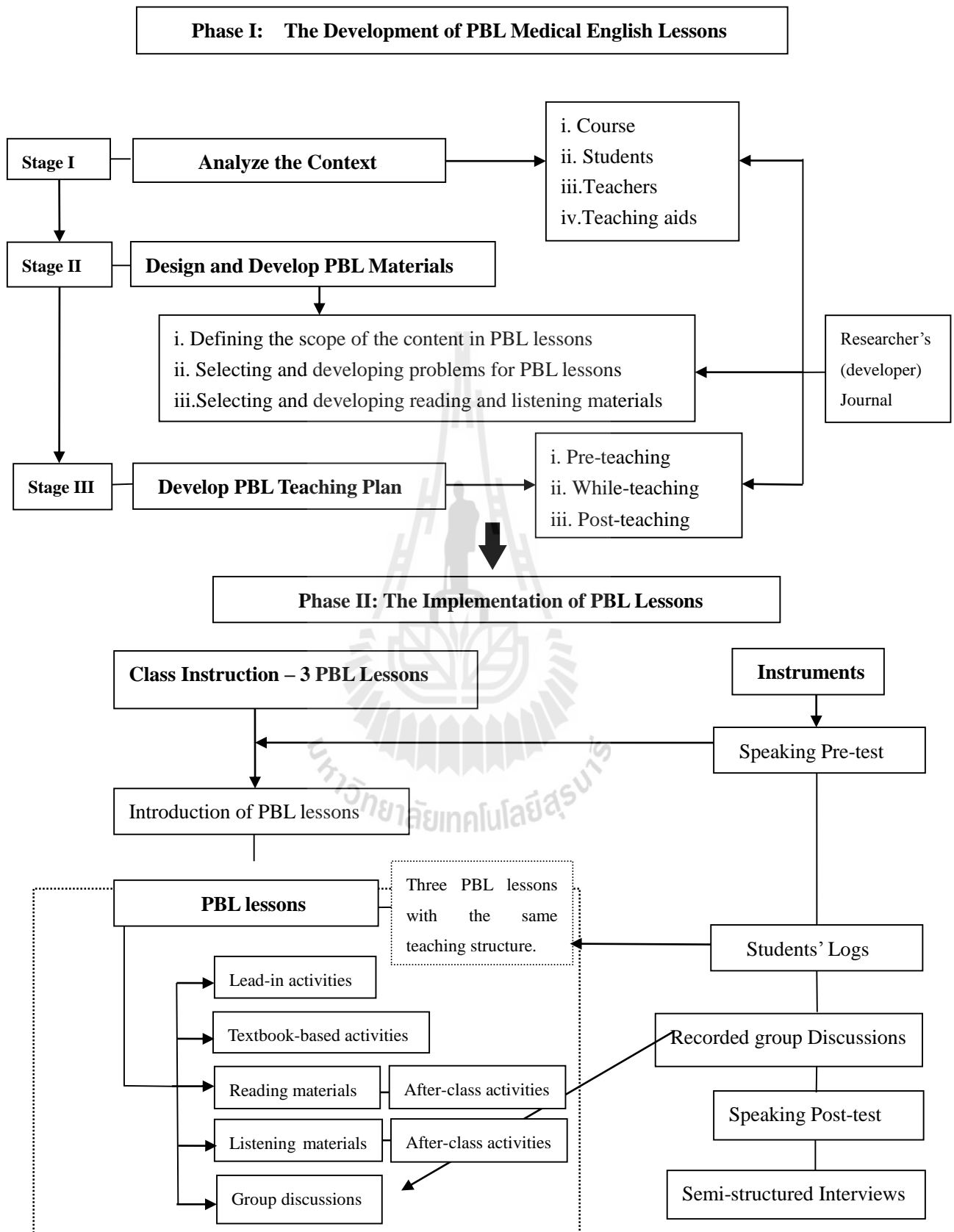
In Phase I, the researcher designed the teaching materials based on PBL problems. She also kept a journal of what she does during the process of PBL lesson development. She followed the framework of course development processes suggested by Graves (2000) (as mentioned in 2.4), and observed the two PBL materials design principles of Merchant (1995): (i) designing from scratch and converting existing “case problems” into PBL lessons; and (ii) guiding or consulting practitioners in designing.

The researcher reviewed the course syllabus first and determined the medical problems with a medium amount of medical content with the help of a medical teacher, then she provided related reading and listening materials concerning the problems. A total of three problems for 30-hours of lessons were designed (5 weeks for each problem for 2 hours each week). In addition, the researcher considered the characteristics of the problems in PBL, as well as the reflections and corrective feedback from the participants.

The design of PBL materials was the preparation for the implementation of the PBL materials in PBL lessons, which were given to the students in an English version to stimulate a discussion in English. The researcher used the text book in medical English with the title of *Contemporary Medical English Teaching Materials - Focus on*

*Health* (edited in 2010, Fudan University Press, Shanghai, China) as the base to prepare the three problems, making them appropriate to the students' medical knowledge and English proficiency. The related reading and listening materials were mainly extracted from the National Medical Practitioner Exam (NMPE) (it has three parts: the Elementary Comprehensive Test, the Special Comprehensive Test and the Comprehensive Practical Test). The clinical medical students must pass this special test to become qualified doctors in their careers. In addition, the researcher kept a journal regularly and designed the problems and related materials step by step so as to work out the whole of the teaching materials, teaching plans and to make them relevant for this study.

Phase II took about 18 weeks with a total of 36 hours (2 hours in each week). 15 weeks (30 hours) for the implementation of the PBL approach for three problems (approximately 10 hours for each problem). 1 week (2 hours) was allocated for: (i) introducing the general PBL lesson, because it is a new method for the students to use for the learning of medical English. They had to know all the requirements and the tasks that they were given in and after class; and (ii) a pair of pre-and post-speaking tests and semi-structured interviews were administered to the students. The last 2 weeks were distributed to post-speaking test and semi-structured interviews separately. The detailed arrangements of the teaching plan for the 18-week PBL lessons were presented in APPENDIX A, which included time schedule, arrangements of activities, forms for the students to fill in, the evaluation forms, students' logs prompts, etc. A flowchart (Figure 3.1) illustrates the procedure of the whole study below.



**Figure 3.1 Research Procedure of the Study**

### **3.5 Research Instruments**

To answer the three research questions concerning the process of the PBL lesson design and its effects on the students' speaking performance in group discussions, the following instruments were used: researcher's journal, pre-and post-speaking tests, students' logs, semi-structured interviews, and recorded (video-taped) group discussions for different purposes in the present study.

#### **3.5.1 Researcher's Journal**

In qualitative research, teacher journal writing is often used to promote critical reflectivity (Calderhead, 1989). Teacher journals hold special promise in various ways to gather data on classroom instruction, as Brock, Yu and Wong (1992, p. 296) have summarized:

“Teacher journals enhance awareness about the way a teacher teaches and a student learns. They provide a first-hand account of teaching and learning experiences. They are the most natural form of classroom research in that no formal correlations are tested and no outside observer enters the classroom dynamic. They provide an on-going record of classroom events and teacher and learner reflections. They promote the development of reflective teaching.”

The researcher's journal was the core of this study which described how the PBL approach for the medical English lessons was developed step by step. The journal was also used to capture the challenges encountered during the process of designing the PBL lessons. The researcher kept the journal regularly throughout the entire PBL lessons development process. The form of the researcher's journal is presented in

APPENDIX B. By keeping the journal, the researcher was able to obtain information to answer Research Question 1.

### **3.5.2 Pre-and Post-Speaking Tests**

Pretest and posttest designs were widely used in behavioral research, primarily for the purpose of comparing groups and/or measuring changes resulting from experimental treatments (Dimitrov & Rumrill, 2003). In order to obtain convincing data related to the changes of the students' speaking performance in group discussions and to examine if the PBL approach affected their speaking-ability.

The tests were based on the topic of the medical problems which were similar to the three problems used in the PBL lessons. The test procedure used the second part (group discussion part) of the CET-SET (College English Test – Spoken English Test) as reference. CET-SET is an official English test in China for non-English majors. It is held twice a year in May and November respectively. It has been set to examine non-English major college students' English proficiency. The test has been composed of three parts since November, 2008: listening, reading and writing, and the test score is valid only for one year to ensure that the students will take SET. It includes tasks of self-introduction, answering questions, and group discussions. The existing CET-SET grading system provides systematic criteria (the evaluation of spoken performance according to accuracy and range, size and conversational competence, flexibility and appropriacy) to evaluate students' speaking ability, suitability and validity for a speaking test (Yang & Weir, 1999). The topics and details of the pre-and post-tests are shown in APPENDIX C.

The pre-test was conducted in Week 1 just before the first PBL lesson started. The post-test was held in Week 17 after the three problems were solved in class in 15 weeks. The analysis of the results of the pre-and post-tests was used to answer Research Question 2.

### **3.5.3 Student's Log**

The student's log is a useful tool to gain insights into the students' learning. The teacher can scrutinize the students' learning skills, as they observe, evaluate and criticize their own learning (Berthold, Nückles, & Renkl, 2004).

The students' logs were taken from the 24 students in 4 groups so that the researcher could read and understand their personal perceptions of the PBL medical English lessons. The logs might offer more information about the students' learning during and after class. The model form of the student's log with prompts supplied by the researcher is presented in APPENDIX D. In this study, the students' logs provided the researcher with considerable information to answer Research Questions 2 and 3.

### **3.5.4 Semi-structured Interview**

Of the three types of interview: the unstructured interview, the semi-structured interview and the structured interview, the semi-structured interview has been favored by many researchers for its great flexibility in data collection (Nunan, 1992). Punch (2005) stated that different types of interview had different strengths and weaknesses, and served different purposes in research. Therefore, the type of interview selected should be in accordance with the research purpose and research questions.

Since the purpose of selecting the semi-structured interview for this research was to clarify vague descriptions of the students' perceptions in their logs, and to elicit more insightful information from the students on the PBL approach, group interviews were held with four randomly selected groups. The students were given the following guided questions to ensure that the information required was elicited:

- (1) What do you think of the PBL materials used in the lessons? Do you have any suggestions?
- (2) What are your opinions on the PBL approach?
- (3) What were the effects of the PBL approach on the development of your spoken ability in discussions?
- (4) What do you think of your medical English learning in this semester?

The detailed information in the sub-questions of each interview was provided to the interviewees so that the students did not misunderstand the questions given. A detailed description of the semi-structured interview questions was provided for reference in APPENDIX E. The use of the semi-structured interview in this study was to collect data to answer Research Questions 2 and 3.

### **3.5.5 Recorded Group Discussion**

Group discussion is increasingly being used in different situations. It offers an opportunity for extended speaking and listening practice by all of the contributors (De Wever, et al., 2010). Group discussions recorded by video-taping is a good way to collect feedback on learning, and the dynamics of the class will play an important role in the feedback on the students' speaking and learning (Bouas & Komorita, 1996).



In this study, three-time discussions of one randomly selected group were recorded (video-taped). The three video-taped discussions provided the researcher with an opportunity to investigate whether the PBL lessons had gradual effects on the students' speaking skills. The purposes of the recorded group discussions were: (i) to explore whether PBL had effects on students at different levels in their spoken English development and what differences it made if any; and (ii) to examine the quality of the language use during the discussions.

This in-depth analysis of the video-taped record was used to substantiate the pre-and post-tests scores of Research Question 2.

Taking into account the strengths and weaknesses of the data collection methods, the present study triangulated the methods by means of the researcher's journal, the students' logs, the semi-structured interviews, and the recorded (video-taped) group discussions, with the aims of enhancing the researcher's insight into the PBL approach in an ESP context. These instruments yielded qualitative data to answer Research Questions 2 and 3. In addition, data from this research were collected by means of pre-and post-tests of students' speaking skills in group discussions, which were used to substantiate Research Questions 2 and to explain the research findings.

### **3.6 Data Collection and Data Analysis**

This section explains how data were collected by each instrument and how they were analyzed qualitatively or quantitatively.

### 3.6.1 Researcher's Journals

The data from the researcher's journals were collected during PBL lesson design and development. Hence, the journal was descriptive in nature. A few journal prompts were needed to remind the researcher of the focus of the study.

The development of PBL lessons followed the procedural steps adapted from Graves's (2000) framework of course materials development processes. They began with formulating goals and objectives, and then moved onto the development of materials, and ended with organizing the lessons.

In Phase I, the researcher wrote journals regularly from the beginning till the end of the process. The researcher planned to work closely with a content specialist, i.e., a medical teacher to select appropriate problems and materials. After that, an expert who had extensive experience in designing EFL teaching materials was asked to peer-review the materials to evaluate whether the problems were relevant, practical and suitable. Then, the materials were piloted. During the process of materials development, firstly, the researcher reviewed the syllabus and teaching objectives of the medical English course at GMU, which had to be embedded in the materials design, and then she formulated the objectives of the current teaching, and began to design materials for use in the PBL lessons. Secondly, the researcher wrote down the experiences she had undergone and the issues she encountered in the process of searching for related reading and listening materials, with the relevant vocabulary and content for problem-solving. Since the PBL lessons were concerned with medical

content which was not the developer's expertise, the challenges, issues, feelings, thoughts and reflections in the process from an EFL developer's point of view were recorded and described in detail. Thirdly, materials related to problem-solving were organized to produce printed versions. And finally, the process of how all the piloted materials was recorded. To ensure the reliability of the recorded journal, each entry was submitted to an expert for peer-debriefing.

A form of a researcher's journal in Phase I is illustrated in APPENDIX B. The information obtained from the researcher's journal was descriptive in nature. Every description was scrutinized and analyzed. The researcher sought for relationships between the various themes which emerged from the data. Further content analysis was built on these initial themes, patterns and relationships.

### **3.6.2 Pre-and Post-Speaking Tests**

In order to obtain quantitative data to examine the changes in the students' speaking performance in the process of group discussions and to explore how the PBL approach affected their learning, a spoken pre-test and post-test were held respectively by two English teachers (the researcher and a colleague). The pre-test was given before the PBL lessons began in class and the post-test was conducted when the PBL lessons had finished.

For scoring, the researcher followed the model of the second part (group discussion part) of CET-SET. The original test asked three students to sit in a group for discussion. However, in this study, six students in one group took the test in the form

of discussions with two examiners. One acted as an evaluator gave instruction and the other as an assistant. Each of them gave scores to every student in the group without talking. The evaluation form for grading was shown in APPENDIX F.

To evaluate the group discussions in this study, the researcher adapted the criteria for the discussion part of CET-SET and the group discussion criteria set by Scheidel and Crowell (1979). To ensure the objectivity of the evaluation, the scores were divided into “participation”, “language ability” and “conversational competence”. The scores ranged from a maximum of 5 points to a minimum of 2. As there were three items, the maximum score was 15, while the minimum was 6. There were two examiners.

The framework for conducting the pre-and post-speaking tests was as follows:

- (1) The pre-test administered to all 48 students in Week 1, while the post-test was given in Week 17 after the PBL lessons were completed.

A pre-test was conducted at the beginning of the study in Week 1. All of the 48 students were divided into eight groups on a voluntary basis, in order to make them feel comfortable when talking or discussing with familiar classmates. Otherwise, cooperation in the group might have been difficult to continue. Each group was allowed fifteen minutes for the discussion of one problem in the pre-test. The time allocation was as follows: the first 5 minutes for reading the given materials of the problem; the second five minutes for sharing the ideas after reading, and writing down some notes based on the materials and their own experiences; and the last five minutes for group discussion of possible solutions to the problems.

- (2) The researcher gave a serial number from Group 1 to Group 8 to identify each group, and wrote down the name of each group member who had taken the pre-and post-test.

The total time was 15 minutes. The research study used two adjoining classrooms on the same floor, because it could 1) save time for group members taking the test from the other waiting classroom; 2) conveniently monitoring all the students in different rooms. One room was prepared for the two raters and one group of students, while the next room was for the rest of the students who were waiting inside while watching an English film screened by the researcher. The sequence of taking the pre-and post-test was drawn by lots, numbers from 1- 8 were given to each group for their results.

- (3) The researcher assessed each student with the help of a colleague, who had experience in the teaching of medical English and general English for five years, and knew the criteria for CET-SET. The two assessors worked as inter-raters and used the same standards for evaluation.

Before the beginning of the pre-and post-tests, the two teachers discussed and reached the agreements on the standards to insure the consistency of scoring. The raters scored each group member individually. There were six copies of the criteria for rating the scores for every group member separately. During the process of group discussions, the two raters (the researcher and the colleague) gave the scores for each of the three criteria. Meanwhile, the other groups were waiting in the other classroom. After the first group finished their group discussion, the teacher asked them to leave the

classroom directly and they were not allowed to return to the next door classroom to talk to the other students in case the other students found out what the problem was. Then the second group of students went in and had their speaking test with the same test order.

(4) Test scores were recorded individually.

Two hours later, all of the 48 students in 8 groups were given the scores individually, all the data from the two raters (96 criteria rating copies) were collected and processed with the software SPSS 21.0. The average score elicited from the two raters was the final pre-test score for each student, so each student obtained four scores for their pre-test and the same for their post-test, three for the three criteria items, and the other one was for the final total score of the three items' scores.

The post-test was conducted in Week 17 on the completion of all the PBL lessons. The students did it as the lots' order and followed the same steps under the same criteria by the same two raters. The average score elicited from the two raters was the final post-test score for each student.

(5) The final scores of each member in the group discussions in the pre-and post-test were added up one by one by the two examiners, and divided by the number of the students in the group to produce the average score for the pre-and post-test for each group respectively.

The paired sample t-tests were used to determine the students' English speaking proficiency in group discussion according to the three criteria by a comparison of the

pre-test and post-test scores. The purpose was to see whether there were statistically significant differences between the two tests so as to decide whether the PBL approach was effective in enhancing students' speaking performance. The significant value was set at  $p \leq 0.05$ . The results were used as quantitative data to answer Research Question 2. Also, the analysis of the results was considered as the first evidence for the answer, so as to propose in Chapter 1.

### 3.6.3 Students' Logs

All of the students had to write logs during the study. After the students had used the PBL lessons on each problem (there were a total of three problems to be implemented using the PBL approach in week 1-5, week 6-11 and week 12-16, respectively). Table 3.1 presents the plan for the students to submit their logs for analysis.

**Table 3.1 Plan of Students' Logs Collection and Analysis**

No.	Time	Students' Logs Collection	Analysis
1	Week 6	After 10 hours of lessons for Problem 1	Content Analysis
2	Week 11	After 10 hours of lessons for Problem 2	
3	Week 16	After 10 hours of lessons for Problem 3	

However, there were only 24 students (from the four random selected groups), to avoid confusion, eight different colored notebooks to represent the eight groups with prompts on the first page were distributed to the participants. The different colors distinguished the four groups from the other groups. Prompts were attached in each notebook for log writing (see APPENDIX D).

The three students' logs were submitted by the students in Week 6, Week 11 and Week 16 separately. The logs were collected three times after by the students had written during and after every PBL class for each problem. 72 of the students' logs were collected for qualitative analysis. The students were allowed to use either Chinese or English to describe their reactions and feedback based on their classroom experience. To encourage the students to write more and provide abundant data, the researcher allowed the students to use whichever language they felt most comfortable with (e.g. English, Chinese or mixed-code) so that they could express their ideas easily, clearly and accurately.

The students' logs were part of their final score for the medical English course. This stimulated the students to take writing their logs seriously and helped the researcher to get more information from them. Some key aspects, such as the function of the PBL approach to their speaking English practice in their group discussions, the stimulation of the PBL approach to their English learning, and the changes of their perceptions towards the PBL approach and materials were of particular interest to the researcher. Furthermore, other themes which emerged from the evaluation process were also categorized, grouped and classified for further discussion.

#### **3.6.4 Semi-structured Interviews**

All students were group-interviewed at the end of the PBL lessons in Week 18. However, the interviews of 24 students in the four groups were further analyzed. Each group was interviewed for about 20 minutes. In order to get more accurate information



from the students and to reduce their nervousness in the interview, Chinese was used for communication. The interviews were tape-recorded and transcribed by the researcher for data analysis.

The semi-structured interview questions were open-ended and based on questions relating to the following four concerns:

**Question 1:** What did you think of the PBL materials used in the medical English lessons? Do you have any suggestions?

Sub-questions:

- a. Problems in lessons;
- b. Listening materials;
- c. Reading materials.

Answers from this question were to answer Research Question 1.

**Question 2:** What were the effects of the PBL approach on your ability to discuss in English?

Sub-questions:

- a. How well do you think you performed in speaking in the group discussion?

Why do you think this?

- b. Do you think there were any changes in your speaking ability now compared with that at the beginning of the PBL lessons?

The data on these topics answered Research Question 2 and provided more explanations or evidence for Research Question 3.

**Question 3:** What are your perceptions of the PBL approach?

Sub-questions:

- a. What do you think of these lessons compared with teacher-centered lessons?
- b. Was it helpful for you to learn medical English (e.g. medical words and content)?
- c. Did PBL make / encourage/ motivate / stimulate you to talk more?

The data collected from these sub-topics was used to answer Research Question 3 and substantiated Research Question 2.

**Question 4:** What did you think of your medical English learning in this semester?

Sub-questions:

- a. Were there any strengths and weaknesses in the PBL lessons for your speaking performance in group discussion, and study of medical terminology?
- b. Did using the PBL approach change the learning atmosphere in class?
- c. Do you have anything else to say about the PBL medical English lessons?

The information gathered from these questions was useful in answering Research Question 3. The data from the semi-structured interviews were transcribed, reviewed, labeled and classified into different categories. Relevant views that emerged are grouped, presented and discussed in Chapters Five and Six.

### **3.6.5 Recorded Group Discussions**

Eight groups discussed each problem simultaneously during the specified discussion time, but only the discussions by the members in one focus group were

recorded (video-taped) to provide an opportunity to study the discourse at different levels of speaking proficiency. The students' discussions for each problem in each PBL lesson were recorded respectively in Week 6 (for Problem 1), Week 11 (for Problem 2) and Week 16 (for Problem 3).

Video-taped sessions were transcribed verbatim, and analyses were carried out to find out the development of their speaking performances in group work, especially their discussion skills. The data analyses were conducted based on three criteria as used in the pre-and post-tests: (i) participation in discussion, (ii) language ability and (iii) conversational competence. The details of these three criteria can be found in APPENDIX G. The spoken performance and discourse of the group members in the group discussions yielded information on students' development in speaking ability, the quality and quantity of their comments and their communications skills in group discussions.

Table 3.2 illustrates the relationships between the research questions, research instruments and the data analysis of this study.

**Table 3.2 Research Questions, Research Instruments and Data Analysis**

Research Questions	Instruments	Data Analysis
<b>RQ1:</b> What are the issues encountered by an EFL teacher who develops PBL lessons for Medical English course?	Researcher's Journals	Content Analysis
<b>RQ2:</b> What are the effects of the PBL lessons on the development of the students' speaking ability?	Pre-and Post- Speaking Tests Recorded Group Discussions	Paired Sample t-test Conversation Analysis
<b>RQ3:</b> What are the students' perceptions on the implementation of PBL lessons in the Medical English course?	Students' Logs Semi-structured Interviews	Content Analysis Content Analysis

### **3.7 Pilot Study**

A pilot study was administrated in the present study in order to:

- (1) Try out the PBL lessons (including materials) with students; and
- (2) Check if the instruments used in the pre-and post-speaking tests, students' logs and semi-structured interviews needed to be revised and in what way.

#### **3.7.1 Participants**

The third-year medical students in the clinical medical college of a parallel class were chosen as the participants of this pilot study to evaluate whether the third-year medical students were appropriate for the implementation in the main study. The participants were selected on the basis of convenience and availability. However, they possessed the same characteristics of those in the main study. The number of participants in the pilot study was six and they were from one intact class. They had studied college general English for two and half years and they possessed basic medical knowledge. Among the six students, three had passed CET4 and only one had passed CET6, which meant the four students had intermediate or high level College English level, the least two had relatively low one.

#### **3.7.2 Instruments**

For this study, four main instruments were used to collect data from the participants: the pre-and post-speaking tests, student's log, recorded group discussion and semi-structured interview.

Participants were required to take the pre-and post-speaking tests, and the scores from the pretest and posttest were used to evaluate students' speaking changes. Both tests were conducted by two examiners and topics were taken from previous CET-SET tests. During the PBL lessons implementation, students' logs were to be kept and submitted; group discussion was recorded by video-tape. A group semi-structured interview was conducted after the PBL lessons to obtain the reflections of the students on the PBL lessons.

### **3.7.3 Procedures**

There were two phases of this study. First was the process of designing and development. Second, the PBL lessons were used with the students in class for about 10 hours. Then the participants' discussion ability was assessed and their perceptions of the PBL lessons were investigated. In order to achieve the goals of this pilot study, the emphasis was on the second phase and the procedure for this phase is explained below:

In the second phase, the PBL lessons were taught after the pretest and the introduction of PBL lessons after finishing the pre-speaking test. Then the PBL lessons were taught to the students, during which the recorded group discussion was taped and the students' logs were collected. Finally, the semi-structured interview was conducted.

After the participants had studied the PBL lessons, all of them were required to take the speaking post-test. The same two examiners conducted the test. The post-test scores were analyzed by using SPSS21.0 to compare the means with their pretest ones.

Meanwhile, the speaking criteria conducted by the inter-rater in the main study were checked. Finally, the contents of the students' logs, recorded group discussion and semi-structured interview were analyzed by the researcher to revise the instruments for the main study.

### **3.7.4 Lessons Learned from the Pilot Study**

This pilot study was designed to examine whether the teaching materials, the methodology and the process of instruction prepared for this study were suitable for the participants' level of English and existing medical knowledge, and whether the teaching materials and the pace of teaching instruction were practical for the class teaching. In addition, information from the students' perceptions was expected to be used for the revision of the materials. Thus, modifications could be made to lessen the weaknesses and to enhance the quality of the research study.

There were six main lessons for the main study described as follows:

#### **(1) Necessary to Work Closely with the Medical Teacher**

The problems and the supplementary PBL materials needed to be based on the students' actual level of medical knowledge. A medical teacher who taught the target students was more appropriate than a clinical doctor because the teacher knew about the students' medical background knowledge.

With the confirmation of the medical teacher, the proposed problems were designed, the listening materials were developed, and the reading materials were adapted so that they were appropriate for the participants in the main study. The third-

year medical students who participated in the study commented positively on the problems, the reading and listening materials, and the speaking exercises. The same procedure was used with the close assistance of the medical teacher for the main study as well.

## **(2) Appropriate Time Allocation for PBL Lessons**

The time for each problem had to be appropriate for the PBL lessons. Ten hours for each problem was considered appropriate for the completion of the PBL lessons. The time allocation for each problem had also to be implemented by the researcher with regard to the same concerns in the main study. In the main study, one hour was allocated for information searching and gathering with the forms written in class. About two hours was allowed for textbook learning, two hours for reading materials learning and one hour for the listening materials. Another twenty minutes was allocated to recording the group discussions and forty minutes for group discussions when the information was being prepared. Another one hour was given for the students to write their logs in class. After the class, the students had to search for information and finish the exercises, which took them about two hours. The same time allocation for each part of the PBL lessons was appropriated for the main study.

## **(3) Similar Agreements on the Criteria in Speaking-tests**

The adapted CET-SET grading criteria for group discussion were found to be applicable. Pre-test and post-test had the inter-rater reliability ( $\alpha = 0.739$  and  $0.811$ ), respectively. It indicates that there was a high agreement among raters on scoring. The

result of inter-rater's reliability in the pilot study ensured that the criteria and the reliability were the same for the main study.

The inter-rater reliability was confirmed in the scores of the pre-and post-tests. For each item of the score criteria, an understanding of the language ability and degree of participation was agreed by the two raters. However, they had different views with regard to conversational competence. Therefore a clearer definition of such criterion was necessary.

#### **(4) Superficial Data Elicited from Students' Logs**

The pilot study was conducted with the students as an extra lesson. It was found that some students kept logs briefly and superficially without giving any details. For example, the student stated "*...I like the PBL lessons, because I can practice my listening skill through the listening materials.*" There were no details about what exactly she liked or the changes in her listening skills etc. Therefore, in the main study, guided questions for the students' logs needed to be provided and the students had to be trained for the writing of the logs as well. In addition, the researcher had to remind the students about keeping the logs regularly; and that marks would be allocated for keeping the logs in order to motivate them to write. Moreover, this had to be done after each class to ensure the logs were properly completed.

#### **(5) Additional Comprehensibility of the Reading and Listening Materials**

Based on the reflections from the students' logs and the semi-structured interview, the students mentioned that sometimes they were confused about the



definitions used for the medical vocabulary because some items had many definitions. As an example, the word “acute” had different meaning, such as sharp, serious. Actually in medical English, in the sentence “*The acupuncture treatment is safe for acute stroke patients*”, acute means the patients are in an emergency situation. Furthermore, the pronunciation of the vocabulary needed to be given for the listening and reading materials as without phonetic symbols, the students would not be able to give a quick response.

As a result, the supplementary listening and reading materials had to be revised to include meanings in Chinese and the phonetic symbols in order to facilitate students’ reading comprehension and oral production. In the main study, Chinese meanings of vocabulary and phonetic symbols were provided in both the reading materials and listening transcriptions.

#### **(6) Effective Strategies Used by the Researcher in Group Discussions**

As the researcher allocated too much time for the students to prepare the information for the discussion of the problem in group, the students tried to remember and recite the script they had prepared for the group discussion. This resulted in a planned dialogue rather than an unplanned one. When they could not remember what they had prepared, they could not talk. They relied too heavily on the prepared scripts they had prepared.

In the main study, the researcher had to pay more attention to the amount of time allocated for preparation. Also, clearer instructions for group discussion, and the

role assigned to the group leader to monitor the discussion were necessary, so as to encourage students to talk freely and to lessen the difficulties the participants experienced in group discussions in the pilot study.

In sum, the lessons obtained from the pilot study could be categorized into two main parts: the materials and the instruments.

- (1) For the materials used in the PBL lessons, the problem, exercises and activities in the PBL class were suitable; all could be used with the participants. The researcher needed to add the meanings in Chinese and phonetic symbols for the listening and reading materials to enhance the students' listening and reading comprehension. The time allowed for the students to solve each problem in the PBL lessons was also appropriate for the main study.
- (2) The instruments including the speaking tests, students' logs, recorded group discussions and the questions for the semi-structured interview were tested. In the main study, the criteria for the speaking tests needed to be agreed upon by the two inter-raters. The students needed to be trained in writing their logs with more details. Both the questioning to elicit the information from the students and the questionings used to facilitate group discussions were important for the main study.

### **3.8 Summary**

In sum, this chapter presented the research methodology employed in this study with a focus on the rationale of the research design, the participants, the instruments, and the methods for data collection and analysis.

There were two phases in the present study. In Phase I, a qualitative study was the chief method for the collection of data concerning the PBL lessons development through the researcher's journal. In Phase II, a pre-experimental research design was adopted to examine the effects of the PBL lessons on the development of the students' speaking performance in group discussions. The pretest and post-test were used to compare the spoken performance of the students. Paired-sample t-tests were employed to analyze the students' scores. Students' logs, semi-structured interviews and recorded group discussions were employed to gather qualitative data relating to students' communication during discussions and their perceptions of the PBL lessons. This chapter concludes with a description of the pilot study. A discussion on the research results and research findings are presented in the following chapters.

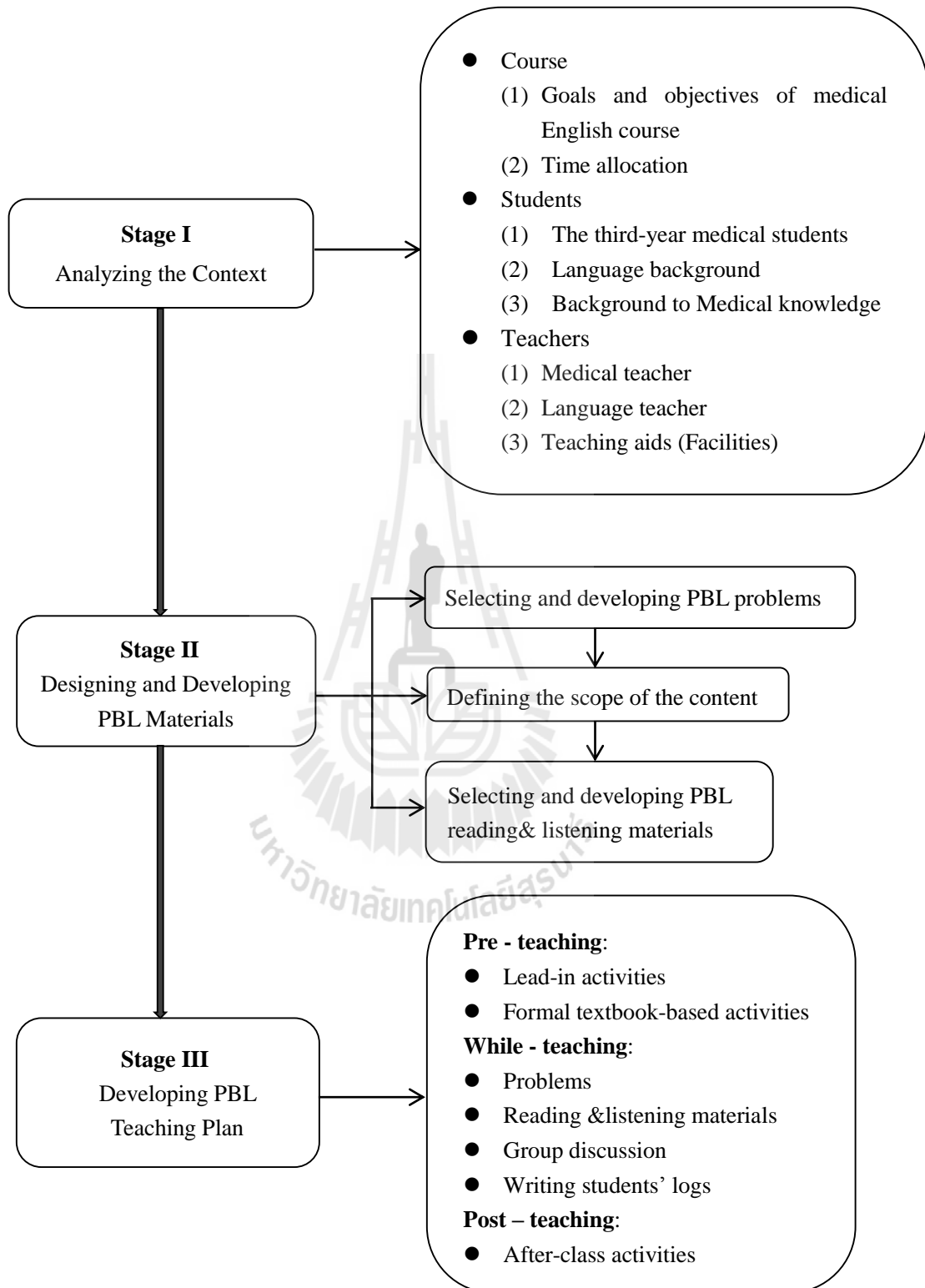
## CHAPTER 4

### RESULTS OF PBL LESSONS DEVELOPMENT

The present study aims to design and develop a PBL medical English course for third-year medical students at Guizhou Medical University of China. This chapter presents the findings in response to the first research question: **What are the issues encountered by an EFL teacher who develops PBL lessons for a Medical English course?**

The design and development of PBL materials included three main steps: 1) analyzing the context; 2) designing and developing PBL materials; and 3) developing a PBL teaching plan. The researcher's journal was the major source of the data to answer this research question. To make it clear, a detailed description of the three steps in developing PBL medical English materials and the reflections on the issues which the researcher encountered through the whole process and solutions to them were reported as well. The researcher's reflections which were extracted from the journals were italicized throughout the chapter to illustrate the development of the data from the discussion. They enriched the information concerning the issues encountered during PBL lessons design and development.

Figure 4.1 on the next page shows the three stages in the procedure of how the PBL medical English materials and the PBL teaching plan were developed.



Adapted from "Framework of Course Development Process" by Graves (2000)

**Figure 4.1 Design and Development of PBL Medical English Lessons**

## **4.1 Analyzing the Context**

To analyze the context of the PBL lessons, four related items needed to be considered. They were the medical English course objectives, the students of medical English course, the teachers, the facilities and the teaching aids in order to ensure the feasibility of an appropriately PBL course. The purpose of this analysis was to obtain a clear picture of the medical English course in order to guide the PBL materials design. The analysis of each item was reported in sequence in the following sections.

### **4.1.1 Medical English Course**

The current medical English course was analyzed in terms of its contents, goals and objectives, and duration. The results of the analysis can help the researcher create a clear picture of what to teach and how to manage it within the provided timeframe. The researcher started with the exploration of the course description of medical English curriculum at GMU so as to find out the instructional goals and objectives. It was found that the objectives and goals of PBL medical English lessons were clearly specified in the Course Syllabus for Medical English, School of Foreign Languages, GMU (2010), which is described as follows:

#### **Course Description:**

Upon completion of the medical English course, an emphasis was placed on the usage of English vocabulary and expressions related to specific professional speaking situations in the medical field and a range of types of reading and listening comprehension as required by various medical professions.

**Course Objectives:**

1. To be able to use medical vocabulary and expressions to elicit English language knowledge and to convey instructions for specific discussions and class activities, verbally;
2. To understand the information in the textbooks, the reading and listening materials and to demonstrate an understanding by using this information to complete specific professional reports and discussions;
3. To determine self-directed learning and cooperative learning, to promote critical thinking, and to apply professional skills for self-improvement.

*(Course Syllabus for Medical English, School of Foreign Languages, GMU, 2010)*

The medical English course at GMU was offered to the third-year medical students in the third academic year. The classes took two hours a week with a total of 36 hours (18 weeks) in one semester. The objectives of this course were to enable the medical students to acquire basic medical English vocabulary and the necessary reading and speaking skills. To be more specific, the learning goals for the students were to acquire 1,000 medical words with affixation and root flexion and to be able to read 800-word medical-science passages. In addition, they should be able to communicate in medical English about their daily duties. In the present study, the researcher developed the PBL lessons based on the objectives for medical English learners set by the university.

*“I felt relax that there were no difficulties for me to determine the objectives of this PBL medical English course because the current learning goals of medical English course were available and clearly stated. I should adopt them to shape the scope of content of the course. The goals also guided me in selecting materials in the design and development stage...”*

*Researcher’s Journal: Feb 28*

#### **4.1.2 Students of the Medical English Course**

Generally, the students of the medical English course were third-year medical students at GMU. They were required to enroll on the medical English course after two years of general English courses. These students were examined in two aspects: English proficiency and existing medical background. That meant that these two elements played a key role in the PBL approach.

Firstly, with regarding to the students’ language proficiency, it was found that of the 48 students who participated in the study, 60% of them (29 of 48) had passed CET 4 and 21% (10 of 48) had passed CET 6. All those students who passed CET 4/6 could be considered to possess sufficient proficiency in general English language skills.

Furthermore, in terms of their medical background, all of the students were from the Clinical Medical College and they had completed two years study of Basic Medical Science. They had to finish eighteen medical courses within three years. They should then complete courses concerning human anatomy, pathophysiology, medical biology, medical immunology, human parasitology, histology and embryology, etc. According to the medical teacher, all of the third-year medical students had the basic medical knowledge to deal with fundamental medical problems.



*“Careful reviewing of the background of the third-year medical students made me more aware of their language proficiency and medical knowledge background. The students’ knowledge of English language and medical proficiency was at a basic level. Some of them did not pass the CET 4 after two years of study English at college. They had finished the general public basic medicine-oriented and science-oriented courses in the past two and a half years. Therefore, they need time to adapt themselves to the new medical English learning approach and new materials out of the textbook. What’s more, the new materials could not contain much more medical knowledge than their previous medical English textbook, and the course developer would have to modify some reading passages and exercises from their original medical English textbook.”*

*Researcher’s Journal: Jan 28*

#### **4.1.3 Medical English Teacher**

Generally, the medical English teachers were the college English teachers with the academic title of lecturer or lecturer with higher rank at GMU. Most of them hold an MA degree and had a background in linguistics. They had at least 5 years’ teaching experience and the use of lectures was the most common teaching method used among them. In relation to medical background knowledge, they admitted that they had no medical background to teach medical English course. They had to prepare the vocabulary and the teaching materials before class to ensure that they themselves and the students understood the lessons. No training was provided either.

The focus of instruction was on language skills, especially the practice and the improvement in speaking ability. Particular efforts were made in the explicit explanation of the usage of medical English vocabulary and expressions. When the English teachers explained the medical English language points in the text to the students, the focus was mainly on the English language rather than the medical content. Therefore, this limitation should be seriously taken into consideration when designing the materials.

*“...frankly speaking, I was afraid that I could not explain very clearly some of the medical content, which was not my field, but my aim was to improve the students’ speaking ability by using relevant vocabulary and expressions as much as possible. So my teaching focus was basically on the language and vocabulary rather than on the medical content. A lack of medical knowledge was really my major concern when I had to develop the PBL materials.”*

*Researcher’s Journal: Feb 1*

#### **4.1.4 Teaching Aids for Medical English Course**

With regarding to teaching aids, the school of foreign languages had twelve advanced language labs with multi-media and audio equipment. The internet could be accessed by each computer. The medical English course could use the labs for each class; every student had one computer to do his/her own work or to listen to the assigned tasks independently. They could use it for searching for information. In short, the labs were well equipped with technology for language learning.

*“...the teaching aids that I can use to increase the students’ interest are very good. In the new campus of the university, all the language labs are open to all the students if they want to use them for study. It is convenient for me to guide the students to search for information during classroom teaching, and monitor the students’ group discussion. For me, it is also easier to update the information to prepare any supplementary materials for teaching...”*

*Researcher’s Journal: Feb 27*

#### **4.1.5 Difficulties and Solutions**

At the stage of analyzing the institutional context, the difficulty that the researcher anticipated was the implementation of the PBL approach, which required a change from the regular and traditional teaching that most lectures used to the PBL approach. In the Chinese education system at tertiary level, classroom teaching is

required to strictly follow the university guidelines as controlled by the Teaching Affairs Administration. Thus, the PBL implementation was totally new to the GMU instructional context. As a consequence, the researcher had to make the administrator understand the meaning and value of this research program in order to obtain the permission. Therefore, the researcher explained to the administrator the principles and positive effects of the PBL approach on students' learning and that the PBL's principles were congruent with the goal of college English educational reform.

*"...the approval from the dean and the Teaching Affairs Administration is vitally important before I implement the PBL in place of the existing course. I should inform them of the rationale and describe the positive effects of the PBL approach to students and on the students' career development in their future work. Meanwhile, it should be emphasized that the set teaching goals would be achieved by the end of the implementation as it was done in normal teaching program. I confess that I was very worried."*

*Researcher's Journal: Jan 30*

*"After my presentation, the dean allowed me to do this research. The dean was happy for the reform of the current teaching strategy. She agreed with my ideas and even recommended a medical teacher from College of Clinical Medicine to me. Later, the report to the Teaching Affairs Administration was approved. I was very relieved because without approval, I could not do anything though I knew it would prove useful things to the students."*

*Researcher's Journal: Feb 28*

In summary, the relevant factors including the course, students, teachers and teaching aids at GMU were analyzed. The results of the analysis were documented and taken into consideration during the materials design process. The main issues experienced concerned administration rather than the analysis itself.

## **4.2 Designing and Developing the PBL Materials**

Based on results of the context analysis, the objectives of the medical English course were determined and the scope of the content of the PBL lessons was defined. The next step was to design the PBL lessons. In the design process, four main steps were conducted. They were: 1) define the scope of the contents of the PBL lessons; 2) select the problems for the PBL lessons; 3) conceptualize the listening and reading materials; and 4) specify and design the learning activities. Details of each stage are described in the following sections.

### **4.2.1 Defining the Scope of the Contents of the PBL Lessons**

The contents of the PBL medical English materials can be divided into two parts: medical knowledge and English. After analyzing the objectives of the course, the researcher had the ideas of narrowing the scope down of the contents of the PBL problems and their related materials. The students' existing background knowledge in medicine, their current English ability, and the scopes of the course needed to be well integrated.

As for the goals of the course, the students were expected to develop their speaking skills through the PBL lessons and develop their confidence in using English in medical contexts. In addition, ways of increasing the students' familiarity with medical English vocabulary were also taken into consideration. The PBL lessons should help the students improve their speaking ability by expanding both their general English and medical vocabulary repertoire through discipline-specific reading and listening materials, activities of medical problem analysis, and group discussions.

At this stage, as an English teacher, the first difficulty the researcher faced was how to develop the problems and materials at the right level for both students' existing knowledge in medicine and English in relation to the course objectives that they had to attain. Since the students would have to cope with two things at the same time while studying the PBL lessons at the same time, the English language and the medical contents. Thus, the PBL problems and materials should help facilitate students' comprehension of the medical terms. Concurrently, the students should effectively use what they had comprehended together with their medical background knowledge to express their ideas in group discussions. With the help of the medical teacher, who was a famous pathological professor with a high degree of English proficiency, the researcher would be able to obtain substantial information about the students' current medical background knowledge because she taught the medical course herself to these students. The medical teacher suggested using common problems and uncomplicated reading materials because these students did not have enough exposure to complex diseases or any experience of diagnosis. According to her suggestion, the points of discussion for the third-year medical students should be the pathological changes of the patients' illnesses and the treatment for those patients. These types of problems were suitable to the students' present medical knowledge.

*"I have to get suggestions about the scope the content for the PBL lessons before its development, because I cannot judge the students' level of medical background by myself. This is the main difficulty for me...it is necessary for me to talk to the medical teacher, so as to get more information about the students' medical background. It is important because the level of difficulty of the materials directly affects the students' production in the following stage. Without thorough*

*comprehension of the input materials, they will not be able to produce quality output in their discussions.”*

*Researcher’s Journal: Feb 1*

Based on the suggestion of the medical teacher, the students’ medical English textbook entitled “*Contemporary Medical English Teaching Materials - Focus on Health*” (edited in 2010, Fudan University Press, Shanghai, China) seemed to be the most appropriate source for the input of the PBL problems. Furthermore, the reading and listening materials would be suitably related to the problems and develop the students’ understanding of the problems.

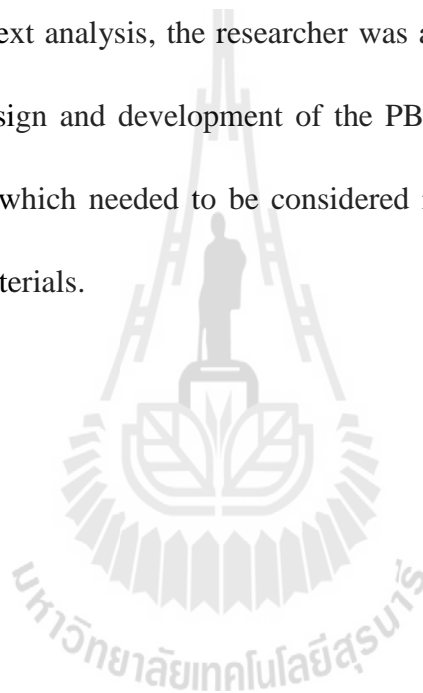
In order to define the scope of the related materials, the second difficulty was that many sources of information and knowledge needed to be reviewed. The information could be from different sources, such as textbooks, workbooks, audio-videos and photocopied handouts that contained the target problems. It exhausted the researcher to tackle a lot of medical-oriented sources in a short space of time. With the help of information from the internet, she was able to read, sort and filter them, although it took her a long time. Meanwhile, the researcher obtained some further recommendations from the medical teacher; as a result, she narrowed down the scope of the sources, and then finalized the contents.

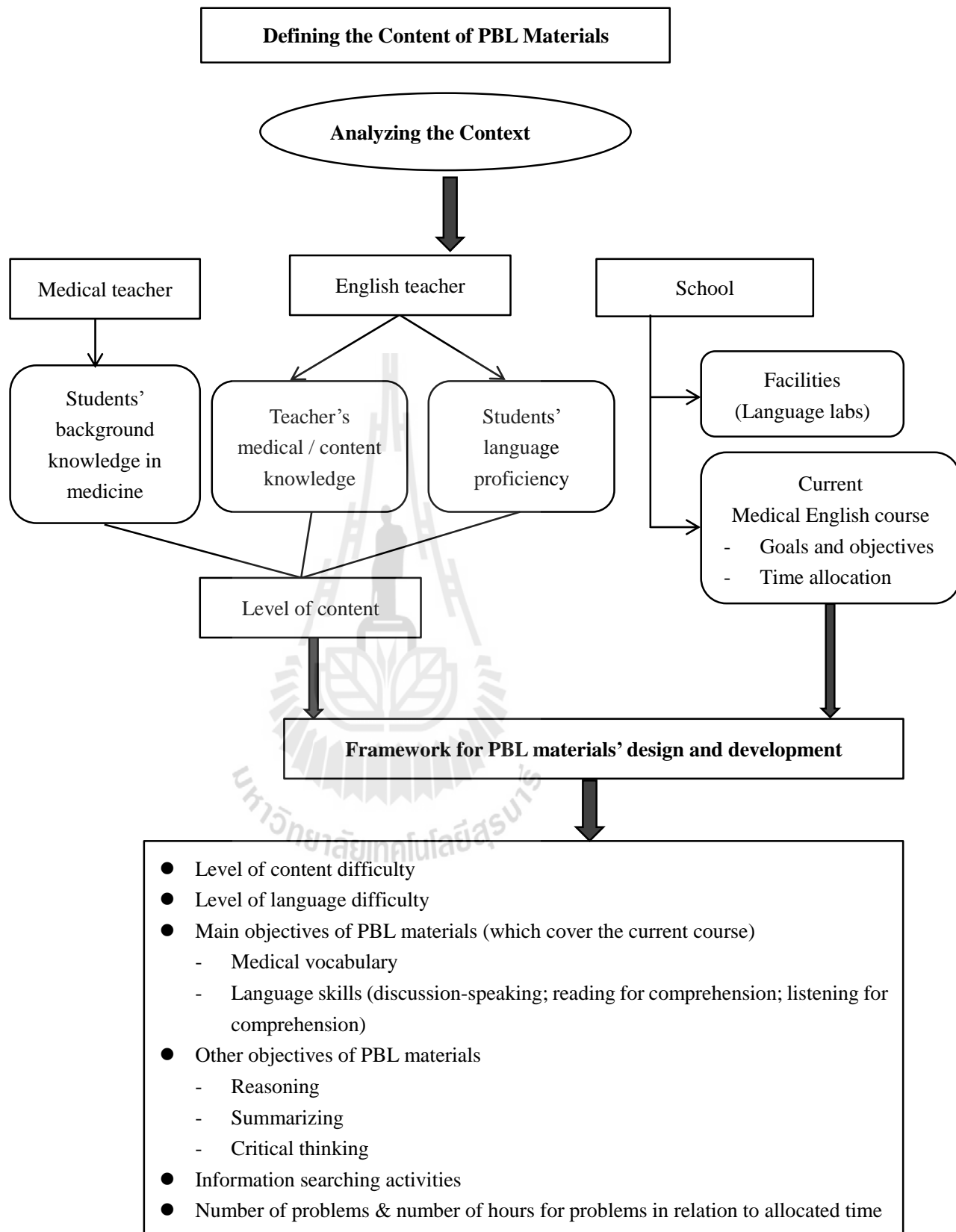
*“...first of all, the PBL lessons must encourage the students to learn English through medical content. The design of the content must combine two elements: content and language together. I had no medical English knowledge, except for the teaching experience on the medical English course. So both defining the problem and selecting the reading and listening materials was difficult for me. Anyway, I knew the language and most of the information from the internet was in English, which helped me overcome the difficulties. I could surf the information from the internet and comprehend*

*it with online assistance. It was as if I was a freshman at medical school and needed to learn new medical terms. In addition, I was able to consult the medical teacher, who was very nice and helped me with many suggestions. For example, she recommended materials I could use from the journals and related websites to me. After I had received assistance from her, I felt more confident in defining the scope of the materials and in continuing with the materials design for the next stage. ”*

*Researcher’s Journal: Feb 2*

In consideration of the objectives of the PBL materials and all the constraints derived from the context analysis, the researcher was able to produce an appropriate framework for the design and development of the PBL materials. Figure 4.2 below illustrates the factors which needed to be considered in specifying the scope of the content in the PBL materials.





**Figure 4.2 Factors of Specifying the Scope of PBL Materials**



## **4.2.2 Determining and Developing Problems for PBL Lessons**

The PBL approach is centered on a problem. A well-designed problem is essential for the success of its implementation. Thus, a problem acts as a springboard for discussions that allow students to recall what they already know, and what they do not know to search for more information, and to formulate questions in order to exchange ideas in a group. Therefore, it is extremely important to select an appropriate problem.

### **4.2.2.1 Selecting Problems**

The problem selection was a complicated process because the researcher must consider many factors, such as 1) time allocation for each problem, 2) suitability for group discussion, and 3) appropriateness of students' existing medical knowledge. The three main facets of issues in selecting problems included time allocation for problems, sources of problems and the lack of medical knowledge of the researcher. The details were described as follows:

#### **● Time Allocation for Problems**

The problem selection in PBL lessons must take into account the course schedule and also with the major characteristics of the problem. Therefore, the first difficulty for the researcher was how to match the course schedule with these characteristics. The requirements of the medical English course were that it was to be completed in one semester (18 weeks), with two hours per week. Merchant (1995) suggested that one Problem should take from 6 to 21 hours of inside and / or outside

class hours. As a consequence, three problems should cover a total of 36 hours for the whole of the PBL lessons. Therefore 10 hours were allocated for the completion of each problem-solving activity.

### ● Sources of Problems

The first difficulty the researcher had to deal with was the selection of a suitable problem that could be completed within the allocated time and, secondly, what sources would be suitable for the selection of the problem. The students were not available for a special training outside of the time allocated for the PBL lessons due to their regular learning schedule of seven medical courses. Moreover, they needed to study the materials in their textbooks in order to pass the exam for which time was limited. In order to limit difficulties for the students it was decided to relate the problems to what the students would find easy to discuss. Therefore, the students were asked study PBL lessons which were related to the content of their textbook.

After the decision was taken to use the textbook as the main source of the problems, it was necessary to consider how to combine the students' existing medical knowledge with the main source. The researcher consulted the medical teacher with regard to what the students were studying in their textbooks. The medical teacher suggested that three units could be used as the basic input for the three problems, which were derived respectively from Unit 1 – The Past and Future of Tuberculosis, the most widely spread infectious disease in China; Unit 4 – Prevention and Treatment of Diabetes; and Unit 8 – Research into the Causes of Heart Disease. Diabetes and heart

disease are closely connected physiologically. Furthermore, the reason given by the medical teacher for this suggestion was that it was crucial for the students to consider the pathological changes while solving the problems. The sequences of these three problems were from the simple to the more difficult based on a sequential level of medical knowledge. The following excerpts from the researcher's journal exemplify this point:

*“On the other hand, I think the majority of the third-year students could fulfill the requirements of the PBL lessons after talking with their medical teacher (an expert pathology). The teacher suggested that I should give them basic problems to avoid clinically complicated cases due to their limited medical background. So I think I will follow her suggestions in deciding on the problems.”*

*Researcher's Journal, Feb 2*

- **Lacking Medical Content Knowledge**

Since the researcher lacked knowledge of medicine, it was hard for her to integrate alternative multi-factored information into the discussion of the problems to stimulate the students' group discussions. In addition, the problems were designed to prompt students to engage more fully the group discussions by using their knowledge of the language to complete the problem-solving task rather than by focusing on the accuracy of their medical knowledge. Also, the discussion of the problems might lead to the students finding alternative solutions to the problems, and challenge them to assess their ideas and propositions according to their medical knowledge. All the above considerations made the problem-designing process more complicated. The researcher spent lots of time on reviewing the content from the sources, searching for related

information of the target problems through the internet, and learning about the issues of the problems from the medical teacher. However, this hands-on experience helped the teacher in the design of the problems.

*“...although I had read a lot about PBL principles and materials development, I never had any experience in determining a PBL problem. So I have to elicit and change the language taken from the established PBL programs and try to clarify the concepts of these problems based on the same topic of the selected units from the textbook. The problems should match the realities of the units in medicine. As a language teacher, the problems I design should not go beyond the medical content of the students’ existing knowledge which directly resulted in the delay of the design process.”*

*Researcher’s Journal, Feb 3*

#### **4.2.2.2 Developing Problems**

Based on the suggestions from the medical teacher, it was possible to adapt some of the medical topics from the textbook. It was necessary for the researcher to review the list of the main contents of the three units. The contents listed in the textbook for the three medical topics are described in the following Table 4.1.

**Table 4.1 Contents of Textbook for Three Medical Topics**

Items Units	Title of Unit	Theme Reading	Vocabulary	Aspects
<b>Unit 1</b>	The Past and Future of Tuberculosis	What's in Your Pipes?	Tuberculosis (TB) Immune system Infection Latent TB Active TB Micro-bacteria Respiratory Antibiotics, etc	For example: <ul style="list-style-type: none"> <li>● What is TB?</li> <li>● What is latent TB infection?</li> <li>● What is active TB infection?</li> <li>● How does TB develop at present?</li> <li>● What is the pathological information of TB?</li> <li>● How can we treat and prevent TB?</li> </ul>
<b>Unit 4</b>	Prevention and Treatment of Diabetes	Why so Many of Us Are Getting Diabetes?	Diabetes Insulin Insulin resistance Glucose Genetic Calorie Dialysis Cardioprotective, etc	For example: <ul style="list-style-type: none"> <li>● What is Type 1 diabetes?</li> <li>● What is Type 2 diabetes?</li> <li>● What are the functions of insulin?</li> <li>● What are the functions of glucose?</li> <li>● What is insulin resistance?</li> <li>● What are the effects of genetic and environmental factors on diabetes?</li> <li>● How can we treat and prevent diabetes?</li> </ul>
<b>Unit 8</b>	Research into the Causes of Heart Disease	Heart-Health Lessons from the Clinton Case	Coronary Heart Disease (CHD) Cholesterol Hypertension Blocked artery Plaque Statin Angina, etc	For example: <ul style="list-style-type: none"> <li>● What are the details of Mr. Clinton's case?</li> <li>● What are the functions of statin medicine?</li> <li>● What are the clinical manifestations of CHD?</li> <li>● What are the complications resulting from CHD?</li> <li>● What are the causes that trigger CHD?</li> <li>● How can we treat and prevent CHD?</li> </ul>

Although the researcher had the concept of the three medical topics, she needed to consider the characteristics of the problems to be used in PBL. As a consequence, the two main issues for the researcher to deal with the developing problems were (1) how to integrate the characteristics of the problem in PBL to the present problems; (2) how to develop the problems in order to provide the best means by which the students

could be stimulated in their group discussions concerning the pathological changes and the treatment and prevention of the disease.

Firstly, some scholars (Weiss, 2003; Savery, 2006; De Simone, 2008; Barrett, 2010) suggest that the most important characteristic of a problem in PBL is that the problem should be authentic. In relation to language learning tasks, authentic tasks, in the sense of being from real-life, are far more motivating than contrived ones and motivation is crucial to learning. In this study, an authentic problem could act as a stimulus for group discussion and learning and provoke an extended discussion in the PBL lessons. The students would be stimulated when judging themselves by their prior medical knowledge, and be stretched when challenged by an authentic problem. Hence, the problems should be ones that most medical students would encounter regularly in their study and future work. Authentic problems could be selected from the NMPE, which contains many authentic medical cases for each of the target problems.

Secondly, the inherent difficulty was caused by the rigid or suggested characteristics of the problem in PBL as well. For example, the problems should be ill-structured. This means the problems should lack an easy solution; the problems must not be limited in scope and must be conducive to many interpretations and solutions (Chin & Chia, 2006). In this study, the problems should have gaps (incompletion) of information and provide partial information for the answers to the disease. Although the students had some prior knowledge to help them to understand the problem, they still needed more in-depth information to solve the problem. Therefore, an ill-structured

problem can be provided by creating gaps in controversial information, which can yield many possible answers and ambiguities. Furthermore, to design the “jigsaw of information” was an important part of the development of the problem, which required time, understanding and experience.

The researcher looked through the target topics of the textbook in NMPE, in order to decide which one would be suitable for the students’ medical background; the researcher firstly selected nine medical cases for the three problems, three cases for each problem. The researcher consulted the medical teacher, and explained to her the meaning of authentic and ill-structured, which helped the medical teacher finally to determine three authentic medical cases for the three problems. The three medical cases with different types of information included the disease history, the symptoms, body check results and medical history were developed in the end, all of which supplied comprehensive background knowledge to make the students have an understanding of the cases. The students could investigate by themselves to obtain the answers, which included the diagnosis, the explanation on the pathological changes, the treatments and preventions of the disease, etc. The excerpts from the three developed problems for the diseases are shown in Table 4.2.

**Table 4.2 Excerpts from Three Problems**

Items Problems	Patient	Symptoms	Medical History	Body Check Results	Others
<b>Problem 1</b>	A 33-year-old woman	- Fever with chills; - A mass in the upper quadrant of her left breast. .....	1. No history of TB or diabetes mellitus 2. No family history of breast cancer.	1. T: 38°C, BP:126/68 mmHg, a pulse rate of 89/minute, and a respiratory rate of 19/minute. 2. A firm mass of 5 × 6 cm with an erythematous open non-healing wound. .....	Findings through imaging (X-ray).
<b>Problem 2</b>	A 57-year-old man	- Polydipsia; - Polyphagia; - Weight loss of urine. .....	1. More than 20 years' history of hypertension; 2. Medication is not regular, history of colon cancer surgery three years ago. ....	1. T: 37°C, P: 80 beats/min BP:175/80 mmHg. 2. Limb muscle strength 5, and limbs tension or muscle tension were normal. .....	Findings through imaging (X-ray).
<b>Problem 3</b>	A 75-year-old man	- Short of breath; - Fatigues easily .....	1. Osteoarthritis and mild chronic obstructive pulmonary disease (COPD); 2. High blood pressure; 3. No history of infectious diseases.	1. T: 36.7°C, P: 64 beats / min, R: 20 beats / min, BP: 140/85mmHg. 2. Lungs breathing exercises symmetrical intercostal space normal fremitus symmetrical. .....	Findings through imaging (X-ray).

Next, the researcher used the main concepts from the textbook and produced some questions concerning the important information, for example: What are the bases for the diagnosis? What is the pathogenesis of disease? What are the recent advances in research? Based on the questions that came with the problem, the students needed to have a thorough comprehension for the problem. These questions helped guide the



students to the key concepts of the problem; and their thinking process; and view the problem from different perspectives. The students were permitted to write answers on the given forms and to discuss with their group members the information they knew or they did not know.

*“I talked to the medical teacher and asked her which kind of medical cases would be appropriate to the students with suitable features for a problem in PBL. She suggested some cases from NMPE, because the students needed opportunities to confront various types of problems in order to gain an understanding of different diseases. Furthermore, they had to pass this exam to be a qualified doctor. These cases should be interesting to them, too.”*

*Researcher’s Journal, Feb 3*

In conclusion, when selecting and developing a problem, the researcher should select a problem relevant to the students’ background knowledge and also useful for students’ future career prospects. Moreover, the important thing is that the problem should be authentic in terms of diseases and stimulate discussion in the PBL lessons.

#### **4.2.3 Selecting and Developing Reading and Listening Materials**

In general, before students could form their own sentences in speaking, they needed to have enough exposure to the target forms. In this study, the researcher realized the importance of adequate input for language preparation. Therefore, supplementary materials for both reading and listening were provided. These reading and listening materials would serve as language input and be expected to help the students to develop their language ability. The reading and listening passages should contain particular and target medical vocabulary and expressions. The students would later be able to use them in their speaking activities.

#### **4.2.3.1 Selecting Reading and Listening Materials**

Three main issues were found in the process of selecting the reading and listening materials. The first difficulty was proper allocation of time for reading and listening instructions and activities. The second one was the number of reading passages and the number of listening videos to be used for each problem. The third one was the proper vocabulary to be covered in the reading and listening materials.

##### **● Time Allocation for Reading and Listening Materials**

According to the regular schedule of the medical English course, there were two hours each week with a total of eighteen weeks to achieve the goals of the course. The major learning activities included learning vocabulary and expressions in the textbook and reading exercises on the texts.

In theory, the cognitive process and the working memory resources of readers and listeners, is limited. The cognitive load required for the information input should not “exceed the working memory resources available if learning is to occur” (Paas, Renkl, & Sweller, 2003, p.2). In this study, owing to the fact that the normal class teaching schedule was 2 hours for textbook teaching and learning at one time, the reading of the materials the teaching and learning was allocated 1 hour. Furthermore, another 1 hour was allocated to the listening materials.

In addition, on the basis of the previous teaching experience and the results of consultation with the senior teacher, a total amount of 5 hours and 20 minutes was allocated. Thus, 2 hours was used for textbook teaching and learning, 2 hours for

reading materials and 1 hour for the teaching and learning of the listening materials, and 20 minutes for sharing ideas respectively. After piloting, it was confirmed that the allocation of time was appropriate as the students were able to handle all the tasks within the time provided.

### ● **Amount of Reading and Listening Materials**

According to Barrouillet, Bernardin and Camos (2004), the information input, whether verbal or visual, should not require much cognitive load. That is, the length and time allocation for the verbal and visual input have to satisfy the limitations of the working memory resources available. Each reading passage in the textbook contains around 1100 words in length, and the researcher, based on the previous teaching experience and the time allocation for the reading of the materials, selected two passages of 1000-1200 words for each problem in this study. These two passages were selected from medical textbooks, research articles and materials found on the internet.

With regard to the videos used for listening, usually one independent listening section takes a maximum time of 5 minutes in a general English course, and the content is used for conversation practice or as a short passage for listening. It was decided that two videos, each of about 3 to 5 minutes in length would be suitable as listening materials.

The decision on the number of reading and listening materials was based on by the results of the pilot study.

### ● Vocabulary Coverage in Reading and Listening Materials

In terms of the vocabulary coverage in the reading and listening materials, the vocabulary from the textbook was the first choice. It was expected that these vocabulary items 1) would be used in the discussion related to the themes in the textbook and 2) would also appear in the reading and listening materials. So these were the criteria for the selection of the vocabulary.

In addition, after piloting, it was found that the researcher had to provide the phonetic symbols and Chinese definitions for each of the vocabulary items in order to help the students' with pronunciation and correct comprehension.

*“...as the medical vocabulary in the reading and listening materials should be used in the group discussions, after I decided on a suitable list of vocabulary items, I highlighted and added vocabulary which might be used in the discussions. Then I consulted the medical teacher who confirmed the list of items was appropriate. Because I had to provide the phonetic symbols and the meaning in Chinese for each vocabulary item, it took me a lot of time to repeat the process. However, I benefited from the labeling process, which offered me an in-depth understanding of the vocabulary.”*

*Researcher's Journal, Feb 3*

### ● Solutions to the Difficulties

Difficulties were inevitably encountered during the process of designing the reading and listening materials, and the researcher was successful in dealing with them through hard work and with the help of the medical teacher. For example, the researcher often found it hard to understand some of the listening and reading materials as they were highly technical. The researcher had to devote considerable time and effort to search carefully for other suitable materials after she viewed the existing materials. Furthermore, the researcher was assisted by a native speaker, who taught at GMU and

who helped check the video transcriptions. Since the native speaker herself could not provide accurate definitions of some of the medical expressions, she needed time to search for them from the internet. After that, the researcher had to work with the medical teacher to check not that the materials were at the right level, but also that the medical content was accurate.

*“...I was disappointed after I talked with the native speaker. She was not sure about the accuracy of some medical vocabulary used in the videos because of the lack of medical knowledge background. So it was necessary to get help from the medical teacher. After I got the transcriptions from the native speaker, I worked with the medical teacher for the accuracy of the vocabulary; it really took a lot of time and made me felt exhausted...”*

*Researcher’s Journal, Feb 4*

#### **4.2.3.2 Developing the Reading and Listening Materials**

In this study, the researcher provided the students with the reading and listening materials in relation to the problem to be solved in class. The students chiefly relied on the content from the reading and listening materials to solve the problem. Thus the information from the reading and listening materials was used for both medical and language input so that the students would be able them for their speaking activities.

##### **● Reading Materials**

The reading materials provided the input for the medical information, which lead to the speaking output. The reading passages covered a broader range of learning issues than the ones directly applicable to the learning objectives. The reading materials provided various facets of the problem situation, and helped the students solve the problem and prepare for the discussion.

The issues for the researcher in developing the reading materials were: 1) The prepared reading materials should provide students with more specific medical information than the textbook, and 2) the information should be comprehensible to the students.

In order to deal with these two issues, on the suggestion put forward by a senior teacher who had prepared the reading materials for her own teaching practice, the researcher searched for the key words of the problem via the internet and was able to obtain many medical-related research articles. However, according to the medical teacher, most of the articles were too complicated for the students to comprehend, for they were beyond the students' existing medical knowledge. Therefore, the medical teacher reviewed the medical vocabulary and content again in the sources to recommend suitable items for use in the reading passages. All the selected passages had to represent multiple types of knowledge (both theory and practice) to frame the problem and to increase the speaking output, and furthermore, attention had to be given to limiting the number of words in the reading materials.

Although the text had two reading passages for the students to learn, two with more medical vocabulary and professional medical content were selected and used as the reading materials for each problem (for details, see APPENDIX H).

In order to assist the students' comprehension, two options were provided by the researcher, one was the meanings of the vocabulary items in Chinese and the other was a phonetic transcription. Thus, each item of medical vocabulary was provided with both phonetic symbols and Chinese definitions. It should that this facilitated the

students' thinking and avoided any incorrect pronunciations of the medical vocabulary.

For example:

*“Diabetes, often referred to by doctors as diabetes mellitus [daɪ.ə.bi.tiːz 'mel.i.təs] 糖尿病, describes a group of metabolic [metə'bɒlɪk] 新陈代谢的 diseases in which the person has high blood glucose ['glu:kəʊs] (blood sugar) 血糖, either because the insulin ['ɪnsjʊlɪn] 胰岛素 production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria [pɒli'jʊəriə] (frequent urination) 多尿症. They will become increasingly thirsty (polydipsia [pɒli'dɪpsɪə] 烦渴) and hungry (polyphagia [pɒli'feɪdʒɪə] 杂食症).”*

In addition, the statistics and the pictures provided useful visual aids that made the lesson effective and meaningful (Cakir, 2006). In addition, some cited statistics and pictures relating to the information in the reading materials were also attached. The researcher collected pictures and statistical information from the medical textbook and from the internet. For example, the pictures and statistics showed recent changes in the pattern of diabetes in the last 30 years which appeared in different countries and also the effects of diabetes on pregnancy were observed. The information from the pictures and the statistics were checked with the medical teacher as well.

*“Sometimes the definition of one item of medical vocabulary did not match, so I did not know which one was the best to use for the target vocabulary. With the help of the medical teacher, I was finally able to revolve these problems. On the other hand, it was a time-consuming task for me since the passages included a lot of medical vocabulary. I felt as if I was a robot continually reviewing and recording the phonetic symbols and definitions of the vocabulary. However, I learned a lot, e.g. how to discuss problems in detail with teachers from other disciplines and how to make requests from different colleagues.... Anyway, the help from the medical teacher was essential for the development of the reading materials.”*

*Researcher's Journal, Feb 6*

### ● **Listening Materials**

The meaning-focused input involves learning through listening and reading with the focus on understanding and gaining knowledge (Nation, Stephen, & Newton, 2008). In order to improve students' comprehension and speaking ability, in this study, a combined input of reading and listening was used. The audio-videos were the direct input for speaking; the student may learn to recognize symptoms and to utilize the visual and auditory input in the spoken output, which provides additional modalities for students to understand the problem scenario. Some sections of the audio input were outlined to help the students understand the medical content.

The difficulty for the researcher in the development of the listening materials was how to make the listening materials comprehensible. In order to overcome this difficulty, three solutions were found in the course of their development.

Firstly, the listening contents were related to the students' existing medical knowledge and English listening comprehension ability. Secondly, the length and the speaking speed were adjusted by the researcher to guarantee that the listening materials could be handled by the students. Thirdly, the transcriptions had to be accurate so that the words and expressions would be used correctly in discussions. In addition, the materials were reviewed by the medical teacher, and then revisions were made accordingly.

The vocabulary of the target disease was searched through YouTube searching slot by the researcher. It was really a time-consuming period, over fifty audios were found via internet, and there were even some documentary films. The researcher needed



to watch the audio while trying to scan the key vocabulary list from the textbook. In addition, she had to consider the time length with the similar 3-5 minutes. Two videos with the limited time were chosen as the listening materials for one problem. Finally, the listening materials should be checked by the medical teacher to ensure the appropriateness of the content.

The listening materials for each problem contained two videos together with the transcriptions. The selected videos had to be given to a native speaker to check the transcriptions. During the process, the researcher also talked with the native speaker about the content mentioned by the medical teacher. As an example, it was necessary for the native speaker to understand the eight systems in the human body, because the native speaker had to describe it, and the sentence was cited in the listening materials as *“Insulin is a hormone that helps your body use blood sugar, known as glucose for energy”*. Finally, the completed transcriptions had to be double-checked by the researcher and the medical teacher. Where there were doubts about the accuracy of the materials, the medical teacher was able to explain the meaning to the native speaker with the help of the researcher. If there were any mistakes they were corrected, but if not, the original form was kept. This was the process used in the development of the listening materials with transcriptions.

*“I understood that the native speaker was very careful about the meaning of the medical vocabulary and expressions because she had no background in medicine. As a developer (researcher), I learned a lot of medical knowledge through the PBL medical English development, which would be helpful for me to teach the PBL lessons and I could facilitate the students with more medical knowledge in the class.”*

*Researcher’s Journal, Feb 5*

### **4.3 Developing the PBL Teaching Plan**

PBL is both an approach to the curriculum and a teaching method. It consists of carefully designed problems that challenge students to use problem-solving techniques, self-directed learning strategies, group participation skills, and disciplinary knowledge (Duch, 1995). The development of Stage III of the PBL medical English lessons was about how to develop the teaching plan based on the developed PBL medical English materials. According to the framework of the course development process in Figure 4.1, there were three steps in the teaching plan for the PBL lessons. The first step was the pre-teaching period, with sub-steps of lead-in activities and textbook-based activities. The second step was the while-teaching period, which included problems, learning the reading and listening materials, group discussions and students' logs writing. The last step was the post-teaching period, which was after-class activities. The three teaching periods were the main components of the teaching plan in the PBL medical English lessons, which are described in detail in the following sections.

#### **4.3.1 Pre-teaching Development**

Pre-teaching is a pre-requisite for admission to while- and post-teaching. It contained the lead-in activities and textbook-based activities.

##### **4.3.1.1 Lead-in Activities**

Tan (2003) recommends that the teacher's introduction of the problem is important to guide the students to fully understand the problem. The lead-in activity is a technique used by teachers at the beginning of teaching to prepare students to learn

and establish a communicative link between themselves and the information about to be presented (Kumar & Narendra, 2012). Therefore the lead-in activity for the PBL lessons should be the first task in the development of the teaching plan, so as to guide the students to have the pre-requisite information to follow the learning process.

The difficulty in developing the teaching plan for the lead-in activity lay in how the activity could arouse the students' interest in the target problem. The researcher had to obtain the clues from the problem to elicit the directions related to the lead-in topics so as to solve the difficulty. The researcher read the content in the textbook and its related reading and listening materials, and then she surfed the internet to look for possible templates to encourage the students with discussions. Furthermore, Slavin (2004) considers that it is not good to take up too much time when teachers are leading into a new lesson. It should only take about 3-10 minutes. If teachers spend too long on a lead-in, it will probably result in the teaching aims or key points becoming unclear. As a consequence, the time for the lead-in activity in the PBL lessons was less than 10 minutes for each problem which also took into account the length of the whole lesson (each class had one hour).

For example, the lead-in activity of Problem 2 (about diabetes) was about 8 minutes. The problem was about diabetes, which was a normal disease. The researcher considered how to stimulate the students' interest in this disease and introduced the disease referring to some famous people, such as Hu Jingtao, the ex-chairman of China and Grand Master Hsing Yun, who both suffered from the disease.

Both of them suffered from diabetes for many years. In addition, it was possible to show the picture of a congenital teras, which resulted from a mother's gestational diabetes. The students then discussed what they saw, and then the researcher asked questions selected from the text such as "What do you know about diabetes? What are its causes? How can it be prevented? etc." The students discussed these questions and drew conclusions based on their existing knowledge before their study of the PBL materials.

*"The lead-in activities are very important to arouse the students' interest and stimulate the sharing of their information. Firstly, I chose questions from the textbook, tried to reach the features with short and interesting materials, e.g. Problem 2 about diabetes. I thought it might attract students' interest. The case was about Chinese former Chairman Hu Jintao. He is a powerful person but he could not eat desserts; yet, he actually likes it very much. Why? Maybe this case would arouse the students' interest because they would be confused about that, and then they could be assigned to discuss the information they had or did not have in English, which cultivated their thinking of the target problem as well."*

*Researcher's Journal, Feb 12*

#### **4.3.1.2 Textbook-based Activities**

The researcher, who was also the medical English course teacher, provided activities based on the textbook to the students after they had carried out the pre-requisite thinking in the lead-in activities. No special teaching method was used other than class activities to enhance the students' vocabulary learning and improve their reading comprehension. But the problem for the researcher was how she could make a success of presenting this to the students. This was the difficulty that the researcher had to deal with.

In order to update the teaching method concerned with the emphasis on vocabulary and reading, the researcher reviewed related books and articles, including the domain of teaching methods about vocabulary and reading comprehension, the teacher's role in vocabulary teaching, the teaching of reading, and reading comprehension (e.g. *Teaching and Researching: Reading*: Routledge, 2012, *Multisensory Teaching of Basic Language Skills*: ERIC, 2011, Literature Circles in ELT, *ELT journal*, 2012 (66); What Every Teacher Needs to Know, *The Reading Teacher*, 2012(65), etc.).

The researcher tried to develop the activities to ensure that the goal the students could master the vocabulary and comprehend the content in reading comprehension, since the vocabulary and content was useful input for the following while-and post-teaching periods. Furthermore, the researcher had to consider how the students could master the vocabulary and digest the reading materials and how they would employ the information in discussions. The aim of the activities was to help students understand the vocabulary and text and to develop their basic language skills. The researcher tried to make the lecture-based lessons reflect a communicative view of language and language learning that can be used to support a wide variety of classroom procedures.

The vocabulary teaching conducted by the teacher focused on the meaning and pronunciation of the vocabulary items. The teacher helped students get into the habit of noticing by making clear in classroom instruction and after class activities: how

the vocabulary items could be accurately pronounced, what each item is (a single word, a phrase, a collocation etc.) and how words are formed by using affixation and root flexion. Learning vocabulary was largely about remembering in lecture-based learning, and students generally need to see, say, and write newly learned words many times before they can say to have learned them. The teacher used different ways to present new vocabulary including pictures, sounds, and different text types with which students could identify: situational dialogues, web pages, questions & answers, etc.

Furthermore, the use of the textbook as the materials helped students in two broad areas: First, they needed to present and practice in classroom contexts the vocabulary that was frequent, current, and appropriate to learners' needs of examination. Second, the materials helped students become better learners of vocabulary by teaching different techniques and strategies they could use in the PBL lessons learning to continue learning outside the classroom. Textbooks also presented vocabulary in thematic sets as an aid to memory. However, the ways of practicing newly presented vocabulary in class, from repeating the words, controlled practice, to using the vocabulary in true cases, etc. For example, in learning the vocabulary of respiratory system in the unit about TB, students listened to the names of organs, identified the location of the organs they knew by using the medical knowledge, and added new ones if possible. They tried to speak out which functions the organs performed in the respiratory system, or which they had the pathological information of the terms of the organs (e.g., "pulmonary lobe" and its pathological changes and clinical changes, etc.).

*“The students should master the vocabulary and medical information because they cannot only to obtain useful input, but also to obtain the knowledge to pass their final examination. So I gave the lectures with an emphasis on vocabulary and reading comprehension related to the medical information... Since the research’s aim was to improve the students’ speaking ability, Question-Answer interactions could be used in the class. They helped students practice the pronunciation of vocabulary, and aroused their learning motivation... ”*

*Researcher’s Journal, Feb 13*

### **4.3.2 While-teaching Development**

Besides the teaching and learning from the pre-teaching period, the students should be actively involved in the while-teaching period. In this study, the while-teaching meant that the students would study the PBL materials provided (problems, reading and listening materials) by the researcher, and then they would discuss in groups and write their students’ logs.

#### **4.3.2.1 Problems**

The introduction of the problem in the PBL lessons was the key which lead to the development of other skills. The difficulty for the researcher was how to make the students use the problem as a “trigger” to define their own learning objectives, which would help them with their self-directed studies before the group discussed and refined their acquired knowledge subsequently.

The study of the problem was limited to one class (one hour). The researcher distributed an outline to each student about the characteristics of the problem in PBL to make sure everyone understand the importance of understanding the problem and the function of the problem in PBL learning. It would be the trigger to their later

learning. Furthermore, the researcher explained the outlines to the students, and questioned them to make sure that everyone understood the meaning of the problem. The students had to understand the problem fully for themselves, and the researcher would help them with explanations of the words and expressions in the context of the problem.

*“It was necessary for me to ensure that each student understands the function of the problem in PBL lessons, and then comprehends the problem. Otherwise, the following PBL learning would mislead the students into detaching the set strategy for the experiment, so I had to print the list of characteristics of the problem in PBL approach and distribute them to every student in class...”*

*Researcher’s Journal, Feb14*

#### **4.3.2.2 Reading and Listening Materials**

The reading and listening materials in PBL lessons should help activate the learning of the vocabulary and content. The effect should be the same as that of the reading comprehension in the textbook. All the materials were essential to provide the students with more relevant information of the problem. The difficulty for the researcher was how to make the materials as comprehensible input in order for them to be used in the production stage.

On the one hand, the researcher tried to stimulate the students’ by brainstorming ideas for problem-solving. On the other hand, she asked the students to review the information from the materials and write in the forms provided, e.g. problem issues form, investigation form, information searching form and solution defining form (see details, in APPENDIX A). The students were asked to make a group action plan



and also an individual action plan for their after-class activities. When the students finished the reading or listening materials, they began to search for information in class for the target problem, which provided them with more opportunity to be exposed to the language content. Next, they shared the information, or synthesized the information in their groups. In studying the reading and listening materials, the researcher had to devote more effort to giving explicit explanations of the medical English vocabulary and expressions, which would be hopefully transferred into the speaking output in group discussions. The use of the reading and listening materials should expand the students' medical English information and provide useful input through learning by the students. The teaching time was a total of three hours, two hours for reading materials and one for listening in different weeks.

*“As a teacher, I should facilitate the process (help the students maintain group dynamics and keep the group studying the materials). In addition, I ensured that the group reached the learning objectives in line with information searching in their reading and listening. In group discussions of gathering information, I ensured that all the group members participated. Finally, I helped them finish filling in the forms. All the facilitation I did was to ensure that the reading and listening materials provided comprehensible input for the students. When necessary, I encouraged the students to check their understanding of the material by means of group discussion...”*

*Researcher's Journal, Feb16*

#### **4.3.2.3 Students' Logs Writing**

The PBL lesson was a different teaching method for the students compared with that for their general medical English course. It started with a problem, concern, or challenge that was real and relevant to their medical background knowledge. Meanwhile, the PBL lessons provided the students with opportunities to collaborate

with their peers to work through a problem-based process. The students would have to make their own reflections on studying the PBL lessons. Hence, the students' logs writing were necessary to record the nature of learning in the PBL context.

The difficulty for the researcher was that perhaps the information from the logs would be inconsistent with what the researcher expected. The logs might not give any useful information to be explored. Therefore, the researcher would reduce this possibility by reminding the students when they were writing the logs in class, and asking them to write down only the reflections of the vocabulary learning and the content learning from the textbook, and their study of the reading and listening materials, etc. For example: the researcher provided them with prompts such as "I felt confused when reading / listening of ... and so I...; Vocabulary / some expressions I did not know...." The researcher offered them different prompts when they needed to write the logs. The time allowed them for logs writing in each class could be 10 minutes.

*"The students' log writing was an important part of students' self-learning in PBL lessons; I helped them try to reflect more useful information. By the way, I can modify my own teaching based on the reflections from the students in the teaching of PBL in the future. So it was necessary to provide them prompts, and I also explained the prompts in class when they began to write their logs."*

*Researcher's Journal, Feb17*

### **4.3.3 Post-teaching Development**

After the students studied the PBL lessons in the pre-and while-teaching periods, the students were given some learning activities so as to foster their learning after class. In this study, the researcher assigned the students to carry out activities both

individually and in group work, which helped the students reinforce the knowledge they had learned in class and gave them an opportunity to exercise their ability to clarify, connect, summarize, and evaluate their knowledge.

#### ● **After-class Activities**

PBL required the students to complete after-class activities such as information searching and the integration of their knowledge. The after-class activities asked the students to foresee the problems and to find possible ways out of the potential problems. It stimulated them to learn by themselves and benefited them with a critical thinking disposition by searching for, integrating, synthesizing and producing information. It also helped them practice communicative activities in their groups as well.

The difficulty for the researcher was how the students would manage the after-class activities and how to make the activities more systematic and orderly.

Firstly, a group leader was necessary to be appointed to organize the activities so as to keep the after-class activity as a regular one, which was the basic solution to the difficulty. As each student should be engaged in knowledge construction during their self-learning for information searching and group discussion for information gathering after class, the group leader could organize the group work to share and evaluate the findings that the students had found for themselves. Without the after-class self-learning and group work to collect relevant information, the students' knowledge-base would be limited to information from the textbook and the materials provided in class by the teacher, and consequently their discussions would be very narrow in scope.

Therefore, a group leader was required to (a) assign a regular time and place for the groups to meet; (b) collect and summarize the information obtained by the members in each group; (c) check that the members finished filling in the forms, and (d) obtain the cooperation of all the group members. It was voluntary to choose the group leader, who needed to have both responsibility and enthusiasm for the job.

The second solution was to fill in the forms. The forms were not only to help the students record what different information they wrote down in class learning, but also to be a monitoring tool to encourage the students to search for information for themselves. The sequences of the forms were: (a) facts known or unknown, (b) questions, sources to solve the problems and actions to get information from the sources, (c) the understanding of the problems and (d) details of information searching, all of which guaranteed that the after-class activities helped to keep a check on the students' learning process.

Besides the appointment of the group leader and filling in the forms, every group had to prepare a presentation after class. The presentation included a summary of the findings and solutions to the problem. It had to be presented in the final class of each of the problem lessons. One or two students were chosen as the representatives to present their work in class. The presentation was a reflective and evaluative process for the students. They were evaluated by their peers based on their speaking performance and usage of the medical vocabulary.

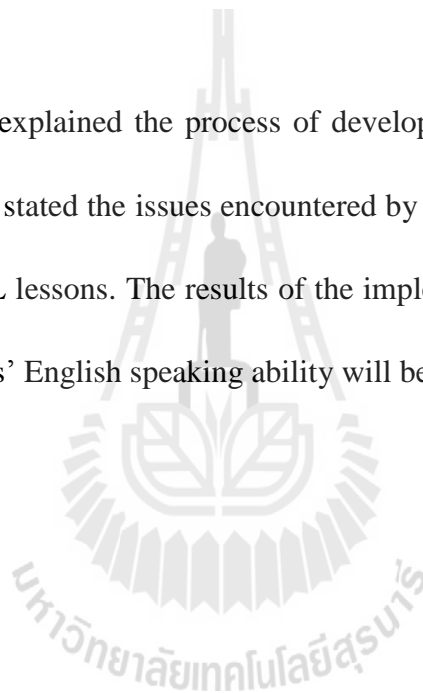
*“...sometimes the students needed to be monitored to ensure that they could finish the tasks after class in line with the research requirements regarding time. The*

*appointed group leader was the one who had the duty of monitoring and making the arrangements for the after-class activities, so allowed the leaders to volunteer. Furthermore, filling in the forms was another way of monitoring the students' self-learning after class, which could be a guide to the search for information as well. I hoped these activities would help the students have enough knowledge to provide a comprehensive input in their discussions, and that they would improve the outcomes of the students' PBL medical English learning."*

*Researcher's Journal, Feb 18*

#### **4.4 Summary**

This chapter explained the process of developing the PBL medical English lessons. In addition, it stated the issues encountered by the EFL teacher in the process of developing the PBL lessons. The results of the implementation of the PBL lessons to develop the students' English speaking ability will be presented in the next chapter.



## **CHAPTER 5**

# **RESULTS OF STUDENTS' SPEAKING ABILITY AND THEIR PERCEPTIONS OF THE PBL LESSONS**

The main purpose of this chapter is to present the findings of the study in response to the two research questions (Research Questions 2 and 3) postulated in Chapter One. It consists of two sections: 1) the answers to RQ2, which are based on the pre-and post-speaking tests scores and the students' speaking performances, together with the results gathered from the students' logs, semi-structured interviews and group discussion analysis; and 2) the responses to RQ3, which include the results and analyses of the students' logs and semi-structured interviews. These two sections demonstrate the effects of the PBL approach on the development of the students' speaking ability and their perceptions of the PBL lessons on their medical English course.

### **5.1 Answers to Research Question 2**

**What are the effects of the PBL lessons on the development of the students' speaking ability?**

#### **5.1.1 Results of the Pre-and the Post-Speaking-Tests**

After the 18-week implementation of the PBL lessons in the medical English course, all of the 48 students took the parallel post-speaking-test which had the same level of difficulty and allocated time.

The descriptive statistics of the pre-and post-speaking-test scores of all the students are shown in Table 5.1 below.

**Table 5.1 Paired-sample T-test of the Pre-and Post-Speaking Tests**

	Paired-sample t-test			df	t	Sig. (2-tailed)
	Mean ( $\bar{X}$ )	Std. Deviation (SD)	Mean Difference			
<b>Pre-test score</b>	10.71	1.89	1.01	47	7.811	.000*
<b>Post-test score</b>	11.72	1.88				

\* $p < 0.05$

A paired-sample t-test was conducted to determine whether the differences in the students' mean scores of the pretest and the posttest were statistically significant. The results from Table 5.1 showed that the mean difference was 1.01; meanwhile, a two-tailed  $p$  value was .000\*, which indicated that there was significant difference between the means of the pre-and the post-speaking-test scores. In conclusion, the results suggested that the PBL lessons helped improve the speaking ability of the third-year medical students in terms of their medical English use.

Furthermore, the pretest and the posttest were both divided into three parts: participation, language ability and conversational competence in group discussion, so as to look into the detailed progress of the students' speaking ability in group discussions. Two inter-raters gave scores for each group member of these three parts in the pretest and the posttest according to the criteria for the discussion part of CET-SET 4/6. The results of each part of the two tests are shown in Table 5.2.

**Table 5.2 Paired-sample T-tests of the Three Criteria Items Scores**

Criteria Items	Tests	Paired-sample t-test			df	t	Sig. (2-tailed)
		Mean ( $\bar{X}$ )	Std. Deviation (SD)	Mean Difference			
Participation	Pre-test	3.56	0.80	0.35	47	4.749	.000*
	Post-test	3.91	0.70				
Language Ability	Pre-test	3.54	0.78	0.30	47	4.152	.000*
	Post-test	3.84	0.74				
Conversational Competence	Pre-test	3.60	0.73	0.37	47	4.352	.000*
	Post-test	3.97	0.71				

\* $p < 0.05$

After comparing the mean scores ( $\bar{X}$ ) of the pretest and the posttest in each part, it was found that the mean score of these three items increased respectively from 3.56 to 3.91, 3.54 to 3.84 and 3.60 to 3.97, listed in the three parts in the table above named participation, language ability and conversational competence. These results indicated that the students' speaking abilities in group discussions improved after they underwent the PBL lessons.

In addition, a paired-sample t-test was used to compare the speaking scores from the pretest and the posttest in each part. The results demonstrated that the mean difference was 0.35, 0.30 and 0.37 in each of the three items, while a two-tailed  $p$  value of the three were .000\* respectively, which suggested the significant difference between the means of three items of the speaking scores from the pre-and the post-test. The results indicated that the PBL lessons helped the students improve their speaking ability in terms of the ability to participate in the group discussions, to use the medical English vocabulary and expressions, and to use conversation strategies.



In conclusion, the quantitative data obtained from the pre-and the post- speaking tests revealed that the students' speaking ability in group discussion had improved significantly after engaging themselves in the PBL lessons. In order to explore how the students improved their speaking ability during the process of the PBL lessons, the data gathered with the qualitative research instruments were also analyzed, the results of which were presented and explained in the next section.

### **5.1.2 Analyses of the Group Discussions**

The analyses of the group discussions focused on three aspects: 1) students' participation, 2) their language ability and 3) conversational competence in group discussion.

After the first recording of the group discussion was finished, the researcher transcribed the recordings, read the transcripts line by line, marked potentially interesting and relevant parts of the three criteria in different colors, and wrote key concepts in the margins. The concepts which were similar to one another in the discussions were labeled fine. Finally they were categorized according to themes. The second and third recordings of the problem discussions in groups were transcribed in the same way. The researcher compared a list of the three categories derived from the first transcription with the second and third ones, in order to find out the effects of the PBL lessons on the development of the students' speaking ability through group discussions.

### **5.1.2.1 Criteria for PBL Group Discussions**

The researcher adapted the rating criteria from the three aspects based on the rating criteria of CET-SET 4 / 6. For each aspect, a scale of 2 to 5 is given (for details, see Appendix G). Then the scores for these three aspects were totaled to demonstrate the students' performance in group discussions.

The rating criteria focused on the evaluation of language speaking ability in group discussions. Therefore, the analysis focused on the quality of their speaking ability in three aspects: (1) individual participation (verbal involvement); (2) language ability (medical-related vocabulary use) and (3) conversational competence (conversation strategies use). The next section presents descriptions of the three rating criteria.

#### **Participation**

The participation in group discussions engages the students' in active learning rather than passive activities. It reinforces practical communication through the active involvements of group members in the discussion. In this study, the participation referred to the verbal involvement of each group member in the discussion, which provided an opportunity for all the group members to practice communicating their ideas with other group members and to produce language, which was the ultimate goal of the PBL lessons and medical English course. Such participation also assisted the group members in learn how to effectively convey their ideas to others in the process of discussion. The researcher counted the turns taken by each group member in different group discussions.

### **Language Ability**

Generally, language ability means that proficient speakers demonstrate both accuracy and fluency. In this study, it referred to the ability of an individual to speak or perform in group discussions by using appropriate medical vocabulary and expressions. However, as the problems used in the PBL lessons were ill-structured and controversial in order to encourage different opinions from the group members, the accuracy in relation to medical content was not evaluated. Besides, the PBL lessons did not train the students in explicit grammar; instead, they emphasized mainly the medical-related vocabulary and expressions, which provided more opportunities for students to practice speaking. Therefore, language ability referred to the occurrences of vocabulary items in each discussion, which demonstrated the effective use of the specific medical English vocabulary was taught in the PBL lessons. So the use of medical vocabulary was the analytical focus. It was anticipated that one would be able to see whether the students could transfer the language from the PBL materials into their speaking output.

### **Conversational Competence**

Conversational competence is the ability to comprehend and produce conversation based on one's knowledge of conversational procedures and strategies. It studies how individuals process many different phrases or verbal ideas and how they direct their spoken conversation in a specific direction. In this study, the conversational competence refers to the use of conversation strategies in discussions by the students and to the ability to keep communication going or to enhance the effectiveness of the

communication in group discussions, such as checking comprehension, requesting clarification, repeating utterances, stressing key words and switching topics and stating agreement or disagreement.

The use of conversation strategies is necessary to enhance the speaker's ability to express their ideas in an appropriate manner. The students were required to participate in the training in the use of conversation strategies for group discussion in the PBL lessons. The conversation strategies used in this study were divided into four categories: 1) To use the conjunctions like *and, but, however, because, etc.*; 2) To keep the conversation going by agreeing/disagreeing with others such as *I agree/disagree with you; I couldn't agree more; I'm afraid I can't/don't agree with you*; 3) To be able to not only express their own opinions, but also ask for opinions from others. For example, *What do you think about it? What do you think? In my opinion*; and 4) To use phrases that act as fillers, thinking of words they can turn to when they need time to come up with an appropriate response. Some of these fillers are: *"Let me see..."*, *"You mean..."*, *"I think..."*, *"What I mean is..."*. The results of this analysis should illustrate how the students used these phrases in the organized discussions.

#### **5.1.2.2 Participation in Group Discussions**

During the three group discussions on Problem 1, 2 and 3, the focus group was video-taped for analysis so that the participation of the students' in the discussions and the development of their speaking English level could be examined, and the number of turns taken by each student in the interaction in the discussions could be recorded.

The group members consisted of two male and four female students. The six students in this group were categorized in terms of their language speaking ability at three levels: high, intermediate and low. The high speaking level was labeled as HSL; the intermediate speaking level was labeled as ISL; and low speaking level was labeled as LSL. For the HSL group, there were two students: male 1 (HM1) and female 2 (HF2); for the ISL group, there were two students: male 2 (IM2) and female 3 (IF3); and for the LSL group, there were also two students: female 1 (LF1) and female 4 (LF4).

The researcher counted the turns that each student took in the three discussions individually. Table 5.3 shows the frequency and the mean of number of turns that the students took in the discussions in four parts: 1) the total turns taken by the student at a high speaking level; 2) the total turns taken by the students at an intermediate speaking level; 3) the total turns taken by the students at a low speaking level; and 4) the total turns taken by the students in the three groups in each discussion.

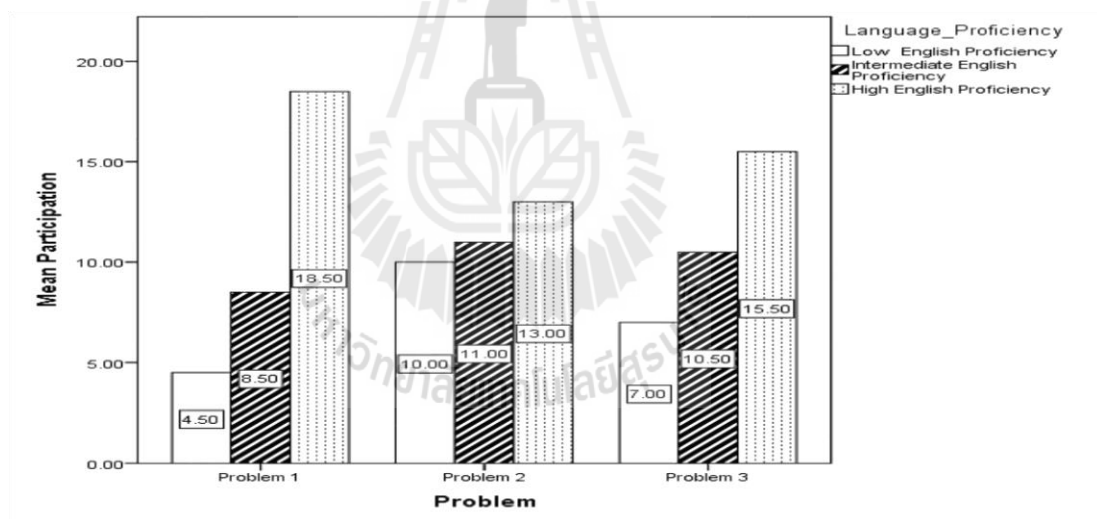
**Table 5.3 Frequency and Mean of Turns in Discussions**

Group Members in Three Levels	Problem 1		Problem 2		Problem 3		Total turns of individual	Total turns of each level	
	Frequency	Mean	Frequency	Mean	Frequency	Mean			
HSL	HM1	20	18.5	14	13.0	22	15.5	56	<b>96</b>
	HF2	17		12		11		40	
<b>(1)Total turns of HSL</b>		<b>37</b>		<b>26</b>		<b>33</b>			
ISL	IM2	12	8.5	10	11.0	12	10.5	34	<b>62</b>
	IF3	5		12		11		28	
<b>(2)Total turns of ISL</b>		<b>17</b>		<b>22</b>		<b>23</b>			
LSL	LF1	3	4.5	13	10.0	10	7	26	<b>49</b>
	LF4	6		7		8		23	
<b>(3)Total turns of LSL</b>		<b>9</b>		<b>20</b>		<b>18</b>			
<b>(4)Total turns (of HSL+ ISL + LSL) in each discussion</b>		<b>63</b>		<b>68</b>		<b>74</b>			

Results from the discussions on Problem 1, 2 and 3 indicate that, generally, the HSL students participated more (with the total turns of 96) than the ISL (62) and the LSL (49) in the three discussions, with the time for discussion being respectively, 11, 10 and 13 minutes. As shown in Table 5.3, the ISL and LSL students had increased their turns in the discussion from Problem 1 to Problem 2 and 3. The ISL students increased their turns from 17 to 22 and to 23 in the last two discussions, and the LSL students increased their turns from 9 to 20 and to 18 in the same periods of discussion. The ISL had a lower increase of participation in discussions, and the LSL students had increased participation from the first discussion to the third one. In contrast, the total turns taken by the students in the HSL group experienced a change of down and up process from 37 down to 26, and then up to 33 in the three discussions. For the grand total numbers of turns in each discussion, the turns of involvement in each discussion by the students in three levels increased from 63 in the first discussion to 68 in the second one, and then to 74 in the third one. This change demonstrates that students at all three levels increased the amount of their participation from the first group discussion to the third one.

To be more specific, Figure 5.1 shows the differences as the mean participation score of the three speaking levels in discussions of the three problems. The participation by the students of the LSL group increased sharply from the discussion on Problem 1 ( $\bar{X}=4.5$ ) to Problem 2 ( $\bar{X}=10$ ), and decreased little in Problem 3 ( $\bar{X}=7$ ). The tendency to participate was curvilinear, going up initially and then down. The participation by the students of the ISL group also increased from the discussion on Problem 1 ( $\bar{X}=8.5$ ) to

Problem 2 ( $\bar{X}=11$ ), and decreased a little on Problem 3 ( $\bar{X}=10.5$ ). The trend of the changes in participation was to increase generally. The participation by the students of the HSL decreased from the discussion on Problem 1 ( $\bar{X}=18.5$ ) to the second discussion ( $\bar{X}=13$ ), and then increased in the third discussion ( $\bar{X}= 15.5$ ). For the students of the three speaking levels, the HSL students always had more turns than those taken by the ISL students, and in turn, the ISL students took more turns than those taken by the LSL students from the first discussion to the last one comparatively. Comparing the students at all the three speaking levels, the ISL group and the LSL group had more turns in the later discussions; however, the HSL group had fewer turns.



**Figure 5.1 Differences in Student Participation in Each Discussion**

Generally, it was demonstrated that the participation by the students at the three speaking levels increased in the three discussions. Thus, all the students at the three levels participated more in communication in the group discussions as a result of the PBL lessons.

To sum up, all students at the three levels in the group discussions made contributions to the solutions to the problems through participation, which improved their English speaking ability in the group discussions. The main results of the analyses are presented below:

First, in the three group discussions, the increase of the turns by the LSL and the ISL students lead to a decrease in the turns taken by the HSL students.

Second, in each group discussion, the HSL students participated than the ISL ones, who in turn contributed more than the LSL students.

Third, the amount of turns taken by the HSL students for the discussion changed greatly, increasing considerably in the first discussion, and then declined in the second discussion. However, in the third discussion, it increased again.

Fourth, in contrast, the amount of turns taken by the ISL students for the discussion did not change as much as for the HSL students, and conversely, it did not rise to a high level in the first discussion, and then it rose to a higher level in the second discussion; however, in the third discussion, it declined.

Fifth, similarly, the amount of turns taken by the LSL students presented the same changing curve as that for the ISL students; however, its change was greater than the other two.

When comparing the three discussions, the second discussion presented the feature that the time difference taken by every student in discussion was less. They took on average a similar number of turns compared with the other two discussions, because



the problem was about diabetes, which was a disease frequently heard about in daily life. Therefore, every student got involved because they had more information for this discussion. This indicates that familiarity with the information helps the students to discuss a problem more freely in the group discussions.

### **5.1.2.3 Language Ability in Group Discussions**

In this study, the students' language ability was related to a range of medical vocabulary occurrences in group discussions. The students encountered medical vocabulary in the textbook, in the problems, and in the reading and listening materials, and then they were directly exposed to the vocabulary through the PBL lessons. Therefore, it was expected that the students would use these words and phrases more freely in the group discussion activity.

The total number of the medical vocabulary that the students used in the three discussions were as follows: in the first discussion there were 36 occurrences, in the second discussion 38, and finally, the third discussion 46. All these occurrences are shown in Table 5.4. The occurrence rate demonstrated a tendency to increase.

**Table 5.4 Occurrence of Vocabulary Items in Discussions**

Group Members		Problem 1	Problem 2	Problem 3	Total No. of vocabulary use in Each Discussion
HSL	HM1	14	14	12	<b>62</b>
	HF2	10	5	7	
<b>Total No. of HSL</b>		<b>24</b>	<b>19</b>	<b>19</b>	
ISL	IM2	4	4	8	<b>37</b>
	IF3	4	7	10	
<b>Total No. of ISL</b>		<b>8</b>	<b>11</b>	<b>18</b>	
LSL	LF1	2	6	6	<b>21</b>
	LF4	2	2	3	
<b>Total No. of LSL</b>		<b>4</b>	<b>8</b>	<b>9</b>	
<b>Total No. (of HSL+ ISL + LSL) in each discussion</b>		<b>36</b>	<b>38</b>	<b>46</b>	

The occurrences of vocabulary items in the three discussions on Problems 1, 2 and 3 reveal that, generally, the HSL students performed the best (with the number of 62) in using the medical vocabulary compared with the ISL (37) and LSL (21) students respectively.

As regards the number of occurrences in each discussion, the ISL and LSL students used more medical vocabulary from the first discussion to the second, and then in the third, which meant that they improved their medical vocabulary usage in the group discussions. On the contrary, the HSL students used less medical vocabulary than in the second and third discussions, because they participated less involvement in the latter two discussions. Despite the decrease in the number of medical vocabulary items in the latter two discussions, the HSL students still used the medical vocabulary items the most.

In addition, the top ten occurrences counted from frequency in each group discussion are listed in Table 5.5. The vocabulary items are arranged from the highest frequency in each discussion to the lowest.

**Table 5.5 Top 10 Occurrences of Vocabulary Items in Discussions**

	<b>Problem 1</b>	<b>Problem 2</b>	<b>Problem 3</b>
<b>1</b>	Latent /active	Insulin	Coronary
<b>2</b>	Tuberculosis (TB)	Insulin resistance	Coronary Heart Disease (CHD)
<b>3</b>	Fever	Symptom	Statin
<b>4</b>	Infection of lungs	Glucose	Symptom
<b>5</b>	Pathological changes	Urinating	Blood pressure
<b>6</b>	Contagious	Genetic	Shortness of breath
<b>7</b>	Immune system	Polydipsia	Cholesterol
<b>8</b>	Night sweat	Pathogenesis	Hypertension
<b>9</b>	Disease spread	Sedentary	Pathological changes
<b>10</b>	Infection of respiratory	Calorie	Chest pain

The excerpts from the video-tape transcriptions are given below to illuminate the specific usages of medical vocabulary in the three recorded group discussions. The input sources from the PBL lessons are also presented as follows.

**Excerpts from the Discussion on Problem 1:**

- HM1: “You mean the patient is an **active** one.”  
 IM2: “Yeah, the **latent and active**.”  
 IF3: “Yeah, yeah.”  
 HM1: “Just **active** one in this case.”  
 IF3: “If he is **active**, he can be infected.”  
 IM1: “But I think the **latent** disease can also infect others.”  
 IF3: “Yeah, but you said that is in some situation. It is the one whose immune system is weak. He will also be infected by the TB and finally becomes the **active** one. ”  
 HM1: “OK, you mean the **latent and active** diseases are both infected by ...?”  
 HF2: “Er..., in other word, the **latent** can be the **active** one.”

Input from the textbook:

“**Latent** TB could develop into (an **active** TB infection) later, particularly if your immune system becomes weakened.”

“Since these **latent** infections can eventually become active, even people without symptoms should receive medical treatment.”

Input from the reading material:

“Even then, as the bacteria generally stay **latent (inactive)** after they invade the body, only a small number of people infected with TB will ever have the **active** disease. The remaining will have what's called **latent** TB infection – they show no signs of infection and won't be able to spread the disease to others, unless their disease becomes **active**. Since these **latent** infections can eventually become **active**.....”

“If you have TB – in its **active or latent** state, you must seek medical treatment.”

“About 90% of those infected with M. tuberculosis have asymptoms. **Latent** TB infections (sometimes called LTBI), with only a 10% lifetime chance that the **latent** infection will progress to overt, **active** tuberculosis disease.”

Input from the listening material:

“If a person has **latent** or sleeping TB, they are treated with antibiotics.....”

“If a person has **active** tuberculosis of the lung and is considered to be contagious.....”

“This patient education program explains **latent and active** tuberculosis infections.”

As it was the first recorded discussion, all of the six students expressed their ideas mostly by using simple sentences since (1) it was the first time they used video-taping to talk; (2) they lacked the experience to express themselves in spite of several inputs from the PBL lessons. The excerpts also indicate that the HSL and ISL students performed much better than the LSL students in their use of medical vocabulary. The LSL students seldom used the medical vocabulary. Therefore the HSL and the ISL students had a higher number of vocabulary occurrences than the LSL students in their first recorded group discussion.

### Excerpts from the Discussion on Problem 2:

- HF3: “OK, in my opinion, his body does not produce enough **insulin** for proper function, or the cells in the body do not react to **insulin**, we also call it **insulin** resistance.”
- HF2: “So there is another word? I want to know, er..., how to treat this disease?”
- HM1: “Oh, you mean how to know the treatment, I think there are many ways to prevent it and treat it. For example, keep a good life style, stop smoking, maybe, er..., er..., but I think the most important is to use **insulin** to treat her, er...(do the self-correction), treat him. Because we think he is a type 2, so we must use **insulin**.”
- LF1: “Yeah, I agree with you, but I think from his medical history, he has no history of drug allergy and no history of acute and chronic disease, so I think the best way to treat it is taking **insulin** if the cells in the body do not react to **insulin** well, that is to say, **insulin** resistance, so he has to get pain forever, en..., en..., in order to reduce his condition, what should we do?”

### Input from the textbook:

- “**Insulin** is a hormone made by specialized cells in the pancreas, whose job is to push glucose out of the blood into various cells in the body. Whenever the amount of glucose in the blood starts to rise...”
- “Type 1 diabetics have high glucose levels because their pancreas can no longer make **insulin**. By definition, Type 1 diabetics must eventually take insulin shots to get their diabetes under control. Type 2 diabetics can still make their own **insulin**, but their bodies don't respond as well to it – a situation called **insulin** resistance.”
- “Any scientist who can figure out why Type 2 diabetics are **insulin** resistant will probably be a candidate for a Nobel Prize. It's not a simple consequence of being overweight. Many obese people are not insulin resistant, and not everyone who is **insulin** resistant is overweight.”

### Input from the reading material:

- “**Insulin** is a hormone made by (specialized cells in the pancreas), whose job is to push glucose out of the blood into various cells in the body.”
- “Type 1 diabetics have high glucose levels because their pancreas can no longer make **insulin**.”
- “Type 2 diabetics can make their own insulin, but their bodies don't respond as well to it – a situation called **insulin** resistance.”
- “...either because **insulin** production is inadequate, or because the body's cells do not respond properly to **insulin**, or both.”

“The body does not produce insulin. Some people may refer to this type as **insulin**-dependent diabetes, juvenile diabetes, or early-onset diabetes.”

“Balance insulin intake with food and lifestyle – The quantity of **insulin** intake must be closely linked to how much food you consume, as well as when you eat. Your daily activities will also have a bearing on when and how much **insulin** you take.”

Input from the listening material:

“Type 1 diabetes is a condition in which the pancreas produces little or no **insulin**. **Insulin** is a hormone that helps your body use blood sugar, known as glucose for energy.”

“**Insulin** helps your cells absorb the glucose in your blood, allowing them to be used as energy. A healthy pancreas releases a regular supply of **insulin** into your bloodstream. **Insulin** acts as the key, opening up a cell, so it can accept the glucose.

“In a person with Type 1 diabetes, the pancreas produces little or no **insulin**. Without **insulin**, blood glucose levels rise. Without **insulin**, glucose cannot enter the cells and be used for energy.”

“In diabetes Type 2, the production of **insulin** is low, and sometimes there may be resistance to **insulin**. The circulating **insulin** fails to facilitate the absorption of glucose into the cells...”

Based on the excerpts from the discussion on Problem 2, the LSL students participated more in using the medical vocabulary than they did in the first discussion. Furthermore, the HSL, the ISL and the LSL students demonstrated almost ability in their use of the medical vocabulary in this discussion. Although the HSL and the ISL students performed at a similar level to that in the first discussion, the LSL students performed better in using the medical vocabulary. The examples from the discussion of Problem 2 reveal this clearly as follows:

**Example:**

HM1: “...and we know he has a fasting **blood glucose test** with the result beyond the normal **indicator**. We know it is normal, and we also get the message of his **medical history**. He has a **hypertension** over 20 years. So he also got a **colon cancer surgery** three years ago. OK, that is all for the surface information. What are the bases of

- diagnosing?** How about you, girls?”
- LF1: “According to the detailed information, he was no difficulty in **urinating**, and no **urinary tract irritation**. He got at least one **symptom** of **diabetes**.”
- IF2: “You have the point now, but, er..., but what kind of the **diabetes**. I mean people also should, should control being taking **glucose**, which is very important.”

All students at the three different levels increased their medical vocabulary from the first discussion to the second one.

### Excerpts from the Discussion on Problem 3:

- HM1: “But, I want to know what kind of pathological changes of **coronary** artery it is?”
- LF4: “His case, we can know him..., er...”
- IF3: “We know that **coronary** heart disease is buildup of substances such as cholesterol. It makes the plaque, and the arteries narrow by pressing the heart muscles for much needed oxygen. So I think it is the pathological changes of **coronary** artery.”
- IF2: “I want to know much better than the information we have, do you know what the normal treatment to this **coronary** disease is?”
- LF4: “I think the treatment, er...”
- HM1: “OK, we know there are so many ways to treat this disease, the **coronary** angioplasty, stents and atherectomy or brachytherapy, etc.”

### Input from the textbook:

- “When Mr. Clinton was admitted to New York-Presbyterian Hospital/ Columbia University Medical Center for **coronary** bypass surgery, his L.D.L. was still high...”
- “Mr. Clinton underwent annually before, during and after he was president, which showed no sign of his nearly completely blocked **coronary** arteries.”
- “It can take years for fatty deposits to build up enough to block **coronary** arteries, producing angina and ultimately, a heart attack. But angina and heart attacks can also result from so-called vulnerable plaques, when small deposits in largely open **coronary** arteries rupture...”

### Input from the reading material:

- “It can take years for fatty deposits to build up enough to (block **coronary** arteries), producing angina and ultimately, a heart attack.”

“Standard exercise tests measure (the heart's physiologic responses) and cannot show the anatomical contour of **coronary** arteries.”

“That’s because the heart experiences increased demand for nutrients and oxygen that cannot be met because the **coronary** arteries are blocked...”

“The following are common procedures used to treat heart disease: **Coronary** angioplasty: a thin catheter inserted into the blocked artery with a tiny balloon on the end.”

“The insertion of a stent is similar to **coronary** angioplasty except that the over balloon is...”

“Angina occurs as a result of restriction of blood flow to the heart due to plaque formation in the **coronary** arteries.”

Input from the listening material:

“**Coronary** disease is a condition in which the arteries (blood vessels) become narrower, reducing blood flow into the heart muscles...”

“It calls the **coronary** heart disease. This can lead to chest pain, or angina and eventually heart attack. The network of blood vessels brushed over the surface of the heart is called **coronary** arteries. The coronary arteries supply the heart with blood over years.”

“How **coronary** heart disease (atherosclerosis) develops and what is the pathophysiology of **coronary** artery disease.”

In the discussion of Problem 3, the three groups of students used a considerable amount of medical vocabulary continuously. Compared with what they used in the first and second discussions, the vocabulary they used was not only from the given input, but also from other sources that they had studied by themselves through after-class activities, such as information searching, information gathering and completing forms. In this discussion, all the students were engaged in using the medical vocabulary to participate in the conversation. Even the LSL students were able to use more medical vocabulary in their turn. The medical English vocabulary was combined with general vocabulary and used in communication continuously by the students at the three levels.

The excerpts from the discussion of Problem 3 illustrate this below:



- LF1: “OK, I know the **symptoms** he has. He has the **chest pain, shortness of breath and jaw pain, back pain**, especially on the left **side**. I think according to his **symptoms**, en..., he has the problem of **heart disease**. This is my idea.”  
.....
- IM2: “Yeah, er..., you mean the **physical examination**, the **temperature**, the **pressure**, er..., and **blood pressure**. So we can see his temperature and the **pressure** are **normal**.”  
.....”
- LF3: “We know that **coronary heart disease** is **buildup** of substances such as **cholesterol**. It makes the **plaque**, and the **arteries** are narrowed by **pressing** the **heart muscles** for the needed **oxygen**. So I think it is the **pathological changes of coronary artery**.”  
.....
- HM1: “OK, we know there are so many ways to **treat** this disease, the **coronary angioplasty, stents** and **atherectomy** or **brachy-therapy**, etc. Those ways can treat **coronary heart disease**, how about you.”

To sum up, based on the level of their language ability (the number of occurrences of the medical vocabulary) as shown in the discussions, three points emerge clearly:

First, the language level of the HSL, the ISL and the LSL students corresponded to their participation in the three discussions. The HSL students had good language so they participated the most in discussions. The ISL students participated less and the least participation in the discussion was observed among the LSL students, who took the least number of turns in the group discussions.

Second, the best continuous spoken utterances using medical vocabulary in communication were observed in the discussion of Problem 2. Complex sentences were frequently used in this discussion compared with those used in the discussions of Problems 1 and 3.

Third, compared with the medical vocabulary from different sources within one turn that could be traced in the discussions of Problem 1 and 2, the use of medical vocabulary was similar to that used in the discussion of Problem 3.

The results of the analysis illustrated that the medical vocabulary the students used in their discussions was mainly from the listening and reading materials. Furthermore, the top 10 medical vocabulary (see Table 5.5) used in group discussions confirmed that most of the medical vocabulary was from the listening and reading materials. This finding might help the researcher to confirm the view that the students were more confident to speak when they were well equipped with medical vocabulary and content. It was one of the objectives of the PBL lessons that the students should learn the medical vocabulary and use the vocabulary in a real spoken environment.

#### **5.1.2.4 Conversational Competence in Group Discussions**

The group discussions in the PBL lessons aimed at the appropriate application of conversation strategies, which were constituted by the norms of speaking turns arising out of the repeated use of shared practices of distributed prompts. The conversation strategies the students used in the discussions of the three problems were found to be 41, 54 and 64 times respectively. Generally, the use of conversation strategies indicated an improvement in the conversational competence by the students. Table 5.6 indicates the number of conversational strategies the students used under each category.

**Table 5.6 Students' Conversation Strategies Use under Each Category**

Category	Problem 1	Problem 2	Problem 3	Tendency
(1) To use of conjunctions;	23	31	37	↗
(2) To keep the conversation going by agreeing / disagreeing;	7	5	3	↘
(3) To express own opinions and ask others' opinions;	3	8	8	↗
(4) To use phrases as fillers, thinking words with an appropriate response.	8	10	16	↗
<b>Total</b>	41	54	64	↗

Although the general tendency to use the conversation strategies increased, compared with the other three strategies, the use of the second strategy decreased. The conversation strategy based on “agree or disagree” was used less in the recorded group discussions because the group members had reached agreements on the information provided resulting from the after-class activities of searching for and gathering information as the PBL lessons progressed, so there was less disagreement in the group discussions.

To be more specific, the details for each category in the four conversation strategies are described separately as follows.

#### **(1) To use of conjunctions**

The functions of conjunctions are to link or join words, phrases, and clauses (Kardimin, 2004:167). The most common used conjunctions are: “and”, “but”, and “or”. While, “because”, “so”, and “however” are also conjunctions. In this study, the students used “and”, “but”, “or”, “because”, “so” and “however” in the discussions of Problem 1, 2 and 3.

The conjunctions used by the students formed complex utterances in the discussions, which were indexed according to the length of the utterances and the amount of medical vocabulary the students used in the discussions. Excerpts from the discussions can be seen as follows:

Excerpts from the discussion of Problem 1:

- HF2: “**And** he has a test, examination that is positive.”  
 HM1: “**But** what kind of pathological changes occurred to him?”  
 IM2: “Yes, **and** he has a fever.”  
 HF2: “**And** sweat.”

Excerpts from the discussion of Problem 2:

- IF3: “**Because** many diseases can take different complications, er... yes.”  
 LF1: “**So** there is another word? I want to know, er... **and** how to treat this disease?”  
 HM1: “Oh, you mean how to know the treatment, maybe, er... er... **but** I think the most important is to use insulin to treat her, er... treat him. **Because** we think he is a Type2, **so** we must use insulin.”  
 HF2: “Yeah, I agree with you, **but** I think from his medical history, he has no history of drug allergy and no history of acute **and** chronic disease. **So** I think the best way to treat is taking insulin if the cells in the body do not react insulin well, that is to say, insulin resistance, **so** he has to get pain forever, er... what should we do?”

Excerpts from the discussion of Problem 3:

- IF3: “Do you know what makes this case confused, **or** what can we do for the diagnosis from the patient’s physical examination **and** his past medical history.”  
 LF1: “OK, I know the symptoms he has, **and** he has the chest pain, shortness of breath **and** jaw pain, back pain. **So** I think according to his symptoms, er... he has the problem of heart disease.”  
 IM2: “Mostly he always take the adalat **and** bonuo anti-hypertensive drugs, which make his blood pressure down, **and** we know his physical examination, it is normal, **however**, **so** now do you know what the diagnosis of this patient.”

HM1: “**Because**...we can see from his medical history, yeah, the history, he got serious shortness of breath, even he went to the mailbox. **So** it just like us, normal people, **and** if we go just like very short distance, we can’t, we won’t (others nodded heads and went on looking at him), **and**, er... er...”

From the above excerpts, the conjunctions increased from the discussions of Problem 1 to Problem 2, and then to Problem 3. The length of utterance was a significant predictor of a larger number of conjunctions being used in the group discussions.

In the discussion of Problem 1, all students used simple utterances to express themselves. Meanwhile, the students used medical vocabulary, such as “*pathological*”, “*fever*” and “*sweat*”. In the discussion of Problem 2, the students used more complex utterances by using more conjunctions, and these utterances included more medical vocabulary than they used in the discussion of Problem 1. They used “*because*”, “*so*”, “*and*”, “*but*” as conjunctions in the longer utterances with the medical vocabulary of “*complications*”, “*insulin*”, “*insulin resistance*”, “*drug allergy*” in this discussion. In the discussion of Problem 3, more complex utterances and more medical vocabulary were used by the students with conjunctions. Compared with the previous two discussions, “*however*” was a new conjunction used by IM2, and more medical vocabulary, such as “*diagnosis*”, “*symptoms*”, “*chest pain*”, “*shortness of breath*”, “*jaw pain*”, “*back pain*”, “*adalat*”, “*bonuo anti-hypertensive drugs*” and “*blood pressure*” appeared in their utterances.

The increased length of utterance and more medical vocabulary use in the discussions lends support to the idea that the conjunctions used in group discussions might play a role in students' speaking performance. In addition, the use of the conjunctions increased in length and complexity. The use of medical vocabulary and conjunctions in complex utterances improved their overall speaking performance and their success in the problem-solving activity in group discussions.

**(2) To keep the conversation going by agreeing / disagreeing**

The students expressed their agreement or disagreement by "*I agree with you*" and "*I don't agree with you*" in the discussions. The agreement acted as a show of support from one speaker for a belief or proposition expressed by another, the disagreement meant students had some beliefs which were partly or fully inconsistent with some others in the discussion. In the three discussions, the HSL and ISL students used this strategy more than the LSL students. This could be found from the excerpts from the discussion displayed below:

Excerpts from the discussion on Problem 1:

HF2:        "**I agree with** her. As we know, it is shown that the man has fever every afternoon, and felt some pain in his back."

.....

HM1:        "**I agree with** your idea about the infection of the lungs, **but I think** he has a fever and ...en... in the middle of night sweat..."

.....

IF3:        "**I don't agree with you.** If you cough out of the tuberculosis, maybe they can be infected. When you share the food, you will be infected."

The strategy used in the second and third discussion on Problem 2 and 3 were as follows:

Excerpts from the discussion on Problem 2:

HM1: “**I agree with** you, but I think from his medical history, he has no history of drug allergy and no history of acute and chronic disease. So, I think the best way to treat it is taking insulin if the cells in the body do not react to insulin well...”

.....

HM1: “So **I don’t agree with** the idea that only the sedentary and over middle aged person has the high risk of diabetes.”

.....

IM2: “**I agree with** all of you, and yes, er... yes, he is a Type 2 diabetic, but we should know what is the pathogenesis (repeated this word again for stressing), pathogenesis of diabetes.”

Excerpts from the discussion on Problem 3:

HM1: “**I agree.** That’s right, but we want to know which indicator you can confirm to show that this disease is coronary heart disease (having the arrogant attitude with this question).”

.....

HF2: “**I agree with you.** In my opinion, the traditional Chinese medicine need so long-term, it is difficult to control his disease.”

.....

IM2: “en..., **I agree with you,** and the reduced blood to the heart muscles and this, this could lead to a complete artery blockage.

Agreement was used more by the students in Problems 2 and 3 than in Problem 1, because they reached more agreement with much information sharing and cooperative group work than at the beginning of the PBL lessons. The students used “*I agree with you*” or “*I agree*”, both expressions indicating that agreement was understood in terms of the ongoing cooperation in which speakers twist their utterances so as to appear to agree. For example, in the discussion of Problem 1, although the HM1 said “*I agree with your idea about the infection of the lungs*”, however, he only agreed with the speaker partially, because he continued with “*but I think he has...*”. This

reveals that whereas agreement was usually produced unambiguously, disagreement was frequently delayed, and often prefaced with an element of agreement.

*"I don't agree with you"* used in the discussion of Problem 1 showed strong disagreement, although it was also used in the discussion of Problem 2. However, strong disagreement was used less and less in the discussions of Problem 2 and 3. There are two reasons for fewer usages of strong disagreements. Firstly, since the students became more familiar with group work by participating in the ongoing PBL lessons, they shared information through the activities in and after-class. Also they had fewer different ideas in group discussions. Secondly, the LSL students never disagreed because they were not able to express their disagreement adequately. The disagreements tended to be more complex, with structural delays to the production of the actual disagreement such as explanations and other qualifications. For instance, IF3 said in the discussion of Problem 1 that *"I don't agree with you. If you cough out of the tuberculosis, maybe they can be infected. When you share the food, you will be infected."* IF3 continued to explain the reasons and provide more information to justify her strong disagreement.

Agreement and disagreement involved examining the ways in which group members expressed agreement, and how they responded to disagreement. In the three discussions, the LSL students used this strategy less than the HSL and ISL students. In Problems 2 and 3, the students used agreement more than in Problem 1, and strong disagreement was used less and less. Keeping discussion going by agreeing and



disagreeing improved the flow of communication in group discussions, which provided access to information concerning the problem-solving.

### (3) To express one's own opinions and ask for other opinions

The strategy of expressing not only one's own opinions but also asking for others' opinions was used increasingly in the discussions of Problems 2 and 3, from 3 to 8 times. It was found that the students used this strategy in different expressions. In the discussion of Problem 1, the students used such expressions as "*How do you think of it?*" "*In my opinion*". However, in the discussion of Problem 2, they used more expressions such as "*What's your opinions?*" "*How about you, girls?*" "*In my opinion...*" "*What should we do?*" In the discussion of Problem 3, different expressions such as "*Do you know? Come on, guys...*" "*Can you tell us more...*" were used by the students. Besides the expressions used in the discussions of Problems 1 and 2, the students expressed their opinions and asked for the opinions of others in the discussion of Problem 3. Because the students were able to practice their speaking in the group discussions, all of them learnt more expressions and they were able to respond more easily to the discussions in order to solve the problems in the PBL lessons.

Excerpts from the three discussions in which students express their own opinions and asking for others' opinions are presented below:

Excerpts from the discussion of Problem 1:

IF2:        "**In my opinion**, if one had the TB, one could infect others. Therefore, he/she must be the one of the two items. **Do you think so?**"  
 .....

LF4: “**I think** what your guys mean according to his physical examinations. We draw a conclusion that is typical tuberculosis. **How do you think of it?**”

.....

LF4: “**I think** he is not a HIV. HIV should have a very long time, a very long latent time. **How do you think of it?**”

Excerpts from discussion of Problem 2:

HM1: “We can get information from the case itself, but the symptoms we can see about the polydipsia, and the weight loss of urine for twenty years, right? **What’re your opinions?**”

.....

HF2: “And we know he has a fasting blood glucose test and the result is beyond the normal indicator. We know it is normal, and we also get the message of his medical history. He has a hypertension over 20 years. So he also got a colon cancer surgery three years ago. OK, that is all for the surface information. **So, what are the bases of diagnosing? How about you, girls?**”

.....

LF1: “...So, **I think** the best way to treat it is taking insulin if the cells in the body do not react to insulin well, that is to say, insulin resistance, so he has to get pain forever, en..., en..., in order to reduce his pain, **what should we do?**”

Excerpts from the discussion of Problem 3:

HM1: “He always takes the adalat and bonuo anti-hypertensive drugs, which make his blood pressure down. We know his physical examination. It is normal, however, so now **do you know** what the diagnosis of this patient is?”

.....

IF3: “**Do you know** what makes this case confused, or what can we do for the diagnosis from the patient’s physical examination and his past medical history. **Come on, guys, can we talk something about it?**”

.....

IM2: “**In my opinion**, if he can know the danger of smoking and drinking earlier, which would reduce the risk of this disease? **What do you think of it?**”

.....

LF1: “**Can you tell us** the physical medical situation of him (she looked at IM2 directly).”

In the discussion of Problem 1, the students used *“I think”* and *“in my opinion”* to express their opinions, furthermore, they were able to introduce more information about what was being discussed and to switch to new topics. For example, LF4 said that *“I think he is not a HIV. HIV should...”* she switched the topic from the symptoms of the patient to a new topic of HIV and she started to speak about this topic. In this discussion, *“how do you think of it?”* and *“do you think so?”* were also used as a request for more ideas.

In the discussion of Problem 2, the students used *“what’re your opinions?”* *“so, what ...”* *“how about you, girls?”* *“What should we do?”* to show they wanted to go on discussing the sub-topics of the main issue just introduced. They hoped the others would follow the discussion and offer more ideas to contribute to the discussion, so even a change of topic would be welcome.

Compared with the discussions of Problems 1 and 2, the discussion of Problem 3 displayed different phrases to express the students’ own opinions and to ask for the opinions of others. The students used *“do you know”*, *“come on, guys, can we talk...”* *“do you know...”* *“can you tell me...”* *“what do you think of it?”* and *“in my opinion”*, etc. All of them played introductory roles and/or created links between what had just been said and what was about to be said. In addition, *“come on, guys, can we talk...”* was used for emphasizing parts of the utterance or to solicit understanding.

In general, the above excerpts from the three discussions indicate that in the discussions of Problems 2 and 3, this strategy was used by the students more to express

their ideas for speaking than in the discussion of Problem 1. In addition, the students had a stable application of this strategy with different expressions in the discussions of Problems 2 and 3. This shows that the students could use the strategies to express their own opinions and to ask for others' opinions using different expressions as the ongoing PBL lesson progressed. This strategy use influenced the succession of turns and led to the completion of the discussions.

#### (4) To use phrases as fillers and thinking words with an appropriate response

The use of phrases as fillers helped the students to come up with an appropriate response in the discussions. Compared to such fillers used in the discussion of Problem 1, the use of fillers increased remarkably from 8 times to 10 and then to 16 in the discussions of Problem 2 and 3 respectively. The phrases of "*I think*" and "*you mean*" were the ones that appeared the most in each discussion. The students used different phrases such as "*we can get to know*", "*I'd like to add*", "*I want to say ideas*" in the discussions of Problems 2 and 3 as the PBL lessons proceeded, and these phrases appeared to be more complex. The complexity and diversity of the phrases indicated that the use of the students' conversation strategies was improved. Excerpts from the discussions are presented below.

Excerpts from the discussion of Problem 1:

- LF1: "Oh, **let me see**, she / he has many symptoms, such as night sweat, fever, cough, his right lung with positive fluid."
- IF3: "**You mean** the patient is active one."
- HM1: "**You mean**, when, when I cough out the TB on my hand, and I shake, I shake my hands with you, you can affect this TB."
- LF4: "**I think** if he is active, he can be infected."

Excerpts from the discussion of Problem 2:

- IF3: “Er... , **I think** he has symptom of diabetes Type 2.”  
 IM2: “**By the way**, Type 1 diabetes related to genetic from the family, but Type 2 comes according to the people who have bad life style or life behaviors.”  
 LF4: “**You mean** how to treat this kind of disease. Maybe a healthy care provider (HCP) available can heal, to heal. Am I **right**?”  
 HF3: “**I think** that taking exercises every day is important.”

Excerpts from the discussion of Problem 3:

- HM1: “**This is my idea**. I know the symptoms he has, He has the chest pain, shortness of breath and jaw pain, back pain, especially on the left side.”  
 IF3: “**We can get to know that** he has a high-blood pressure history of 10 years, right?”  
 IM2: “**I think** he gets the coronary heart disease.”  
 LF1: “**You mean** your guys get the diagnosis is CHD, **right**?”  
 LF4: “**I’d like to** add more, and in the past, his past medical history to consider. The patient is with high blood pressure of 10 years. So...”

In the three discussions, the students used “*you mean*” frequently, and they clarified the interlocutor’s words, which enabled them to dominate the discussion many times and allowed them to continue to express their own ideas. They used “*I think*”, “*I’d like to*” when they needed to make a new start to what they wanted to say. For instance, in the discussion of Problem 3, the students were discussing symptoms, then IM2 spoke out “*I think he gets the coronary heart disease*”, which was the diagnosis of the symptoms mentioned in the previous discussion. This led to a change of topic, from discussing the symptoms to the pathological changes, etc. In the discussion of Problem 1, LF1 used “*let me see*”, which showed her hesitation. LF1 rephrased what the others said since she lacked the confidence to make a hedge. “*By the way*” was used by the IF3 in the discussion of Problem 2, and “*we can get to know*” was also used by

IF3 in the discussion of Problem 3, both of which indicated that the speaker continued her ideas by introducing a sub-topic of the statement just made on a different topic connected to what the students had discussed. Furthermore, in the discussions of Problems 2 and 3, “*right*” was used by LF1 and LF4 to encourage others to continue to speak. “*This is my idea*” was used by HM1 in the discussion of Problem 3 which showed a confident attitude and strong beliefs in his own opinions.

The use of these phrases increased during Problems 1, 2 and 3. Through the use of these phrases as fillers in the three discussions, it is clear that all the students could use these phrases to perform different functions: speech floor, new start of topic and sub-topic, hesitation, encouragement of speaking, and self-confidence and self-belief in their own ideas and statements. Generally, the use of such fillers contributed to create an atmosphere which was favorable to the continuation of the interactions in the group discussions.

In summary, the excerpts from the discussions of Problem 1 / 2 / 3 have shown various examples of the conversation strategies used in the group discussions and their contribution to problem-solving. The conversation strategies used in the group discussions in the PBL lessons helped the students to be active listeners and speakers. They remained attentive and focused on what was being said and identified the main ideas being discussed.

In the group discussions of Problems 1, 2 and 3, the students were able to use different examples of conjunctions to respond to the different features of the

communicative situations, and to increase their use of complex utterances. For the strategy use of agreement and disagreement, the students used agreement more in Problems 2 and 3 than in Problem 1, and strong disagreement was used progressively less and less in Problems 1, 2 and 3. All of the students tried to make contributions in the discussions through agreeing with what someone had said or asking to them to expand their points (asking for an example or for more information), which might promote the discussion in a favorable psychological background, or with the intention of strengthening the relationship between the group members.

With respect to expressing and asking for opinions, in the discussions of Problem 2 and 3, the students used this strategy with different expressions more to express their ideas for speaking than in Problem 1. The students were able to use the strategy to express their own opinions and to ask for others' opinions more and more and consistently in the ongoing PBL lessons. In addition, all the students were able to use different phrases as fillers to perform different functions. The use of conversation strategies helped the group discussions to be conducted successfully, and improved the students speaking ability in the PBL lessons. However, there were some misuses of these strategies, for example, in the discussion of Problem 2, IM2 said *“By the way, Type 1 diabetes related to genetic from the family, but Type 2 comes according to the people who have bad life style or life behaviors.”* The student used *“by the way”* to introduce his topic of Type 2 diabetes, but he followed with the Type 1 information again, and then changed to Type 2. *“By the way”* was inappropriately used to detach

the meaning from the opinions. He could have used other fillers, such as “yeah”, “I think”, or the conjunction “although”, etc. Therefore, further examples and clearer instructions may be needed to help students enhance their communicative competence by developing their skills in the use of more and more accurate conversation strategies.

## 5.2 Answers to Research Question 3

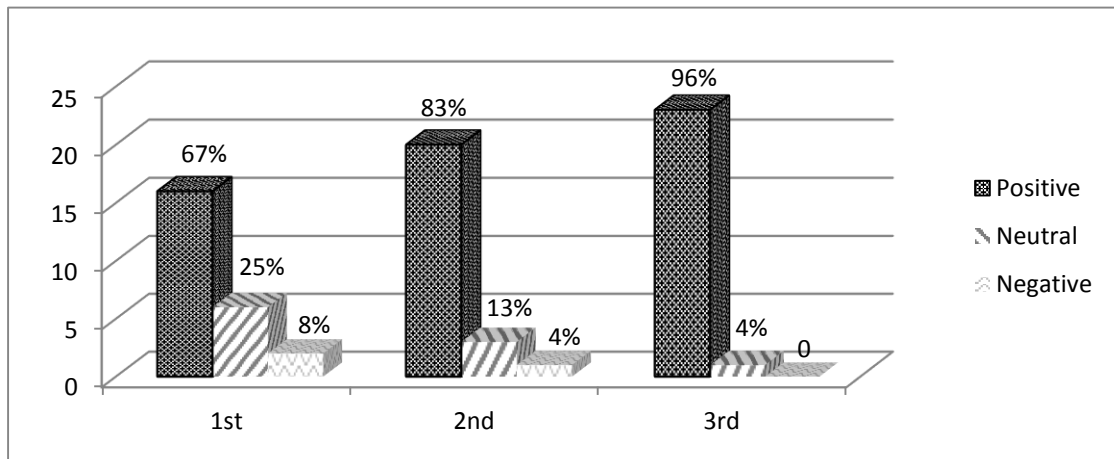
The previous section presented the results of the pre-experiment, showing that the PBL lessons had positive effects on improving the students’ speaking ability in their group discussions. In order to answer the third research question: **What are the students’ perceptions on the implementation of PBL lessons in the Medical English course?** This part describes the students’ perceptions on the implementation of the PBL lessons in their medical English course.

### 5.2.1 Overall Perceptions

It was found that the students had different perceptions of the PBL lessons. However, the majority had positive perceptions while some had changed their minds over the course of the implementation of the PBL lessons. The number of the students who previously had neutral or negative perceptions decreased.

Based on the data analysis of the students’ logs and semi-structured group interviews, Figure 5.2 shows the distribution of the 24 students’ perceptions towards the PBL approach in their medical English learning.





**Figure 5.2 Distributions of 24 Students' Perceptions of PBL Lessons**

Figure 5.2 demonstrates that the number of the students who held positive perceptions increased gradually through the whole process of implementation, and the number of the students who held neutral or negative perceptions decreased after the second and third problems had been implemented. Finally, 96% students had positive perceptions towards the PBL approach, leaving only 4% of them with a neutral perception, and no student held negative perception in the end.

### 5.2.2 Students' Perceptions on Different Aspects of PBL Lessons

In addition, the qualitative data concerned with the students' perceptions of the PBL lessons were analyzed and categorized into four major aspects as follows: (i) the activities in the PBL lessons; (ii) the learning process of the PBL lessons; (iii) the learning results; and (iv) the other learning effects of the PBL lessons related to the study of medical English. The students' opinions on each topic are presented below.

### 5.2.2.1 Activities in PBL Lessons

The results reveal that most of the students (96%) expressed positive feelings towards the PBL lessons for the reason that it provided them with an interactive learning environment. The reasons that were mentioned the most as making the students feel satisfied with the PBL lessons involved three areas: the interactive learning environment, more opportunities for speaking, and after-class activities for information gathering.

#### ● Interactive Learning Environment

Firstly, most of the students preferred group work because it helped them develop their teamwork skills. The students were able to interact with their peers while completing the group activities. Secondly, they were able to learn to share ideas and solve the problem interactively. Finally, the students could get timely help and encouragement from each other. Below are presented some of the students' comments.

*Student 1: "...compared with the previous English course, I like PBL lessons because I could work in group, which gave me more fun in class learning. We could share ideas about what we had read / listened to / studied information for solving problems..."*

*Student 8: "I could learn how to work in a team to achieve the target question answers. I liked the feeling of discussing with friends in class, although it was a challenge to my English speaking ability..."*

*Student 19: "...whenever I had difficulty with understanding, my group members were always willing to explain to me until I understood. We had a good relationship after class. Every group member should have contribution to group discussion and should listen to others, and finally draw a conclusion to solve the problems."*

The students experienced interactive learning in class. They developed positive peer relationships as they depended on one another to encourage and complete the problem-solving activities. Interactive learning also provided a good model of working together in a group. The group members learned medical English through their different but equally important roles in group work.

### ● More Opportunities for Speaking

The students felt that they had more opportunities to learn and improve their speaking ability through the PBL lessons. Unlike their previous learning experience, reading and listening materials were the major focus of PBL lessons teaching, which played an important role as input to increase their speaking output. The students had more opportunities to speak and produce the language based on the medical information by working with their group members and discussing the shared information to solve the problems. The extracts stated by the students were as follows:

*Student 2: "...as everyone in the group had to speak to solve the problem, it was important to be a group work. The provided reading and listening materials enabled us to speak with more information. At least I could use some medical vocabulary in speaking based on the information from the English materials..."*

*Student 9: "My English was not good, and I was afraid of speaking English. However, in PBL lessons I could read information from the supplementary materials provided by the teacher. Group members shared the information and solve the problems in group. Anyway, I could speak out and participate in the discussion with the medical vocabulary from the materials..."*

*Student 12: "...PBL lessons were better than what we had last term. I got a chance to speak, even though my English speaking was not so good. I could practice it based on the PBL materials, which provided some medical vocabulary and useful expressions for me to speak."*

The students' English speaking ability improved as a result of the activities in the PBL lessons, which allowed the students or required them to talk. In addition, they were able to speak by referring to the reading and listening materials, which could be regarded as the direct sources for them to get their input. Also, the students benefitted from the use of the medical content which helped them produce their own expressions. More opportunities of speaking not only benefited the students in improving their English speaking ability, but also benefited them in memorizing the medical content.

#### ● **After-class Activities for Information Gathering**

In the PBL lessons, the students had to prepare the information concerning the problems. Under the PBL approach, a small student-centered group discussion was essential. The content of what the students would talk about in a group discussion was important. They needed to find or gather details about the medical cases such as symptoms, pathological changes and preventions, etc., to ensure they could discuss the problem which should finally lead to the possible explanations of and solutions to the problems. After-class activities let the students obtain additional information that they could not find in the materials provided. In groups, the students had to share what they had prepared beforehand with their peers to ensure the successful completion of the discussion. This was a new experience which the students had never done before in a normal medical English class. The following were the students' comments.

*Student 2: "...I enjoyed after-class preparation for searching for information, which enabled me to speak out with confidence in a group discussion. The prepared information was useful for speaking, and some expressions could be used more naturally with their repeated occurrences in discussion."*

*Student 11: "...in order to solve the problem, I had to search for information via the internet. I also looked for information from the medical books. All the information must be translated into English with the help of the online dictionary, or the special medical English dictionary and application of the information to the problem analysis. Although it was a complicated process, I found the memorization of such vocabulary was better improved than before. I could even use them when I had to speak in discussion."*

*Student 15: "...frankly speaking, firstly I could not speak with the medical information in the discussion. But the assigned forms-written helped me have a good amount of information to speak. Now I realized that I could speak about the medical cases with medical words and expressions. I felt it was a great improvement for me."*

Though most of the students expressed positive attitudes towards the PBL lessons, a few gave negative responses which are worth exploring. For example, Student 20 stated that *"I felt stressed in the group discussion, because I could not understand what the other group members were talking about. So, I could not discuss with others. I felt the learning style of PBL was a challenging to me."* That apart, Student 9 reported that she did not like the PBL lessons, for she had to share what she had learned with the other group members, *"...I did not like sharing information with the other group members. I worked hard and got a lot of information, but some of them got only a little. Although we were studying in the same group, I felt unfair to my efforts..."*

In sum, the overall results indicated that almost all of the students had positive perceptions of the PBL lessons as it made medical English learning more relevant to their future needs. Only a few had negative feelings towards the PBL lessons due to their limited English language ability and lack of familiarity with cooperative learning activities, such as group work.

### 5.2.2.2 Constructive Learning Processes of PBL Lessons

In the PBL learning process, the students had to (1) present the problem, (2) discover and study the related information and resources for the problem, (3) present solutions and reflect on the problem-solving approach, and (4) discuss and draw conclusions. The students had to take a role in participation in activities, such as an active learning process, after-class activities and group discussions. Four sub-themes of the learning process were elicited from the students' perceptions: self-directed learning, stimulating ideas for discussion, collaborative learning, and shared workload.

#### ● Effective Self-directed Learning

Most of the students reported that in the PBL lessons, they needed to prepare for a good discussion. Without information, they would not have enough information to communicate with other group members. Otherwise they would not be able to get involved in the discussion. All the students had to be seriously about completing the PBL tasks in an after-class activity. The students' opinions on learning by themselves were as follows:

*Student 1: "...today I had to find the information about the prevention of the illness. The answers were not only the information from the given materials. If I could not find the information, I would have no contribution to group discussion tomorrow. The other group members should blame me for my irresponsibility. Everyone was expected to search for the related issues and share in group..."*

*Student 16: "...everyone was assigned for one part to solve the problem. I felt that a sense of duty had been instilled to me. I would try to do it. This motivated me to work hard to finish my own part based on the directions from the teacher."*

*Student 19: "...PBL is very useful for my medical English learning. It helped me learn by myself after class. I could make my own decision to read further chapters of the problem because I thought I know much medical knowledge to the target questions than my group members. I had a good memory for the vocabulary and the chosen content by myself."*

Because of the requirements in the PBL lessons, the students had to study to equip themselves with the information used in their group discussions. They had to study by themselves after class to gain more information. In addition, the group leader regularly gathered them together to share information so as everyone would be able to contribute to the problem-solving activities in class.

### ● Stimulating Ideas for Discussion

Almost all students said they had more information to talk about and discuss as they got more ideas from the materials provided to them inside and outside the class. Furthermore, they were also able to obtain ample ideas from listening to the ideas of their group members and sharing the information together.

*Student 4: "...The problems given are complicated, but they are the real-life medical cases. I can use the information from my medical class, which is helpful to gain a good amount of medical content knowledge and to talk about them in group discussion. At least I know what I should say after digesting the searched content."*

*Student 10: "...We got a chance to review what we learned in class. Next, the information preparations with other group members were conducted after class. So we got a lot of information from interacting with them. The more I think about the problem, the more information I could use in discussion. In addition, I had to organize ideas to make them expressed easily. Group discussion is a good way to boost ideas and opinions."*

*Student 13: "...each student has lots of time in- and after-class to think over the PBL materials. We have to synthesize the existing content knowledge as well. The more I think about the content, the easier I can translate into English via the dictionary. Finally, I can organize my ideas and then speak. In fact, PBL is a push for me to understand the medical content and learn English..."*

The students applied the English language and medical content in their discussions that they had learned in PBL lessons. The language and content they were

exposed to while and after class were the main sources to provide them with the input to talk about and the stimulation for them to express more information in discussions.

### ● Useful Collaborative Learning

Group work, ill-structured problems, and activities in PBL lessons allowed the students to experience different types of learning such as (1) collaborative learning; (2) group planning to find a solution through shared assignments; and (3) problem-solving skills of reasoning, selecting the right information to support their own argument.

The students mentioned that the PBL lessons enabled them to know what collaborative learning was and it stimulated them to collaborate with others actively.

*Student 7: "...group is essential in PBL learning, I like it because I feel less nervous when working in group. All of the group members are nice and friendly. Each one has to take the responsibility for problem-solving. Actually, it is a must to collaborate with others in PBL learning; otherwise, the discussion cannot be carried out ..."*

*Student 14: "...PBL provided us with chance to work together. The group members always have to share the information, and we can encourage each other while discussion. Once I work with others, I realize that the isolated learning style is not enough to explore the knowledge."*

The above extracts show clearly that well-planned activities in the PBL lessons assisted the students their participation in the collaborative learning. It was relatively easier with assistance of their group members to encourage each other to fulfill the problem-solving activities.

Another benefit of the group work mentioned by the students was "shared workload". Two students insisted that they had decreased the amount of work by sharing the workload with other group members. This made their learning more



effective. They stated:

*Student 18: "...I felt the amount of work was much less than before. I felt much more relieved by working in a group. The group members could share information gathered in after-class activities, even though I could not collect more information, for I could obtain more information from the other group members."*

The excerpts indicate that the students were able to do less individual work, because the group members had the same goal of solving the problem, so they could share the responsibility with each other to accomplish the set work together.

In summary, the activities in learning the PBL lessons benefited the students, because the characteristics of the PBL approach and the activities in the PBL lessons were both helpful in motivate thing the students to participate in medical English learning and it also stimulated their enthusiasm in speaking. The next section will describe the effects of the PBL lessons on the results of the students in their medical English learning.

### **5.2.2.3 Positive Learning Results**

Regarding the learning results of the PBL lessons, all of the students had positive perceptions of the improvement of their language ability, especially for two parts: the enhancement of medical vocabulary and the improvement of speaking ability in group discussion. The details can be seen below:

#### **● Enhancement of Medical English Vocabulary**

All students learned a lot of medical English vocabulary through immersion in medical-related reading and listening materials. The majority of them believed that their

medical English vocabulary was enriched more than before with the implementation, which provided them with real-life problems involving medical English content, and helped them to expose themselves to medical English vocabulary. The remarks from the students speak for themselves, some of which are presented below.

*Student 1: "... I preferred this PBL approach. The learning not only helped me remember medical English vocabulary easily by repetition in the discussion, but also pushed me to use the vocabulary with my existing medical content knowledge. My memory of the medical English vocabulary was enhanced."*

*Student 14: "...learning with PBL materials provided me a lot of opportunities to use the medical English words and expressions. For example, I used the vocabulary for the information searching in after-class activity and for the discussion in class. Furthermore, I had to talk to my group members with the vocabulary and expressions. It helped me to have more practice of using vocabulary I had learnt..."*

*Student 22: "...PBL lessons gave me at least three times as many as opportunities to learn the vocabulary for each problem. The first learning could be teacher's lectures, the text-book content and distributed materials. The second learning was from after-class information searching. Finally, the third time was the group discussion. PBL lessons provided me chances to practice medical English vocabulary. Sometimes the vocabulary appeared in my dreams..."*

The PBL lessons gave the students more exposure to the medical English vocabulary because of its use in the group discussions and because attention was focused onto it when they prepared for the discussions. Furthermore, the repetition of such vocabulary strengthened their memory of these vocabulary items in the problem-solving process in the PBL lessons. The students felt that through the process of learning the PBL lessons, they could remember the vocabulary better than before when they were taught by traditional teaching methods. Thus repetition of use in reading, listening, as well as speaking played a substantial role in medical English learning.

### ● Improvement of Speaking Ability in Group Discussion

Besides the medical vocabulary enhancement, all of the students described that their English speaking ability in group discussions and having improved as a result of the PBL lessons, especially in speaking accuracy and fluency.

*Student 2: "...because of the real-life problem, I thought it was essential for me to solve, for I would encounter such problems in work in the future. I tried to speak more with the information I obtained from the reading and listening materials, which equipped me with more information to speak. I felt I could speak correctly and without hesitation."*

*Student 10: "...at the beginning, I did not know how to discuss and what to discuss. In learning the PBL lessons, the problems given in the class were real medical cases and close to our medical course study. I could try to find out the information to deal with the problems. Through the practice, I came to know how to talk and what to talk about in discussion in English. I had confidence in expressing myself in the group discussion with the medical knowledge with the times going. My speaking became more and more fluent than before..."*

*Student 17: "...there were not enough opportunities for us to exercise speaking English, and gradually we became reluctant to speak before learning the PBL lessons. But the truth is that most of us wanted to learn English well and we all hoped that we could speak fluent English. The PBL lessons provided many opportunities for us to speak. We participated in the discussion actively..."*

From the statements by the students on the improvement of their speaking ability, we can see that it was the problems that the teacher provided them with that stimulated the students to talk more in their group discussions. These problems and materials were authentic and from real life. They were not very difficult for the students in comparison with their medical knowledge level and the content they had acquired. The students were well-prepared for the English language that they would use, which helped them know what and how to talk about the problems. The ill-structured problems

were controversial so all kinds of possible ideas could come out. This stimulated the discussion.

As a consequence, the students thought that the PBL lessons worked effectively in stimulating their medical English vocabulary and improving their speaking fluency as well. In the next section, the details of the students' perceptions of other skills than English language will be reported, for they also improved or changed through the study of the PBL lessons.

#### **5.2.2.4 Other Positive Learning Effects of the PBL Lessons Related to Language Learning**

Through the content analysis of the students' logs and semi-structured interviews, the results revealed some other benefits for the students in other areas: (1) increasing their confidence; (2) increasing their motivation to learn; and (3) increasing their disposition to think critically.

##### **● Increase in Confidence**

Firstly, most of the students revealed that they felt more confident when speaking in English in group discussions than before after participating in the PBL lessons.

*Student 6: "...I felt more confident in speaking English in class this semester because my group members helped me a lot and they were very friendly to me...."*

*Student 13: "...I felt more confident about myself after so many group discussions. I never realized that I could become so relaxed when speaking English with others. When I discussed with group members in English, all of them were my union..."*

*Student 15: "...I liked to take the PBL lessons. I used to think that I was not able to speak English and could not accomplish anything in medical English. Now I know that I can present on behalf of what I know in public, because I really know about the words and expressions from the materials and textbook, so I could speak them out naturally."*

The students explained that they had more opportunities of speaking in the PBL lessons than in their previous lessons. Through frequent speaking their confidence in their ability to communicate in English improved considerably. After practicing, they felt more confident in speaking than before. As a result, they knew what to talk about and how to talk in group discussions, and they could communicate in English more easily, fluently and confidently, especially with the help of their group members. Furthermore the students had a great amount of input of vocabulary because of the in- and after-class activities. With the help of collaborative learning in group work, the students boosted their confidence by practicing speaking in English with either their group members or by themselves.

#### ● **Increase of Learning Motivation**

The most of students compared the PBL lessons with their previous learning experience. They felt that the PBL lessons were more interesting and motivating, because of the nature of PBL approach. It provided the real-life problem for the students to deal with. They had cultivated their interest in encountering such kind of the issues and challenges. In addition, the students learned the medical content, which was their major, and the medical English language, which was useful for their future career. Hence, they were motivated to learn harder. Just as the students said:

*Student 4: "...I felt happy to learn the real medical cases in terms of our medical knowledge content. Actually my English is not bad, so it was a challenge to me in my speaking English. The PBL lessons aroused my interest in learning medical English. I tried my best to fulfill all I could do in group work and in group discussion..."*

*Student 14: "...the teacher is good to give us some special experience of medical English learning. I only learned a little medical English vocabulary without the other language skills in the last semester. This semester, to me, although my English is not good, I can speak in group discussion with the medical content. It is amazing to arouse my interest in learning medical English."*

*Student 23: "The PBL lessons are new to me, with many challenges in learning. Although we are third-year medical student, we cannot solve the real problems when we encounter in this course. It arouses my interest in not only medical language learning, but also in the medical content study. Both are useful for my university study, and I will benefit from my English improvement and I will do my work in the future better with the help of the learning these PBL lessons..."*

From the extracts, they could see strong connections between the language class and the medical content. They learned language not only in one aspect of English as did in the previous lessons, but also the medical English vocabulary and speaking practice in medical context. They realized that PBL was the useful way of learning medical English. Although PBL was new and even a challenge to them, it could help them to improve their medical English learning and had the effects on their future career promotion. The students were motivated of their medical English learning.

#### ● **Increase of Thinking Process**

From the data, it can be seen that some students in the PBL learning became involved in higher-order thinking skills, such as logical reasoning or scrutinizing arguments in the problem-solving and group discussion. They were no longer merely the recipients of the information provided for them. They could select appropriate

information, since they had to read a large amount, and then they needed to synthesize the information carefully. Their perceptions of this can be observed from some of their remarks below.

*Student 8: "...sometimes I cannot get the information to answer questions directly. It is necessary to explore information from senior students and from internet except from the textbooks. There would be the mass information for each item in the outline. So I have to categorize, group and then write them down, which cost me a lot of time, but I could have good understanding of the related issues of the problem-solving..."*

*Student 19: "As a group leader, actually I did a survey along with my group peers in order to solve the problems, which made us feel exhausted... It was not easy work for us because the teacher was very busy and always could not find the right time to answer our questions... We had to arrange the questions logically, put the target problem and its connections with the clinical points, wrote down everything with repeated discussion and thinking them over..."*

*Student 23: "Learning while thinking, this was the main reflection I yielded from the learning of the PBL lessons. We always obtained the knowledge mechanically in the previous language lessons. But in this PBL lesson, I learned to think over for each of the medical English vocabulary and medical content. As the students, we were not only to digest superficially, but also had to think of the origins, the sources, the context, the language and the content. Then we had to try to reason, evaluate, conform and utilize in classroom learning and in group discussion."*

These students had a habit of exploring the related materials, ideas, and events before they formulated their final conclusions from the sources for speaking in the group discussions. Thus they progressed in their studies through the process of studying the PBL lessons. This might help them to get accustomed to the different sorts of situations that they would encounter, since they will need well developed skills needed in their learning, both at the present time and in the future.

### 5.2.2.5 Reasons for Students' Neutral or Negative Perceptions

According to the data analysis, at the end of the PBL lessons, 4% students had neutral perceptions. The proportion of the subjects for this view was dropping down from 25% to 13%, and then to 4% during the process of the PBL implementation. No one held negative perceptions (from the number 8% to 0) in the end. Three reasons could be found out to explain why the students experienced such a change from negative to neutral to positive. They were categorized as follows:

- **Preferring Ready-made Materials**

A few of the students thought that the PBL lessons would not promote their English speaking ability. One of the students wrote:

*Student 20: "...I like the previous teaching lectures for this course. In that class, I have no need to do self-learning for the materials preparation. I do not like to spend much time on the preparation of the materials for speaking discussion. Why does the teacher not give us the materials for problem-solving directly? Anyway, I can reach the standard of the PBL lessons with teacher's instruction; however, I prefer the ready-made materials rather than the self-learning and group sharing one."*

The student preferred taking the lessons with series of the ready-made materials and lecture-based instructions rather than self-learning and group work. Only a few students would not like to share information with the group members to accomplish the problem-solving activities.

- **Low English Level Proficiency**

Throughout the study of the PBL lessons, it was obvious that English language would be always used in the problem-solving activities. Two students who held neutral



ideas agreed that they lacked motivation in participating in the PBL lessons, and that they had no time for materials preparation, all of which resulted from the insufficiency of their English language ability. Furthermore, if the students could not understand what the other group members said, they could not improve their speaking ability.

*Student 20: "...it is difficult for me to concentrate on participating in group discussion. This is a problem for me, because of my low English proficiency. At the same time, my anxiety arises when I cannot follow the discussion. To be frank, the PBL materials do not help a lot to improve my speaking."*

*Student 24: "...even though I cannot understand the materials the teacher gave us, the vocabulary are too much for me, and I have no interesting to look for more related information. Actually I do not believe I can have progress through this course, no matter what its affection to my speaking skills."*

It was revealed that somehow the students tried to follow and develop their English language learning; however, they gave up for participation in the PBL lessons because of their low or insufficient language knowledge and under-cultivated English language skills.

#### ● **The National Exam Concerns**

Due to test-driven system in China, the PBL lessons cannot squeeze its way easily into college English learning to change the traditional lecture-based teaching and national exam-driven learning. As some students stated:

*Student 9: "Sometimes I could know definitely how to answer and how to speak in Chinese with medical knowledge, but it was difficult for me to speak to them in English in group discussion. So I could realize why we had to get more materials used in group discussion and problem-solving activity, but it was too much for me. I need time to do exercises to pass CET6, so I held neutral to PBL lessons."*

*Student 24: "...I should say that I just want to pass the final exam, so I do not think I must spend my time on speaking practice. By the way, I need to spend the time*

*dealing with the forthcoming CET4 and the final exam of the other medical courses. Otherwise, I would not be a qualified graduate, so I give my negative view to the PBL lessons.”*

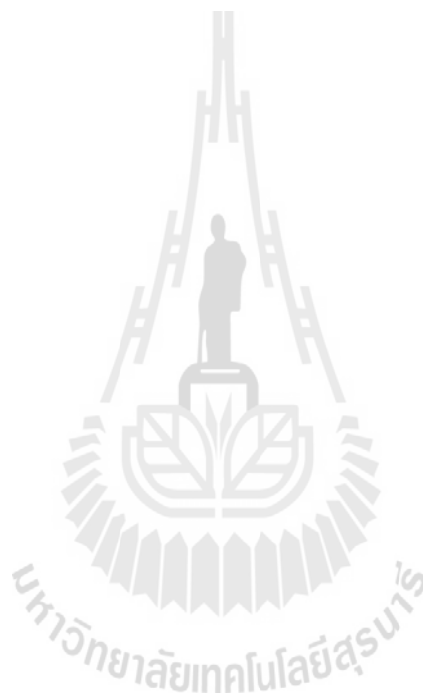
The students who had a specific goal for language learning which was to pass the national CET 4 or 6 exams, refused to learn English language in other ways. They could not spend much time on the PBL lessons with self-learning and group work.

In conclusion, the findings from the students' logs and semi-structured interviews show that the PBL lessons were essential for the developments of their medical English learning. It could be a supplement to cultivate the students' learning compared with the previous lessons, because of the positive effects on the improvement of the students' English speaking ability. The students also stated that the PBL lessons helped them experience of English language learning in a new way, which could promote their medical English learning in groups and develop it in group discussions, all of which were necessary for their English learning and future professional work.

### **5.3 Summary**

In summary, this chapter presents the results of the present study. The findings give an overview of the students' speaking performances in the PBL lessons, and the students' perceptions towards the implementation of the PBL approach and lessons. The findings from the statistical analyses reveal that the students' speaking ability in group discussion was improved after the PBL lessons. A significant relation was found

between the students' speaking ability and their PBL lessons learning. The students benefited from the implementation of the PBL lessons in the medical English course, especially in their speaking ability. Also, the findings indicate that the students had positive perceptions of the PBL approach. The next chapter will present a discussion on the research findings of this study.



## **CHAPTER 6**

### **DISCUSSION AND RECOMMENDATIONS**

This chapter consists of three parts. First, it discusses the results and findings reported in the previous chapters. Second, it presents the summary of the main findings of the study, which can be organized into two major phases: Phase I –development of the PBL lessons and Phase II – the implementation of the PBL lessons. Third, it states the pedagogical implications, presents the limitations and proposes recommendations for further studies concerning the PBL approach in (ESP) course lessons.

#### **6.1 Summary of the Study**

The present study was conducted to examine the issues in designing and developing PBL lessons for medical students, to investigate the effects of the PBL lessons implemented in the students' medical English course, and to explore the students' perceptions of the PBL lessons implementation. It employed a mixed method design, a quantitative inquiry to assess the students' speaking ability at the beginning and at the end of the pedagogical intervention, a qualitative inquiry to explore the process of the PBL lessons development for medical English course and the issues in developing the PBL lessons for medical students; to probe the improvements of the students' speaking ability in the discussion on the PBL lessons; and to investigate the

students' perceptions of implementation of the PBL lessons during their medical English studies.

There were two phases to achieve the study. Phase I focused on the issues of the development of the PBL lessons, while Phase II was designed as a pre-experimental design consisting of pretest, treatments and posttest. The duration of the PBL medical English course was 36 hours during the course of an 18-week semester. The researcher's journal was the instrument used in the process of design and development of the PBL lessons. The pedagogical intervention in this study aimed to improve the students' English speaking ability through the implementation of the PBL lessons. The instruments used in this implementation were pre-and post-speaking tests, students' logs, recorded group discussions and semi-structured interviews.

The research procedure consisted of two phases. The first phase included the design and development of the PBL lessons. The second phase was the implementation of the PBL lessons in a medical English course, with the exploration of the students' speaking changes and their perceptions on the implementation.

In Phase I, the design and development of the PBL lessons included three processes: analyzing the context; designing and developing the PBL materials and developing the PBL teaching plan. From the researcher's perspective, as both an EFL teacher and the developer of the PBL lessons, it was found that the development had several unique features which set it apart from general language lessons. The individual reflections on the PBL lessons development by the researcher helped to illuminate the

nature of the PBL medical English lessons' development. There was a motion that appeared in making an ESP lesson covering the part of professional speaking in groups, in constructing a teaching complex based on the PBL approach at university level.

In Phase II, this study implemented the PBL lessons at the center of the research as a means to improve the students' language skills especially their speaking ability in group discussion and the development of knowledge. Since clinical PBL is aligned with constructivism as the researcher described in the literature review, the research findings have revealed that the students benefit from the scaffolding and the structuring of the PBL lessons. Before the implementation of PBL lessons, the students' speaking ability in group discussions was assessed by using a pre-speaking test, and then it was tested by a post-speaking test after the PBL lessons were completed. The students' logs were kept after completing each of the problems in the PBL lessons. The students had to write down what they had learned and how they had searched for the information to solve the related problems. The discussions on each of the problems by the focus group of six students were recorded. Finally, all the groups were interviewed.

The data obtained from each instrument were analyzed quantitatively and qualitatively. The quantitative data were factored along with the data from the pre-and post-speaking tests scores. The statistical procedures used on the pre-and post-speaking tests scores used descriptive statistics, the outcome of the paired-sample t-test with the significance level at 0.05. The qualitative data analysis was integrated data obtained from the researcher's journal, the students' logs, the semi-structured interviews and the

recorded group discussions. Three research questions were addressed. Based on the data analyses and the results of this study, the following conclusions were produced:

1. The researcher's development of the PBL lessons for medical English course provided a deep understanding of the process of content lessons development, which consists of analyzing the context, designing and developing the PBL materials, and the development of the teaching plan. The complicated process of the lessons design and development required the researcher's English language and content knowledge, language and teaching creativity, and persistence in mastering its complexity.
2. The results of the students' speaking in group discussions following the implementation of the PBL lessons in the medical English course were significantly different. In addition, the language proficiency (participation, medical vocabulary use and conversation strategies used in group discussions) of the students after the implementation of the PBL lessons increased with significant statistical differences at a level of 0.05 ( $\leq .000^*$ ).
3. The students had positive perceptions of the PBL lessons in their medical English course.

In Phase I, the data from the researcher's journal provided the main sources for the researcher about the issues of the development of PBL lessons. It also described the researcher's reflections. Furthermore, the data helped the researcher comprehend the practice of the PBL approach. In Phase II, the data from the pre-and post-speaking tests,

the students' logs, the semi-structured interviews and the group discussions clearly displayed the effects of the implementation of PBL lessons for the third-year medical students on the medical English course at Guizhou Medical University of China. The data also indicated that the PBL lessons implementation had positive effects on their speaking ability, especially in group discussion.

In conclusion, it was found that the PBL approach helped to improve the students' speaking ability in group discussions, even though development of this procedure was rather complicated. However, it worked well in the context of a medical English program.

## **6.2 Discussion**

The discussion includes three sections. The first section describes the issues encountered by the researcher (developer) during the developmental process of the PBL lessons. The second section explains the effects of the PBL lessons implementation on the medical English course. The third section provides the students' perceptions of the PBL lessons and its implementation in the medical English course.

### **6.2.1 Development of PBL Lessons**

From the results of the qualitative data and the analyses of the researcher's journal relating to the PBL lessons development, the researcher learnt that the developmental process of PBL medical English lessons is complex, containing several stages that require the researcher's collective experiences, knowledge and skills. All of



these require a knowledge of English language teaching and learning, content knowledge of other academic disciplines, knowledge of the PBL approach, and being able to communicate effectively with the content-teacher. In addition, the developmental process of the PBL medical English lessons is very time-consuming, but well worth the effort. Each of these factors is discussed in detail in the following sections.

#### **6.2.1.1 Issues in the Development of PBL Lessons**

The result for the first research question indicates that the PBL lessons development for class teaching is a complex process and has a systematic sequence which involves three stages. It begins with analyzing the context for the first stage, continues with the design and the development of the materials for the second stage, and then ends with developing a teaching plan for the last stage. The researcher encountered some issues as a developer in these stages. The issues are discussed as follows.

In the stage of analyzing the context, the issues were attributed to two parts. The first part was that the researcher had no information about the level of the third-year medical students' medical background. Without this information, it was hard to determine the difficulty level of the problem. If the problem was beyond the level, the students could not solve it with insufficient medical knowledge, and this would have a negative effect on their motivation for problem-solving. Similar issues were experienced by Michel, Bischoff and Jakobs (2002) in their study, in which each PBL

designer had to check on the subjects' discipline background knowledge level as to provide the most appropriate problems to solve. The second one concerned the institutional context of the research. It was not easy to obtain administrative permission for the PBL implementation in the medical English course. Such issues were also experienced by Massa (2008) and Kolmos (2010) respectively. They suggested that it was necessary to take into consideration the issues in obtaining institutional permission for PBL approach implementation.

In the second stage of the design and the development of the PBL materials, the two main issues that the researcher experienced were a lack of medical knowledge and how to find comprehensible materials from various sources.

First, because of a lack of the content knowledge, it was not easy for the researcher to read the related medical information connected to the target medical cases for the proposed design of the problem. This point was also mentioned by Fortanet-Gómez and Räisänen (2008). They claimed that the content knowledge of the developer was of importance in the development of pedagogical approaches in ESP course. In addition, So and Kim (2009) stated that there would be conflicts in the translating of pedagogical content knowledge into PBL design as a result of insufficient understanding of the content.

Second, the issue involved with selecting authentic and ill-structured problems and the related reading and listening materials; otherwise, the PBL problems could not be discussed with different identifications. In the general EFL educational

situation, it is normal for the language teacher to have such issues in developing a content-based language course. The solution could be collaboration between the language teacher and the content experts. The researcher strictly followed the layout under the close consultation of the medical teacher. All the selected problems and related materials were determined by the medical teacher to ensure that they could be comprehended by the students. This was according to the suggestion by Gibbons (2003) that active interaction with the content teacher is the only way for the ELS teacher to develop the classroom content-based lessons. In this study, the researcher had to dedicate sufficient time and energy to dealing with the issues in designing and developing the PBL materials through working closely with the medical teacher.

In the last stage of developing the PBL teaching plan, the issue for the researcher was found in the study of the medical vocabulary. The study of Saeidi, Zaferanieh, and Shatery (2012) stated that there is a direct positive connection between the ESP vocabulary input and learning results. Since the medical vocabulary was the main input to the students for their discussion in their groups, and in the pre-while and post-teaching of the PBL lessons. Therefore, the facilitation of medical vocabulary learning was the main concern in developing the teaching plan. Jurković (2006) suggested that in an ESP vocabulary context, the students should be informed of a whole array of medical vocabulary in order to enable them to use it. Moreover, the teacher should also have a good command of vocabulary teaching and learning. The teaching focus should be on both contextualized and de-contextualized vocabulary

learning, independent of the task objective. Similarly, the solution to the difficulty was specific. All the teaching activities provided the students with a wide range of medical vocabulary input sources with the language skills integrated in the textbook learning and problem-solving. The teaching plan ensured the PBL lessons would help the students to learn the medical vocabulary and acquire communicative competence through the instruction of the PBL medical English lessons. Furthermore, in the development of the PBL teaching plan, the focus on learner-centeredness is inherent in the teaching procedure which promotes the construction of meaningful and authentic language use in the present PBL lessons.

#### **6.2.1.2 Time Consuming**

One of the findings is that the research for materials development is complex and time-consuming. Previous studies have experienced similar issues with the amount of time needed to develop materials for ESP courses (Markee, 1997; Seepho, 2002; Ribeiro & Mizukami, 2005; Tomlinson, 2005, Park, 2010; Tomlinson, 2011). The development of PBL lessons consists of several steps, and for the researcher, due to a lack of medical knowledge, she had to develop the materials for English language teaching from another discipline, which took her a long time. The researcher spent a considerable amount of time on three parts of materials development. The first part was the development of the listening materials; the second one was the provision of more materials input; and the third was the focus of vocabulary learning input in the process of development. The details of these three parts are as follows.

First, in the development of the listening materials the research encountered many unexpected obstacles, such as the differences of pronunciation and meaning between the medical vocabulary and general English. Also, the researcher had to check both on the internet and also consult the medical teacher. Furthermore, the researcher spent much time in preparing transcripts of the listening passages.

Second, the researcher needed time to provide the students with more input relevant to the learners' medical knowledge. The more input provided to the students, the more contribution it could make to the development of their language ability, especially speaking skills. The materials development placed an emphasis on the improvement of the students' speaking skills rather than their medical knowledge. However, the medical knowledge was needed to be used in a real language communication in the PBL lessons. Because of a lack of medical knowledge, the researcher spent a lot of time on the search for and in consultation about the input materials.

Third, the time was needed to prepare or activate students' background knowledge about the target language and facilitate the students' vocabulary learning by providing them with specific input, which was necessary in the later activities. Such learning activities ensured that the students would employ their prior knowledge (language and medicine) in the PBL lessons. The researcher tried to design activities that required students to unconsciously use their knowledge or target vocabulary which followed naturally in the next stage.

In addition, more time was needed, since the medical teacher was very busy with teaching tasks and medical duties for the clinical doctor. Many duties prevented the medical teacher from engaging seriously in this extra activity concerning the selection of materials.

### **6.2.1.3 Cautions for the Developer of PBL Materials**

The three main cautions experienced by the researcher, as a PBL medical English materials developer, should be pointed out for further applications of the PBL approach.

The first word of caution is that the developer should provide a specific and explicit PBL problem which can develop the students' academic knowledge as well as their speaking ability. As a result, higher-order thinking skills can be developed because of the integration of the existing background knowledge and new knowledge in the PBL problem-solving analysis and its applications in relation to the given problems. The determination of the PBL problems should stimulate the higher-order thinking skills, which are vital to the success of the PBL lessons (Tanner, Keedy, & Galis, 1995) since the metaphorical space between the problem and its solution is where the learning takes place.

The second word of caution is that the development of the PBL materials should be authentic. The authenticity of the PBL materials is frequently stressed in the literature (Weiss, 2003; De Simone, 2008; Jonassen, 2011; Woods, 2012; Svanström, et al., 2012). In relation to language learning tasks, authentic materials, in the sense of

being real-life, are far more motivating than contrived ones, and motivation is crucial to learning (Barrett, 2010). Savery (2006) also thinks that only authentic materials can generate the solutions of the problems in PBL. Authentic materials should then be an essential characteristic of the PBL materials. PBL is largely chosen as an approach for use in practical disciplines, and the materials need to touch on students' current or future experiences (Weiss, 2003; Lau, Leung, & Lee, 2012).

The last word of caution is that language teachers who develop the PBL materials need to facilitate students' self-confidence and curiosity. A well-developed teaching plan is needed (Qiu, et al., 2012). Therefore, the learning issues and problems especially designed for group discussion should frequently make students clarify meanings, identify arguments, assess claims, query evidences and assess arguments so that they can have a better understanding of the issues and come up with their own views.

In sum, teachers who wish to develop appropriate materials for PBL need to be aware of many issues during the PBL materials development which are important which will affect their outcome. To complete this development with fewer difficulties, the teacher-developer should have adequate time to follow a well-thought out plan for carrying out this tough task with full efforts and concentration. Moreover, the materials developer needs to have an in-depth understanding of the nature of the target course, and be able to adopt and adapt different types of materials to their own teaching. Last but not least, close co-operation between the language teacher and the content expert is absolutely necessary.

### **6.2.2 Effects of PBL Lessons on Students' Speaking Ability**

The second research question aimed to explore the effects of the PBL lessons on the development of the students' speaking ability. The results for the second research question show that the PBL lessons had positive effects on the students' speaking ability in the group discussions. The students attributed their satisfaction to the effects of the PBL lessons on making the medical English teaching and learning more dynamic and content-loaded than the previous lessons.

The following views cover the major findings of the positive effects of the PBL lessons on students' speaking ability in group discussions.

Quantitatively, the results and analysis of the pre-and post-speaking tests showed the difference between the students' mean score of the pretest and that of the posttest, which was shown to be statistically significant by using a pair-sample t-test. Furthermore, the scores for the three different criteria in the speaking tests increased significantly from the pretest to the posttest respectively.

Qualitatively, the results and analysis of the recorded group discussions, the students' logs and the semi-structured interviews revealed that the PBL lessons resulted in the improvement of the students' speaking ability in group discussions. It is difficult to find any previous studies with the same significant positive effects of PBL lessons on medical English courses which investigate students' speaking ability in group discussions. However, other studies (Azer, 2009; Sojisirikul, 2010; Coffin, 2013; Othman & Shah, 2013) found that the implementation of the PBL approach has significant positive effects on students' reading and writing ability in general English.



In line with the findings of this study and the literature review, the reasons for this can be summarized in five parts as follows.

First, the researcher provided the students with authentic and real-life PBL materials in the PBL lessons.

PBL provides opportunities for students to interact and negotiate meaning in an authentic context. The students became involved in authentic tasks, which promoted exposure to and production of varied and creative language, with which they had to formulate ideas and develop intentional cognition. Most of the students mentioned in their logs that they liked to solve the problem of real medical cases. These real-life materials provided a better context for both language and content learning, which was corroborated by a study conducted by Ochoa (2004). The students searched the medical content about real medical cases with frequent English use. This medical English context provided the students with real communication, which allowed the use of the target vocabulary and medical knowledge in speaking. Meanwhile, all the students worked collaboratively through problem-solving in groups. Therefore, by engaging the students in real-life problem solving, this helped enhance their speaking ability naturally. The same findings were also obtained by De Graaff and Saunders-Smiths (2011) in their study.

Second, the researcher provided the students with more medical vocabulary as input for the PBL lessons to enhance their speaking output.

The medical vocabulary was the focus for the researcher to design and develop the PBL materials and the teaching plan. The PBL materials provided by the researcher served as good examples for learners to learn medical vocabulary in an authentic setting. In this study, the repetition of the input of the medical vocabulary in the materials through group discussions, information searching and after-class activities supplied the students with a substantial amount of medical vocabulary and information that they were able to use in their speaking output. In addition, a sequence of activities was necessary for the students to be able to use the vocabulary. Similar findings were reported in many previous studies (Weizman & Snow, 2001; Gass & Mackey, 2007; Pica, 2013). These studies all reveal that students' spoken output is directly affected by their exposure to vocabulary input. Furthermore, the studies by Paretti (2006), Azman and Shin (2011) show similarly surprising findings that the students' exposure to new vocabulary enables them to participate more fully in discussions in the PBL lessons. In conclusion, the students' speaking ability increased due to the integration of the PBL approach into the medical English class with a variety of activities and opportunities for language practice. Hence, the implementation of the PBL lessons ultimately provided more and better opportunities for the students to practice their speaking.

Third, the researcher provided a comprehensible input for the PBL materials, which set up a rich discourse context in the students' discussions.

The students were presented with target language materials in a meaningful, contextualized form with a focus on acquiring information, which led to successful

language communicative learning. Based on the belief that comprehension produces production, the students needed to understand what they had to say before saying it. In order to make the materials comprehensible, Kolmos, et al. (2008), Du, Anette and Holgaard (2009) suggest that it is necessary to lessen the cognitive burden when students have to process content and language at the same time. Thus, in the present study, the students' speaking fluency was improved by the guided comprehensible materials and information sources. They were challenged to interact with each other naturally in English and gained a true picture of the richness and complexity of medical English by developing their discussion skills in real communication.

Fourth, in the PBL lessons, the students received specific guidance from the researcher in choosing appropriate language to improve their accuracy in group discussions.

In the PBL lessons, the researcher trained the students to learn how to use conversation strategies before the first discussion began so as to help them perform better in the group discussions by using the medical vocabulary and knowledge input. According to the analysis of the recorded group discussions, all students in the groups paid attention to what they said as they participated in the discussions and availed themselves of the conversation strategies when speaking. They tried to explore new language forms and the terminology of the medical content by negotiating the meaning as well. In addition, since all the activities in the PBL lessons engaged students in problem-solving and supplied a better context for the activation of learning process than

form-focussed teaching (Richards & Rodgers, 2001), most of the students in the groups were motivated to speak English in class to express their own ideas.

Fifth, the researcher gave a semi-controlled instruction to the students' group work in the PBL lessons.

In the present study, six students in each group carried out the problem-solving activities, which reduced the amount of stress and increased their chances to speak English using medical content in a large class. Since the group discussion section was vital to implement the PBL lessons, the researcher monitored the students' group work by collecting the forms filled in by the students and observing their group discussions at various times in class. The students had to speak out, practice the language with the materials and information. They did not only become more aware of the gaps in their knowledge of spoken English, but also they could see how their spoken English was changing through communication peers with their peers. Furthermore, as a result of the experiences of other researchers (Pastirik, 2006; Wun, et al., 2007), every group was assigned a group leader to control the group work while and after class, such as information gathering, forms' filling and after-class discussions. The group leader was under the control of the researcher to ensure that all the activities were completed as planned. Frequent uses of English and speaking skills in group discussions motivated the students to learn the particular target language and medical content knowledge, all of which provided them with full opportunities for both input and output requirements, which was a as the key process in their speaking practice (Kolmos, et al., 2008; Kolmos, 2010).

In summary, it was found that the students in the PBL lessons tended to speak by using the medical vocabulary from the PBL materials. In other medical courses at GMU, students have no opportunity to participate in the use of medical vocabulary (all learning materials are in Chinese version and no medical departments provide lectures in English). The PBL materials played an important role in the students' medical English learning, as De Graaff and Saunders-Smits (2011) described, and the language production through speaking was needed for the successful outcome of the language teaching materials. As an essential part of the group discussions in the implementation of the PBL lessons, speaking ability can "facilitate language acquisition and development" (Goh, 2007), and can be beneficial to learners' academic achievement as well as professional success (Gallagher & Gallagher, 2013). Furthermore, as Golkova and Hubackova (2014) claimed, "today, students are considered successful if they can communicate effectively in their second or foreign language". Therefore, the use of PBL lessons in a medical English course facilitated the students' speaking ability.

At present, research in PBL in English language teaching and learning is slowly emerging (Othman & Shah, 2013) and it is becoming more task-based and involves normal communicative teaching (Eckerth, 2008; Toth, 2008; Huang, 2012). Despite the lack of research in the field of language teaching per se, PBL has its merits as it is a move toward professional training. It gets students ready for the real world, as students are exposed to the following challenges and skills (Tan, 2003): teamwork, independent learning, communication skills, problem-solving skills, interdisciplinary learning,

information-mining skills, and high-order thinking skills. Since research in PBL in language courses is still very limited, this study, aims to address the effects in research on PBL in ESP language teaching, in general, and on the changes in students' speaking ability, in particular.

### **6.2.3 Students' Perceptions of PBL Lessons in the Medical English Course**

This section describes and discusses the findings for the second research question about the students' perceptions of the PBL lessons implementation in the medical English course. The qualitative analysis of the students' logs and semi-structured interviews which examined the students' perceptions of the PBL lessons implementation found that the students' perceptions were grouped into two categories of similar answers: positive and neutral (or negative) perceptions towards the PBL lessons.

#### **6.2.3.1 Possible Reasons Leading to Students' Positive Perceptions**

As is shown in Figure 5.3, the analysis of the three-time logs entry displays that the students had more and more positive perceptions of the PBL lessons. In addition, the data analysis from the interviews draws the conclusion that 96% (23) students held positive perceptions in the end, and 4% (1) held neutral perception; while, no one held negative perceptions of the PBL lessons implementation in the medical English course. Many previous studies also corroborate that almost all the participants had positive reactions to the PBL approach concerning language teaching and learning (Azer, 2009; Houyin, 2009; Sojisirikul, 2010; Coffin, 2013; Othman & Shah, 2013). In this study,

the students' positive perceptions of the PBL lessons were caused by three main reasons which are presented as follows:

First, the PBL lessons provided the students with an authentic, useful and relevant learning context.

In the PBL lessons, the students were exposed to authentic medical English input, which was integrated with their existing medical knowledge. The medical content knowledge which was related to their background was interesting for them and facilitated their learning. This useful learning context aroused their awareness of their needs and interests in language skills. The findings correspond to the results of previous studies, which show that most medical students perceive PBL lessons as effective for their learning and that they have positive perceptions of the benefits of the PBL approach (Singaram, et al., 2008, 2011; Huang, 2012; Emerald, et al., 2013; Zheng, Cai, & Chiang, 2013). In addition, in such a medical English learning context, the students' learning motivation was stimulated as well. They were apt to have an intrinsic motivation to learn, since the PBL learning activated their prior knowledge and provided them with a language speaking environment in which they could explore their medical knowledge and became familiar with communicating in the target language communication, which was helpful to the development of their English language proficiency. Gram (2013) also mentioned that PBL students' interest in learning can be motivated by the use of an authentic environment. Hence, the majority of the students in this study agreed on the positive effects of the PBL lessons in their study of medical English.

Second, the PBL lessons assisted the students to change their roles and responsibilities in learning medical English.

In the traditional medical English classroom, a teacher-centered teaching approach is used. The teacher gives lectures on the vocabulary and explains the texts and the students complete the exercises. However, in PBL lessons, the teacher does not teach content (Houyin, 2009). A student-centered teaching is defined as a teaching which the students are actively involved in the learning process. This is a classroom where the focus is not on the teacher teaching, but rather the student learning. The teacher can be the facilitator, the monitor, but not a real language teacher. He or she guide the group discussions, observe students' speaking performances, check group work, monitor students' progress and interaction, and provide feedback. Therefore, the students have to change their roles to that of participants and collaborators in the learning process.

In the present study, the students were highly involved in learning both medical content and language and they learned from two kinds of reflection activities. It was a student-centered learning context. Students were given frequent opportunities to confront new information and experiences in information searching. These opportunities were provided in ways that allowed students to participate more actively than in a normal class. However, the students were allowed to overcome new challenges using their past experiences without the dominance of the teacher and of given information. Students communicated and took responsibility for their learning instead



of listening and reacting to lessons. The teacher helped students achieve the activities by scaffolding, with the activities in pre-while and post teaching. The first focused on the content, the second was a reflection on the language learning process, and both of the reflections helped them in group discussions. The students shifted from a passive recorder into an active communicator. The teacher encouraged their personal discovery of information and made them feel safe in order to take risks in discovering new knowledge. This finding was confirmed by the results from the students' logs and interviews.

Third, the PBL lessons catered for the Chinese medical university needs for students' future career in medical English which led to their positive perceptions.

In this study, the PBL lessons contributed to the development of the students' learning-related skills. The students made substantial progress in their speaking ability at the same time as they more about medical English. The teaching and learning activities in the PBL lessons were connected with various fields, and useful not only for the medical English learning, but also for the students' professional development besides language and medical. Although some students told the researcher that they did not think they would spend time on English learning after they passed CET, they realized how large the gap was their ability to communicate in general English and in medical English through their study of the PBL lessons' learning. They needed to master particular medical terms and specific medical English expressions. They knew that it was necessary for them to learn medical English if they wanted to study further

and to obtain a good position in their future workplace. Furthermore, they needed to fulfill some academic professional research by communicating in medical English. Their opinions were similar to those found by Oliveira and Rumble (2013), whose research results pointed out that the language learning process at medical university can focus on both public aspects and then on vocational aspects after considering its educational aspect, because these are related to the students' future professional needs. As a result, studying the PBL lessons positively affected the students' insights into the study of medical English.

In summary, the students' positive perceptions on the implementation of the PBL lessons resulted from their learning motivation which was activated by an authentic, useful and relevant learning context. Their learning roles and responsibilities changed in their study of medical English and will help to prepare them for their future professional needs. The PBL lessons contributed a lot to the development of the students' speaking ability if the students held positive perceptions of the lessons. They began to consider that, as medical students, they could improve their medical English communication proficiency through the PBL approach to the study of medical English and could become not only good learners, but also professional medical experts in the future.

#### **6.2.3.2 Possible Reasons Leading to Neutral (or Negative) Perceptions**

In spite of the positive perceptions of most of the students, there were still a few students who held negative perceptions towards the PBL lessons but, by the end

of the course, they had changed their negative perceptions to neutral ones. By the end of the PBL lessons, one group had neutral perceptions of the PBL lessons implementation. Two main categories could account for why those students had negative perceptions initially, and then neutral ones after studying the PBL lessons.

First, low language proficiency might be one reason influencing the students' perceptions of the PBL lessons.

The study of the PBL medical English lessons requires speaking ability, medical vocabulary use, self-learning on information searching, collaborative group work and group discussions of the learning process, all of which develop gradually, so eighteen weeks' of lessons might not be enough for some students. Particularly those students at a low level of English proficiency were not able to obtain both language and content information and comprehend them well enough to speak in group discussions using the necessary medical vocabulary. The results from the recorded group discussions demonstrated that, although the students with low proficiency could manage some medical vocabulary from the materials to figure out the main points, and then convey their ideas, they found it difficult to gather all the details of the information through speaking in English in group discussions. As Zhu (2010), Sebastián-Gallés and Díaz (2012) point out, students need support to express themselves in group discussions and their feedback really depends on their language ability level. The students felt anxious and they lacked confidence in studying the PBL lessons. Some of the disadvantages of PBL can be seen from this since the creativity and enthusiasm of students would

naturally decrease because of their lack of language proficiency (Farrow & Norman, 2003). This was the main factor that might have caused their negative or neutral perceptions of the PBL lessons.

Second, all the input and output were in the target language in the PBL lessons, which was hard for such students to process thinking.

Although the language teacher gave detailed explanations covering medical English materials in class, the students still needed to spend time on information searching during and after class. Since all the information needed to be in the target language, the students had to synthesize the information from Chinese version into English expressions, all of which could be used in group discussion for problem-solving activities. However, a few students who were familiar with the traditional lecture-based mode would expect to get all the ready-made information and knowledge directly. When they faced a large amount of information in the materials without adequate knowledge of the target language, they gave up. Data from the students' logs showed that a few students felt lacked the motivation to participate in the PBL lessons, became depressed when preparing information preparation and they were unable to understand what the others were talking about in the group discussions. Therefore, these students felt that it was far beyond their capabilities to use the authentic materials as input and then to speak out (output) in the group discussions.

In conclusion, the group discussions showed that the majority of the students exhibited positive perceptions of the PBL lessons in the medical English course. They

were motivated by the PBL lessons to learn the medical content and improve their language proficiency in speaking. Although the PBL lessons might not be appropriate for students at a low level of language proficiency who needed to improve their speaking ability, the teacher was able to provide them with more help to encourage and assist them with their leaning. Except for those few students who held neutral perceptions of the PBL lessons, the majority of the students constructed the medical content knowledge and English speaking proficiency through collaborative interaction with an educational environment in which personal learning experience, such as self-learning in the context for the PBL lessons, was stimulated.

### **6.3 Pedagogical Implications, Limitations and Recommendations**

The research findings summarized earlier demonstrate that the PBL lessons had positive effects on the EFL students' medical English knowledge and their speaking skills. In this section, the pedagogical implications, limitations and recommendations of the study are presented. Firstly, some significant implications may be drawn. Secondly, the limitations will be presented. Thirdly, based on the information from the present study, many recommendations for further research are made.

#### **6.3.1 Pedagogical Implications**

The findings of this study formulate specific although not extensive conclusions that will hopefully shed lights on particular issues of the development of teaching materials and the development of students' speaking ability in a medical English

context. Some significant implications for the teaching and learning of medical English for medical university students can be concluded as follows:

First, language teachers themselves can develop the PBL materials. Although the language teachers would encounter some content challenges, they should take advantage of the main principles of PBL for foreign language learning and the improvement of language skills, and select and develop a problem which embraces both content and language knowledge. The language teachers need to provide comprehensive knowledge and the appropriate background of the medical content as the developer, and the production process will be achieved. Macklin (2008) found that PBL language teachers can be the designers for ESP courses, which also facilitates their professional advancement.

Second, the present study makes some contribution to the application of the PBL approach into content-based English teaching. The teacher should consider students' content background knowledge and English language proficiency simultaneously. According to Echevarria and Short (2004), Şendağ and Ferhan (2009), making the content comprehensible could be effective for the study of PBL lessons, provided the content is carefully selected to ensure that it is applicable for use in the context of the PBL group discussions. Furthermore, as Solomon and Geddes (2001) state that it will be of direct benefit to other researchers aiming at the use of authentic problems. Therefore, the problems and the content knowledge need to be highly valued in PBL language course.

Third, training learners in the PBL approach should be provided. This should start before the PBL lessons so that the students can learn and practice how to put this approach into learning practice effectively. Ochoa, et al. (2004) found that training in the PBL approach can bring a realistic flavor to their training and it is essential to make them know that the PBL approach is a valuable instructional tool that facilitates the application of content and language.

Lastly, a practical framework of developing the PBL lessons to the medical students to learn medical English was provided. The students can construct new knowledge, i.e.: content and language while learning medically related materials. Cooperative group work promotes interaction among the students and activates them to use the language in authentic communication. In such a learning environment, the students increasingly develop both their medical knowledge in particular areas and also their language proficiency. The PBL approach supplies retrospective research and educational thinking to specific language teaching and learning with an increasing focus on communication in education and practice (Hoekje, 2013).

### **6.3.2 Limitations of the Study**

The researcher verified the research findings by means of triangulation, which yielded many insights and perspectives about the implementation of the PBL approach. However, three limitations should be discussed.

First, the sample of 48 third-year medical undergraduate students used in this study was limited to a single university – Guizhou Medical University, China. Future

research should include more students from more universities in order to significantly improve the generalizability of the results.

Second, the present study did not examine the grammatical functions when analyzing the data from the recordings of the students' group discussions. If the investigations had involved the analysis of grammatical structures and functions, it would be assist EFL learners more in their learning to speak on an ESP course.

Third, this study was not allowed fully student-centered as designed in the PBL lessons instruction, for the reasons of teaching time schedule and administrative systems.

Fourth, for this study, the researcher took on many roles at the same time, as the researcher, the developer and the teacher. Therefore, it may be rather subjective. However, a few techniques such as peer-descriptor, inter-rater reliability, data triangulation have been used to reduce the subjectivity of the study.

### **6.3.3 Recommendations for Further Study**

The limitations discussed above lead to the need to conduct further research that explores the effects of the implementation of the PBL approach via a medical English course in language class. Based on the information from the present study, further research can be used to obtain information with a greater variety of populations.

First, the focus of this study was on speaking ability of discussion teaching, it would be interesting to extend to teaching in collaboration between content and language with the other teaching focuses.

Second, it is recommended that additional studies for content language instruction for other disciplines could be conducted by the language teacher. the



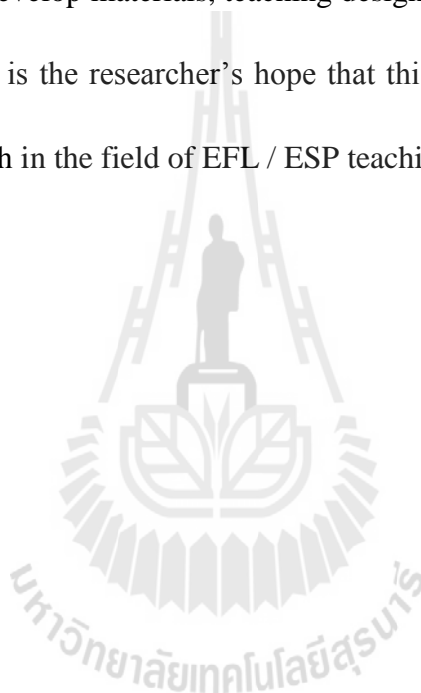
language teachers can try to be the designer and developer of such content ESP courses and materials, such as business English courses, hotel and tourism management English courses, and marketing English course, etc. the principles of the design and development of the courses and investigations if the PBL approach can help to enhance the learners' command of English communication skills.

Third, the present study does not investigate the grammatical structures when students were speaking in the group discussions. Moreover, the exploration of grammatical functions in communication in further studies will help to find meaningful solutions on how to effectively assist the EFL learners' speaking fluency.

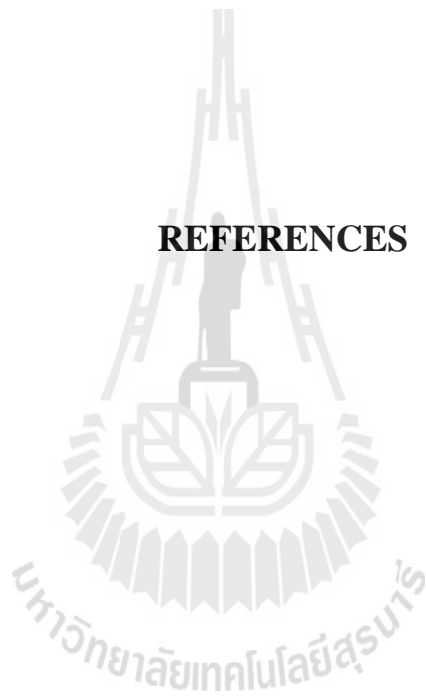
Fourth, the students mentioned other high-order thinking skills, but these were not systematically measured in this study. In other studies the high-order thinking skills can be explored qualitatively.

Fifth, the PBL lessons in this study were fundamentally designed around face-to-face class teaching and learning with group work for discussions, learning resources sharing and problem-solving. To the best of my knowledge, there has been little research on the PBL approach for learning and speaking in ESP by using computers and recent technology. To redesign to incorporate virtual groups or teams, i.e. collaboration in PBL online is therefore the researcher's new perspective on future work in PBL in language teaching and learning exploration. There could be more empirical studies of this nature in the future.

All in all, the effects of the study of PBL lessons on the EFL learners' speaking performance in an ESP course is still at an exploratory stage in the Chinese context and more research on this would be well worth conducting. Although the use of PBL lessons may not solve all the problems that Chinese students have in speaking on an ESP course, it does have impact on students' communication skills. Also, it has developed the teacher's capacity to develop materials, teaching design and cooperation with teachers in other disciplines. It is the researcher's hope that this study has made a significant contribution to research in the field of EFL / ESP teaching and learning.



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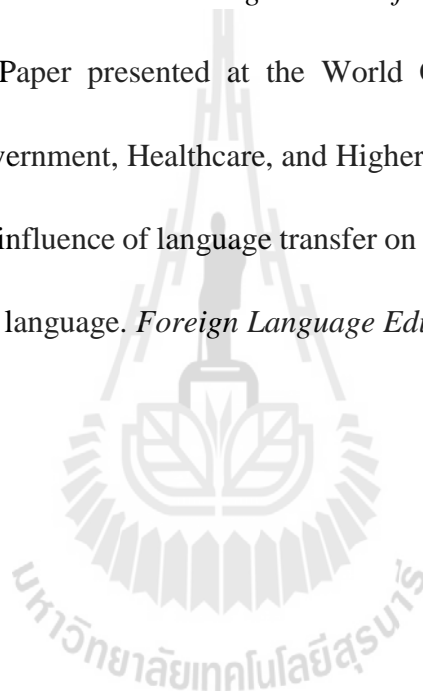
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**APPENDICES**



# APPENDIX A

## PBL Lessons Teaching Plan

**Subject / Course:** Medical English

**Students:** Third year clinical students

**Topic (Problem):** Problem 1/ Problem 2/ Problem 3

**Time and Length of Period:**

One week – Introduction / Pre-speaking test

Five weeks (Problem 1)

Five weeks (Problem 2)

Five weeks (Problem 3)

One week – Post-speaking test

One week – Semi-structured interview

**Teaching Aids:**

- (1) Multimedia facilities (Video, Internet access, Projector, audio equipment);
- (2) Reading materials;
- (3) Listening materials;
- (4) Student's worksheet.

---

### **Week 1**

- (1) Give an introduction of PBL lessons and announce the requirements for students.
- (2) Conduct a pre-speaking test to all the students.
- (3) Divide Students into eight groups of six people in each group.

**Objectives:**

- a. to prepare the students concern to the readiness for the new teaching approach (PBL);
- b. to get the baseline of students' spoken ability
- c.

**Week 2**

<b>Steps</b>	<b>Content of Each Step</b>	<b>Time</b>
1	Lectures (based on the textbook, including lead-in activity).	50 minutes
<b>Class break</b>		<b>10 minutes</b>
2	Teacher gives the problem*(1)	20 minutes
3	Teacher explains the problem to the students.	
4	Students think about what they know and what they do not know about the problem; Teacher facilitates them by brainstorming and asking some questions, e.g. Have you ever heard about this situation before? Do you think it is common? Why? And why not?	20 minutes
5	Students write down known and unknown on the form* (2).	10 minutes
6	Students write student's log* (3).	10 minutes
7	Students study about the problem after class in groups on their own.	
<b>After-class activities:</b> To investigate information after class and write down in the investigation form* (4).		<b>Total about 2 hours for lesson teaching</b>

**\*(1) Problem 1:**

See APPENDIX H

**\*(2) Form for students to write:****What is the Problem? (Issues in the Problem)**

From what you know so far list the facts that are presented in the problem study. Sometimes you need to have more facts that are not provided when you first take on a problem. List any additional facts that you would need to have to help you solve the difficulties.

<b>FACTS I KNOW</b>	<b>FACTS I NEED TO KNOW</b>

**\*(3) Beginning Your Investigation**

**Investigation Form:**

You need a deeper understanding of the issues in the problem before you can recommend solutions. These questions can help you think about possible issues.

List four questions you should answer in order to get a better understanding of the problem.

**Question:** What you do not know?

**Resources:** Where can you get the information? From the internet, books, or ask from others, etc.?

**Actions:** What action(s) will you take to obtain information?

QUESTION	RESOURCES	ACTIONS (HOW)
1:		
2:		
3:		

**\* (4) Student's log (more in Appendix D):**

Week: \_\_\_\_\_ Date: \_\_\_\_\_

**Prompts:**

1. How much could I understand each "problem" in the class?
2. What did I do during the class?
3. How and when can I look for the information concerning the problem?

### Week 3

Steps	Content of Each Step	Time
1	Lectures (based on the textbook).	50 minutes
<b>Class break</b>		<b>10 minutes</b>
2	Teacher gives students reading materials and they read them by themselves.	15 minutes
3	Teacher prepares the students with new vocabulary in reading passages*(1).	15 minutes
4	Students discuss the related information to the problem through the reading materials.	10 minutes
5	Students write down questions and the understanding of the reading materials in the form *(3).	10 minutes
6	Students discuss the problem by using information from reading materials and information from after-class activities.	10 minutes
7	Students write logs*(4) about the reading materials and their performance in discussion.	10 minutes
<b>After-class activities:</b> Students can search for more information concerning the problem after class if needed.		<b>Total about 2 hours for lesson teaching</b>

#### \* (1) Reading vocabulary

See APPENDIX H

#### \* (2) Reading materials

See APPENDIX H

#### \* (3) Search for Information

##### **1. Deepening Your Understanding of the Problem**

To begin your investigation, choose one of the questions you identified in **investigation form**. Clearly state the question you want to answer. If the question seems big and complex, divide it into smaller questions.

**Your question:**

---

**Sub-questions:**

---



---

**Your question:**

---

**Sub-questions:**

---



---

**Your question:**

---

**Sub-questions:**

---



---

## **2. Searching for Information**

### **A. Internet**

Site: \_\_\_\_\_

Date of search: \_\_\_\_\_

Important information:

---



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Site: \_\_\_\_\_

Date of search: \_\_\_\_\_

Important information:

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### **B. Books**

Title: \_\_\_\_\_

Reference: \_\_\_\_\_

Important information:

---



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Title: \_\_\_\_\_

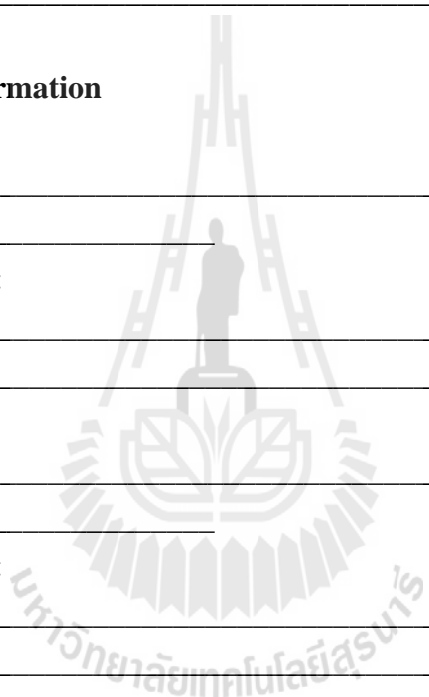
Reference: \_\_\_\_\_

Important information:

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### C. Contacting teachers or other knowledgeable people.

Keep a separate log sheet for each expert or knowledgeable person you contact.

Name of person and Identity	Questions	Answers

#### \* (4) Student's log:

Week: \_\_\_\_\_ Date: \_\_\_\_\_

#### Prompts:

1. How do I think of the reading materials? any suggestion for it?
2. My personal activity after class, such as how to get the information, what kind of methods I usually use to get the information and how much time I spent on it.
3. My opinions to my own speaking performance in group discussion.
4. My opinions to other group members' speaking discussion performance.

### Week 4

Steps	Content of Each Step	Time
1	Teacher gives students listening materials for studying by them.	10 minutes
2	Teacher prepares the students with new vocabulary in listening passage *(1).	15 minutes
3	Teacher teaches students the listening comprehension *(2).	25 minutes
<b>Class break</b>		<b>10 minutes</b>
4	Students discuss the related information to the problem together with listening materials.	10 minutes
5	Students write down the questions and the understanding of the listening materials in the form *(3).	20 minutes
6	Students discuss the problem by using information from reading materials and information from after-class activities.	10 minutes
7	Students write logs*(4) about the listening materials and their performance in discussion.	10 minutes

<p><b>After-class activities:</b> Students can search for more information concerning the problem after class if needed.</p>	<p><b>Total about 2 hours for lesson teaching</b></p>
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\* **(1) Listening vocabulary**

See APPENDIX H

\* **(2) Listening materials**

See APPENDIX H

\* **(3) Search for Information**

**1. Deepening Your Understanding of the Problem**

To begin your investigation, choose one of the questions you identified in **investigation form**. Clearly state the question you want to answer. If the question seems big and complex, divide it into smaller questions.

**Your question:**

---

**Sub-questions:**

---

**Your question:**

---

**Sub-questions:**

---

**Your question:**

---

**Sub-questions:**

---

**2. Searching for Information**

**A. Internet**

Site: \_\_\_\_\_

Date of search: \_\_\_\_\_



Important information:

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Site: \_\_\_\_\_

Date of search: \_\_\_\_\_

Important information:

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### **B. Books**

Title: \_\_\_\_\_

Reference: \_\_\_\_\_

Important information:

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Title: \_\_\_\_\_

Reference: \_\_\_\_\_

Important information:

---



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### **C. Contacting teachers or other knowledgeable people.**

Keep a separate log sheet for each expert or knowledgeable person you contact.

Name of person and Identity	Questions	Answers

#### **\* (4) Student's log(details in Appendix D):**

Week: \_\_\_\_\_ Date: \_\_\_\_\_

Prompts:

1. How do I think of the listening materials? any suggestion for it?

2. My personal activity after class, such as how to collect information, what kind of methods I usually use to collect the information and how much time do I spend on it.
3. My opinions to own speaking performance in group discussion.
4. My opinions to other group members' speaking discussion performance.

### **Week 5**

<b>Steps</b>	<b>Content of Each Step</b>	<b>Time</b>
1	Students synthesize the information from the listening, reading materials and the other information gathered by them.	20 minutes
2	Students discuss the materials about the problem.	10 minutes
3	Group members reach agreements on problem, such as diagnosis, treatments, causes, and pathological changes and write down in the form*(1).	20 minutes
<b>Class break</b>		<b>10 minutes</b>
4	Students write down the summary for this problem-solving in the form*(2).	20 minutes
5	Students prepare the group discussion.	20 minutes
6	Students discuss for the final answers. (Record for focus group)	10 minutes
<b>Supplement:</b>		<b>Total about 2 hours for lesson teaching</b>

#### **\*(1) Form of Finding the Solutions:**

##### **The Possible Solutions for the Problem**

After collecting relevant information, state the possible solutions for the Problem.

(1) \_\_\_\_\_

\_\_\_\_\_

(2) \_\_\_\_\_

\_\_\_\_\_

(3) \_\_\_\_\_

\_\_\_\_\_

#### **\*(2) Summary form:**

##### **Summarizing What You Learned**

Summarize what you have learned by answering the question or questions you wrote down at the beginning of your search.

**Your question (s):**

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**Your information:**

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### Week 6

Step s	Content of Each Step	Time
1	One or two students represent(s) the group to make presentation (total 8 groups) according to the discussion results. (Each group will have about 10-13 minutes, including Question and Answer time) Students assess to the presentation with score form*(1).	100 minutes
2	Students write down the student's log*(2).	10 minutes
3	Students do self-assessment*(3).	5 minutes
4	Students submit the student's log.	5 minutes
<b>Supplement:</b>		<b>Total 2 hours for lesson teaching</b>

**\*(1) Score form for presentation:**

### **Rating Score for Oral Presentation**

**Purpose:** To help students to evaluate the peers' learning, a rating score should be given to assess the presentation by giving a mark from 1-5 (1= need improvement, 2= fair, 3=good, 4=very good, 5= excellent).

**Group No.**

**Topic:**

**Your name:**

Items	5	4	3	2	1
The topic is relevant, well-researched and content-appropriate. 内容和主题相关, 经过了很好的研究并且内容适当。					
Clear and well-structured organization, supported by visuals. The medical vocabulary can be used frequently in speaking. 结构清晰, 组织严密, 并有多媒体材料辅助完成报告。					
Excellent delivery, appropriate body language, can invite questions and answer them successfully 很好的表达, 较好的身体语言, 能很好的完成提问问题。					
Good pronunciation, fluent with little hesitation, appropriate vocabulary, use of discourse markers. 好的语音语调, 流利少有停顿, 合适的表达, 有一定的话语标记。					
The relative medical vocabulary can be used. 可以使用足够多的医学英语单词。					
<b>Total Score 总分</b>					

**\*(2) Student's log (details in Appendix D):**

Week: \_\_\_\_\_ Date: \_\_\_\_\_

**Prompts:**

1. My opinions to own speaking performance after learning PBL lessons.
2. My opinions to the 5 times PBL lessons.
  - a. Teaching materials:
  - c. Phenomenon of the class:
  - d. Any suggestions to the lessons:

**\*(3) Self-assessment**

Which face can express your perception of your PBL medical English learning, please circle the number correspond to it.

(1=very bad      2= bad      3= normal      4= good      5=very good)

1

2

3

4

5



**Week 7 – Week 11:**

The teaching plan of the 10 hours PBL lessons (week 7-11) is the same structure as week 2- 6. But it has different Problem and different concerning reading and listening materials.

**Week 12 – Week 16**

The teaching plan of the 10 hours PBL lessons (week 12-16) is the same structure as week 2- 6. But it has different Problem and different concerning reading and listening materials.

**Week 17****Teacher:**

1. Hold a speaking post-test to all the students. Two inter-examiners (the researcher and her colleague) will spend 20 minutes on each group (160 minutes).
2. Have a short break for the two inter-examiners. (10 minutes)
3. The two inter-examiners will mark the final score of each group member.

**Students:**

Prepare the post-test and participate in the test.

**Week 18:****Teacher:**

1. Hold the semi-structured interviews to the students as the form of group interviews.
2. Distribute the semi-structured interview questions to each of the student among the four groups.
3. Begin to do interviews to all students. Each group will be interviewed 15 minutes (it will spend 120 minutes).

**Students:**

Participate in the semi-structured interviews.

## APPENDIX B

### Researcher's Journal Form

Date: \_\_\_\_\_ Day: \_\_\_\_\_ Time: \_\_\_\_\_

Phase I	Steps	Detailed Descriptions
(Example)	<ul style="list-style-type: none"> <li>● Course</li> </ul>	
Stage I	<ul style="list-style-type: none"> <li>● Students</li> </ul>	
Analyzing the	<ul style="list-style-type: none"> <li>● Teachers</li> </ul>	
Context	<ul style="list-style-type: none"> <li>● Teaching aids (facilities)</li> </ul>	
Stage II	<ul style="list-style-type: none"> <li>● Selecting and developing PBL problems</li> </ul>	
Designing and	<ul style="list-style-type: none"> <li>● Defining the scope of the content</li> </ul>	
developing PBL materials	<ul style="list-style-type: none"> <li>● Selecting and developing PBL reading and listening materials</li> </ul>	
Stage III	<ul style="list-style-type: none"> <li>● Pre-teaching</li> </ul>	
Developing PBL	<ul style="list-style-type: none"> <li>● While-teaching</li> </ul>	
Teaching Plan	<ul style="list-style-type: none"> <li>● Post-teaching</li> </ul>	

## APPENDIX C

### Pre-and Post-Speaking Tests

**Purpose:** The speaking pre-and post-tests conducted to all the students in order to collect obtain the speaking scores before the implementation of PBL teaching approach.

#### PRE-TEST

##### Group Discussion

(20 minutes: 10- Preparation; 10- Discussion)

##### Shortness of Breath

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea(呼吸急促) and acute(严重的) shortness of breath with audible wheezing (听得见的呼气). The patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium(色甘酸钠) and Ventolin(沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

#### Instructions:

*Each student will get one piece of ROLE CARD with the Problem and different information.*

##### ROLE CARD

No.1

##### **Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

##### **Information:**

1. A physical exam revealed the following: HR 110, RR 40 with signs of accessory muscle use.
2. Auscultation (听诊) revealed decreased breath sounds with inspiratory (吸入) and expiratory (呼出) wheezing (喘气) and pt (凝血酶元时间) was coughing up small amounts of white sputum (痰, 唾液). SaO<sub>2</sub> (血氧饱和度) was 93% on room air.

**ROLE CARD****No.2****Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

**Information:**

1. An arterial blood gas (ABG) (动脉血液气体分析) was ordered with the following results: pH 7.5, PaCO<sub>2</sub> 27, PaO<sub>2</sub> 75.
2. An aerosol (喷雾) treatment was ordered and given with 0.5 cc albuterol (舒喘宁) with 3.0 cc normal saline (生理盐水) in a small volume nebulizer (喷雾器) for 10 minutes.

**ROLE CARD****No.3****Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

**Information:**

1. Peak flows (最大流量) done before and after the treatment were 125/250 and auscultation revealed loud expiratory wheezing and better airflow.
2. 20 minutes later a second treatment was given with the above meds. Peak flows before and after showed improvements of 230/360 and on auscultation. There was clearing of breath sounds and much improved airflow (气流).

**ROLE CARD****No.4****Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

**Information:**

1. RR was 24 at this time and HR 108.
2. Symptoms resolved and patient was given prescription for inhaled steroids (激素类, 内固醇) to be used with current home meds. Instruction was given for use of inhaled steroids and the patient was sent home.



**ROLE CARD**

**No.5**

**Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

**Information:**

1. The inflamed (发炎的) tissues produce an excess amount of "sticky" (粘的) mucus (粘液) into the tubes. The mucus can clump (形成一丛) together and form "plugs" (插头) that can clog (堵塞) the smaller airways.
2. In patients with asthma, the chronically (慢性的) inflamed and constricted airways become highly sensitive, or reactive, to triggers such as allergens (过敏原), irritants (刺激物), and infections (传染病).

**ROLE CARD**

**No.6**

**Problem:**

A 37 year old female with a history of asthma, presents to the ER (急症室) with tachypnea (呼吸急促) and acute (严重的) shortness of breath with audible wheezing (听得见的呼气). Patient has taken her prescribed medications (规定的药物治疗) of Cromolyn Sodium (色甘酸钠) and Ventolin (沙丁胺醇) at home with no relief of symptoms prior to coming to the ER.

**Information:**

1. Inhaled medications include beta-2 agonists (激动剂), anticholinergics (抗胆碱能类), corticosteroids (类固醇), and cromolyn sodium (色甘酸钠).
2. Absorption (吸入) of inhaled medications into the rest of the body is minimal. Therefore, adverse side effects are fewer as compared to oral medications.

*The extra information for discussion will be provided to each group member as follows:*

1. Explain how a proper forced expiratory (强制呼气) test is to be performed.
2. Describe the 3 primary pathologic (病理学的) reactions during as asthmatic episode (喘气过程).
3. Describe some of the equipment necessary for an exercise test.
4. Why and how a bronchoprovocation (支气管扩张) test is done.

5. The side effects related to the different medications (药物治疗) .

**Discuss the following points:**

1. What happened to this patient?
2. Why did this disease happen?
3. How to diagnose and treat the disease?
4. How to prevent or reduce the disease?

*After 10 minutes for preparation, the group discussion begins.*

**POSTTEST**

**Group Discussion**

**(20 minutes: 10- Preparation; 10- Discussion)**

**The Elusive Stomachache**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Instructions:**

*Each student in group will get one piece **ROLE CARD** with the Problem and different information are provided.*

ROLE CARD	No.1
<b>Problem:</b>	
The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “ <u>crabby</u> ” (坏脾气) and having <u>mood swings</u> (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being <u>bloated</u> (发胀) after eating.	
<b>Information:</b>	
1. According to the patient, the problem had been present for a “long, long time”. She denied any <u>vomiting</u> (呕吐), <u>diarrhea</u> (腹泻), <u>dysuria</u> (排尿困难), night sweats (盗汗), or <u>fever</u> (发烧).	
2. The abdominal pain was located in the <u>upper quadrant</u> (上限象) of the <u>abdomen</u> (腹腔).	

**ROLE CARD****No.2****Problem:**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Information:**

1. On physical examination, the patient was a well-developed, thin, pale 10-year-old child whose physical examination was completely normal except for boggy turbinates (肥厚鼻甲) and slight nasal congestion (鼻充血).
2. Her abdomen was soft, and bowel sounds (肠音) were normal.

**ROLE CARD****No.3****Problem:**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Information:**

1. She denies anyone inappropriately touching her. The abdominal pain was dull and generalized over the upper gastric (胃部) area. It occurred about 20 to 30 minutes after she consumed a meal and lasted for about an hour.
2. This abdominal discomfort is constant throughout the week, including weekends.

**ROLE CARD****No.4****Problem:**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Information:**

1. Further investigation of the abdominal pain is necessary because there was a change in the growth curve and the child is now complaining that the discomfort is worsening.
2. Further investigation revealed a strong family history of ulcerative colitis (溃疡性结肠炎), chronic abdominal pain (慢性腹痛), irritable bowel syndrome (肠道易激综合症), and colon cancer (结肠癌).

**ROLE CARD****No.5****Problem:**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Information:**

1. The patient has a few environmental allergies (过敏) that do not seem to be of any consequence.
2. The most concerning symptoms according to the patient’s mother were her emotional ups and downs (时好时坏), loss of appetite (食欲不振), and chronic complaint (慢性疾病) of stomachache after eating.

**ROLE CARD****No.6****Problem:**

The patient, accompanied by her mother, was a 10-year-old girl in the fourth grade. Her chief complaint was feeling “crabby” (坏脾气) and having mood swings (情绪波动), an occasional headache, a 5-lb weight loss over several months, and abdominal pain with the feeling of being bloated (发胀) after eating.

**Information:**

1. The mild symptoms are like a specific area of the body, such as a rash (皮疹), itchy (刺痒), watery eyes (流眼水), and some congestion (充血).
2. The other symptoms may begin with the sudden onset of itching of the eyes or face and progress within minutes to more serious symptoms, including abdominal pain (腹痛), cramps (抽筋), vomiting (呕吐), and diarrhea (腹泻), as well as varying degrees of swellings (肿大) that can make breathing and swallowing (吞咽) difficult.

*The extra information for discussion will be provided to each group member as follows:*

The family has not traveled out of country. The patient has been doing well in school. She likes her teacher and has lots of friends. Her social calendar is always full, and she takes dance and piano lessons. However, her home has been in a bit of turmoil (混乱) for more than a year. Her two older brothers have chronic illnesses; the eldest has bipolar (双重的) disease, and the middle brother has Tourette’s syndrome (妥

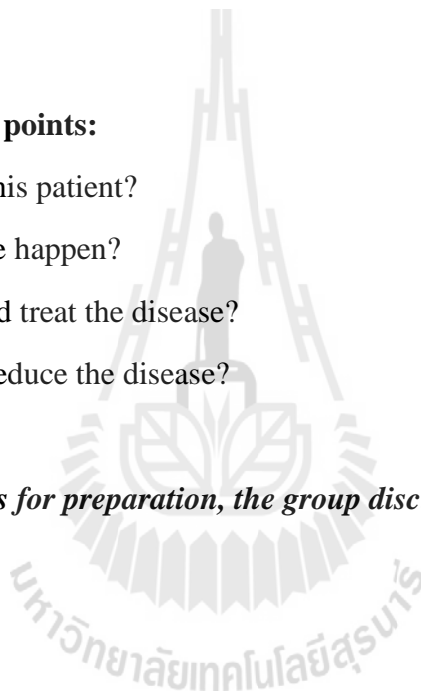
瑞氏症候群). Issues with both brothers have occurred recently, upsetting the entire household. The father is trying to help out at home, but according to the mother, he just does not understand the “big picture”.

A review of the patient’s chart(记录) reveals that she had been growing appropriately along her growth curves (生长曲线) (75% for height and 50% for weight) for the past several years. Today’s measurements indicated a drop in the percentile for height to the 50th percentile and weight to the 25th percentile since her physical 10 months ago.

**Discuss the following points:**

1. What happened to this patient?
2. Why did this disease happen?
3. How to diagnose and treat the disease?
4. How to prevent or reduce the disease?

*After 10 minutes for preparation, the group discussion begins.*



## **APPENDIX D**

### **Student's Log Prompts**

#### **(English Version)**

**Purpose:** All the participants will freely record his/her retrospection regarding the learning of PBL lessons. Examples of the prompts attached in the notebook are as follows:

1. What could I understand well? What could not I understand?
2. My role in the group discussion.  
(Could I discuss or could not I discuss the topic today? Why / why not?)
3. Do I want to participate in speaking in group discussion?
4. My feeling about the PBL approach.
5. My activity after class.  
(How to collect information to solve the problem, what kind of methods I usually used to collect the information and how much time I spent on preparing it.)
6. My opinions to group members' speaking performance in group discussion.
7. My responses to group members' speaking performance in group discussion.
8. How about the relationship among my group members (in and out of class)?
9. Is there any changes of my own speaking ability? (If so, give an example; if not, write some reasons.)
10. My impression and problems that occurred when trying to solve problem (finding information and discussing).

## Student's Log Prompts

### (Chinese Version)

**目的：**所有的本研究参与者都要记录下自己对于 PBL 教学法应用于医学英语教学的回顾和看法，所有的信息将用于回答研究问题，下面就是关于学生记录日记的提示点。

1. 我对于今天课堂上的 PBL 教学理解得很好，理解不了。
2. 我在小组讨论中的表现如何。  
(对于今天的讨论主题我说了很多，或是不能说，为什么?)
3. 在小组讨论中我参与的表现如何?
4. 我个人对于 PBL 教学法的看法。(优势和不足有哪些)
5. 我个人在课下收集资料的活动有什么?  
(我是怎么样收集资料的，一般我采用哪种方式去收集，大概花了多少时间在上面，理解这些资料又用了多少时间，等等。)
6. 我怎样看待小组成员在小组中发言的表现。
7. 我对于小组成员在小组中发言的反应如何。
8. 小组成员间的关系如何(课堂内外)?
9. 我自己的口语能力有什么改变?  
(如果有，请举一个例子说明；如没有，请给出一些原因。)
10. 在学习中碰到的问题(两个方面的问题：查找资料，小组讨论)，我是如何解决的。

## APPENDIX E

### Semi-structured Interview Questions

#### (English version)

**Purpose:** To elicit further information about the students' reactions towards PBL approach in their medical English learning and the effects of PBL approach on students' spoken discussion ability.

**The semi-structured interview questions and sub-questions for students are as follows:**

1. What do you think of the PBL materials used in lessons, do you have any suggestions?
  - a. Problems used in lessons
  - b. Listening materials.
  - c. Reading materials.
2. What are your opinions to the PBL approach?
  - a. What do you think of taking these lessons compared to teacher-centered lessons?
  - b. Is it helpful for you to learn medical English (words and expressions, etc) or learn medical content? If yes, can you give some examples? If no, can you give the reasons?
  - c. Does PBL make / encourage/ motivate / arouse you to talk more? If yes, can you give some examples? If no, can you give the reasons?
3. What are the effects of PBL approach on your spoken discussion ability?
  - a. How about your speaking performance in group discussion? Why it happened in that way? or why not?
  - b. Are there any changes of your oral speaking ability compared to the beginning of the PBL lessons?
4. What do you think of your medical English learning this semester?
  - a. Are there any strengths and weaknesses of the PBL lessons for your (i) speaking performance in group discussion and (ii) medical terminology learning?
  - b. Can the PBL lessons change learning atmosphere in class?
  - c. Do they have anything else to express about the PBL medical English lessons?



## Semi-structured Interview Questions

### (Chinese version)

**目的：** 为了引出更深的关于学生对待关于 PBL 教学法对他们医学英语学习的反应，还有 PBL 教学法对他们口语表现水平的影响的信息。特做此访谈。

**访谈问题如下：**

1. 你怎么看待在课堂上使用的以医学内容为依托的材料？有什么意见和建议？
  - a. 教学中的问题本身
  - b. 听力材料
  - c. 阅读材料
  
2. 你对待 PBL 教学法的态度是怎样的？
  - a. 相对于传统英语课授课方式现在的 PBL 英语教学你怎么看？
  - b. 它是否有助于你的英语学习（词语和用语的表达，自主学习找资料等）和医学相关内容的学习？假如有帮助，请举例子说明；假如没有帮助，请给出原因。
  - c. PBL 教学是否能够使，启发，促进，唤起你说得更多？假如有帮助，请举例子说明；假如没有帮助，请给出原因。
  
3. PBL 教学法对于你的口头表达（讨论）能力有何影响？
  - a. 你在小组讨论中的表现如何？为什么会有这样的表现？
  - b. 相对于本学期开始时你觉得你现在的英语口语能力有何变化？
  
4. 你如何看待你这个学期的医学英语学习？
  - a. PBL 教学法的好处是什么，不足之处是什么（i. 小组讨论的表现，ii. 医学词汇学习）？
  - b. 其能够改善你课堂学习氛围吗？
  - c. 你对 PBL 授课方法还有什么意见？

## APPENDIX F

### Scoring Form for Spoken Test

**Purpose:** In order to obtain data to explore are there any changes of students' spoken

<b>Group No.</b> <b>Name of student:</b>	<b>PRE-TEST</b>		<b>POST-TEST</b>	
<b>Participation</b> (Verbal Involvement)	5		5	
	4		4	
	3		3	
	2		2	
<b>Language Ability</b> ( Medical Vocabulary Use)	5		5	
	4		4	
	3		3	
	2		2	
<b>Conversational Competence</b> (Conversation Strategies Use)	5		5	
	4		4	
	3		3	
	2		2	
<b>Total Score</b>				
<b>Final Score</b> (Average of Two Inter-raters)				
<b>Comments (pre-test):</b>				
<b>Comments (posttest):</b>				

performance in group discussion and to examine how PBL affect students' spoken skills in group discussion.

Mark from 2-5 (2= need improvement, 3=fair, 4=good, 5= very good).

(Adapted from [http://www.cet.edu.cn/cet\\_spoken2.htm](http://www.cet.edu.cn/cet_spoken2.htm))

## APPENDIX G

### Group Discussion Criteria

**Purpose:** This group discussion criterion is used as a base to do data analysis in recorded group discussion, and the spoken pre-and post-tests.

**Week** \_\_\_\_ **Date** \_\_\_\_\_

SCORE	Participation (Involvement)	Language Ability (Medical Vocabulary Use)
5	- Frequent, natural and active participation in the discussion.	- Adequate medical vocabulary and expressions use; - Fairly good ability to deliver information and medical vocabulary in discussion.
4	- Frequent contribution to the discussion, but sometimes not to the point with other participants.	- A basically satisfactory range of vocabulary and expressions use; - Acceptable ability to deliver information and medical vocabulary in discussion.
3	- Less active participation in the discussion.	- A minimum range of vocabulary and expressions use. - The information and medical vocabulary delivery may be faulty and sometimes impede communication.
2	- Inability to take part in group discussion.	- Insufficient vocabulary and expressions use - Poor information and medical vocabulary delivery that causes breakdowns in communication.

Adapted from the CET-SET assessment system for group discussion ([http://www.cet.edu.cn/cet\\_spoken1.htm](http://www.cet.edu.cn/cet_spoken1.htm))

## APPENDIX H

### Problem-based Learning Materials

The PBL materials of each problem include (1) the problem, (2) the reading materials (two pieces) and (3) the listening materials (two pieces).

The PBL lessons contain three problems and their related listening and reading materials.

---

#### **Problem 1**

##### ***Problem***

##### **Tuberculosis Case**

**Patient:** A 33-year-old woman

**Symptoms:** She was admitted to our surgical ward for fever with chills and a mass in the upper quadrant of her left breast. She had suffered from a left-sided mastitis that had been incised and drained at another institution 20 days prior to her presentation at our hospital. Poor wound healing with pus discharge was noted.

**Medical history:** She did not have any personal medical history of TB or diabetes mellitus. She also had no family history of breast cancer. She was married and had a three-year-old child.

##### **Body check results:**

- **Vital Signs:** Upon admission she had a body temperature of 38°C, blood pressure of 126/68 mmHg, a pulse rate of 89/minute, and a respiratory rate of 19/minute.
- **Physical examination:** we noted a firm mass of 5×6 cm with an erythematous open non-healing wound and a brownish discharge measuring 1.5×1.5 cm over the upper outer quadrant of her left breast. Dark reddish plaque skin lesions were found over both lower legs and the dorsal aspect of her feet. Her blood test results showed the following: white blood cells at  $11.80 \times 10^3/\mu\text{L}$ , neutrophils at 77.3%, lymphocytes at 12.7%, platelets at  $418 \times 10^3/\mu\text{L}$ , C-reactive protein at 4.9 mg/dL (normal range  $\leq 0.8$ ), and an erythrocyte sedimentation rate (ESR) during the first hour of 56 mm/hour (normal  $\leq 12$ ). Her blood culture revealed no growth, while her chest radiography was unremarkable.

**Other information of the patient:** An ultrasonography of our patient's left breast

showed a lump measuring about 5×5 cm, which was conglomerated, with an irregular margin with hypoechoic heterogeneous echogenicity, and with a left axillary lymph node. An echo-guided core needle aspiration biopsy of her left breast was also performed which revealed a mastitis with granulation tissue.

### Answering Questions:

1. What is the diagnosis of the patient?
2. What kind of pathological [pæθə'lədʒɪk(ə)l] changes (病理变化) occurred to him?
3. How this disease is spread?
4. What kind of the patient is contagious [kən'teɪdʒəs]? (该疾病患者如何具有传染性)
5. What are the recent research advances in heart disease?

### Reading Materials

#### No.1

#### What is Tuberculosis?

Tuberculosis, commonly known as TB, is a bacterial infection 细菌感染 that can spread through the lymph nodes 淋巴结 and bloodstream to any organ in your body. It is most often found in the lungs. Most people who are exposed to TB never develop symptoms, because the bacteria can live in an inactive form in the body. But if the immune system weakens, such as in people with HIV or elderly adults, TB bacteria can become active. In their active state, TB bacteria cause death of tissue in the organs they infect. Active TB disease can be fatal 致命的 if left untreated.

Because the bacteria that cause tuberculosis are transmitted through the air, the disease can be contagious [kən'teɪdʒəs] 感染的. Infection is most likely to occur if you are exposed to someone with TB on a day-to-day basis, such as by living or working in close quarters with someone who has the active disease. Even then, because the bacteria generally stay latent ['leɪt(ə)nt] 潜在的 (inactive) after they invade the body, only a small number of people infected with TB will ever have the active disease. The remaining will have what's called latent TB infection - they show no signs of infection and won't be able to spread the disease to others, unless their disease becomes active.

Since these latent infections can eventually become active, even people without symptoms should receive medical treatment. Medication can help to get rid of the inactive bacteria before they become active.

At one time, TB was a widespread disease. It was virtually wiped out with the help of antibiotics developed in the 1950s, but the disease has resurfaced 重新露面 in potent new forms - multidrug-resistant TB and extensively drug-resistant TB. Today, these

new and dangerous forms of the disease - resistant to some of the commonly used drug treatments - have created a public health crisis in many large cities worldwide. If you have TB - in its active or latent state - you must seek medical treatment.

Doctors make a distinction between two kinds of TB infection: latent and active. In latent TB, the TB bacteria remain in the body in an inactive state. They cause no symptoms and are not contagious, but they can become active. In active TB, the bacteria do cause symptoms and can be transmitted to others. About one-third of the world's population is believed to have latent TB. There is a 10% chance of latent TB becoming active TB, but this risk is much higher in people who have compromised 缺乏抵抗力的 immune systems i.e. people living with HIV or malnutrition 营养不良 [mælnju'triʃ(ə)n], or people who smoke. TB affects all age groups and all parts of the world. However, the disease mostly affects young adults, and people living in developing countries. In 2012, 80% of reported TB cases occurred in just 22 countries.

*What Are the Symptoms of Tuberculosis?*

The symptoms of TB range from no symptoms (latent tuberculosis) to symptoms of active disease (for example, cough and weight loss). In fact, you may not even be aware that you have a latent TB infection until it's revealed through a skin test, perhaps during a routine checkup 健康检查.

*If you have active TB disease, you may have these symptoms:*

Pleurisy ['plʊəri:si] 胸膜炎, also called pleuritis, is an inflammation of the pleura 胸膜, which is the moist [mɔɪst] 潮湿的, double-layered 双层 membrane ['membreɪn] 膜 that surrounds the lungs and lines the rib cage 胸腔. The condition can make breathing extremely painful. Sometimes it is associated with another condition called pleural effusion, where excess fluid fills the area between the membrane's layers. The double-layered pleura protect and lubricate the surface of the lungs as they inflate and deflate within the rib cage. Normally, a thin, fluid-filled...

*Overall sensation of feeling unwell*

- Cough, at first with yellow or green mucus(粘液), possibly with bloody mucus later in the disease.
- Fatigue(疲惫)
- Shortness of breath(呼吸急促)
- Weight loss (体重减轻)
- Slight fever (低烧)
- Night sweats (夜间盗汗)
- Pain in the chest, back, or kidneys; or perhaps all three.(胸, 背, 肾疼痛, 或三者都有)

*Call Your Doctor About TB If:*

You have any of the symptoms of active TB disease, especially if you live in crowded conditions, are malnourished, or have HIV. You have been exposed to someone with active tuberculosis (TB). Virtually all of the symptoms of tuberculosis can be confused with symptoms of other diseases. Bloody mucus, for example, can also be a symptom of pneumonia [nju:'məʊnjə]肺炎. An evaluation by your doctor is key to confirming whether you have latent TB infection, active TB disease, or some other condition.

*What are complications 并发症 of tuberculosis?*

Although some people may develop no complications, others range from mild to severe complications, including death. Some of the more severe complications include lung function damage, bone pain (spine [spain]脊柱, ribs, and joints), meningitis [,menɪn'dʒɑːtɪs]脑膜炎, kidney and/or liver malfunction, cardiac tamponade 心压塞, 心脏填塞, and visual disturbances 视觉障碍.

*How do physicians diagnose tuberculosis?*

Because TB may occur as either a latent or active form, the definitive diagnosis of active TB depends on the culture of mycobacteria from sputum or tissue biopsy. However, it may take weeks for these slow-growing bacteria to grow on specialized media. Since patients with latent TB do not require isolation or immediate drug therapy, it is useful to determine if a person is either not infected, has a latent infection, or is actively infected with transmissible TB bacteria. Consequently, doctors needed a presumptive test(s) 假定测试 that could reasonably assure that the person was infected or not so therapy could begin. After getting a patient's history and physical exam data, the next usual test is the skin test (termed the Mantoux tuberculin skin test or the tuberculin skin test or TST). The test involves injecting tuberculin (an extract made from killed mycobacteria [maɪkəʊbæk'tɪəriə]分支杆菌) into the skin. In about 48-72 hours, the skin is examined for induration [,ɪndʒə'reɪʃən]硬化 (swelling) by a qualified person; a positive test (induration) strongly suggests the patient has either been exposed to live mycobacteria or is actively infected. Another test, IGRA (interferon-gamma release assays) can measure the immune response to Mycobacterium tuberculosis. Other quick tests are useful; chest X-rays can give evidence of lung infection while a sputum smear stained with certain dyes that are retained mainly (but not exclusively) by mycobacteria can show the presence of the bacterium. These tests, when examined by a doctor, are useful in establishing a presumptive diagnosis of either latent or active TB, and most doctors will initiate treatment based on their judgment of these tests. In addition, some of these tests are useful in the U.S. and elsewhere only in people who are not vaccinated ['væksɪneɪt] 接种疫苗 with a TB vaccine (see below) but are less

useful in vaccinated people. For some patients, culture studies still should be completed to determine the drug susceptibility of an infecting TB strain.

*How can people prevent tuberculosis?*

A vaccine against TB is commercially available; it is termed BCG, or Bacille Calmette-Guerin vaccine. However, the vaccine is not recommended for use in the U.S. because of the low risk for TB infections. Also, the vaccine is highly variable in its ability to prevent adult pulmonary disease. Another problem is that the vaccine may interfere with the interpretation of the tuberculin skin test. Despite this, a number of countries still use it to reduce childhood infections and miliary disease 粟粒疹的疾病. Consequently, the CDC makes this recommendation: "The BCG vaccine should be considered only for very select persons who meet specific criteria and in consultation with a TB expert."

Currently, people who have active TB are suggested to be treated using isolation techniques along with anti-TB drugs to prevent spread according to the CDC. The CDC suggests that patients with probable active TB be isolated in a private room with negative pressure (air exhausted to outside or through a high-efficiency particulate air filter). Further, staff taking care of them must wear high-efficiency disposable masks sufficient to filter out any airborne mycobacteria. Continued isolation is suggested until sputum smears are negative for three consecutive determinations (usually after approximately two to four weeks of treatment).

## No. 2

### About Tuberculosis

*Pathogenesis* 发病机制

About 90% of those infected with *M. tuberculosis* have asymptomatic [ə,sɪmptə'mætɪk] 无症状, latent ['leɪt(ə)nt] 潜在的 TB infections (sometimes called LTBI), with only a 10% lifetime chance that the latent infection will progress to overt ['əʊvə:t] 明显, active tuberculous disease. In those with HIV, the risk of developing active TB increases to nearly 10% a year. If effective treatment is not given, the death rate for active TB cases is up to 66%.

TB infection begins when the mycobacteria [maɪkəʊbæk'tɪəriə] 分支杆菌 reach the pulmonary ['pʌlmən(ə)rɪ] alveoli [æl'vɪəlaɪ] 肺泡, where they invade 入侵 and replicate 复制 within endosomes ['endəʊsəm] 核内体 of alveolar macrophages 巨噬细胞. The primary site of infection in the lungs, known as the "Ghon focus 戈恩病灶", is generally located in either the upper part of the lower lobe, or the lower part of the upper lobe. Tuberculosis of the lungs may also occur via infection from the blood stream. This is known as a Simon focus and is typically found in the top of the lung.



This hematogenous [hemə'tɒdʒɪnəs] 造血的 transmission can also spread infection to more distant sites such as peripheral [pə'rɪfərəl] lymph nodes 外围淋巴结, the kidneys, the brain, and the bones. All parts of the body can be affected by the disease, though for unknown reasons it rarely affects the heart, skeletal ['skelɪt(ə)l] muscles 骨骼肌, pancreas ['pæŋkrɪəs] 胰腺, or thyroid ['θaɪrɔɪd] 甲状腺.

Tuberculosis is classified as one of the granulomatous [grænju'lɒmətəs] 肉芽肿 inflammatory diseases. Macrophage, T lymphocyte 淋巴球, B lymphocytes, and fibroblasts 纤维原细胞 are among the cells that aggregate ['ægrɪgət] 聚合 to form granulomas, with lymphocytes surrounding the infected macrophages. The granuloma prevents dissemination [dɪ,semi'neiʃn] 传播, 感染 of the mycobacteria 分支细菌 and provides a local environment for interaction of cells of the immune system. Bacteria inside the granuloma can become dormant, resulting in latent infection. Another feature of the granulomas is the development of abnormal cell death in the center of tubercles ['tju:bək(ə)l] 结节. To the naked eye 裸眼, this has the texture of soft, white cheese and is termed caseous ['keɪsɪəs] necrosis [ne'krəʊsɪs] 干酪样坏死.

If TB bacteria gain entry to the bloodstream from an area of damaged tissue, they can spread throughout the body and set up many foci ['fəʊkɪ] 焦点 of infection, all appearing as tiny, white tubercles in the tissues. This severe form of TB disease, most common in young children and those with HIV, is called miliary tuberculosis 粟粒性肺结核. People with this disseminated TB have a high fatality rate even with treatment (about 30%).

In many people, the infection waxes 变大 and wanes 变小. Tissue destruction and necrosis are often balanced by healing and fibrosis [faɪ'brəʊsɪs] 纤维化. Affected tissue is replaced by scarring [skɑr] 结痂 and cavities ['kævəti] 空洞 filled with caseous necrotic material. It contains living bacteria, and so can spread the infection. Treatment with appropriate antibiotics kills bacteria and allows healing to take place. Upon cure, affected areas are eventually replaced by scar tissue.

### *Prevention*

Tuberculosis prevention and control efforts primarily rely on the vaccination [,væksɪ'neiʃən] 种痘 of infants and the detection and appropriate treatment of active cases. The World Health Organization has achieved some success with improved treatment regimens ['redʒɪmən] 数量, and a small decrease in case numbers.

### *Vaccines*

The only currently available vaccine as of 2011 is bacillus Calmette - Guérin (BCG) 卡介苗 which, while it is effective against disseminated disease in childhood, confers inconsistent protection against contracting pulmonary 收缩肺部 TB. Nevertheless, it is the most widely used vaccine worldwide, with more than 90% of all

children being vaccinated. However, the immunity it induces decreases after about ten years. As tuberculosis is uncommon in most of Canada, the United Kingdom, and the United States, BCG is only administered to people at high risk. Part of the reasoning arguing against the use of the vaccine is that it makes the tuberculin skin test 结核菌素皮肤试验 falsely positive, and therefore, of no use in screening 筛查. A number of new vaccines are currently in development.

#### *Public health*

The World Health Organization declared TB a "global health emergency" in 1993, and in 2006, the Stop TB Partnership developed a Global Plan to Stop Tuberculosis that aims to save 14 million lives between its launch and 2015. A number of targets they have set are not likely to be achieved by 2015, mostly due to the increase in HIV-associated tuberculosis and the emergence of multiple drug-resistant tuberculosis (MDR-TB) 多重抗药性结核病. A tuberculosis classification system developed by the American Thoracic Society 美国胸科协会 is used primarily in public health programs.

#### *TB is NOT spread by*

Shaking someone's hand

Sharing food or drink

Touching bed linens 床上用品 or toilet seats

Sharing toothbrushes

Kissing

#### *Latent TB Infection and TB Disease*

Not everyone infected with TB bacteria becomes sick with TB disease. People who become infected, but are not sick have what is called latent TB infection. People who have latent TB infection do not feel sick, do not have any symptoms, and cannot spread TB bacteria to others. But some people with latent TB infection go on to get TB disease. People who have TB disease do feel sick, have signs and symptoms, and may spread TB bacteria to others.

#### *Symptoms of TB Disease*

Symptoms of TB disease depend on where in the body the TB bacteria are growing. TB disease symptoms may include:

A bad cough that lasts 3 weeks or longer

Pain in the chest

Coughing up blood or sputum (phlegm from deep inside the lungs)

Weakness or fatigue

Weight loss

No appetite

Chills

Fever

Sweating at night

If you think you may have been exposed to someone with TB disease, contact your health care provider or your local or state TB control office.

*TB Risk Factors*

Man reading a TB brochure  
Not all people need a TB test. You should get a TB test if you are at increased risk. Generally people at high risk for developing TB disease fall into two categories:

People who have been recently infected with TB bacteria

People with medical conditions that weaken the immune system

Conditions or activities that place you at increased risk:

You have spent time with a person known to have TB disease or suspected to have TB disease

You have HIV infection or another condition that puts you at high risk for TB disease

You have signs and symptoms of TB disease

You are from a country where TB disease is very common

You live or work where TB disease is more common, such as a homeless shelter, migrant farm camp, prison or jail, and some nursing homes

*You use illegal drugs*

While anyone can get TB disease, some people who are infected with TB bacteria are more likely to get sick.

You have a higher chance of getting TB disease if you

*Have HIV infection*

Have been infected with TB bacteria in the last two years.

Have other health problems that make it hard for your body to fight disease.

Abuse alcohol or use illegal drugs.

Were not treated correctly for TB infection or TB disease in the past.

There are two kinds of tests that are used to determine if a person has been infected with TB bacteria: the tuberculin skin test and TB blood tests.

A positive TB skin test or TB blood test only tells that a person has been infected with TB bacteria. It does not tell whether the person has latent TB infection or has progressed to TB disease. Other tests, such as a chest x-ray and a sample of sputum, are needed to see whether the person has TB disease.

## **Listening Transcripts**

### **No.1**

“Excerpt from talk on tuberculosis”

Transcription:

*Introduction:*

- Tuberculosis, or TB, is a bacterial infection that causes more death in the world than any other infectious disease. About 2 million people are infected with tuberculosis worldwide. In the United States about 15 million people are infected.
- When tuberculosis becomes active, it killed 60% of those who are not treated. This amounts to 3 million deaths worldwide every year. In the United States, about 20,000 tuberculosis become active every year.
- There is a treatment for tuberculosis when treated, 90% patients who have an active tuberculosis infection survive.
- This patient education program explains latent and active tuberculosis infections. This program discusses the diagnosis, the treatment, and prevention of tuberculosis.

*Causes:*

- Tuberculosis is an infection caused by a bacterium called mycobacterium tuberculosis. The bacterium is also called tubercle bacillus.
- Tuberculosis spreads from person to person through air as a person with active tuberculosis cough, sneezes, or expels air.
- After a person becomes infected, the bacteria are controlled by the person's immune system. The infection became latent, or confined, when the bacteria spread out of the control, the infection become active.
- Since most of the people breathe out only a few bacilli when they exhale, transmission of tuberculosis usually occurs after one or more months of exposure to someone with active tuberculosis. Adequate ventilation is the most important measure to prevent the transmission of tuberculosis.
- Tuberculosis is not usually transmitted through personal items belonging those with tuberculosis, such as clothing, bedding, or other items they have touched.

*Latent VS. Active infection*

- As a person breathes infected air, the bacilli go to the lungs through the bronchioles.
- At the end of the bronchioles are alveoli. Alveoli are balloon-like sacs where the blood takes oxygen from inhaled air and released carbon dioxide into the air inhaled.
- Tuberculosis bacilli infect the alveoli. The body's immune system fights them. The immune system includes special blood cells that identify and destroy foreign materials, including viruses and bacteria. These blood cells are called white blood cells.

- Special with blood cells called macrophages attack tuberculosis bacteria. Many of the bacteria die.
- Tuberculosis bacteria have a cell wall made of complex waxy materials. This wall protects some bacteria inside the macrophages.
- Special cells of immune system surrounded and separated the infected macrophages. The mass resulting from the separated, infected macrophages are hard, grayish nodules called tubercles.
- If an infected person is not healthy, particularly she or he has a weak immune system; the bacilli may overwhelm the immune system. The bacilli will break out the tubercles in the alveoli and spread to the lungs and other site of the body through the blood stream. This is called active tuberculosis.
- If an infected person is healthy, the initial tuberculosis infection is controlled by the immune system. The tuberculosis bacilli may remain confined within tubercles for years. This is called latent tuberculosis. Latent means dormant or sleeping.
- About 90% of the infected people heal completely after the initial infection. The tubercles calcify and the bacteria can not break out again.
- For about 10% of the infected people, the bacilli inside the tubercles becomes active sometime late in life when their immune system becomes weak. This is known as active tuberculosis.

## No.2

“Excerpt from talk on tuberculosis”

Transcription:

Tuberculosis, called TB for short, is a disease that is caused by a bacterium called microbacterium tuberculosis. It is a serious infection, but it is now infrequent in the United States. The infection primarily attacks the lungs of the patients, but there can be infection in other parts of the body in certain individuals. It is important when a person has active tuberculosis that they be diagnosed and treated by physicians.

Tuberculosis is an airborne infectious disease that is spread from person to person through infected droplets. If a person accidentally happens to have tuberculosis in their lungs and they cough or sneeze, those droplets could infect another person who is in close physical proximity to the person who has the infection. It is important to note, however, that tuberculosis cannot be spread by shaking hands, or sharing food or drink or by touching hard surfaces, like a door knob. The overwhelming majority of people who are infected by TB have no symptoms. They are not sick, they do not feel badly, and they cannot spread the infection to other people. If a person has active tuberculosis, however, in their lungs, they do have many symptoms and those symptoms can include

a bad cough that can last for many weeks, pain in the chest, coughing up deep chest secretions often with blood, weakness or fatigue, weight loss with a loss of appetite, fever and chills and night sweats, which can often be very profound. If a person has these symptoms, it is important to seek immediate medical attention and be evaluated for tuberculosis. If a person has latent or sleeping TB, they are treated with antibiotics for either 4 months with a two antibiotic regimen or for 9 months with a single antibiotic, as an outpatient.

If a person has active tuberculosis of the lung and is considered to be contagious, they are generally hospitalized and treated with intensive antibiotics until they are no longer contagious. At that time while they are able to return to the community, they are continued on anti-tuberculosis antibiotics, generally for many months thereafter.

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## **Problem 2**

### *Problem*

**Patient:** Wu Zuchun, male, 57 years old.

**The symptoms are:** polydipsia, polyphagia, weight loss of urine associated with twenty years, now he is hospitalized.

**Disease history points:** patients with no obvious incentive in the next twenty years ago polydipsia, polyphagia, polyuria, accompanied by weight loss, daily water intake increased significantly, appetite surge, nocturia, about an average of 10 times/night was no difficulty urinating, no urinary tract irritation, weight of 90 kg gradually fell 70 kg, is about 50 kg, check blood sugar is high, the diagnosis of diabetes, has served Xiao KeWan treatment, did not monitor blood glucose control is unknown, three days in the hospital for observation, fasting blood glucose test yesterday 11.51mmol / l, total protein 54.2mmol / l, albumin 30.3 mmol / l, BUN15 mmol / l, Crea259umol / l, CHO7.88 mmol / l, random blood sugar 30mmol / l or more, switch to insulin hypoglycemic patients with poor night sleep, agitation, shouting, suggested that the family inpatient monitoring of blood glucose, medication adjustment. Patients without chest tightness, palpitations, no dizziness, headache, no fatigue, malaise, no appetite loss.

**Medical history:** The patient usually constitution in general, there are more than 20 years history of hypertension, medication is not regular, history of colon cancer surgery three years ago. He has no history of drug allergy, no history of acute and chronic diseases.

**Body check results:**

- **Vital Signs:** T37 °C, P80 beats / min , BP175/80 mmHg, clear mind, spirit can, emaciation appearance, examination cooperation, verbal exchanges irrelevant, superficial lymph node enlargement, sclera without jaundice, pupils and other large, light reflex, heart rate Qi 78 beats / min.
- **Physical examination:** Breath sounds lungs still clear, did not hear rales, abdominal tenderness, abdominal surgical scar in the middle see 10cm, liver and spleen ribs and kidney area without percussion pain, bowel sounds not active. Limb muscle strength 5, and limbs tension or muscle tension were normal. Lower extremity edema, pathological sign was not elicited.

**Questions:**

1. What are the bases for the diagnosis?
2. What is the pathogenesis of diabetes?
3. What are the type 2 diabetes-related genetic factors?
4. How to treat and prevent the disease?
5. What are the recent advances in diabetes research?

**Reading Materials****No. 1****What Is Diabetes? What Causes Diabetes?**

Diabetes, often referred to by doctors as diabetes mellitus 糖尿病, describes a group of metabolic [ˌmetəˈbɒlɪk] diseases 新陈代谢的疾病 in which the person has high blood glucose ['gluːkəʊs] (blood sugar) 血糖, either because insulin ['ɪnsjʊlɪn, 'ɪnsə-] 胰岛素 production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria [ˌpɒliˈjʊəriə] (frequent urination) 多尿症, they will become increasingly thirsty (polydipsia) and hungry (polyphagia).

**There are three types of diabetes:****(1) Type 1 Diabetes**

The body does not produce insulin. Some people may refer to this type as insulin-dependent 胰岛素依赖 diabetes, juvenile ['dʒuːvənəl] 青少年 diabetes, or early-onset 早发型 diabetes. People usually develop type 1 diabetes before their 40th year, often in early adulthood or teenage years.

Type 1 diabetes is nowhere near as common as type 2 diabetes. Approximately 10% of all diabetes cases are type 1. Patients with type 1 diabetes will need to take insulin injections for the rest of their life. They must also ensure proper blood-glucose

levels by carrying out regular blood tests and following a special diet.

## (2) Type 2 Diabetes

The body does not produce enough insulin for proper function, or the cells in the body do not react to insulin (insulin resistance) 胰岛素耐受性. Approximately 90% of all cases of diabetes worldwide are of this type. Some people may be able to control their type 2 diabetes symptoms by losing weight, following a healthy diet, doing plenty of exercise, and monitoring their blood glucose levels. However, type 2 diabetes is typically a progressive disease - it gradually gets worse - and the patient will probably end up have to take insulin, usually in tablet form 终身服药.

Overweight and obese people have a much higher risk of developing type 2 diabetes compared to those with a healthy body weight. People with a lot of visceral ['vis(ə)r(ə)l] fat 内脏脂肪, also known as central obesity 躯干性肥胖, belly fat 胃部肥胖, or abdominal [æb'dɒmɪn(ə)l] obesity 腹部肥胖, are especially at risk. Being overweight/obese causes the body to release chemicals that can destabilize the body's cardiovascular and metabolic systems.

Being overweight, physically inactive and eating the wrong foods all contribute to our risk of developing type 2 diabetes. Drinking just one can of (non-diet) soda per day can raise our risk of developing type 2 diabetes by 22%, researchers from Imperial College London reported in the journal *Diabetologia*. The scientists believe that the impact of sugary soft drinks on diabetes risk may be a direct one, rather than simply an influence on body weight.

The risk of developing type 2 diabetes is also greater as we get older. Experts are not completely sure why, but say that as we age we tend to put on weight and become less physically active. Those with a close relative who had/had type 2 diabetes, people of Middle Eastern, African, or South Asian descent also have a higher risk of developing the disease.

Men whose testosterone 睾丸素 levels are low have been found to have a higher risk of developing type 2 diabetes.

## (3) Gestational [dʒe'steɪʃənəl] Diabetes 妊娠糖尿病

People can often have diabetes and be completely unaware. The main reason for this is that the symptoms, when seen on their own, seem harmless. However, the earlier diabetes is diagnosed the greater the chances are that serious complications 并发症, which can result from having diabetes, can be avoided.



Here is a list of the most common diabetes symptoms:

Frequent urination 多尿症

Have you been going to the bathroom to urinate more often recently? Do you notice that you spend most of the day going to the toilet? When there is too much glucose (sugar) in your blood you will urinate more often. If your insulin is ineffective, or not there at all, your kidneys cannot filter 过滤 the glucose back into the blood. The kidneys will take water from your blood in order to dilute [dar'l(j)u:t; dɪ-] 稀释 the glucose - which in turn fills up your bladder['blædə]膀胱.

Disproportionate thirst 经常口渴

If you are urinating 小便 more than usual, you will need to replace that lost liquid. You will be drinking more than usual. Have you been drinking more than usual lately?

Intense hunger 非常饥饿

As the insulin in your blood is not working properly, or is not there at all, and your cells are not getting their energy, your body may react by trying to find more energy - food. You will become hungry.

Weight gain

This might be the result of the above symptom (intense hunger).

Unusual weight loss

This is more common among people with Diabetes Type 1. As your body is not making insulin it will seek out another energy source (the cells aren't getting glucose). Muscle tissue and fat will be broken down for energy. As Type 1 is of a more sudden onset 突发 and Type 2 is much more gradual, weight loss is more noticeable with Type 1.

Increased fatigue 经常疲惫

If your insulin is not working properly, or is not there at all, glucose will not be entering your cells and providing them with energy. This will make you feel tired and listless['listlis]倦怠.

Irritability [ˌɪrɪtə'bɪlɪtɪ] 过敏

Irritability can be due to your lack of energy.

Blurred [blɜ:d] vision 视力模糊

This can be caused by tissue being pulled from your eye lenses. This affects your

eyes' ability to focus. With proper treatment this can be treated. There are severe cases where blindness or prolonged vision problems can occur.

Cuts and bruises don't heal properly or quickly 切口或外伤不易很好很快愈合

Do you find cuts and bruises take a much longer time than usual to heal? When there is more sugar (glucose) in your body, its ability to heal can be undermined.

More skin and/or yeast infections 更多皮肤和酵母菌感染

When there is more sugar in your body, its ability to recover from infections is affected. Women with diabetes find it especially difficult to recover from bladder and vaginal [və'dʒaɪnəl] infections 膀胱和阴道感染.

Itchy ['ɪtʃi] skin 皮肤瘙痒

A feeling of itchiness on your skin is sometimes a symptom of diabetes.

Gums[gʌm] are red and/or swollen - Gums pull away from teeth 牙龈红肿

If your gums are tender, red and/or swollen this could be a sign of diabetes. Your teeth could become loose as the gums pull away from them.

Frequent gum disease/infection 经常性牙龈疾病或感染

As well as the previous gum symptoms, you may experience more frequent gum disease and/or gum infections.

Sexual dysfunction among men 男性性功能障碍

If you are over 50 and experience frequent or constant sexual dysfunction (erectile dysfunction), it could be a symptom of diabetes.

Numbness ['nʌmniːs] 没有知觉 or tingling ['tɪŋɡlɪŋ]刺痛, 麻刺感, especially in your feet and hands

If there is too much sugar in your body your nerves could become damaged, as could the tiny blood vessels that feed those nerves. You may experience tingling and/or numbness in your hands and feet.

## No.2

### **Treatment for Diabetes - How is Diabetes Managed?**

A long time ago

Before insulin was discovered in 1921 Diabetes Type 1 was a fatal disease – most patients would die within a few years of onset. Things have changed a great deal since then. You can lead a normal life, if you have Type 1 and follow a healthy eating plan, do adequate exercise, and take insulin, you can lead a normal life.

### Balance insulin intake with food and lifestyle

The quantity of insulin intake must be closely linked to how much food you consume, as well as when you eat. Your daily activities will also have a bearing on when and how much insulin you take.

### Checking your blood glucose levels

A person with diabetes has to have his/her blood glucose levels checked periodically. There is a blood test called the A1C which tells you what your average blood glucose levels were over a two-to-three month period. Type 2 patients need to eat healthily, be physically active, and test their blood glucose. They may also need to take oral medication, and/or insulin to control blood glucose levels. Prevent developing cardiovascular disease As the risk of cardiovascular disease is much higher for a diabetic, it is crucial that blood pressure and cholesterol levels are monitored regularly.

Healthy eating, doing exercise, keeping your weight down will all contribute towards good cardiovascular health - some patients will need oral medication for this.

### Stop smoking!

As smoking might have a serious effect on the cardiovascular health the patient should stop smoking.

### A health care provider

A health care professional (HCP) will help the patient learn how to manage his/her diabetes. The HCP will also monitor the diabetes control. It is important that you know what to do and that a professional is helping and monitoring the management of your diabetes.

In most countries the GP (general practitioner, primary care physician, and family doctor) provides this regular care. There are also diabetitians, endocrinologists[,endəukri'nɒlədʒɪst]内分泌专家, cardiologists 心脏病学家, nurses, internists[ɪn'tɜ:nɪst] 内科医生, pediatricians [pɪdɪə'trɪʃən] 儿科医师, dietitians[daɪə'tɪʃ(ə)n] 营养学家, podiatrists[pəu'di:ətrɪst] 足病专家, ophthalmologists[pfθæl'mɒlədʒɪst]眼科医师, optometrists[ɒp'tɒmɪtrɪst]验光师, sports specialists and many others.

If a diabetes patient is pregnant she should see an obstetrician who specializes in diabetes (gestational diabetes). There are pediatricians who specialize in caring for the infants of diabetic mothers.

### The aim of diabetes management

The main aim of diabetes management is to keep the following under control:

- Blood glucose levels 血糖水平
- Blood pressure 血压
- Cholesterol levels 胆固醇

High and low blood glucose

The patient will need to make sure his/her blood glucose levels do not fluctuate too much.

Hypoglycemia 低血糖 - low blood glucose - can have a bad effect on the patient.

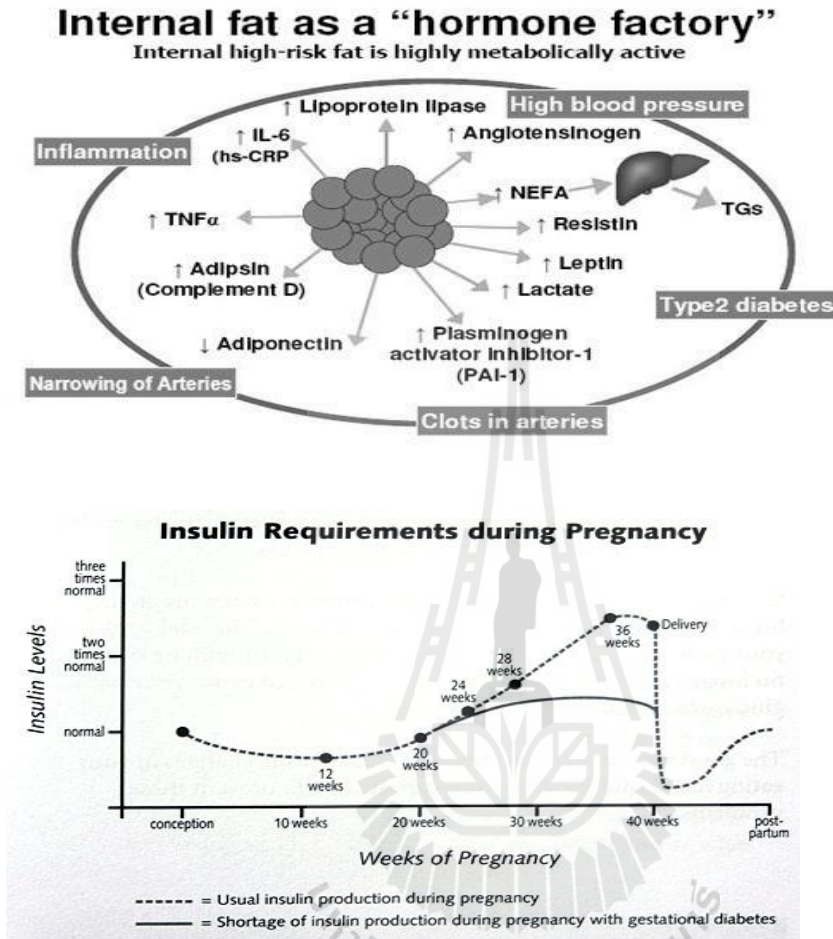
Hypoglycemia can cause:

- Shakiness 颤抖
- Anxiety 焦虑
- Palpitations, Tachycardia 心悸, 心动过速
- Feeling hot, sweating 感觉热, 盗汗
- Clamminess 湿冷
- Feeling cold 感觉冷
- Hunger 饥饿
- Nausea 恶心
- Abdominal discomfort 腹部不适
- Headache 头痛
- Numbness, pins and needles 麻木, 针刺感
- Depression, moodiness 抑郁, 喜怒无常
- Apathy, Tiredness, Fatigue, Daydreaming 冷漠, 疲倦, 乏力, 白日梦
- Confusion 混乱
- Dizziness 头晕
- Bad coordination, slurred speech 不好协调, 口齿不清
- Seizures 发作
- Coma 昏迷

Hyperglycemia 高血糖- when blood glucose is too high - can also have a bad effect on the patient. Hyperglycemia can cause:

- Polyphagia - frequently hungry 多食 - 经常饿
- Polydipsia - frequently very thirsty 烦渴 - 经常很渴
- Polyuria - frequent urination 尿 - 尿频
- Blurred vision 视力模糊
- Extreme tiredness 极度疲劳
- Weight loss 减肥
- Cuts and scrapes will heal slowly and badly 割伤和擦伤会愈合缓慢, 严重
- Dry mouth 口干
- Dry or itchy skin 皮肤干燥或发痒
- Erectile [r'ektail] dysfunction (impotence) 勃起功能障碍 (阳痿)
- Recurrent infections 反复感染
- Kussmaul hyperventilation: deep and rapid breathing 深, 呼吸急促

- Cardiac arrhythmia 心律失常
- Stupor ['stju:pə] 昏迷



## Listening Transcripts

### No.1

“Excerpt from talk on diabetes”

Transcription:

Type 1 diabetes is a condition in which the pancreas produces little or no insulin. Insulin is a hormone that helps your body use blood sugar, known as glucose for energy. Your body takes food you eat and breaks down fat, protein and carbohydrates for energy. While your body is digesting the food, the carbohydrates are broken down into glucose. The glucose is then absorbed into the bloodstream, where it is carried to cells throughout your body. Insulin helps your cells absorb the glucose in your blood, allowing them to be used as energy. A healthy pancreas releases a regular supply of insulin into your bloodstream. After you eat, your blood glucose levels rise and your

pancreas responds by releasing more insulin to move the glucose into your cells. Insulin acts as the key, opening up a cell, so it can accept the glucose.

In a person with type 1 diabetes, the pancreas produces little or no insulin. Without insulin, blood glucose levels rise. Without insulin, glucose cannot enter the cells and be used for energy. As a result, it remains in the bloodstream. As a person with type 1 diabetes, it is important to monitor and maintain healthy blood glucose levels. High blood glucose levels over a long period of time can lead to health complications. If your blood glucose level drops too low, even for a short amount of time, you may feel dizzy or too hot or cold. If your glucose levels drop extremely low, you may lose consciousness. By taking insulin as prescribed by your doctor and maintaining a healthy diet, you can keep your glucose levels within a healthy range.

## **No.2**

“Excerpt from talk on diabetes”

Transcription:

Diabetes type 2 is the most common form of diabetes. Although it can occur at any age, it is more common in people who are overweight, sedentary and over middle age. Glucose is the main source of energy for body cells. When blood sugar levels rise as is normal after a meal, the pancreas gland located behind the stomach, secretes the hormone insulin. Insulin enters and circulates in the blood and acts on the insulin receptors present in muscle, fat cells and other tissues of the body. Binding of insulin to these receptors causes the glucose transporters to come to the cells' surface. This facilitates the entry of glucose into these cells. In diabetes type 2, the production of insulin is low, and sometimes there may be resistance to insulin. The circulating insulin fails to facilitate the absorption of glucose into the cells and to keep the blood glucose level at optimum levels. These results in the rise of the glucose levels, the excess in blood glucose reacts with protein in tissues to form what are known as Advanced Glycation and End Products or AGEs. AGEs create an inflammatory condition in the vasculature, which causes heart disease and damage to other organs, such as the kidney. Diabetes can eventually cause damage to the heart, arteries, kidneys, nerves, eyes and skin.

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### **Problem 3**

#### *Problem*

#### **Shortness of Breath in a 75 Year Old**

**Patient:** A retired 75-year-old laborer, male, Mr. Luo.

**The symptoms:** He comes to clinic at the request of his wife. He had always been moderately active doing odd jobs around the house and walking 10-30 minutes/day with his wife. However, over the past 6 months, he becomes short of breath while walking and fatigues easily. He is unable to keep up with his wife these days and recently, he has preferred to sit out the daily walks. He notes that he gets more short of breath even when he walks to the mailbox. He has not had chest discomfort. He takes an aspirin daily as well as "a pill for high blood pressure". He is occasionally forgetful, but is able to do all activities of daily living. He smoked 1-2 packs/day for over 40 years, but quit last year.

**Medical history:** His past history is remarkable only for osteoarthritis and mild COPD. The patient had "high blood pressure" history of 10 years, most recently taking the "Adalat, Bonuo" antihypertensive drugs, blood pressure control 140/90mmHg. He has no history of infectious diseases, "hepatitis, tuberculosis, typhoid," and so on, history of blood transfusion, and other surgery.

**Smoking history:** 40 years of smoking history, 20 a day, drinking history for 40 years.

**Family history:** he has no familial genetic history

#### **Body check results:**

- **Vital Signs:** T: 36.7 °C, P: 64 beats / min, R: 20 beats / min, BP: 140/85mmHg.
- **Physical examination:** Lungs breathing exercises symmetrical intercostal space normal fremitus symmetrical, symmetry respiratory activity, no sense of pleural friction, no subcutaneous fat twisted sense of voiceless percussion, auscultation of the lungs and did not hear the end of moist rales. Apex beat is normal, normal position, palpation no tremors, heart rate 64 beats / min, heart Qi, the valve auscultation area is not known and obvious pathological murmurs.

**Findings of coronary angiography:** Findings through imaging: no left main stenosis, left anterior descending artery occlusion from the proximal; left circumflex artery intima not smooth, no significant stenosis; right coronary artery intima not smooth, no significant stenosis, issued a collateral circulation to the distal left anterior descending artery. Normal coronary origin was the right type distribution advantages.

**Answering Questions:**

- What is the diagnosis of the patient
- What kind of pathological changes of coronary artery?
- Why does this disease happen and what are the normal treatments to this disease?
- How to prevent such kind of disease?
- What are the recent research advances in heart disease?

**Reading Materials****No.1****Understanding How the Heart Works**

To understand heart disease, you must first know how the heart works. The heart is like any other muscle, requiring blood to supply oxygen and nutrients for it to function. It beats about 100,000 times a day, pumping blood through your circulatory ['sɜ:kjələtəri] system 循环系统. The cycle of pumping ['pʌmpɪŋ] 抽吸 blood throughout your body carries fresh oxygen to your lungs and nutrients to your body's tissues. Blood also takes waste, such as carbon dioxide, away from your tissues. Without this process, we could not live.

**What is heart disease?**

Heart disease begins when cholesterol [kə'lestərɒl] 胆固醇, fatty material, and calcium build up in the arteries. When this occurs in the arteries that supply the heart, this buildup, or plaque [plæk] 血小板, causes the arteries to narrow, so that oxygen delivery to the heart is reduced. The reduction in oxygen delivery to the heart can create chest pain, also called angina [æ'n'dʒamə] 心绞痛.

**The link between heart disease and heart attack**

When plaque builds up to the point that it ruptures ['rʌptʃə] 破裂, it causes a blood clot 血凝块 to form in the coronary artery. The blood clot blocks blood from flowing to the heart muscle, leading to a heart attack 心脏病. In a worst-case scenario [sɪ'nɑ:riəʊ] 最坏的情况, sudden cardiac ['kɑ:diæk] arrest [ə'rest] 心脏停止 or fatal rhythm ['rɪð(ə)m] disturbance 致命的节律失常 can occur.

**Heart disease: the number-one killer**

Heart disease affects about 14 million men and women in the United States, and it has a high mortality rate. In fact, it takes more lives than the next seven leading causes of death combined.

**What are lifestyle risk factors for heart disease?**

Lifestyle risk factors that contribute to heart disease include:

- lack of exercise, 缺乏锻炼



- high-fat diet, 高脂饮食
- emotional stress, and 精神压力
- having a "type A" personality (aggressive, impatient, competitive). 具有 A 特质

### **What are common symptoms of heart disease?**

Symptoms of heart disease usually occur during exercise or activity. That's because the heart experiences increased demand for nutrients and oxygen that cannot be met because the coronary arteries are blocked. Other symptoms of heart disease include:

- chest pain (angina), 心绞痛
- shortness of breath, 呼吸急促
- jaw pain, and 颌疼痛
- back pain, especially on the left side. 背痛（左背）

### **What are other symptoms of heart disease?**

Other symptoms of heart disease may include:

- dizziness or light-headedness, 眩晕或者轻微头痛
- weakness when at rest, 虚脱
- irregular heartbeat, 不规则心跳
- nausea ['nɔ:ziə], and 恶心
- abdominal [æb'dɒm(ə)l] pain. 腹痛

For many women, seniors, and people with diabetes, pain is not a symptom of heart disease at all. Instead of experiencing discomfort, they often have symptoms of malaise or fatigue.

### **There is no single treatment method for heart disease.**

Each person experiences heart disease differently, and no one treatment method works for everyone. A multi-faceted approach of dietary changes, lifestyle changes, exercise, and medications may be combined, depending on the patient's individual situation and needs.

### **What are some common medications used to treat heart disease?**

Common heart disease medications can include:

- **beta blockers** which reduce heart rate and blood pressure;  $\beta$  受体阻滞剂
- **nitroglycerin**, which dilates 膨胀 the coronary arteries, making it easier for blood to flow; 硝酸甘油
- **calcium channel blockers**, which help slow the heart rate, allowing the heart to beat more efficiently; 钙通道阻滞剂
- **ACE Inhibitors**, which dilate blood vessels to increase blood flow and relieve stress on the heart; and 血管紧张素转化酶抑制剂

- **statins**, which reduce the number of lipids['lɪpɪd]脂肪 (found in cholesterol) in the blood to reduce the likelihood of plaque forming on the arteries.他汀类药物

### What are some of the procedures performed to treat heart disease?

The following are common procedures used to treat heart disease.

Coronary (balloon) angioplasty[.ændʒɪo'plæsti]血管成形术: A thin catheter['kæθɪtə]导管 is inserted into the blocked artery with a tiny balloon on the end. When the balloon is in the spot of the blockage, it is expanded to keep the artery open so blood can flow more freely, and the catheter is removed.

Stents 支架: The insertion of a stent is similar to coronary angioplasty except that over the balloon is a small metallic [mɪ'tælɪk] tube 金属管 (a stent) that stays in place to keep the artery open while the catheter and the balloon are removed.

Atherectomy 经皮腔内斑块旋切术: A drill-like device or laser cuts away the plaque [plæk; plɑ:k]血小板 covering the arteries.

Brachytherapy[bræki'θerəpi]近距离放射治疗: Radiation is applied to the blockages to remove them from recurring after angioplasty.

The key to preventing heart disease is through a healthy lifestyle, starting with a healthy diet.

Although heredity 遗传 is a risk factor for heart disease, and an individual cannot control this factor, other factors can be modified to decrease the risk of heart disease. What you eat can reduce your chances of developing heart disease. A heart-healthy diet includes lots of whole grains 全谷类, vegetables, and fruits. Chickpeas 鹰嘴豆, beans, and soy products can help lower your cholesterol [kə'lestərɒl]胆固醇 as well as olive oil 橄榄油, garlic 大蒜, and avocados [ævə'kɑdɒ]鳄梨. Nuts, such as almonds['ɑ:mənd]杏仁, walnuts['wɔ:lnʌt]核桃, and pecans 胡桃, can boost 促进 "good" cholesterol (nuts are high in calories, so limit the amount you eat). Incorporate fish and seafood into your meals a few times a week. Also, try to avoid sweets.

Lower the risk of heart disease with exercise, aspirin, and by controlling high blood pressure and diabetes.

The following steps may help reduce your risk of heart disease:

- Regular exercise strengthens the heart, lowers bad cholesterol (LDL), raises good cholesterol (HDL), and lowers blood pressure, The AHA recommends exercising at least 30 minutes of exercise at least three to five days a week.
- Control high blood pressure and diabetes: If you have diabetes, keep blood sugars under control.
- Take a low-dose aspirin daily; This can reduce your risk of heart attack.

Talk with your doctor before taking any new medications or starting an exercise program.

### **Lifestyle changes: using alcohol in moderation and quitting smoking.**

To raise good cholesterol levels (HDL), it is recommended that women have only one drink per day, while men should have no more than two. In addition, smoking has been linked to heart disease, so the sooner you quit, the better. In fact, after just three years of not smoking, your risk of developing heart disease becomes equal to that of a nonsmoker.

## **No.2**

### **Coronary Heart Disease - What You Should Know**

It is well-known that coronary heart disease 冠心病 is the most common type of heart disease in developed and industrialized countries. But have you heard that Coronary Heart Disease (CHD) is responsible for over half a million deaths in the United States and more than 150,000 deaths in the U.K. alone yearly? Do you know what CHD is? Let's get to know CHD.

Coronary heart disease is a condition in which the heart's arteries (blood vessels) 动脉血管 become narrower, reducing blood flow to the heart muscles and this could lead to a complete artery blockage. When this happens in the heart, the result is heart attack 心脏病, medically known as myocardial [ˌmaɪəʊˈkɑːdiəl] 心肌 infarction [ɪnˈfɑːk(ə)n] 梗死. The same process in blood vessels supplying the brain results in a stroke 中风 .

Coronary heart disease is caused by a process known as atherosclerosis [ˌæθərəʊskliəˈrəʊsɪs; -sklə-] 动脉粥样硬化: the gradual build-up of substances such as cholesterol [kəˈlestərl] 胆固醇 in the arteries of the heart. This substance, often called plaque or atheroma [ˌæθəˈrəʊmə] 动脉粥样化, makes the arteries narrower, thereby depriving the heart muscles of the much needed oxygen<sup>2</sup>. If blood supply is not restored [riˈstɔːd] 修复, there will be a permanent damage to the heart. The more the fatty deposits (plaques) 脂肪沉淀, the greater the risk of heart attacks<sup>3</sup>. Plaque rupture [ˈrʌptʃə] 斑块破裂 and thrombosis [θrɒmˈbəʊsɪs] 血栓形成 lead to a complete blockage of an artery. When these plaques break, they release a complex chemical which triggers 引发 a lot of events leading to thrombosis.

The build-up of blockages in the arteries is the result of a number of factors. The most common factors are:

- smoking 抽烟
- high cholesterol 高胆固醇

- lack of regular physical activity 缺乏日常锻炼
- excess weight, and obesity 超重, 肥胖症
- high blood pressure 高血压
- diabetes 糖尿病
- family history of heart disease 家族心脏病史
- depression and social isolation 压力和社会隔绝

While there are not specific causes of coronary heart disease, several factors can increase a person's chances of developing CHD. Two of the main risk factors for getting coronary heart disease are aging and being male. Women tend to get heart disease later than men do. It is thought that female hormones ['hɔ:məʊn] 女性荷尔蒙 help protect women from heart disease before menopause ['menəpəʊz] 更年期. After menopause, women should beware that they can get heart disease as often as men do. The risk of heart disease in men increases at the age of 45. For women, heart disease risk increases at 55.

It is important to know that heart attack can occur anytime, anywhere without warning. The warning symptoms of heart attack are: chest discomfort, sweating 发汗, dizziness ['dɪzɪnɪs] 头昏 or nausea 恶心, fatigue 疲惫, palpitation [pæl'pɪ'teɪʃ(ə)n] 心悸, fainting ['feɪntɪŋ] 昏晕, breathlessness 呼吸急促. Not all these symptoms occur in every attack. The most common symptom is Angina [æ'n'dʒaɪnə] 心绞痛 (chest pain). Angina occurs as a result of restriction of blood flow to the heart due to plaque formation in the coronary arteries. The pain is described as a crushing 支离破碎 or gripping ['grɪpɪŋ] 绞痛 pain across the chest which may also radiate into the teeth or throat and followed by sweating and breathlessness.

It is reported that CHD accounts for about 67.4 % of all the deaths relating to heart diseases. Owing to our lifestyle especially in dieting, the health of arteries gradually deteriorates [dɪ'tɪəriəreɪt] 恶化 as we grow older. For the sake of our health, please develop a good lifestyle, stop smoking, do exercises regularly.

Remember this: A move towards healthy eating could help eliminate heart disease.

#### Words & Expression

coronary ['kɒrənəri] adj. 冠状动脉的

industrialized [ɪn'dʌstriəlaɪzd] adj. 工业化的

yearly ['jɜ:lɪ] adj. 每年的, 一年一度的 adv. 每年, 一年一度

artery ['ɑ:təri] n. 动脉

blockage ['blɒkɪdʒ] n. 阻塞, 堵塞

stroke [strəʊk] n. 中风

atherosclerosis [æθərəʊsklə'rəʊsɪs] n. 动脉粥样硬化

- cholesterol [kə'lestərəʊl] n. 胆固醇  
 plaque [plɑ:k] n. 斑块, 齿菌斑, 牙斑  
 atheroma [æθə'rəʊmə] n. 动脉粥样化, 粉瘤  
 rupture ['rʌptʃə] n. (体内组织等的) 断裂, 破裂  
 thrombosis [θrɒm'bəʊsɪs] n. 血栓症  
 diabetes [ˌdaɪə'bi:tɪz] n. 糖尿病  
 beware [bi'weə] v. 小心, 谨防  
 menopause ['menə.pəʊz] n. 停经期, 更年期  
 fatigue [fə'ti:g] n. 疲劳  
 palpitation [ˌpælpɪ'teɪʃən] n. 心悸  
 angina [æn'dʒaɪnə] n. 心绞痛  
 deteriorate [di'tɪəriəreɪt] vi. 恶化, 变坏,  
 eliminate [ɪ'lɪmɪneɪt] v. 除去, 剔除, 淘汰  
 coronary heart disease 冠心病  
 myocardial infarction [maɪə'kɑ:diəl ɪn'fɑ:kʃən] 心肌梗死, 心肌梗塞

### Notes

1. Coronary heart disease is a condition in which the heart's arteries (blood vessels) become narrower, reducing blood flow to the heart muscles...

冠心病是指心脏动脉血管变窄, 使得流向心肌的血量减少。

reducing 引导的分词短语在句中作状语, 表示结果。

2. This substance, often called plaque or atheroma, makes the arteries narrower, thereby depriving the heart muscles of the much needed oxygen.

这种叫做动脉粥样斑的物质使得动脉变窄, 从而使心肌缺少必需的氧气。

deprive sb. of sth. 剥夺某人某物

此处的分词短语在句中也是作状语, 表示结果。

3. The more the fatty deposits (plaques), the greater the risk of heart attacks.

脂肪沉积物(粥样斑)越多, 患心脏病的风险就越大。

这是一个省略句, 完整的句子应为: The more the fatty deposits (plaques) are, the greater the risk of heart attacks is. “The +形容词比较级……, the +形容词比较级……” 意为“越……, 就越……”。

The harder the heart muscles works, the more the oxygen will be required and the greater the imbalance between the oxygen supply and demand.

心肌负荷越大, 所需的氧气越多, 氧气供给的失调就越严重。

4. not all: “并非所有的……” 表示部分否定。

试比较:

Not all the students come from rich families. 并非所有学生来自富裕的家庭。

None of the students come from rich families. 没有一个学生来自富裕的家庭。

5. The pain is described as a crushing or gripping pain across the chest which may also radiate into the teeth or throat and followed by sweating and breathlessness.

这种疼痛表现为胸部压迫性疼痛或绞痛，这种疼痛可能会放射迁延至牙齿或喉部并伴有多汗、气喘。

句中“which”用来引导定语从句，修饰“a crushing or gripping pain”；“followed”是动词的过去分词，在句中作为后置定语也用来修饰“a crushing or gripping pain”。

6. It is reported that CHD accounts for about 67.4 % of all the deaths relating to heart diseases.

据报导，在所有与心脏病有关的死亡病例中，冠心病占了 67.4%。句中“account for”表示“占有……的比例”；“relating to”是动词的现在分词形式在句中作定语修饰“deaths”。

### **Listening Transcripts**

No.1

“Excerpt from talk on coronary artery disease”

Transcription:

#### **Pathophysiology of Coronary Artery Disease**

.... blood pressure above the normal range is known as hypertension. Blood pressure may be elevated by increasing the circulating blood volume or by increasing the cardiac output or by ...the peripheral vasculature to increase total peripheral resistance. Uncontrolled hypertension leads to significant systemic complications including cardiomegaly from left-centre high ... to retrogressive vascular diseases, such as stroke, hypotensive retinography and hypertensive nestsophomy. Hypertension is also a risk factor for accelerated arteriosclerosis... leading to angina and myocardial infarction. Congestive heart failure occurs when the heart is unable to pump blood efficiently around the body. Blood returning to the heart is not circulated properly and the blood becomes congested in the veins and lungs leading to heart failure resulting in vascular congestion in the lungs causing breathing difficulties. Right...heart failure causes blood to accumulate in the legs, the abdomen and liver. Cardiomyopathy...are structural and functional abnormalities of the heart muscle. Dilated cardiomyopathy Is the most common form when the ventricular chamber dilates and the heart muscle wall becomes thinner reducing the ventricles ability to pump blood out into circulation. Other forms of cardiomyopathy will not be discussed in this video. Inflammatory heart disease may affect the endocardium, myocardium or pericardium. Infected endocarditis is damage to the inner lining of the heart and the heart valves. Bacteria enters the circulation and

attaches to the heart valve. Any pre-existing damage to the heart valve makes this attachment more likely to occur. The body's immune system is drawn to this area to mount an inflammatory response against the bacteria. However, this inflammatory response inadvertently damages the valvular tissue... the bacterial replication and inflammation results in damage to the state structure and function of the valves. The valves may become synaptic or incompetent. Parts of the bacterial ... can break off, travel through the circulation and deposit in a different organ causing damage to that organ. These are called (septic emboli). Other inflammatory heart conditions will not be covered in this video. Heart valves regulate blood flow to the heart during the cardiac cycle. Cardiac function is impaired if these valves become leaky or narrowed. In mytoregurgitation an incompetent microvalve leads to the leakage of blood back into the left ...during systole. Normally blood should (flow) into the aorta at this time. Narrowing of the valves is known as stenosis. In mytostenosis blood is unable to flow past the narrowed microvalves and blood accumulates in the left atrium. Congenital heart diseases are a collection of defects in the structure and function of the heart or larger vessels that are present at birth. The most common of these are ventricular septal defects where defects in the intraventricular septal wall allow mixing of oxygenated and deoxygenated blood. Atrial septal defects cause similar mixing of blood but these are the result of defects in the (intra-atrial) septal wall. Other congenital defects will not be discussed in this video.

## No.2

“Excerpt from talk on coronary artery disease”

Transcription:

### **How Coronary Heart Disease (Artherosclerosis) Develops**

The development of atherosclerosis is complicated, but the primary event seems to be repeated, subtle injury to the artery's inner lining (endothelium), through various mechanisms. These mechanisms include physical stresses from turbulent blood flow (such as occurs where arteries branch, particularly in people who have high blood pressure) and inflammatory stresses involving the immune system, certain infections, or chemical abnormalities in the bloodstream (such as high cholesterol or high blood sugar as occurs in diabetes). The infections may be due to bacteria (*Chlamydia pneumoniae* or *Helicobacter pylori*) or to viruses (cytomegalovirus and others).

Atherosclerosis begins when the injured artery wall creates chemical signals that cause certain types of white blood cells (monocytes and T cells) to attach to the wall of the artery. These cells move into the wall of the artery. There, they are transformed into foam cells, which collect cholesterol and other fatty materials, and trigger growth of

smooth muscle cells in the artery wall. In time, these fat-laden foam cells accumulate. They form patchy deposits (atheromas, also called plaques) covered with a fibrous cap in the lining of the artery wall. With time, calcium accumulates in the plaques. Plaques may be scattered throughout medium-sized and large arteries, but they usually start where the arteries branch.

This animation will show how arteriosclerosis develops in heart. Click the navigation areas below the animation's green to play, pause, revised or fast forward the animation. Artherosclerosis is a process by which artery become gradually narrowed and hardened. It happens in the artery to supply the heart. It calls the coronary heart disease. This can lead to chest pain, or angina and eventually heart attack. The network of blood vessels brush over the surface of the heart, are called coronary arteries. The coronary arteries supply the heart with blood over years. Fatted deposits in the blood can build up and form a plaque or atheroma only artery wall. This can prevent heart muscle from getting the blood and oxygen supplies the techniques. This tends to happen during physically exertion or an angry or stressed. It calls a heavy or tight chest pain, called angina. After weeks, the pain goes away. If the plaque continues to grow, the rest of having a heart attack will blood applied to heart if completely cut off. This is the end of animation, click the animation of green to watch again.





## **APPENDIX I**

### **Background of the Content Teacher**

#### **Professor Yanni Yu**

- Ph. D advisor of Pathology in Guizhou Medical University, Guizhou, China
- Chairman, Medical Pathology Branch of Guizhou Province of Chinese Medical Association
- A special government allowances gainer issued by the State Council, China
- The expert who have special treatment by Guizhou provincial government
- The examiner of the National Natural Science Foundation
- The editor of “Journal of Pathology”

มหาวิทยาลัยเทคโนโลยีสุรนารี

## CURRICULUM VITAE

Lan Yu was born on April, 1980, in Guiyang, Guizhou, China. She obtained her BA degree in English Linguistics and Literature from Guizhou University in 2002. In 2009, she graduated from Guizhou University of China with a MA degree in Linguistics and Literature. During her MA study, she was sponsored by the Ministry of Education, China. She studied as a visiting scholar in 2008-2009 at Guangdong University of Foreign Studies, Guangzhou, China.

Since her graduation from Guizhou University in 2002, Lan Yu has been teaching general English and English majors in the School of Foreign Languages at Guizhou Medical University. She is currently an associate professor of the School of Foreign Languages at Guizhou Medical University, China. In 2013, she was honored a Provincial Teaching Achievement Award of Higher Education by Guizhou Educational Department.

Lan Yu earned her PhD degree in English Language Studies in academic year of 2014 from Suranaree University of Technology, Thailand. Her academic areas of interest lie mainly in EFL teaching methodology, problem-based learning instruction and ESP teaching and learning. She can be reached at the email: [likeyulan@sina.com](mailto:likeyulan@sina.com).