NEEDS ANALYSIS OF ENGLISH FOR BIOMEDICAL ENGINEERING STUDENTS: A CASE STUDY OF THAI UNDERGRADUATE STUDENTS

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NEEDS ANALYSIS OF ENGLISH FOR BIOMEDICAL ENGINEERING STUDENTS: A CASE STUDY OF THAI UNDERGRADUATE STUDENTS

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ABSTRACT

This study employed the Needs Analysis theory to investigate the actual English language needs of Thai undergraduate Biomedical Engineering students. The study aimed to identify the English needs of the students and expectations from all relevant parties in order to develop English courses for Biomedical Engineering. This study was a case study for which a survey was conducted at the Biomedical Engineering Department, Faculty of Engineering, of a particular university in Thailand. The participants consisted of (1) 54 Thai undergraduate Biomedical Engineering students, (2) the program chair, (3) five subject teachers, (4) an English teacher, and (5) six stakeholders from different organizations. Three research instruments were used in data collection: a questionnaire, focus group interviews, and semi-structured interviews. The questionnaire was used for collecting quantitative data from students. Focus group interviews were used to follow up data from the students. Semi-structured interviews were used for gathering in-depth data from academic staff and stakeholders. Statistical methods and content analysis were used for interpreting the results. The findings were (1) students and academic staff stated that all English skills were necessary; however, English speaking skills, especially oral presentation, were the most important while the most problematic skill was writing essays and academic papers for journals; (2) academic staff expected students to be highly competent in speaking and writing English; and (3) stakeholders required graduates to be proficient in all English communication skills and reading English manuals. The study suggests that English courses should focus on academic English with course content mainly based on science and engineering. Class activities should be designed to match the students' desires and to meet the language needs in target situations.

KEY WORDS: NEEDS ANALYSIS (NA)/ ENGLISH FOR SPECIFIC PURPOSES (ESP)/ ENGLISH FOR ACADEMIC PURPOSES (EAP)/ BIOMEDICAL ENGINEERING (BME)

132 pages

การวิเคราะห์ความต้องการจำเป็นของวิชาภาษาอังกฤษสำหรับวิศวกรรมชีวการแพทย์: กรณีศึกษาของนักศึกษาไทยในระดับปริญญาตรี

NEEDS ANALYSIS OF ENGLISH FOR BIOMEDICAL ENGINEERING STUDENTS: A CASE STUDY OF THAI UNDERGRADUATE STUDENTS

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บทคัดย่อ

งานวิจัยครั้งนี้ใช้ทฤษฎีการวิเคราะห์ความต้องการจำเป็นเพื่อทราบความต้องการจำเป็นในการใช้ภาษาอังกฤษของนักศึกษาไทย สาขาวิศวกรรมชีวการแพทย์ ระดับปริญญาตรี วัตถุประสงค์งานวิจัยเพื่อระบุความต้องการจำเป็นในการใช้ภาษาอังกฤษของนักศึกษา และเพื่อทราบถึงความคาดหวังของกลุ่มผู้ที่เกี่ยวข้องเพื่อนำไปพัฒนารายวิชาภาษาอังกฤษสำหรับวิศวกรรมชีวการแพทย์ งานวิจัยนี้เป็นกรณีศึกษาซึ่งเก็บข้อมูลจากสาขาวิศวกรรมชีวการแพทย์ คณะวิศวกรรมศาสตร์ของมหาวิทยาลัยแห่งหนึ่งในประเทศไทย ประชากรที่ใช้ศึกษามีทั้งหมด 5 กลุ่ม ได้แก่ (1) นักศึกษาปริญญาตรีสาขาวิศวกรรมชีวการแพทย์ จำนวน 54 คน (2) ประธานหลักสูตร จำนวน 1 คน (3) อาจารย์ผู้สอนวิชาเอก สาขาวิศวกรรมชีวการแพทย์ จำนวน 5 คน (4) อาจารย์ผู้สอนวิชาภาษาอังกฤษ จำนวน 1 คน และ (5) ผู้ใช้บัณฑิต จำนวน 6 คน เครื่องมือที่ใช้ในงานวิจัยได้แก่ แบบสอบถาม การสัมภาษณ์กลุ่ม และการสัมภาษณ์กึ่งโครงสร้าง โดยใช้แบบสอบถามและการสัมภาษณ์กลุ่มสำหรับเก็บข้อมูลจากกลุ่มนักศึกษา และใช้การสัมภาษณ์กึ่งโครงสร้างใช้สำหรับเก็บข้อมูลเชิงลึกจากกลุ่มบุคลากรทางการศึกษาและกลุ่มผู้ใช้บัณฑิต ผลวิจัยพบว่า (1) นักศึกษาและบุคลากรทางการศึกษาระบุว่าทักษะภาษาอังกฤษทุกทักษะมีความสำคัญ แต่ทักษะการพูดภาษาอังกฤษสำคัญที่สุดโดยเฉพาะการพูดนำเสนอแบบปากเปล่า ส่วนทักษะภาษาอังกฤษที่เป็นปัญหามากที่สุดคือทักษะการเขียนบทความวิชาการ (2) บุคลากรทางการศึกษาคาดหวังให้นักศึกษามีศักยภาพในการพูดและการเขียนภาษาอังกฤษ (3) ผู้ใช้บัณฑิตส่วนใหญ่ต้องการให้บัณฑิตมีศักยภาพในการสื่อสารภาษาอังกฤษทุกทักษะอย่างมีประสิทธิภาพ รวมไปถึงทักษะการอ่านคู่มือภาษาอังกฤษ การศึกษาครั้งนี้ได้แนะนำข้อเสนอแนะเพื่อการพัฒนารายวิชาภาษาอังกฤษสำหรับวิศวกรรมชีวการแพทย์ โดยควรออกแบบให้เป็นวิชาภาษาอังกฤษเชิงวิชาการที่มีเนื้อหาเกี่ยวกับวิทยาศาสตร์และวิศวกรรมศาสตร์ นอกจากนี้ควรออกแบบกิจกรรมในห้องเรียนให้สอดคล้องกับความต้องการของนักศึกษาและตรงกับความจำเป็นของการใช้ภาษาในสถานการณ์เป้าหมาย

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CHAPTER I
INTRODUCTION

1.1 Statement of problems

In the age of globalization, English has become an important means of communication in science and technology, especially in the engineering field. Even though a number of engineering faculties in various universities and institutes of technology have provided training courses in academic English and English communication, students and practitioners need to heighten their English communication skills in order to deal with increasingly crucial competition in the job markets. Engineering students who are non-native English speakers should have proficiency in English to cope with academic lectures, labs, projects, and papers. In addition, English has become essential for engineers in their vocational communications (Rayan, 2011).

Due to the full implementation of the ASEAN Economic Community (AEC) in 2015, the three pillars of security, sociocultural, and economic integration have been identified as necessary for regional cooperation among Southeast Asian nations (Sim, 2008). One of the requirements involves Mutual Recognition Arrangements (MRAs): the necessary mobility of qualified professionals within ASEAN, including medical practitioners and engineers. These professionals can broaden access into ASEAN labor markets in Southeast Asian countries (ASEAN Secretariat, 2010). However, most ASEAN countries reserve some MRAs' careers for their own citizens first. The member countries concern about the occupational and language skills of foreign skilled laborers. Nevertheless, if they hire foreign skilled laborers, those workers should have more advance occupational and language skills than their own citizens, making it even more important for Thai laborers to increase these skills (Yue, 2010). Moreover, the charter of the Association of Southeast Asian Nations (ASEAN) 2010 states in Article 34 that the language of ASEAN community is going to be English. Currently, however, of the dean of Faculty of Engineering,

Chulalongkorn University, stated his opinion that most Thai graduates in biomedical engineering are not well enough prepared in their English proficiency and skills in order to be competitive within ASEAN (The Nation, 2012).

In Thailand, engineering is considered as one of the main pillars for the country's development. Engineering helps to improve and support agriculture, manufacturing, transportation, healthcare, and economic growth. Rungfapaisarn reports that, in recent years, biomedical science and healthcare technology have become an opportunity for investment in the ASEAN Economic Community; Thailand has exported over 17 billion baht of medical equipment and supplies yearly (The Nation, 2012). Moreover, Thai domestic demand for healthcare and medical equipment and supplies keeps increasing at the rate of 9 percent per year, resulting in the Thai government's policy that aims to promote Thailand as the medical hub of Asia. Because the industry will be extremely competitive with high potential growth, Thailand has to improve its medical equipment and supply industries in order to reduce the nation's dependence on imported products and to increase exports. Research into healthcare supplies and development of medical equipment is necessary for driving the industry under the upcoming AEC's parameters (The Nation, 2012). Nevertheless, Thailand still has a number of weaknesses, such as the needs for imported technology, improved cooperation among manufacturing, commerce, and research, and increasing biomedical staff who are proficient in both occupational and language skills (The Nation, 2012).

Furthermore, in Thailand, many universities and institutes have awarded degrees in Biomedical Engineering (BME) in order to enhance the graduates' qualifications. The first BME program in Thailand was initially established for Master's Degree students in 1998 at Mahidol University. In 2005, Mahidol University further developed this field by offering the first Bachelor's Degree in BME in Thailand. Chulalongkorn University established a biomedical program for graduates in 2006, while King Mongkut's University of Technology Thonburi began offering Master's and Ph.D. programs in this field in the same year. Currently, there are six universities offering BME programs in Thailand. However, only Mahidol University has offered BME for all degrees including Bachelor's, Master's, and Ph.D. programs (Pintuviruj, 2011). In addition, based on the admission scores in 2010, the Bachelor's

Degree of Biomedical Engineering of Mahidol University was ranked the highest of all universities and institutes (Department of Biomedical Engineering, 2011).

According to the requirements for engineers' English proficiency, their English should have improved since the Bachelor's level; however, there are a limited number of studies of English for Thai undergraduate BME students. For example, Kittidhaworn (2001) investigated the needs in English language of 182 Thai undergraduate engineering students who were studying in the second year of a Thai public university by using questionnaires. The study revealed that the students' needs were related to rhetorical categories, language functions, language structures, and language communication skills. Kaewpet (2009) explored 25 stakeholders' opinions toward Thai Civil engineering students' needs of English communication. This study employed individual interviews as the data collection method. The study stated that stakeholders, lecturers and teachers recommended adding training of the four English communicative skills and professional English in the engineering program. Nevertheless, these studies used a single research instrument and did not directly explore the needs of English for BME students in Thailand.

This study, therefore, will explore the English skills which are needed for BME via applying the mixed method of both qualitative and quantitative approaches in data collection. This study will potentially provide a relevant data for developing a course in English for BME students, especially in a Thai program. The findings of this study can suggest course designers and English teachers relevant data to establish English for Biomedical Engineering courses in the future.

1.2 Purposes of the study

This is a case study that surveys the needs, wants, and expectations of undergraduate students, academic staff at a particular university in Thailand, and stakes holders. This study aims to conduct needs analysis of the English courses for undergraduate BME students from all relevant parties. The purposes of this study are:

1) To reveal the current problems of Thai undergraduate BME students' English skills

2) To investigate the needs of English skills that will be relevant for developing English for Biomedical Engineering courses for Thai undergraduate students

3) To find out the expectations of the program chair, subject teachers, English teachers, and stakeholders, in order to develop English for Biomedical Engineering courses

1.3 Research questions

The research questions of this study are as follows.

1) What are the current problems of English skills of Thai undergraduate Biomedical Engineering students?

2) What are the needs of English skills that will be relevant for developing English for Biomedical Engineering courses for Thai undergraduate students?

3) What are the expectations of the program chair, subject teachers, English teachers, and stakeholders, in order to develop English for Biomedical Engineering courses?

1.4 Significance of the study

This study potentially provides a stepping-stone for developing a course in English for Biomedical Engineering. The results of this study will reveal undergraduate students' actual language needs of English and expectations of academic staff and stakeholders in order to meet the needs of all parties. The findings of this study can offer relevant data for course designers and English teachers to establish English for Biomedical Engineering courses.

1.5 Limitations of the study

This is a case study that surveys the needs, wants, and expectations of undergraduate students, academic staff at a particular university in Thailand, along with stakeholders. The findings can be a guideline for improving existing English courses for BME students. By using focus-group and semi-structured interviews, and questionnaires as the research instruments, this study is limited to the opinions of the participants.

Due to the nature of a case study, although the results of this study may not be generalizable to other cases or only limited to BME fields, the results can be a useful platform for researchers and scholars who would conduct a similar kind of study in the BME academic communities.

1.6 Definitions of key terms

- **Students** refers to the undergraduate students who study in the third year and fourth year of Biomedical Engineering Department, Faculty of Engineering, in a particular university in Thailand.
- **Expectation** refers to English language skills and any factors that are demanded by the academic staff and stakeholders in BME.
- **Needs** refers to English language skills and activities that are required for students in the target situation.
- **Wants** refers to English language skills and activities that are demanded by BME students.
- **Program chair** refers to the head staff who is responsible for the Biomedical Engineering program of the Faculty of Engineering, in a particular university in Thailand.
- **Subject teachers** refers to teachers who teach core subjects of BME to students at Biomedical Engineering Department, Faculty of Engineering, in a particular university in Thailand.

- **English teacher** refers to a teacher who teaches English in EGID 290 (English for Engineering) course to undergraduate engineering students at a particular university in Thailand.
- **Academic staff** refers to the staff in the university who are responsible for teaching English subjects, major subjects, and designing courses for BME students, including subject teachers, the teacher of English, and the program chair.
- **Stakeholders** refers to business owners or companies who employ apprentice students and BME staff.

1.7 Chapter summary

This chapter presents that needs analysis in English is potentially significant for establishing the English course for the Biomedical Engineering program. The data of students' needs, academic staff's opinions, and stakeholders' expectations can offer course designers and English teachers relevant data to establish English courses for BME in the future. This chapter contains the statement of problems, objectives, research questions, significance of the study, limitations of the study, and the definitions of key terms. In the next chapter, there is a literature review of related theories and previous studies.

CHAPTER II
LITERATURE REVIEW

This chapter reviews the development of a needs analysis and investigates the process and findings of this needs analysis involved in English for Biomedical Engineering. The researcher reviews the theories of Needs Analysis (NA), English for Specific Purposes (ESP), related research, and Biomedical Engineering (BME) as follows.

2.1 Needs Analysis (NA)

2.1.1 Definition

Most researchers consider the definition and structure of a needs analysis in similar ways; however, needs are variously described, depending on each researcher. Hutchinson and Waters (1987) distinguish the elements of needs analysis between target needs (the needed skills and the language used in the target situation), and learning needs (what the learners need to learn). Brindley (1984), Dudley-Evans and St. John (1998), and Nunan (1988) describe factors of needs analysis as objective and subjective needs. Further, Mackay and Mountford (1979) describe needs analysis in terms of academic needs and job needs. Dudley-Evans and St. John (1998) add that learners' lack of existing skills lead to figuring out efficient ways of learning language and skills. Even though the researchers divide needs analysis into various kinds, they similarly aim to find the gap between the language skills that will be used in the target situation.

Needs analysis (also called *needs assessment*) is a process for determining the needs of learners who require a language. Needs analysis makes use of subjective and objective information to determine the target information: the purpose for which the language is needed, the situation in which the language is used, the type of

communication, and the level of required proficiency. Needs analysis is a part of curriculum development and is generally required before developing a syllabus for language teaching (Richards & Schmidt, 2010). Researchers define needs analysis as the initial process of every course in order to specify the course's purposes and methods for setting up an effective course outline and materials selection before teaching (Dudley-Evans & St. John, 1998; Hutchinson & Waters, 1987; Mackay & Mountford, 1979).

Besides the definition of needs analysis, it is important to provide elements and conditions in finding out needs. Richterich (1984) states that needs are not only built from learners' individual target, but also other related stakeholders' needs. Hutchinson and Waters (1987) state that language course contents need to be based on the reasonably acceptable perceived needs of learners, teachers, and sometimes sponsors. According to Brindley (1984) and Nunan (1988), the needs consist of the different aspects, subjective and objective. The subjective needs include learners' decisions regarding the content they want or expect to study. In the case of objective needs, the teaching methodology should be designed to match the subjective needs and the learners' language proficiency.

2.1.2 Conceptual framework of this study

The conceptual framework of this study is mainly based on Hutchinson and Waters' (1987) frameworks of target situation analysis and learning needs analysis, together with Jordan's (1997) needs analysis approach in the data collection process.

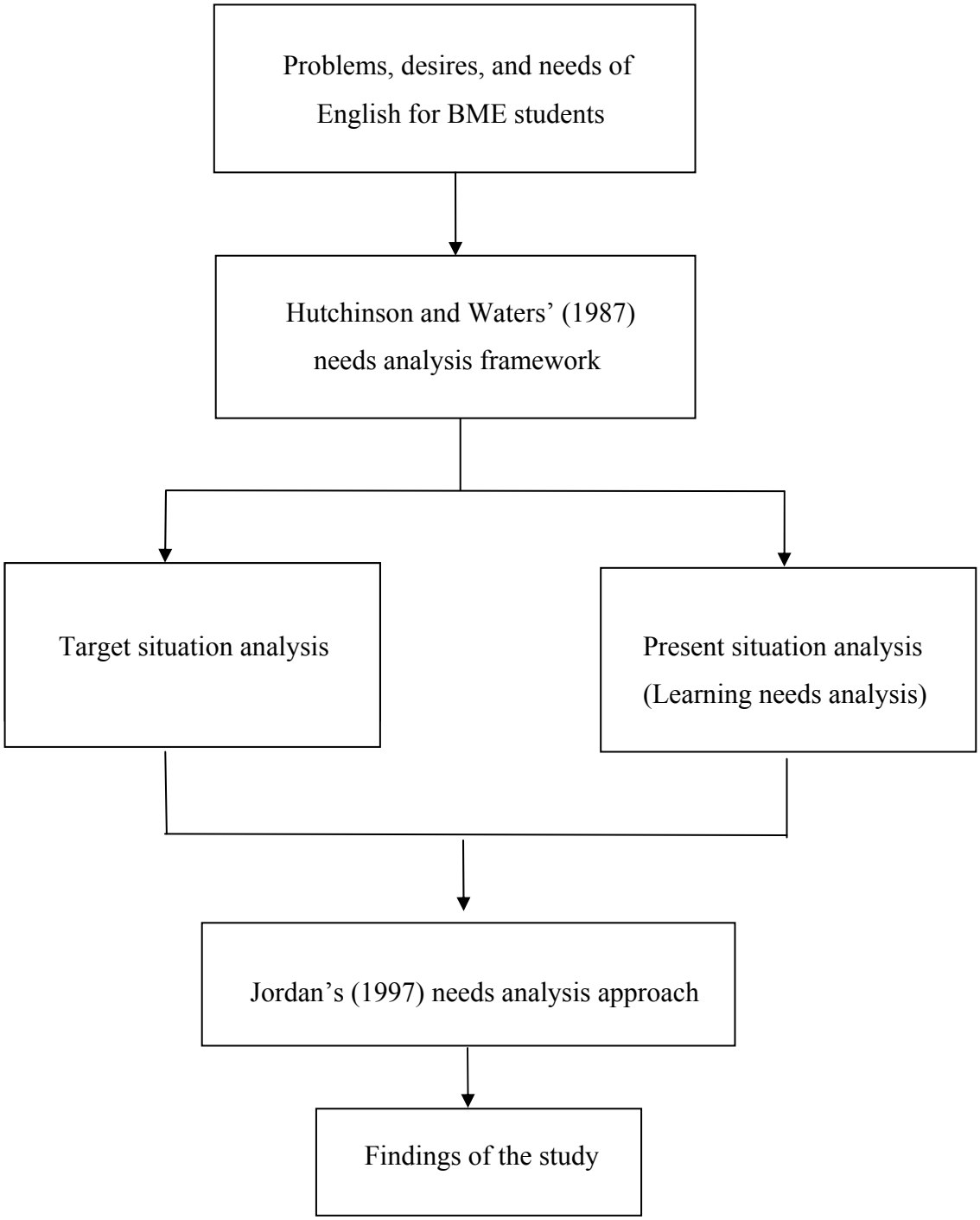

Figure 2.1 Conceptual framework of this study

Although there are various types of needs, they can generally be classified into two fundamental elements, consisting of Target Situation Analysis (TSA) and Present Situation Analysis (PSA), which will be discussed in the following sections.

1) Target Situation Analysis (TSA)

Hutchinson and Waters (1987) point out that target needs are what learners require to perform in the target situation. The learners' target situation firstly comprises language needs for specific purposes, communication needs, and language skills and functions in identified educational or occupational purposes. Munby (1978) offers a sociolinguistic model which divides learners' target level of communicative competences into two stages. The model starts by analyzing the type of purposes: educational or occupational types. The second stage is the process of designing and selecting linguistic data which are related to the target situation. However, Brumfit and Johnson (1979) comment that Munby's (1978) model is complicated and overlooks learners' motivation, attitude, and learning styles. Drawing upon a language-centered approach, the Target Situation Analysis (TSA) focuses on the learners' ability to produce the linguistic features that are needed in specific situations (Dudley-Evans & St. John, 1998; Nunan, 1988).

Hutchinson and Waters (1987) explain that the target situation can be a compass to point at the direction of the destination, but instructors must select the strategies and materials to hold the learners' motivation. Similarly, Nunan (1988) states that, in a selected input for the specific situation, the content is more essential in carrying out the course than the methodology. Hutchinson and Waters (1987) suggest that target situation can be analyzed as the factors of learners' necessities, lacks, and wants. Necessities are the type of needs which can be identified as what learners need to know and perform efficiently in the target situation. They are similar to the objective needs in Nunan's (1988) and Brindley's (1984) theories which state that the objective needs arise from language and functions and are analyzed from the target situation. Lack is the gap between target proficiency (necessities) and the learners' existing knowledge and abilities. Lastly, Want is one of the learners' important motivations in the learning process which cannot be ignored. Learners desire skills or activities they want to access the target situation. Learners' want in Hutchinson and

Waters' (1987) theory is similar to the subjective needs of Brindley's (1984) and Nunan's (1988) theories. There are the learners' psychological wants in learning, which are initiated by the learners themselves. Although scholars describe the target situation analysis (TSA) in to various details, they agree that the learners' target situation should be specified first. Then, the factors of learners' necessities, lacks, and wants in language learning will be investigated.

Hutchinson and Waters (1987, p. 59) offer the target situation analysis framework for gathering information. The framework contains six questions as follows:

(1) Why is the language needed? The language may be needed for study, for work, for training, for combination of these reasons, or for other purposes.

(2) How will the language be used? The language may be used as a medium of communication: by speaking, reading, writing, etc.. The language may be used through various channels: face to face, or telephone; and may be used in the form of various types or discourse: such as lectures, academic texts, and informal conversation.

(3) What will the content areas be? The content areas may be categorized as subjects or levels of language study.

(4) Who will be the learner using the target language with? They can be native speakers or non-native speakers. Moreover, other elements must be considered together; such as, receiver's level of knowledge, and relationship of interlocutor.

(5) Where will the language be used? The language may be used in several conditions, including human context, and linguistic context.

(6) When will the language be used? It is used in ESP courses or in other situations.

2) Present Situation Analysis (PSA)

Most theories, excepting Munby's (1978), concern learner's motivation, attitude, and learning styles as strategies of language learning. Robinson (1980) states that learners' needs identification depends on learners' experiences and skilled levels that are related to their motivation in learning. The learners are encouraged to discover whether the course's content matched with their objectives, experiences, and desires.

In addition, Hutchinson and Waters (1987) refer to Present Situation Analysis (PSA) as learning needs. Learning needs are how the learners can process their learning; thus, it is very important in classrooms. Learning needs involve in learners' motivation, inspiration, knowledge, experiences, and skills. They are necessary and help teachers to specify the content which stimulates the learners in lessons. The target situation acts as the compass pointing at the destination, while the learning needs represent the vehicles which guide along the route, and learners' motivation for reaching the destination. Hence, only the finding of target situation or present situation analysis cannot be individually applied for the course design. The target situation is concerned which what language is used in a specific situation while the present situation is used in language learning; how learners learn and what they do with the target language. Learners' needs are essential in the instruction procedure; therefore, the learning-centred approach is needed in the needs analysis process (Hutchinson & Waters, 1987; Robinson, 1980).

According to the characteristic of present situation (or learning needs), Hutchinson and Waters' (1987, p.63) suggest the framework for learning needs analysis which consists of several questions as the following:

(1) Why are the learners taking this course? The course may be required in the curriculum or it may be an elective course.

(2) How do the learners learn? This aspect focuses on the learner's learning background, the concept of teaching and learning, the methodology which appeals learners, etc.

(3) What resources are available? They include professors, the subject content, academic materials, and activities out of the class.

(4) Who are the learners? We have to analyze the learners' backgrounds including their age, sex, nationality, background knowledge, interests, socio-cultural background, and attitudes.

(5) Where will the ESP course take place? The surrounding, atmosphere, and environment of where the class takes place are considered.

(6) When will the ESP course take place? This aspect comprises of time that the class occurs, the class' length of time, frequency of class occurring for a week.

In addition, based on the conceptual framework of this study, the researcher adapted Jordan's (1997) needs analysis approach in the process of data collection. The data collection begins with identifying the purpose of needs analysis, followed by specifying the learners and other participants, selecting the approach of the needs analysis, and without acknowledging the limitations of the study. Then, the following steps are selecting the data collection methods, the process of collecting data consisting of target situation analysis (learners' necessities, lacks, and wants) and present situation analysis (learning needs), and lastly interpreting and analyzing the results. According to the results, course designers and the department can design the ESP course syllabus, contents, and activities.

2.2 English for Specific Purposes (ESP)

2.2.1 Definition

English for Specific Purposes (ESP) is the role of English in a program of instruction or a language course whose aims are matched with the specific needs of the group of learners (Richards & Schmidt, 2010).

ESP is generally referred to as the approach of instructions in English for a distinctly functional purpose that is designed to match with learners' specific needs (Dudley-Evans & St. John, 1998; Hutchinson & Waters, 1987; Mackay & Mountford, 1979). ESP is a branch of EFL (English as a Foreign Language) and ESL (English as a Second Language) (Hutchinson & Waters, 1987). Bojović (2006) states that ESP has grown up from the combined trends of various elements, including the extension of demand for English for specific occupational needs, the linguistic development which is used in communicating in a specific field, and learners' educational psychology that consists of their motivation and effectiveness in learning. The characteristics of learning ESP are several. Hutchinson and Waters (1987) define ESP as a language pedagogical approach. ESP does not point out any specific teaching material or particular kind of methodology or language. Mackay and Mountford (1979) suggest three types of purposes of ESP: 1) occupational requirements, 2) vocational training

programs, and 3) academic or professional study. In addition, Dudley-Evans and St. John (1998) identify two major characteristics of ESP: 1) a process which is designed to match with learner's specific needs, 2) using of activities or discipline and underlying methodology it serves, and 3) focusing on the language, discourse, genres, and skills that are appropriate for activities. Lastly, variable characteristics of ESP: 1) being related to specific disciplines, 2) being used in specific teaching situations, 3) being designed for adult learners or professional work situation, and 4) usually being for intermediate or advanced learners.

2.2.2 Classification of ESP

English for Specific Purposes (ESP) can be divided into two main areas, according to what learners require English for. ESP consists of English for Academic Purposes (EAP) for academic study, and English for Occupational/ Vocational/ Professional Purposes (EOP/ EVP/ EPP) for working and training (Jordan, 1997; Hutchinson & Waters, 1987; Mackay & Mountford, 1979). Hutchinson and Waters (1987) narrow the level of ESP courses by considering the nature of the learner's situation. There are three categories that are usually defined: 1) English for Science and Technology (EST), 2) English for Business and Economics (EBE), and 3) English for the Social Science (ESS). Mackay and Mountford (1979) classify ESP by professional areas divided into EAP and EOP. On the one hand, EAP (English for Academic Purposes) consists of English for Science and Technology (EST) as the main area. Other fields of EAP, namely, academic study of finance, economy, banking, business, and accounting, have been increasing in their importance. On the other hand, EOP (English for Occupational Purposes) refers to English which is not for academic purposes. This field includes English for Law, Medicine, Business and Administration, and Vocational Purposes for working situations. It is essential to distinguish the language and discourse between academic purposes and occupational purposes; for example, designing English course for medical students or practicing doctors.

2.2.3 English for Academic Purposes (EAP)

English for Academic Purposes (EAP) is the English course which is designed for helping learners to study and conduct research. EAP is usually taught in university or post-secondary levels. EAP is a branch of ESP (English for Specific Purpose). These courses may aim to prepare learners to cope with speaking, listening, writing, and reading demands in academic courses (Richards & Schmidt, 2010).

EAP was first used in 1974 and widely used by 1975. Academic skills had been increasing in practice material in the early 1970s. Students, both in English-speaking context countries and other non-native language countries, may need EAP for their education, such as for reading academic text, and sometimes all study skills. Furthermore, EAP has two divisions that can be common core subject or specific-subject. The common core of academic English is known as English for General Academic Purposes (EGAP) while the subject specific academic English is called English for Specific Academic Purposes (EASP) (Jordan, 1997).

- **The skills in EAP**

The common core element is generally known as study skills, consisting of listening to lectures, seminar skills, academic writing skills, academic reading skills, and note-taking. Specific English is language needs for each particular academic subject and specific language, including register, discourse, and genre (Jordan, 1997).

1) Academic reading

Reading is a skill that is generally linked with writing. Students have to concern with the subject-content and language which the article expresses. Reading skills and strategies will depend on reading purposes. A lot of guide books for reading strategies provide practices in several strategies such as skimming, scanning, prediction, and seeking the main idea. Notwithstanding, students need extensive reading; hence, speed reading strategy is proposed for students to read a long passage. Moreover, straightforward reading techniques such as scanning headings and sub-headings, and skimming texts are strategies that can help students to guess unknown words and phrases (Jordan, 1997). Davies and Pearse (2000) explain that, in scanning a text, readers look quickly through the text to find out some specific information, but

in skimming, the reader looks quickly through the text to get a general idea. In addition, Harmer (1999) suggest that appropriate reading texts can provide opportunities to study language in terms of grammar, vocabulary, punctuation, sentence structure, paragraphs, and texts. Moreover, good reading texts can introduce interesting topics, stimulate discussion, and fascinate lessons.

2) Vocabulary development

Even though vocabulary development is not an academic macro-skill, it is necessary for all language learning. It involves all four main language skills, and takes a role of linking between reading and writing. Students often face obstacles in language learning related to vocabulary difficulties. They result from the limited repository in vocabulary, word choices, and confusion between similar forms and pronunciation of some words (Jordan, 1997). Davies and Pearse (2000) support the perspective of Jordan (1997) that, in communication, vocabulary is more important than grammar. English learners cannot communicate effectively because of their limitation of vocabulary. Despite the essential role of vocabulary, it sometimes is neglected in some English courses. Furthermore, Jordan (1997) suggests that vocabulary for EAP courses should be more advanced than other basic core 3,000 words. The Academic Word List comprises words which are not commonly high frequency, but general to all academic text. The Academic Word List is based on 3,500,000 academic word corpuses, and occurs in all academic text.

3) Academic writing

Academic writing is necessary for students of all fields. Academic writing is an extensive skill; thus, it is hard to arrange its approaches and types of practice. Academic writing approaches and types of practice can depend on the purpose and type of writing, underlying philosophy, personal performance, or the student's starting-point (Jordan, 1997). There are various approaches of academic writing as follows:

A. The product approach

The model of the product approach provides several exercises undertaken for drawing attention to its essential feature. In this approach, students are requested to

produce a parallel text. Contents of text books may be organized on themes or topics, but most are organized on language functions, including description, explanation, definition, narrative, instruction, classification, comparison and contrast, exemplification, cause and effect, expression, discussion and argumentation, and conclusion. The primary focus should be on the nature of academic writing tasks and academic discourse genres such as essays, reports, projects, literature review, and article or research paper. These elements can help students to socialize the academic context (Jordan, 1997).

B. The process approach

This learner-centred approach underlines the processes writers utilize to emphasizes more the meaning than format. In all means of drafting, discussion, feedback, tasks, and others, students can make decisions about own writing. Kinds of feedback include peer evaluation, group conference, and comment writing. These processes are necessary in practicing the writing approach. This approach has beneficial effects in drawing attention to the constant need for encourages students to be responsible for, their own improvement. Teachers can stimulate students in creative processes and tasks. Nevertheless, in this approach it is recommended that collaboration and feedback may be not enough, thus, students should be encouraged to advance their skills in English academic writing (Jordan, 1997).

C. Summarizing, paraphrasing, and synthesizing

Jordan (1997) states that summarizing is an essential part of academic writing. It relates to academic reading via means of note-making or note-taking. Paraphrasing is the means of integrating reading and summarizing in order to express one's ideas in the writer's own words, styles and structure. Paraphrasing is difficult but necessary for academic writing. Lastly, synthesizing is the skill which requires students to practice integrating information, opinion, and argument from other texts, then to transform them into their own language or writing styles.

D. Feedback and evaluation

No matter what kind of academic writing students do, they need feedback which is acceptable and accurate. Jordan (1997) states that feedback can be in various forms generally written by teachers or tutors. Teachers and tutors should give feedback with specific guidance to help students to understand how to correct or

improve their writing. Useful feedback should better be given on a first draft rather than a final draft. One method for giving feedback to students is using correcting codes; however, teachers should ensure that students have a full correcting code version. This will actively encourage students in the self-correction process. In addition, there is an approach to correct the written work which is peer correction. It encourages students to correct each other's writing in pairs or in groups under the teacher's guidance.

Nevertheless, Atabas (2008) argues that not all students need a teacher's assistance to develop, change, or improve their writing. Most students can create their attitudes and new behaviors when they gain the right impetus. Although teachers provide valuable encouragement and suggestion, it may be not relevant to what students need. Therefore, one of the suggested academic writing approaches, which yield new perspective for teachers and students, is coaching. This process aims to create the environment of encouraging individuals to gain new aspects, to improve sufficient skills, and to know how to create desired results. The coaching approach can enable students to take responsibilities for their learning and academic literacy by holding a workshops to encourage them to provide input in academic writing to their peers, while their teachers advise and guide them.

4) Lectures and note-taking

Jordan (1997) reveals that many EAP tutors are concerned with students' tasks. Students need help in building and improving their ability in focusing on the lecture, understanding content clearly, and note taking in that period. Note-taking involves several processes, including (1) ability to distinguish between the more important and less important information, (2) ability to write clearly and concisely, and (3) ability to decipher the notes later and to recall the important points of the lecture. In taking-note, students start with using informal language then transcribe their notes. Some suggest that learners take notes in mind-map form which depends on visual layouts and shows points that link in various ways.

5) Speaking for academic purposes

Speaking for academic purposes is a general term for spoken language which is used in various academic settings. Jordan (1997) explains situations or activities of speaking in academic purposes that generally cover: 1) asking questions in lectures, 2) participating in discussions and seminars, 3) making oral presentations, and 4) verbalizing data in seminars and workshops. Although there are different purposes of each spoken activity, they seem to need many similar skills. However, students perceive that the seminar is the most difficult, resulting from the variety of seminar forms and their different objective (Jordan, 1997).

In addition, speaking and listening skills are combined together in communication. Some people think that conversation is more difficult resulting from taking place in real time and involves various skills; however, receptive skills are as important and complex as productive skills (Davies & Pearse, 2000). Davies and Pearse (2000) suggest that students' English speaking should partly be the main means of communication in the classroom. Teachers should take every opportunity in class to motivate learners to use the language in class, e.g. asking question in English. Furthermore, Harmer (1999) supports the theory of using speaking skill in classroom. He state that speaking tasks in English classroom can highly enhance students' self-confidence and provide both teachers and students useful feedback which can encourage students.

6) Research skills

Jordan (1997) specifies 'research skill' as an umbrella term which compounds sub-skills that are relevant to many types of reference materials including dictionaries, books, using the library, and references. The basic requirement for students in using a dictionary is to be familiar with alphabetical order. Students need to practice by finding words and meaning, spelling, pronouncing with phonetic symbols, remembering words usage, grammatical information, as well as learning extending vocabulary. Useful practice also includes understanding the table of contents and the index of a book. Other elements of the book that may be needed are edition number, date of publishing, etc. Besides, students need to practice skills of using the library. They should know and understand the journal and book references,

the location of journals and books on shelves, library services and facilities, and how to access the source of information. Furthermore, referencing or citation is important for students in recording the reading which they have done from journals and books. The references can empower students who follow up the citations or references of interesting journals or research. Reference or citation includes quotations, footnotes, and bibliographies. Quotation is divided into two types, consisting of direct and indirect quotations. Direct quotation is rewriting original words which are the enclosed written in quotation marks. Indirect quotation comprises summarizing a writer's ideas, then paraphrasing in one's words. Footnotes are usually used in articles for providing references in the content of the text. Lastly, bibliography is a type of references which has a strict layout. It has important features that the writer must follow comprising of: 1) alphabetical ordering of items, 2) author's or editor's initials, 3) title of article in a collection, 4) distinction between book and article title, 5) distinction between items by other in same year, 6) date of collection, 7) volume number and issue number (for journals), and 8) date of publishing and publisher's name (for books).

7) Examination skills

Jordan (1997) views examination skills as another important skill of English for Academic Purpose. Students, after taking a specific course, may decide to take the examination in English for academic qualifications. The examination skills of both native and non-native students are based on (1) reviewing the previous lessons, (2) questioning, including, if possible, analyzing the previous examination to be familiar with the layout, content, instruction, and form of questions, (3) taking the exam in the time allotted for all questions and answers and, lastly, (4) ensuring that the presentation is clear and the writing is logical.

Nevertheless, Carter and Nunan (2001) describe that evaluation is the essential process for successful education because it forms the appropriate decision making. However, new evaluation approaches concentrate teachers as reflective and self-motivated professionals instead of focusing on examination. Davies and Pearse (2000) state that although the examination is useful, it is not only one way for evaluating learning. Instructors can evaluate how effectively the learners perform through classroom activities and assign tasks.

2.2.4 English for Occupational Purposes (EOP)

English for Occupational Purposes (EOP) is related to English needs in professional purposes, including specific skills for working or training in fieldworks (Carter & Nunan, 2001). EOP courses concentrate on meeting the demands of English needs of workers by providing specific training and skills. Dudley-Evans and St. John (1998) state that the teaching process of English or any language for occupational purposes should be initiate with the analysis of four traditional skills within suitable contexts and conditions that are given in the workplaces. Moreover, the use of authentic material could make a connection between academic and professional contexts in a practical way. This theory conforms to Ellis and Johnson's (1996) theory. They resist that the use of authentic material is necessary in teaching English for occupational purposes. The most useful material is which was invented by the companies themselves for their employees or special customers.

2.3 Related research

Needs analysis research in English for Specific Purposes has been carried out widely for decades. The following are studies that mainly involved needs analysis of English for Specific Purposes for engineering fields, together with reviews of the research in course design both in Thailand and other countries.

2.3.1 Related research conducted in Thailand

Koetpo-kha (1994) conducts a needs analysis of English for Specific Purpose (ESP) from three subject groups, including first-year scientific students, teachers of English, and subject teachers. The result reveals that participants realize that English is very important. In the science students' opinions, speaking, listening, translating, and writing English become problems for them. In addition, reading, translating, and writing play an important role in their occupational and educational fields.

Kittidhaworn (2001) investigates the needs in English language of Thai second-year undergraduate engineering students in a Thai public university. The

results conclude that students perceived that their needs of English language were related in four areas: rhetorical categories, language functions, language structures, and language skills (reading, writing, listening and speaking).

Kaewpet (2009) also conducts a survey in an Engineering field, but focuses on communication needs of Thai Civil Engineering students. The study reveals opinions of employers, stakeholders, civil engineers, lecturers, alumni, and ESP teachers. Stakeholders, lecturers, and teachers recommend communicative circumstances, such as talking about duties and daily tasks, reading manuals, reading text books, and writing process reports, to be consolidated into the course. The findings suggest that English is required in circumstances throughout Thailand, along with increase demand for professional English courses in the engineering field which should be added to engineering programs.

In addition, Soonklang and Wongbanakhom (2009) identify in their research that the demand for a professional English course is increasing. Engineering students realized that all macro skills (speaking, listening, reading, and writing) are necessary for them. The results of a needs analysis study suggest that language courses which are based on students' attitude and needs in the subject will improve students' language ability.

2.3.2 Related research conducted in other countries

There are various studies which conduct needs analysis of English for engineering students, using English in the workplaces, and applying needs analysis for curriculum development in foreign countries.

Manakul (2007) conducts a study of English for Japanese graduate engineering students. This study gives feedback of Japanese lecturers and Japanese engineering students toward the English program. The findings reveal that the Japanese students became more active and realized the importance of English in their research and future careers. The Japanese students wanted to improve their English, while most professors were unsuccessful in creating motivation to improve the students' English proficiency. The study suggests that it is important to exchange information among professors about using English in research and its positive effects on the Japanese students.

Chooi et al (2006) studies the needs analysis of English in terms of science and technology. The study discovers that some alumni had problems in speaking and writing skills. They made grammatical mistakes in their English communication, thus, they lost their confidence in speaking English. Alumni used English widely in several tasks, such as writing résumés, writing application letters, job interviews, and communication in other situations. Speaking was considered the most needed skill in workplaces, followed by the other skills such as writing and listening, and lastly, reading. In contrast, technical writing was considered as a highly necessary skill; however, it has been ignored in the English curriculum at Sharif University of Technology.

In addition, Kassim and Ali (2010) offer the findings of their study of English communication events and skills needed at the workplace: feedback from the industry that oral skills are more emphasized than written and other communicative skills. The communication skills that are considered important for engineers are presenting new ideas and strategies, networking for advice and contact, and teleconferencing. In the engineering field, fluency in English seems to increase the opportunity to advance their career.

Finally, the results of needs analysis are useful for course design. Dragoescu and Stefanovic (2010) and Nomnian (2006) suggest that the findings of needs analysis can be applied in designing courses to meet the requirements of academic English. Nomnian (2006) reveals that the course designer recognizes the important role of needs analysis in the course design.

According to the needs analysis, Dragoescu and Stefanovic (2010) adjust the syllabus of ESP in Mechanical Engineering to improve the quality of learning outcomes of graduate engineers. The students' learning outcomes relate to the demand of a rapidly growing market which requires from them additional soft skills such as communication, entrepreneurship, IT, and business. Moreover, Al-Tamimi and Shuib (2010) state that needs analysis helps to determine what the learners want to achieve in the course and helps to improve the existing English course. Thus, the survey of needs is required as the beginning process of designing any course.

To conclude, on the one hand, studies in Thailand conduct research on scientific and engineering students reveal that all macro skills, consisting speaking,

listening, reading, and writing, are necessary for occupation and education. Professional English courses are increasingly demanded for the students. In addition, stakeholders, lecturers and teachers recommend communicative circumstances, such as talking about duties and daily tasks, reading manuals, reading text books, and writing process reports, should be consolidated into the course. On the other hand, studies conducted on scientific and engineering students who are non-native English speakers reveal that speaking is considered the most needed skill in workplaces. Moreover, the studies suggest that needs analysis takes a major role in language course design.

2.4 Biomedical Engineering (BME) studies

2.4.1 Biomedical Engineering education in Asia

Many universities in Asia have incorporated Bioengineering and Biomedical Engineering (BME) as a major program. For instance, in Singapore, there are great manufactured innovations in BME that come from the National University of Singapore and Nanyang University (Peng, 2012). In India, the government has a partnership with Stanford University in California. They have cooperated in establishing Stanford-Indian Biodesign as a new training program for biomedical technology innovators in India. In China, BME was developed ten years ago. Research and development in the biomedical field has been highly regarded. It has resulted from China's focus on biotechnology via developing the Institute of Biomedical Engineering in 1995, providing several programs in undergraduate and postgraduate levels. In addition to China, Malaysia has invested in biomedical research and education in order to respond to the needs of qualified and experienced engineers. The University of Malaya provides an Engineering program which combines Medicine, Biology, Mechanical Engineering, Electrical Engineering, Applied Electronics, and Applied Mechanics. There are various other educational institutes in Malaysia that offer similar programs such as Universiti Tun Hussien On and Universiti Teknologi Malaysia (Singh, 2010).

Resulting from the increased healthcare awareness, population, and needs for qualified biomedical professional engineers in Asian countries, biomedical engineers are employed in both government and private sectors. Biomedical engineers are hired to work at universities, hospitals, industry, government regulatory agencies, centers for education and medical institutions. BME aims to optimize healthcare in various aspects, such as, testing products and safety, establishing safety standards of devices, providing advice and guidance in medical equipment selection, and supervising the performance of equipment (Singh, 2010).

2.4.2 Biomedical Engineering studies in Thailand

In Thailand, the Biomedical Engineering Consortium has been established since 2005 to bring members who work in the BME together to apply their knowledge to public use. This association was created by Her Royal Highness Princess Maha Chakri Sirindhorn's promotion of both education and research in BME in Thailand through the cooperation of educators and researchers from many universities and national research centers. The first BME program in Thailand was initially established in 1998 at Mahidol University for Master's Degree students; then, in 2005, Mahidol University offered the first Bachelor's Degree Program of BME in Thailand. After that, Chulalongkorn University established Biomedical Program for graduate school in 2006, followed by King Mongkut's University of Technology Thonburi that offered Master's and Doctoral degrees in BME in the same year. Currently, there are six universities offering BME in Thailand. Regarding to all universities and institutes, only Mahidol University has offered BME for Bachelor's, Master's, and Ph.D. programs (Pintuviruj, 2011).

2.4.3 Biomedical Engineering with the impact of ASEAN Economic Community (2015)

In the ASEAN Economic Community (AEC) in 2015, there must be regional cooperation among the nations that emphasizes three pillars of security, sociocultural, and economic integration (Sim, 2008). One part of AEC's agreement involves the Mutual Recognition Arrangements' (MRAs) mobility of qualified professionals within ASEAN, including engineers, which can broaden access into the

ASEAN labor market (ASEAN Secretariat, 2010). Resulting from MRAs' support, biomedical science and health care technology become an investment in the ASEAN Economic Community. Moreover, as a result of AEC, English skills proficiency becomes one of the essentials for qualified professional laborers' mobility to neighbor countries in ASEAN (Khaopa, 2012). Thus, neighboring countries must be concerned with both occupational and language skills in hiring foreign employees (ASEAN Secretariat, 2009). Although the MRA supports skilled labor mobility in ASEAN, the possibility of labor market access is still uncertain due to occupational skills and language proficiency requirements (Yue, 2010).

2.5 Chapter summary

This chapter provided concepts of Needs Analysis (NA), English for Specific Purposes (ESP), relevant literatures, and Biomedical Engineering (BME). All language courses should start with conducting the needs analysis to investigated variation of language needs. Thus, in the present study, Hutchinson and Waters' (1987) frameworks of target situation analysis and learning needs (present situation analysis) were employed as the conceptual framework. In the next chapter, research methodology will be explained.

CHAPTER III
RESEARCH METHODOLOGY

This chapter describes the methodology and data collection process of this study. The content of this chapter also presents reasons for employing a case study as a research approach, the participants of the study, and data collection which consists of a questionnaire, focus group interviews, semi-structured interviews, statistical devices and data analysis.

3.1 Case study as a research method

This research employed the case study as an approach to discover BME undergraduates' needs for English in a specific setting with specific participants. The study involved conducting a survey in a particular university in Thailand. Case study research is appropriate to this study. It relates to Dooley's (2002) study which suggests that the research should focus on specific phenomena and participants, including understanding them clearly. Moreover, case study research is useful when the relevant behavior of other sample groups cannot be observed (Rowley, 2002).

3.2 Research setting and participants

This study took place in a Biomedical Engineering Department, Faculty of Engineering, in a particular university in Thailand. The department was selected with these objectives:

1) Firstly, the Bachelor's program of BME of the chosen university was established as the first Biomedical Engineering Bachelor's degree in Thailand.

2) Secondly, the Bachelor's program of BME of the chosen university was the highest ranked Biomedical Engineering Bachelor's degree in Thailand based on the admission scores from all universities and institutes in this field in 2010.

Regarding the Biomedical Engineering department of the particular university, this undergraduate program has been taught in Thai language. In the first semester, the undergraduate students must take two compulsory general English courses which are instructed through instructors of the Faculty of Liberal Arts. Subsequently, there are two more elective English courses which are offered in the curriculum, including EGID 290 (English for Engineering) and EGID 490 (English Communication for Engineers).

This study collected data via a questionnaire and interviews from five sample groups of participants including:

1) The BME students who were studying in the third and fourth years. The total number of students was 54.

2) The program chair of Biomedical Engineering Department, Faculty of Engineering.

3) Five subject teachers in the Biomedical Engineering Department who taught the students in the 2013 academic year.

4) An English teacher who taught English for undergraduate BME students in the 2013 academic year.

5) Six stakeholders who are working as Human Resources (HR) from six organizations that employed apprentice students from the Biomedical Engineering Department of the university.

3.3 Data collection

The first step of needs analysis is to decide what information needs to be collected, who the resources for the data are, and necessary means to carry out the purposes (Nunan, 1988). In the second step, the researcher needs to select data collection instruments. Dudley-Evans and St. John (1998) and Hutchinson and Waters (1987) list the most frequently used tools in gathering needs: questionnaires, structured

interviews, observation, and discussion. From all methods, Mackay and Mountford (1979) and Robinson (1980) agree that the two formal means of gathering essential information of the needs analysis are questionnaires and structured interviews. Dudley-Evans and St. John (1998) state that the questionnaire is one of the most popular methods used for collecting quantitative data. However, the questions should be piloted before the data collection process.

After the process of data collection, statistical techniques were applied for analyzing the survey results. The information of attitude is discovered by the Likert 's checklist scale of "agree" to "disagree" statements in five to seven scales. Chimi and Russel (2009) describe Likert's scale, in the classic form as consisting of two parts: the first one includes a statement of opinion, feeling, or belief, and the second one is the breadth of responses. Nevertheless, semi-structured interviews are very useful for revealing the outcomes of the needs analysis because it consists of key interview questions that can be followed up with respondents for more details.

The research methodology of this study is mainly based on Hutchinson and Waters' (1987) frameworks of target situation analysis and learning needs analysis. The target situation analysis frameworks was employed for finding out the language needs in the target situation in order to answer the third research question, while the Hutchinson and Waters' (1987) learning needs analysis framework was used for investigating learners' current problems in English skills and desire in English courses which answer the first and the second research questions. In terms of data collection process, the researcher applied Jordan's (1997) needs analysis approach for collecting data from the participants. The needs analysis approach of Jordan (1997) indicates steps in data collection which are not stated in Hutchinson and Waters' (1987) needs analysis framework. Jordan's (1997) needs analysis approach is realized in ESP course design in which the content should be based on the learners' needs and target situation analysis. The steps of data collection are follows:

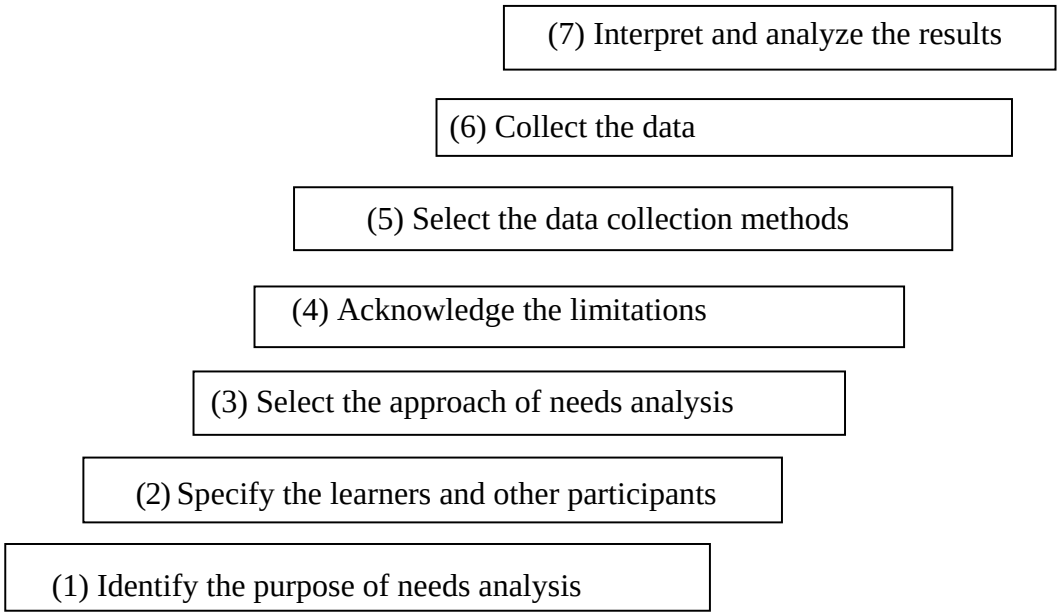

Figure 3.1 The chart of research methodology of this study adapted from Jordan's (1997) needs analysis approach

The research methodology of this study was a mixed method which combined both quantitative and qualitative instruments. The mixed method not only provides information from various data collection methods, but also reduces non-sampling errors and ensures avoiding biased information that results from collecting information from multiple sources. Moreover, the researcher will increase confidence in the results (Axinn & Pearce, 2007). Thus, the researcher designed the instruments of this study as mixed methods of the quantitative instrument: questionnaires, and qualitative instruments: semi-structured interviews and focus group interviews, in order to collect various kinds of information and avoid errors or biased results.

3.3.1 Questionnaire

Richardson (2004) states that there are varieties of research instruments that are used to investigate students' learning, but questionnaires have been most frequently used with campus-based students. One of the popular approaches used in designing a questionnaire is the five-point scale. This approach specifies that

participants respond to a statement from “definitely agree” to “definitely disagree”. Thus, the first data collection of this study starts by using a questionnaire to survey students’ needs. Due to a number of the first subject group of this study, the questionnaire was necessary for collecting data about the needs of English from the BME students.

1) Elements of questionnaire

The questionnaire was based on various elements, including Hutchinson and Waters’ (1987) frameworks of Target Situation Analysis (TSA) and learning needs analysis. The questionnaire consisted of three parts.

Part 1: The demographic of students

The first part aimed to collect background information about the undergraduate BME students. Its questions were designed to discover students’ genders, ages, academic levels, future plans after graduating from the Bachelor’s degree, and experiences in the BME. The data of this part were analyzed by means of percentage and frequency count.

Part 2: The students’ opinions toward perceived necessities and proficiency of academic English skills

The second part aimed to reveal the students’ opinions toward perceived needs and their proficiency of using academic English skills in the BME field. In this part, the subject group is required to rate their opinions on a five-point Likert’s scale. This part consists of two factors: their perceived necessity and proficiency in English skills. The mean scores of the students’ opinions toward the necessity for English skills are interpreted as follows.

Excellent	=	5	(mean scores between 4.21-5.00)
Good	=	4	(mean scores between 3.41-4.20)
Moderate	=	3	(mean scores between 2.61-3.40)
Low	=	2	(mean scores between 1.81-2.60)
Poor	=	1	(mean scores between 1.00-1.80)

The mean scores of the students' opinions toward their English proficiency are interpreted as follows.

Strongly agree	=	5	(mean scores between 4.21-5.00)
Agree	=	4	(mean scores between 3.41-4.20)
Neutral	=	3	(mean scores between 2.61-3.40)
Disagree	=	2	(mean scores between 1.81-2.60)
Strongly disagree	=	1	(mean scores between 1.00-1.80)

Part 3: The students' opinions toward needs of academic English course

Lastly, the third part of the questionnaire was designed to survey what the students want to learn in an academic English course. The checklist items involved the participants' preferred types of courses (elective or compulsory). The participants were required to rate their choices on a five-point Likert's scale based on these elements:

Most desired	=	5	(mean scores between 4.21-5.00)
Highly desired	=	4	(mean scores between 3.41-4.20)
Desired	=	3	(mean scores between 2.61-3.40)
Somewhat desired	=	2	(mean scores between 1.81-2.60)
Least desired	=	1	(mean scores between 1.00-1.80)

The data of these parts are analyzed by the arithmetic means.

In addition, the questionnaire provided an open-ended question which allowed the participants to give comments or suggestions, if any.

2) Construction and development of the questionnaire

The questionnaire of this study was designed and developed through the following steps. Firstly, the literature and researches that related to Needs analysis and English for Specific Purposes were reviewed. The questionnaire's construction were based on Hutchinson and Waters' (1987) needs analysis, including Target Situation

Analysis (TSA) and learning needs analysis frameworks. Secondly, the teachers and alumni of Biomedical Engineering Department, Faculty of Engineering, in a particular university, were interviewed about academic teaching and learning in biomedical engineering and English language used in this filed in order to obtain the preliminary information. Thirdly, the first draft of questionnaire was constructed based on the preliminary data from the teachers and alumni. Afterward, the draft of questionnaire was proved by Thai lectures and researchers who are advisors of this study. The suggestions of the advisors were applied to modify the questionnaire before being piloted. Fourthly, the questionnaire was piloted by alumni of Biomedical Engineering Department of the particular university. After conducting the pilot study, the researcher obtained feedback from the alumni, then consult the thesis advisor about validity of the questionnaire. Then, the questionnaire was revised. Finally, the complete questionnaire was given to the sample group of students.

3.3.2 Focus group interviews

Kitzinger (1995) describes the focus group interview as a convenient and quick means to concurrently collect data from a large group of homogenous participants. This method encourages the participants to talk to others by asking questions, exchanging experiences, sharing opinions, and commenting on each other's ideas. This instrument is beneficial for revealing people’s experiences, knowledge, and attitudes.

Apart from surveying by the mean of the questionnaire, this study also used focus group interviews to disclose more information about BME students’ wants, opinions, and expectations toward the academic English course. The focus group interviews helped the researcher to follow up on unclear responses from the questionnaire. The information that was gained from the focus group interviews also supported or made the results of the questionnaire clearer. The main questions, which were adapted from Hutchinson and Waters’ (1987) framework of needs analysis, were applied from the questionnaire to follow up and check the collected data. The interview questions were as follows.

1) What aspects of the objectives of the English for Biomedical Engineering course do you want to include?

2) Which language skills do you want to practice in this course?

3) Which content do you want to learn in this course?

4) In which academic year should the English course for BME be taught?

In this research procedure, the interviewer used a digital audio recorder. The transcribed information was translated from Thai into English by the researcher.

3.3.3 Semi-structured interviews

According to Axinn and Pearce (2007) and Brenner (2006), the semi-structured interview is more flexible than the structured survey. This research instrument helped the researcher, in the role of interviewer, to ask all respondents the core questions and allowed the interviewer to ask follow-up questions. This data collection process was employed for interviewing four subject groups including the English teacher, subject teachers, the program chair, and stakeholders. The interview questions required participants to answer the questions about their expectations toward BME students' proficiency in English. The semi-structured interview in this study consisted of four sets as follows:

1) Semi-structured interview questions for the program chair

The purpose of interview questions was to find out the program chair's expectations and opinions toward BME students' proficiency in academic English. The questions which were adapted from Hutchinson and Waters' (1987) Target Situation Analysis (TSA) framework were as follows.

(1) What English skills do you think are essential for BME students?

(2) From your experience in the BME, which English sub-skills do you expect the BME students to be proficient in?

(3) What are your expectations toward BME students' proficiency in academic English?

2) Semi-structured interview questions for the subject teachers

The interview questions aimed to collect data about BME teachers' expectations for their students' proficiency in English. The questions which were

adapted from Hutchinson and Waters' (1987) Target Situation Analysis (TSA) framework were as follows.

(1) What English skills do you think are problematic for BME students?

(2) What English skills do you think are essential for BME students?

(3) What English sub-skills do you want BME students to be proficient in?

3) Semi-structured interview questions for the English teacher

The purpose of semi-structured interview questions was to find the English subject teacher's expectations toward the BME students' English proficiency. The questions were designed to explore the English teachers' opinions about appropriate activities for the English course which would help to increase the students' motivation and abilities in academic English. The semi-structured interview questions, adapted from Hutchinson and Waters' (1987) framework, were as follows:

(1) What English skills do you think are problematic for BME students?

(2) What English skills do you think are essential for BME students?

(3) What English sub-skills do you want BME students to be proficient in?

(4) In which academic year should the English course for BME be taught?

4) Semi-structured interview questions for the stakeholders

The questions were designed to discover the stakeholders' opinions toward language needs in the target situation. The questions requested stakeholders to share their perspectives toward the needed English skills in workplaces.

In all semi-structured interview procedures, the interviewer used a digital audio recorder, then, transcribed the files into the content. The transcribed information was translated from Thai into English by the researcher. The main question, which was adapted from Hutchinson and Waters' (1987) framework of needs analysis, was as follows.

What English skills or proficiencies do you need biomedical engineering staff to be good at? In what level: beginner, intermediate, or advanced? Please give examples of situations.

3.4 Data analysis

1) Quantitative data analysis

The data were calculated by using the Statistical Package for Social Science (SPSS) program. The statistical figures used in the study were included as follows:

(1) Percentage and frequency count

The percentage and frequency were used for presenting the participants' background information.

(2) Arithmetic Mean

This method was used in calculating the average of students' needs, proficiency, and wants in their English skills. The ranks of the results which were collected via Likert's five-point scale checklists were interpreted according to following.

4.21-5.00	=	Most
3.41-4.20	=	High
2.61-3.40	=	Moderate
1.81-2.60	=	Low
1.00-1.80	=	Least

(3) Mean Difference Method (MDF)

Mean Difference Method (MDF) is used for identifying differences in mean score in dual-response format. The dual-response format is a type of question which is used for finding out the respondents' needs. The method of MDF is to analyze the importance of needs. The MDF score is the result of the difference between importance and degree of success on each skill (Wongwanit, 2005). Thus, the deficiency of English proficiency was defined by the differences in mean scores between Target Situation Analysis (TSA) and Present Situation Analysis (PSA). Moreover, the MDF score show the rank of needs with a formulation (Wongwanit, 2005). In this study, the questionnaire of this study was designed in a dual-response format. The researcher employed Mean Difference Method (MDF) to analyze the

students' problematic English skills. The differences between the students' perceived necessity and students' proficiency in each English skill were presented as the students' gaps in English.

2) Qualitative Data Analysis

(1) Content Analysis

Content analysis is widely used in data analysis of qualitative research. Patton (2002) claims that content analysis generally refers to the identifying core meaning and consistency (usually called as patterns and themes) of qualitative data. The first step of content analysis is to develop coding categories or a classification system, then to apply the codes for data analysis. The transcripts were validated by the interviewees and sent back to the researcher, who discussed the quantitative data combined with the qualitative data. The researcher followed with recommendations for future studies.

3.5 Chapter summary

This chapter presents the research methodology and how it was applied to interpret the qualitative and quantitative data. The theories of qualitative and quantitative research describe how the research instruments were chosen. The researcher employed the triangulation of participants and mixed-method methodology for avoiding errors and biased data. This chapter describes the case study, participants, research instruments, data collection procedures, and data analysis. In the next chapter, there are the findings of this study, including quantitative and qualitative data.

CHAPTER IV
FINDINGS

This chapter consists of the findings which were collected through three research instruments including questionnaires, focus group interviews, and semi-structured interviews. The findings which were collected from the questionnaire and focus group interviews were analyzed to answer the first and the second research questions, while the findings from semi-structured interviews were analyzed to answer the last research question. The findings answered the research questions as follows.

Regarding the first research question: "What are the current problems of English skills of Thai undergraduate Biomedical Engineering students?", the findings of this question were analyzed and presented as students' current problems in English. This aspect consisted the students' problems in the existing English courses and the curriculum, and the students' self-assessment toward their English proficiency and language needs.

Secondly, due to answering the second research question: "What are the needs of English skills that will be relevant for developing English for Biomedical Engineering courses for Thai undergraduate students?", the findings were interpreted and presented as the students' language needs in English courses, including objectives of academic English courses for engineering, course contents, teaching materials and class atmosphere, and other suggestions.

Finally, the findings of the last research question: "What are the expectations of the program chair, subject teachers, English teachers, and stakeholders, in order to develop English for Biomedical Engineering courses?", were analyzed as the aspects of academic staff and stakeholders' expectations.

The findings of this study were analyzed and presented as the topics of students' current problems in English, students' language needs in English courses, and the expectations of academic staff and stakeholders as follows.

4.1 Students' current problems in English

The findings of this sections aims to answer the first research question: "What are the current problems of English skills of Thai undergraduate Biomedical Engineering students?". This section consisted the topic of students' problems in the existing English course and the students' gaps in English skills.

4.1.1 The students' problems in the existing English courses and the curriculum

The researcher utilized the questionnaire to conduct a survey among 54 Thai undergraduate BME students, consisting of 27 female (50%) and 27 male (50%) respondents, who were studying in the third and fourth academic years. The respondents were in the ages of 19 to over 22 years old.

Regarding Figure 4.1, 30 respondents (55.6%) considered that the existing course (English Communication for Engineering) did not match their goals of practicing English for the engineering field. Based on the curriculum, the respondents claimed that the existing English Communication for Engineers course was provided for undergraduate engineering students in all programs, including: Civil Engineering, Industrial Engineering, Chemical Engineering, Computer Engineering, Electrical Engineering, Mechanical Engineering, and Biomedical Engineering. The 30 respondents (55.6%) considered that the course could not help them achieve their goal of studying English in Engineering field, while 22 respondents (40.7 %) were satisfied with the existing English course. Only two respondents (7.3%) did not state their opinions. Therefore, the perspectives of most respondents (55.6%) toward the existing English Communication for Engineers course revealed that the course did not match their desires.

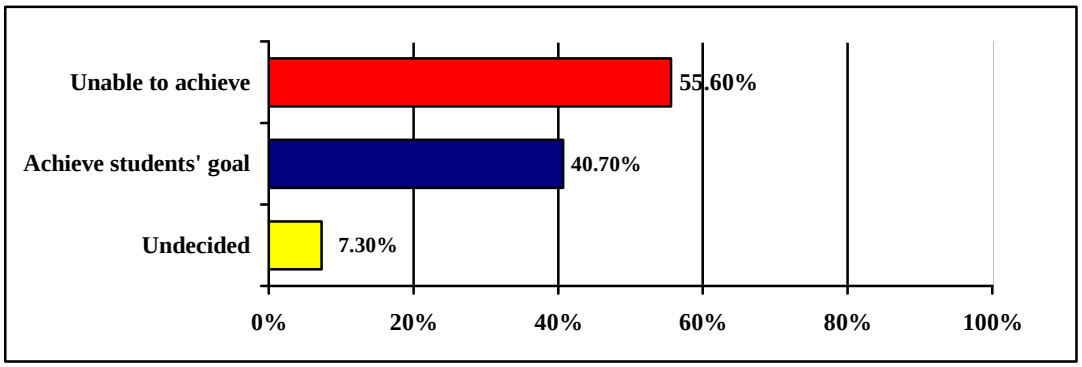

Figure 4.1 Students' opinions toward the existing English courses which are provided for all engineering programs

Further, the questions required respondents to identify the content they want to learn in the English for Biomedical Engineering course. In this case, the respondents could state more than one skill. The most specific skill the respondents expected to learn was reading journal articles (66.7%). Subsequently, 64.8% of the respondents stated their desire to study general English communication, while 55.6% wanted to study English communication for engineers. Moreover, 51.9% stated their desire to study vocabulary in the English course, while other 1.9% wanted to practice other skills.

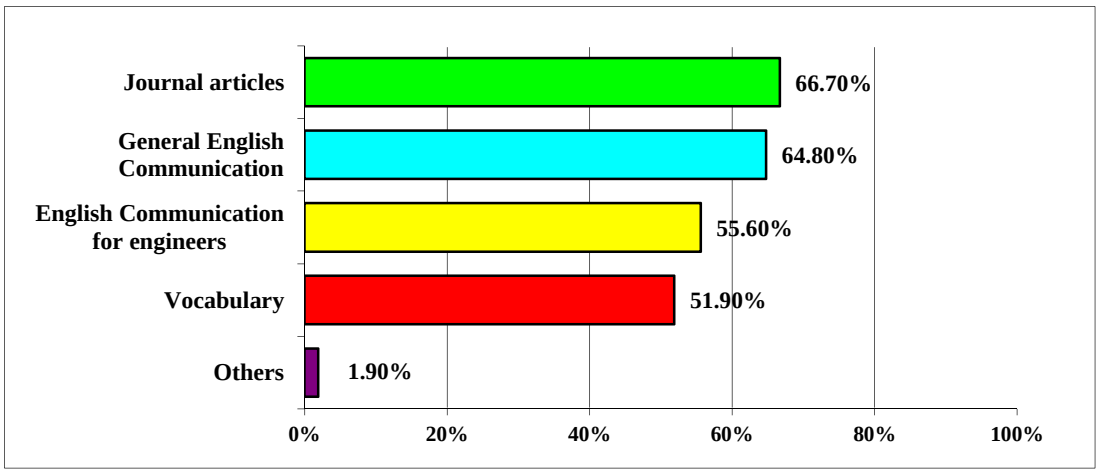

Figure 4.2 Students' perspectives toward English course contents

In addition, the respondents stated their opinions and perspectives toward English courses in the undergraduate BME curriculum of their university. They suggested offering more English courses in early academic years. Most respondents preferred to study EAP in the second academic year (25.9%). Other respondents suggested studying EAP in the first academic year (24.1%), the third academic year (20.4%), and the fourth academic year (20.4%), while least respondents preferred to study in all academic years (9.5%) (see Figure 4.3).

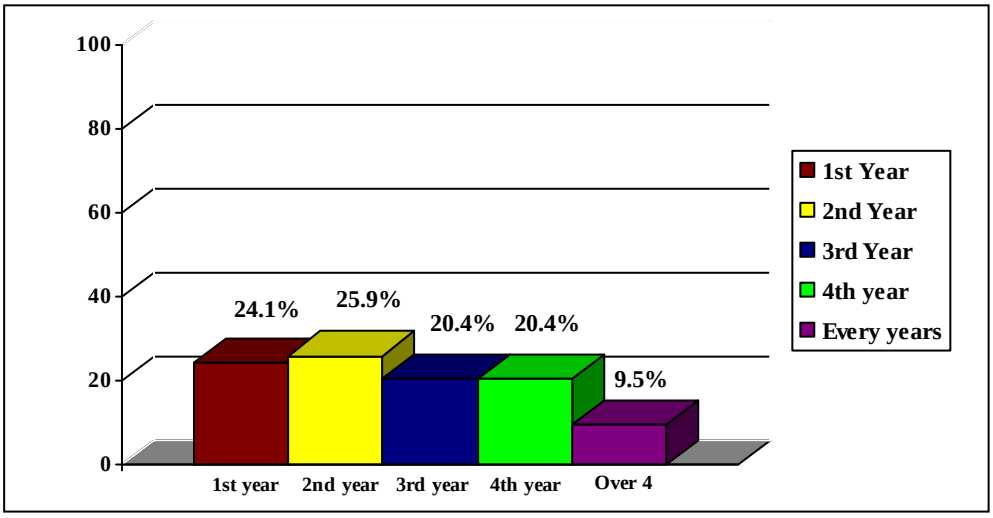

Figure 4.3 Appropriate years of studying EAP courses

Besides, in terms of a number of English courses in the curriculum, 16 respondents (29.6%) suggested providing four courses of academic English for the whole curriculum. Fifteen respondents (27.8%) preferred two courses of academic English, while 12 respondents (22.2%) suggested providing three courses. However, seven respondents (13.0%) preferred one course. Only four respondents (7.4%) requested more than four courses of academic English (see Figure 4.4).

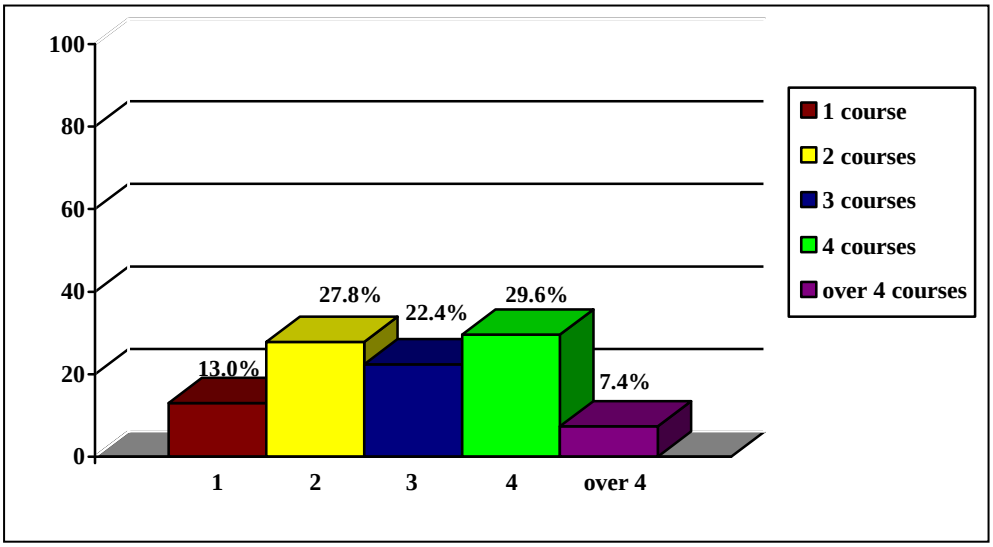

Figure 4.4 Number of EAP courses which should be provided in Engineering curriculum

Figure 4.5 presents the respondents' opinions in terms of offering English courses in the curriculum. In Column A, 50 respondents (92.6%) agreed that English courses should be provided for engineering students throughout the curriculum; only four respondents (7.4%) did not want to be required to take English courses throughout the curriculum. Subsequently, data in Column B showed that 39 respondents (72.2%) agreed with dividing English for Engineers courses into sub-courses which are based on each English skill. Fifteen respondents (27.8%) disagreed with this idea. Furthermore, in Column C, 47 respondents (87.0%) considered that Academic English for Engineers should be more emphasized; however, seven respondents (13.0%) were satisfied with existing English courses.

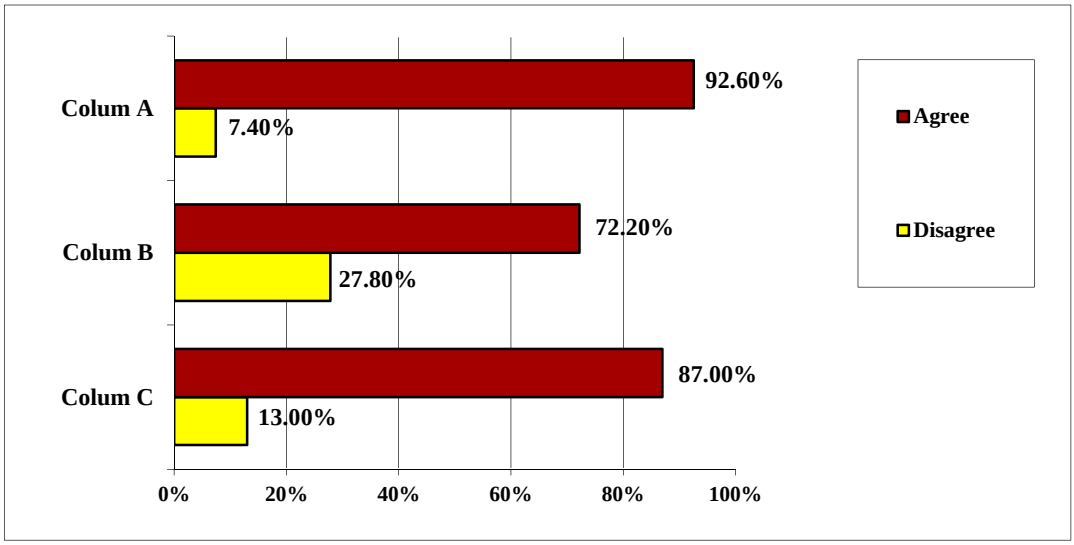

Figure 4.5 The respondents' opinions in term of providing English courses in the curriculum

Apart from that, the questionnaire provided more information about the respondents' perspectives toward compulsory cooperative education. Forty-one respondents (75.9%) agreed with including compulsory cooperative education in the curriculum, yet eleven respondents (20.4%) considered that cooperative education was not necessary for BME program. Two respondents (3.7%) refused to comment (see Figure 4.6).

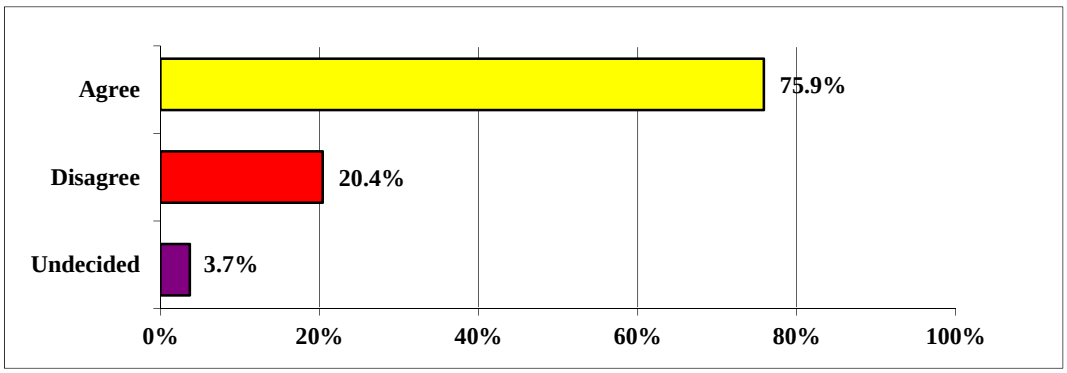

Figure 4.6 The respondents' opinions toward the cooperative education

On the other hand, the questionnaire surveyed the respondents' work experiences in BME to reveal their opinions toward the necessity of English for this field. However, the questionnaire allowed only the respondents who had work experiences, both as apprentices and professionals in BME, to respond to these three questions. Thus, only 16 respondents (29.7%) were able to share their opinions about their need for general English skills in their work experience. In Figure 4.7, the respondents stated that all general English skills were necessary for working in BME**.** The most necessary skills in the workplaces were reading (100%), followed by speaking (87.5%), writing (87.5%), and listening (87.5%). necessary.

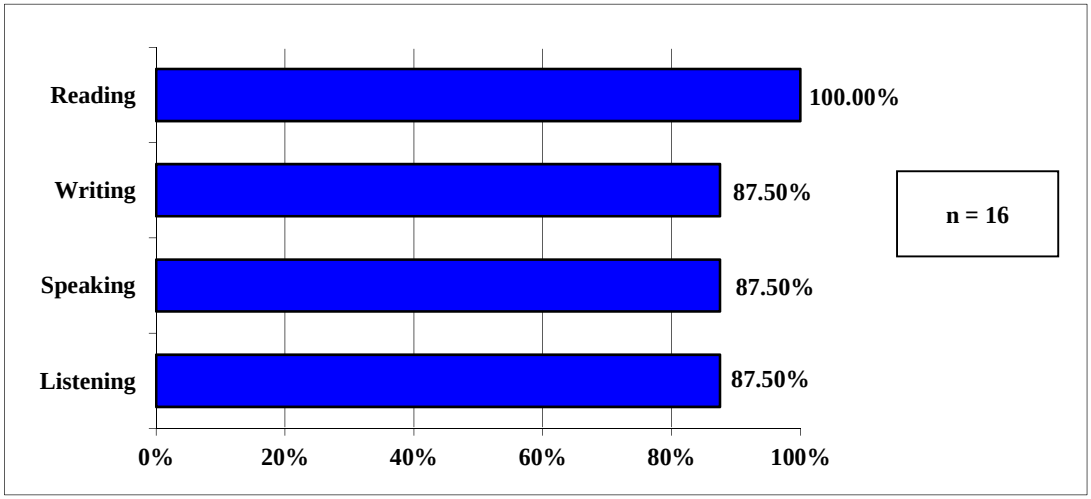

Figure 4.7 The students' opinions toward the necessity of using general English skills in their work experience

In addition, 11 respondents (68.75%) considered English skills for BME as a necessary proficiency, while five respondents (31.25%) disagreed (see Figure 4.8).

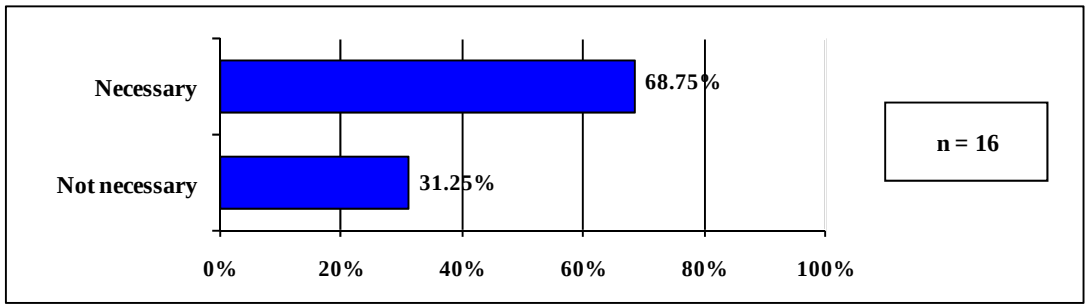

Figure 4.8 The students' opinions toward the necessity of English for Biomedical Engineering in their work experience

To sum up, according to the respondents' opinions and expectations toward the existing English course in the curriculum, most respondents (55.6%) considered that the course (English Communication for Engineering) could not meet their goals of practicing English. The most needed skill which the respondents expect to practice is reading journal articles; followed by general English communication, English communication for engineers, vocabulary, and other skills. Moreover, most respondents (25.9%) suggest additional English courses ought to be offered to students in the second academic year.

4.1.2 Students' self-assessment toward their English proficiency and language needs in EAP and English for BME

The data of the participants' self-assessment in English proficiency and the importance of each English skill in terms of BME were collected via questionnaires for finding out the undergraduate BME students' English proficiency and language needs. The data were presented by the Arithmetic Mean ($\bar{x}$) and Mean Difference Method (MDF). Arithmetic Mean ($\bar{x}$) was employed to analyze the findings of the participants' realization of their need for English and self-assessment toward their current proficiency in each English skill regarding the BME. The MDF was the instrument employed for comparing the differences in mean score between Target Situation Analysis (TSA) and Present Situation Analysis (PSA) in order to define the gaps. Furthermore, the researcher employed focus group interviews as another research instrument for following up the surveyed data and collecting more

information from the participants. The findings of participants' self-assessment toward their problems and needs in English skills consisted of three major categories: general English, English for Academic Purpose, and English for Biomedical Engineering.

1) General English skills

The respondents defined their perceived needs and proficiency with general English skills as including listening, speaking, reading, and writing. In Figure 4.9, the respondents identified all general English skills as 'most necessary'. The most needed skill was writing ($\bar{x}$ = 4.46), followed by listening ($\bar{x}$ = 4.35), speaking ($\bar{x}$ = 4.30), and reading ($\bar{x}$ = 4.24). In terms of their English proficiency, the respondents viewed their three English skills as moderate, including reading ($\bar{x}$ = 3.07), listening ($\bar{x}$ = 3.02), and speaking ($\bar{x}$ = 2.83), while their writing skill was identified as low proficiency ($\bar{x}$ = 2.59). In identifying the deficiency of the respondents' language needs in general English skills, the main problem was writing. The highest MDF of respondents' perceived needs and current proficiency was English writing skill (MDF = 1.87) which the largest gap of all general English skills. The other problematic skills were speaking and listening, while the least problematic was reading (MDF = 1.17).

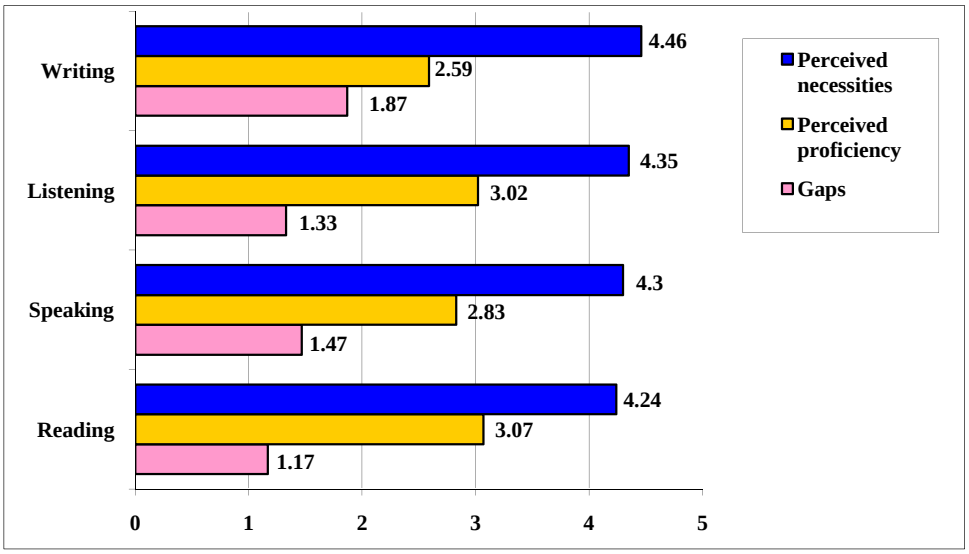

Figure 4.9 Students' self-assessment toward general English skills

In addition, respondents were requested to specifically identify their proficiency and needs for general English sub-skills to define the gaps in each skill. As shown in Figure 4.10, respondents perceived the skill of listening to general conversation as the most necessary ($\bar{x}$ = 4.37), followed by listening to complex sentences ($\bar{x}$ = 4.26) and listening to short sentences ($\bar{x}$ = 4.07) which were perceived as highly needed skills. Besides, the respondents stated their ability of listening to English in the rates of high to low. Their proficiency in listening to short sentences was stated as good ($\bar{x}$ = 3.87). However, their proficiency in listening to general conversations ($\bar{x}$ = 3.31) was moderate, while their listening to complex sentences ($\bar{x}$ = 2.33) was poor. Considering the gaps between the respondents' proficiency and necessities of general listening sub-skills, the most problematic sub-skill was listening to complex sentences (MDF = 1.93), followed by listening to general conversations (MDF = 1.06), and listening to short sentences (MDF = 0.20) which were slightly problematic for the respondents.

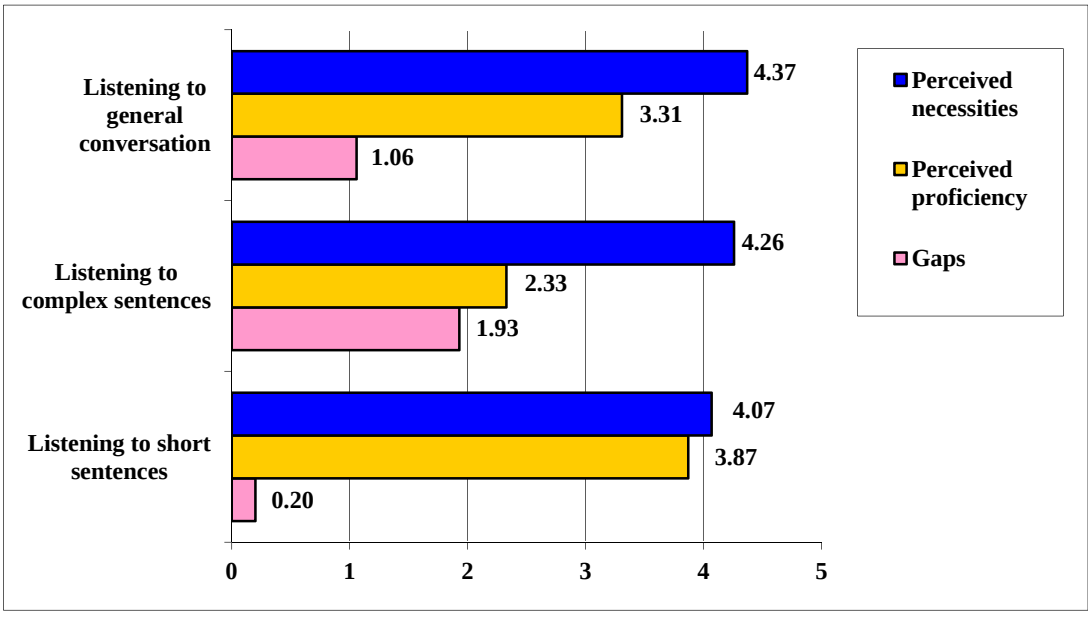

Figure 4.10 Students' self-assessment toward English listening sub-skills

Regarding Figure 4.11, on the one hand, the respondents ranked sub-skills of speaking in English as highly necessary. Both speaking in general conversation ($\bar{x}$ =

4.37) and speaking in complex sentences ($\bar{x}$ = 4.24) were perceived as the most essential, while speaking short sentences ($\bar{x}$ = 4.04) was identified as a highly necessary skill. On the other hand, the respondents rated their proficiency of speaking sub-skills in the ranks of moderate to high; speaking short sentences ($\bar{x}$ = 3.57) was rated as a high proficient skill, followed by speaking general conversation ($\bar{x}$ = 3.26) and speaking complex sentences ($\bar{x}$ = 2.61), which were evaluated in the rank of moderate proficiency. In terms of finding gaps, speaking complex sentences became the most problematic skill for the respondents (MDF = 1.63). The skill of speaking short sentences was the least problematic (MDF = 0.47).

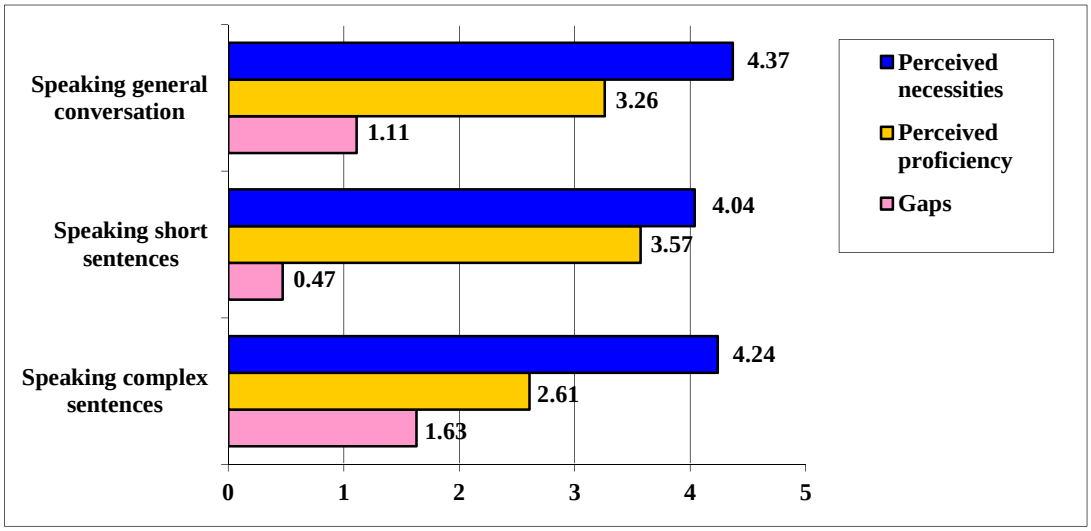

Figure 4.11 Students' self-assessment toward English speaking sub-skills

Furthermore, in Figure 4.12, the respondents stated that necessities of each general reading English sub-skill were in the rate of high to most necessary. The most essential reading sub-skill was reading complex sentences ($\bar{x}$ = 4.44), followed by reading general printed media ($\bar{x}$ = 4.04), while the least necessary skill was reading short sentences ($\bar{x}$ = 3.81) despite being ranked as a highly essential skill. In terms of the respondents' competency in reading English sub-skills, they specified their reading sub-skills as moderate to high. They evaluated their proficiency in reading short sentences as high ($\bar{x}$ = 3.83), while their abilities in reading general printed media ($\bar{x}$ = 3.31) and reading complex sentences were moderate ($\bar{x}$ = 2.70). Due to the gaps

between the respondents' perceived needs and proficiency, reading complex sentences was their most problematic skill (Mean difference = 1.74), followed by the skill of reading general printed media (MDF = 0.73). Reading short sentences was the least problematic (MDF = -0.02) of all general English sub-skills.

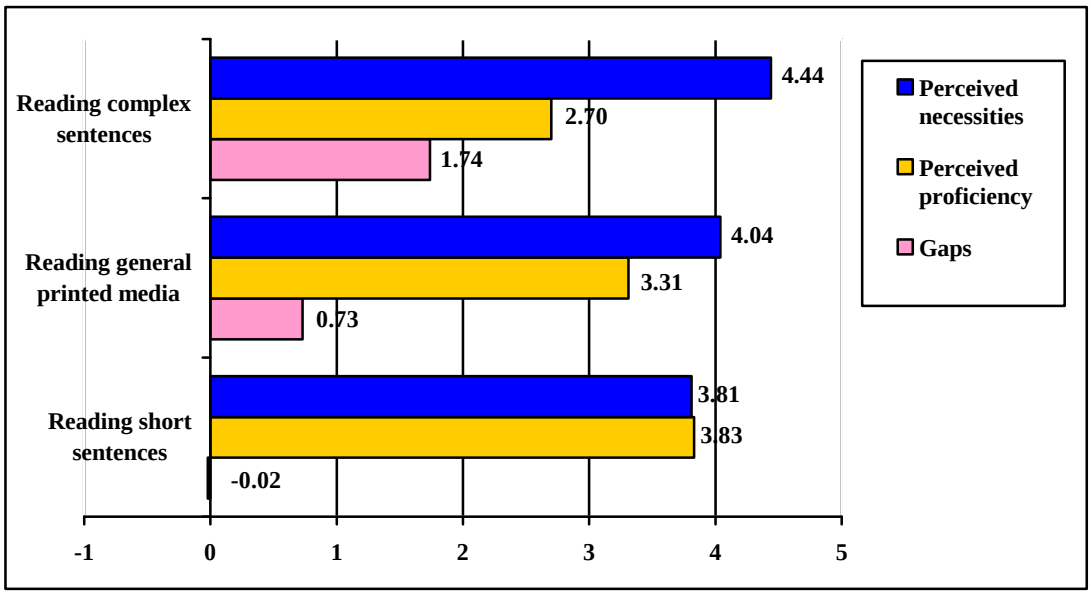

Figure 4.12 Students' self-assessment toward English reading sub-skills

Moreover, as shown in Figure 4.13, writing sub-skills were identified as the highest to most necessary skills. Writing complex sentences ($\bar{x}$= 4.39) and writing general printed media ($\bar{x}$ = 4.22) were stated as the most necessary sub-skills; while writing short sentences ($\bar{x}$ = 3.81) was stated as high necessary. Apart from that, the respondents specified their proficiency of writing sub-skills at various levels. The proficiency of writing short sentences was evaluated as high ($\bar{x}$ = 3.43), while their skill of writing general printed media was stated as moderate ($\bar{x}$ = 2.80), and their writing complex sentences proficiency was evaluated as low ($\bar{x}$ = 2.41). In terms of calculating gaps, the writing complex sentences skill was the most problematic (MDF = 1.98), while writing short sentences was the least problematic (MDF = 0.38) of the respondents.

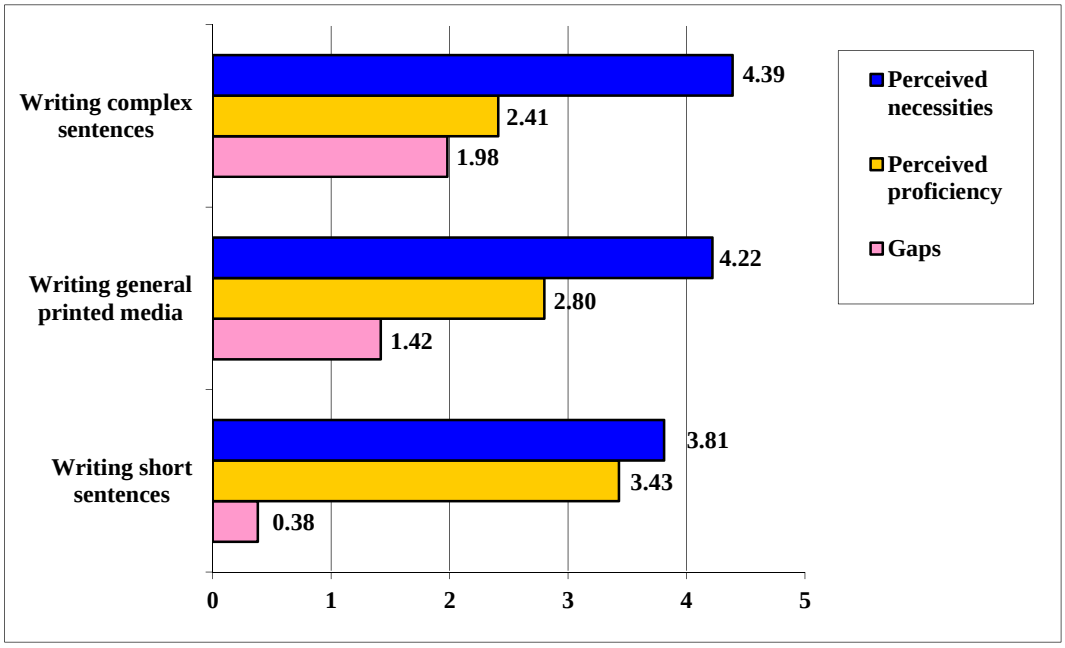

Figure 4.13 Students' self-assessment toward English writing sub-skills

To conclude, in term of general English skills, although the participants stated that all general English skills were highly important, the writing skill was the most necessary for them. However, the reading skill was perceived as the highest proficiency meanwhile the writing sub-skill was stated as their main problematic skill. Furthermore, regarding general English sub-skills, reading complex sentences was perceived as the most necessary, while respondents stated their skill of listening to short sentences was the best proficiency of all English general sub-skills. Moreover, they claimed they had no problem in reading short sentences. Writing complex sentences, however, was their most problematic skill.

2) Academic English skills

The questionnaire also required the respondents to identify their proficiency and necessities of using academic English skills along with finding out the gaps in these skills. The findings were divided into each group of academic skills to compare the students' perceived necessities, proficiency, and gaps in English listening, speaking, reading, and writing. The data are presented as Figure 4.14 to Figure 4.16 as follows:

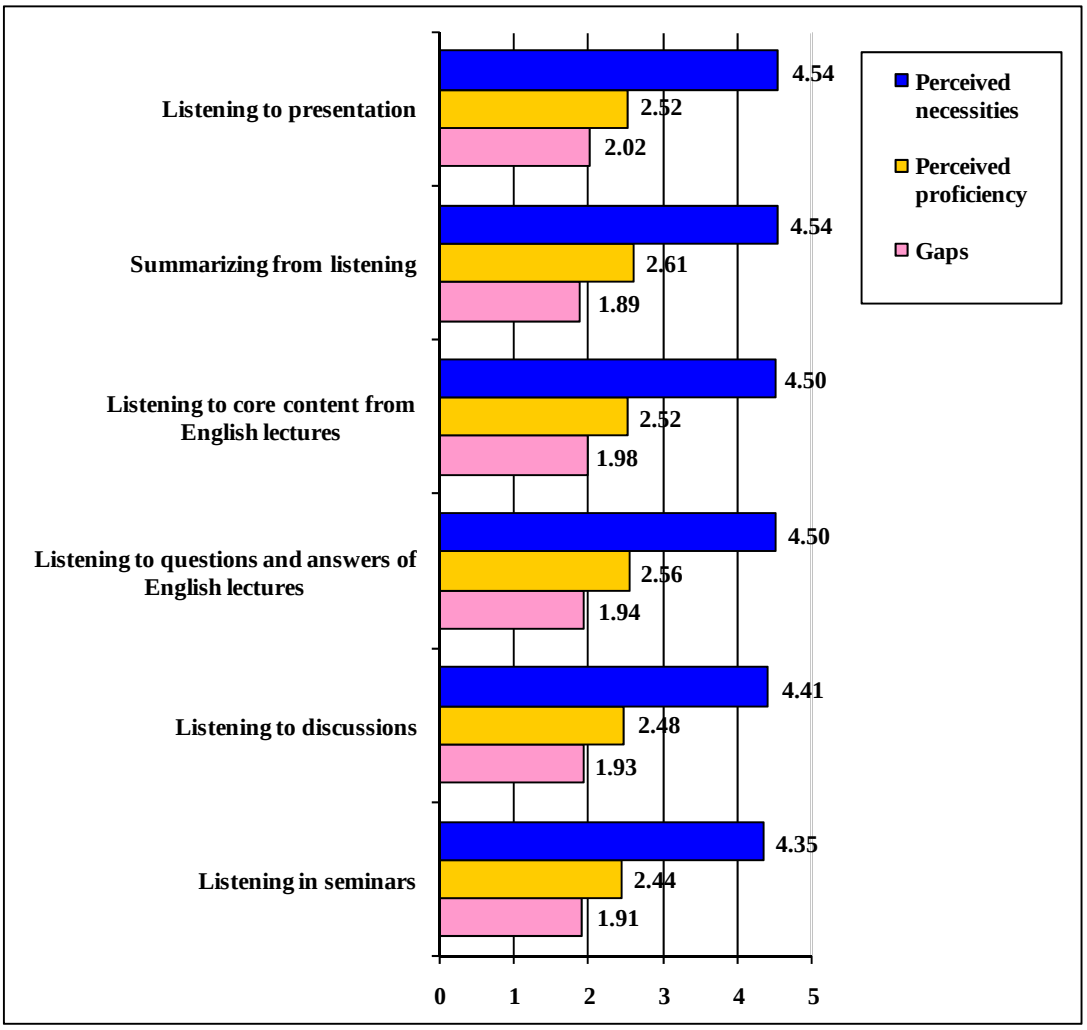

Figure 4.14 Students' self-assessment toward academic English listening sub-skills

Based on Figure 4.14, the respondents perceived all academic English listening skills as most necessary. The highest mean of perceived needs included the skills of listening to presentations ($\bar{x}$ = 4.54) and summarizing from listening ($\bar{x}$ = 4.54), followed by listening to core content from English lectures ($\bar{x}$ = 4.50), listening to the questions and answers of English lectures ($\bar{x}$ = 4.50), listening to discussions ($\bar{x}$ = 4.41), and listening to seminars ($\bar{x}$ = 4.35). Besides, the respondents identified their proficiency in academic listening skills in the rate of poor to moderate. Their proficiency of summarizing from listening is the only academic English listening skill which was perceived as moderate ($\bar{x}$ = 2.61), while other

listening skills including listening to the questions and answers of English lectures ($\bar{x}$ = 2.56), listening to core content from English lectures ($\bar{x}$ = 2.52), listening to presentations ($\bar{x}$ = 2.52), listening to discussions ($\bar{x}$ = 2.48), and listening in seminars ($\bar{x}$ = 2.44) were stated as poor. In order to find out the gaps, the most problematic of academic English listening skills was listening to presentations (MDF = 2.02), while summarizing from listening was the least problematic skill (MDF = 1.89).

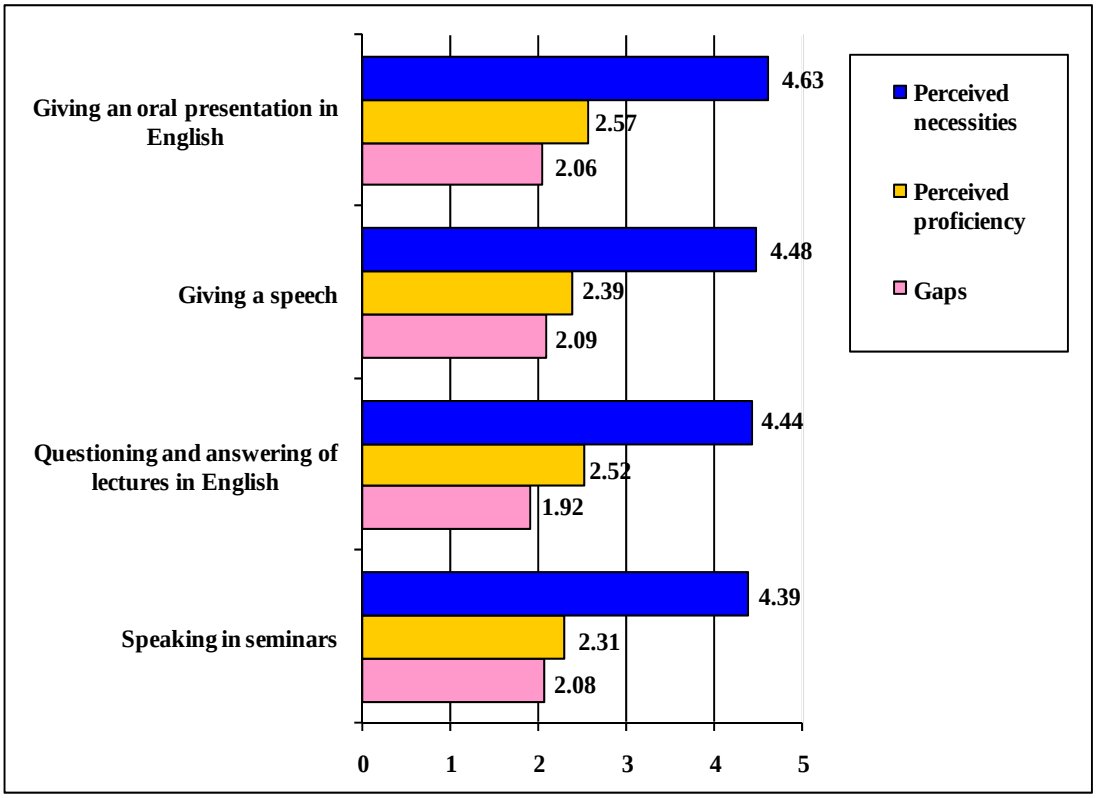

Figure 4.15 Students' self-assessment toward academic English speaking sub-skills

As presented in Figure 4.15, the respondents stated all academic English speaking sub-skills as almost equally necessary. The highest essential skill was giving an oral presentation in English ($\bar{x}$ = 4.63), followed by giving a speech ($\bar{x}$ = 4.48), questioning and answering lectures in English ($\bar{x}$ = 4.44). The least demanding academic English speaking skill was speaking in seminars ($\bar{x}$ = 4.39). Apart from that, the respondents evaluated their proficiency in all academic English speaking

skills as poor. The highest mean of speaking competency was giving an oral presentation in English ($\bar{x}$ = 2.57), followed by questioning and answering lectures in English ($\bar{x}$ = 2.52), and giving a speeches ($\bar{x}$ = 2.39). Speaking in seminars was specified as the lowest competency ($\bar{x}$ = 2.31). Therefore, giving a speech becomes the most problematic speaking skill (MDF = 2.09); in contrast, questioning and answering lectures in English was the least problematic (MDF = 1.92).

Regarding Figure 4.16, academic English reading skills are considered highly necessary skills, consisting of reading essays or journal articles ($\bar{x}$ = 4.67) and summarizing from reading ($\bar{x}$ = 4.57). However, the respondents evaluated themselves as moderately competent in both reading essays and journal articles ($\bar{x}$ = 2.91) and summarizing from reading ($\bar{x}$ = 2.85). Reading essays and journal articles was the more problematic (Mean difference = 1.76) than summarizing from reading skill which was the less problematic (Mean difference = 1.72).

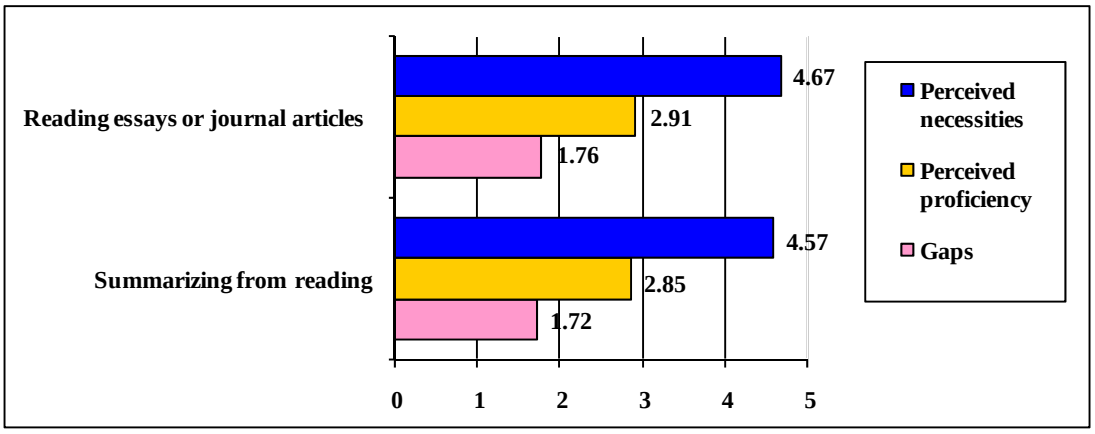

Figure 4.16 Students' self-assessment toward academic English reading sub-skills

Regarding Figure 4.16, academic English reading skills are considered highly necessary skills, consisting of reading essays or journal articles ($\bar{x}$ = 4.67) and summarizing from reading ($\bar{x}$ = 4.57). However, the respondents evaluated themselves as moderately competent in both reading essays and journal articles ($\bar{x}$ = 2.91) and summarizing from reading ($\bar{x}$ = 2.85). Reading essays and journal articles was the

more problematic (MDF = 1.76) than summarizing from reading skill which was the less problematic (MDF = 1.72).

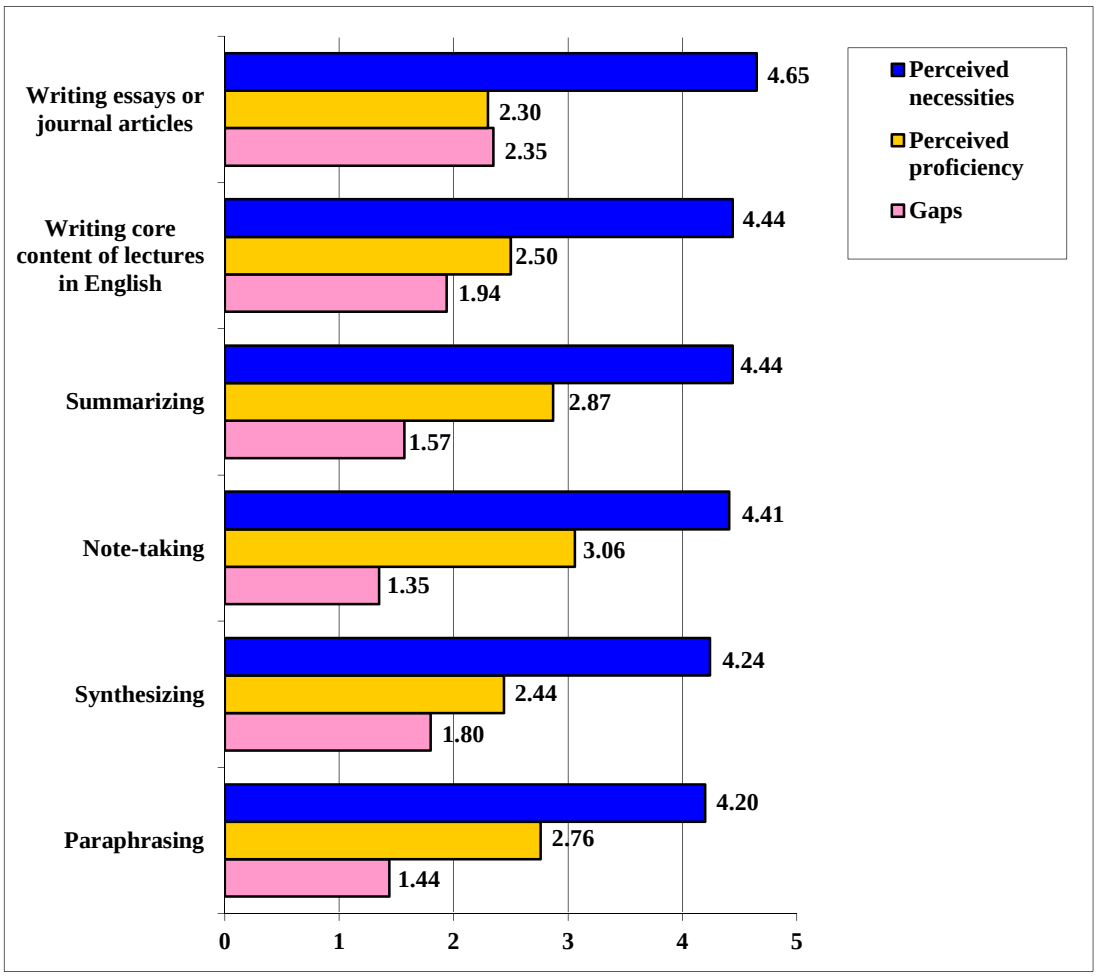

Figure 4.17 Students' self-assessment toward academic English writing sub-skills

Figure 4.17 presents the respondents' perceived necessity and proficiency toward academic English writing sub-skills. The respondents perceived writing essays or journal articles as the most necessary skill ($\bar{x}$ = 4.65), followed by writing core content of lectures in English ($\bar{x}$ = 4.44), summarizing ($\bar{x}$ = 4.44), note-taking ($\bar{x}$ = 4.41), and synthesizing ($\bar{x}$ = 4.24). The least necessary academic writing skill was paraphrasing in English ($\bar{x}$ = 4.20). Regarding the respondents' proficiency of academic writing in English, note-taking skill was stated as moderate ($\bar{x}$ = 3.06). Other

academic writing skills were rated as poor to moderate proficiency including summarizing ($\bar{x}$ = 2.87), paraphrasing ($\bar{x}$ = 2.76), writing core content of lectures in English ($\bar{x}$ = 2.50), and synthesizing ($\bar{x}$ = 2.44). The least proficient skill was writing essays or journal articles ($\bar{x}$ = 2.30). Hence, the most problematic skill was writing essays or journal articles (MDF = 2.35), while the least problematic skill was note-taking (MDF = 1.35).

Apart from the findings of the questionnaire, the respondents who participated in the focus group interviews expressed their opinion that all English skills were important; however, their needs in developing English skills were diverse. Most interviewees mentioned their desire to practice academic English skills, focusing on giving oral presentations. An interviewee stated his perspectives as follow:

> ***Extract 1***
> *All English skills are important. Listening and speaking are necessary for conversation. Reading and writing are also needed in studying. Anyhow, I want to emphasize practicing speaking skills, especially oral presentations.*

Another interviewee identified the desire to practice various English skills including speaking, writing, and listening. Reading was considered as a necessary skill; however, it was not as problematic as other English skills. The student explained that reading journal articles helps him to read English text; however, there were some difficulties in understanding the content of English lectures (see Extract 2).

> ***Extract 2***
> *I expect to develop all English skills. Reading is needed but it is not as problematic as the others. I know some technical terms from English texts, but sometimes, I don't understand when teachers lecture in English.*

An interviewee said that although academic English reading was necessary in studying in the BME program, it is the least problematic skill. In contrast, another

interviewee said that academic writing skills were considered as the main obstacle for the participants (see Extract 3 and Extract 4).

> ***Extract 3***
> *Academic reading skills are necessary for studying. We are assigned to read a lot of English texts and journals. Actually, reading skills are not very problematic because I can use a dictionary to translate vocabulary.*

> ***Extract 4***
> *I think the hardest English skill is writing such as proposal writing, report writing, and project writing.*

To sum up, the collected data with regard to the questionnaires and focus group interviews revealed that the participants perceived reading English essays and journal articles as the highest necessity. Other highly perceived necessary academic English skills were writing essays or journal articles, oral presentations, listening to presentations, and summarizing from listening. Their highest proficiency was in note-taking, while speaking in seminars was identified as their lowest proficiency. Moreover, the most problematic skill was writing essays and journal articles, while the least problematic skill was note-taking. Although the participants realized the need for all English skills, they requested more opportunities for practicing some academic English skills. Most participants wanted to practice academic English speaking skills, particularly giving oral presentations in the English course. Some participants requested improving various English skills including academic writing, speaking, and listening. Academic English reading skills were considered as the least problematic; however, these skills played an important role in studying in this field.

3) English for Biomedical Engineering skills

In terms of the students' proficiency and necessities for using English skills specifically in the BME field, the respondents identified their self-assessment at

various rates. Although they perceived all skills to be most necessary, they evaluated their proficiency toward all skills as low to moderate.

Regarding Figure 4.18, the respondents specified all English listening skills for BME as most necessary. The highest mean was the skill of summarizing from listening in BME ($\bar{x}$ = 4.72), followed by listening to questions and answers of BME lectures in English ($\bar{x}$ = 4.59), listening to core content of BME lectures ($\bar{x}$ = 4.56), listening to presentations in BME ($\bar{x}$ = 4.52), and listening to technical terms in BME ($\bar{x}$ = 4.41). The least necessary skills were and discussions in BME ($\bar{x}$ = 4.39), and listening to seminars in this field ($\bar{x}$ = 4.39). Further, respondents ranked their proficiency in English listening skills as low to moderate. Their highest proficiency was listening to core content of lectures in BME which was at a moderate level ($\bar{x}$ = 2.65), followed by listening to technical terms in BME ($\bar{x}$ = 2.59), listening to discussions in BME ($\bar{x}$ = 2.59), listening to the questions and answers of BME lectures in English ($\bar{x}$ = 2.54), listening to presentations in BME ($\bar{x}$ = 2.52), and summarizing from listening to BME lectures ($\bar{x}$ = 2.52). Their lowest proficiency was listening to seminars in BME which was stated as low ($\bar{x}$ = 2.46). Nonetheless, the most problematic skill was summarizing from listening in BME (MDF = 2.20), while the least problematic skill was listening to discussions in BME (MDF = 1.80).

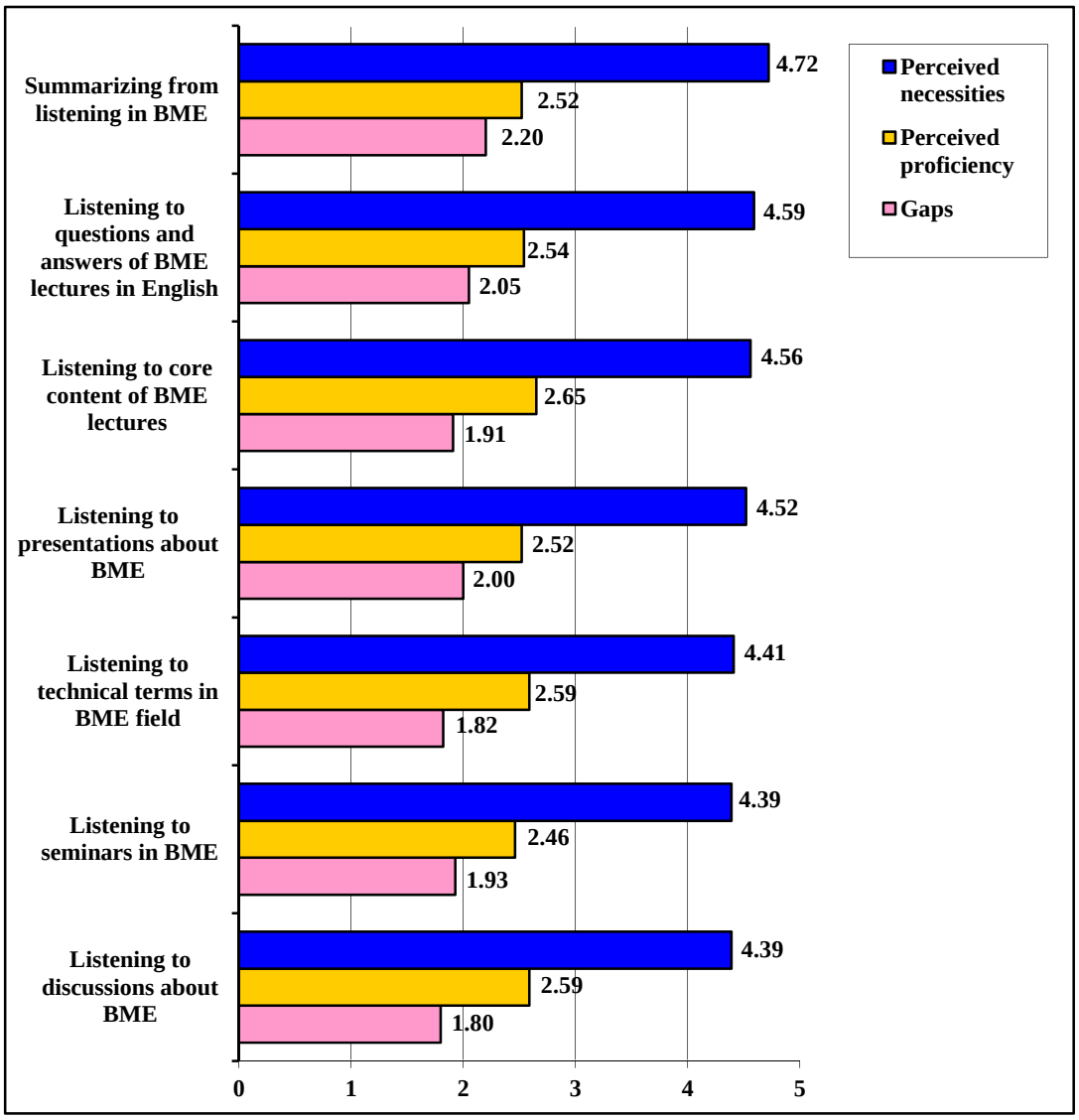

Figure 4.18 Students' self-assessment toward English listening sub-skills for BME

Furthermore, Figure 4.19 shows that all English speaking skills for BME were perceived as most necessary. The highest necessity skill was giving oral presentations in BME ($\bar{x}$ = 4.65), followed by questioning and answering in English lectures ($\bar{x}$ = 4.59), speaking technical terms in BME ($\bar{x}$ = 4.56), describing various tools in English ($\bar{x}$ = 4.54), and discussing in BME ($\bar{x}$ = 4.46). The least important skill was speaking in BME seminars ($\bar{x}$ = 4.39). Moreover, the respondents evaluated their proficiency in all English speaking skills for BME as low. Their highest competency

was describing various tools in English ($\bar{x}$ = 2.59), followed by speaking about technical terms in BME ($\bar{x}$ = 2.50), giving oral presentations in BME ($\bar{x}$ = 2.44), questioning and answering in English lectures ($\bar{x}$ = 2.44), and speaking in BME seminars ($\bar{x}$ = 2.43). The lowest competency was discussing in BME ($\bar{x}$ = 2.39). Regarding the gaps between the necessities and the respondents' proficiency, giving oral presentations in BME was the most problematic (MDF = 2.21), while the least problematic skill was describing various tools in English (MDF = 1.95).

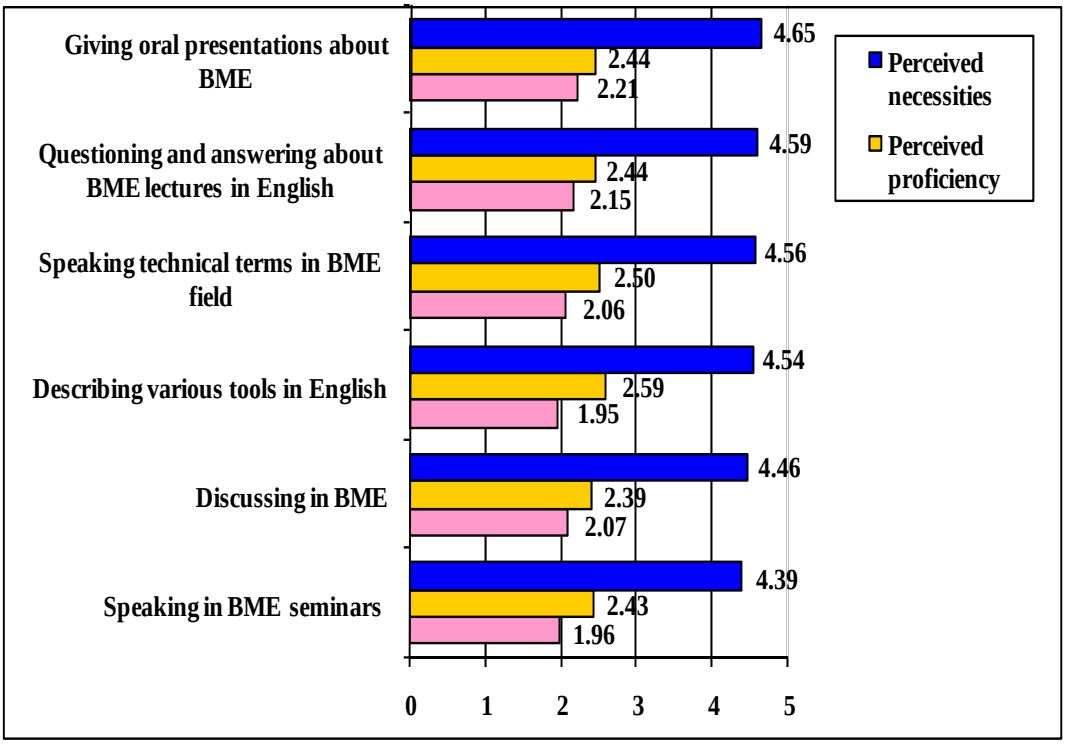

Figure 4.19 Students' self-assessment toward English speaking sub-skills for BME

Figure 4.20 shows that all English reading skills for the BME were defined in the rank of most necessary. Summarizing of reading in BME was stated as the most necessary skill ($\bar{x}$ = 4.61), followed by reading essays or journal articles in the field ($\bar{x}$ = 4.56), and reading technical terms in BME ($\bar{x}$ = 4.54). The least perceived necessary skill was reading manuals of tools in English ($\bar{x}$ = 4.43). Furthermore, the respondents specified their proficiency in all English reading skills in BME as moderate. Their

highest proficiency was reading technical terms ($\bar{x}$ = 3.00). The respondents' proficiency in other academic English reading skills i.e. reading manuals of tools in English ($\bar{x}$ = 2.98), reading BME essays or journal articles ($\bar{x}$ = 2.74), and summarizing their reading ($\bar{x}$ = 2.70) was stated as moderate. Therefore, the most problematic academic reading skill was summarizing in BME (MDF = 1.91), while the least problematic skill was reading manuals in English (MDF = 1.45).

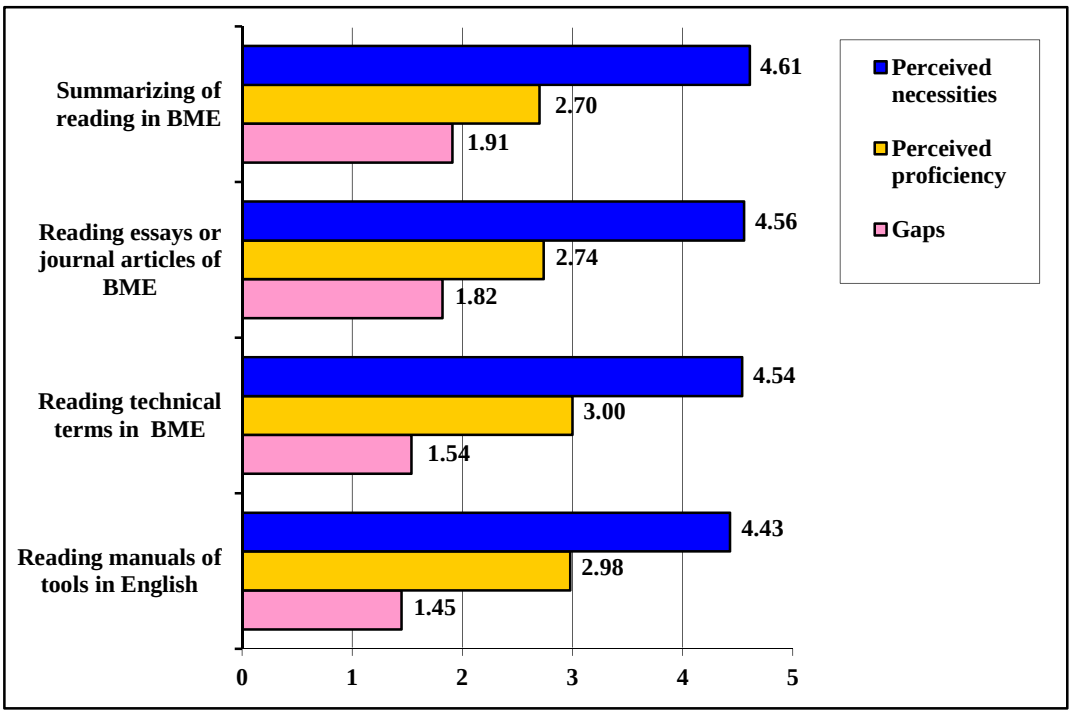

Figure 4.20 Students' self-assessment toward English reading sub-skills for BME

Moreover, regarding Figure 4.21, the respondents perceived all English writing skills for BME as most necessary. The highest essential skill was writing descriptions of technical terms ($\bar{x}$ = 4.52), followed by writing summaries in BME ($\bar{x}$ = 4.50), and writing reports of experimental results ($\bar{x}$ = 4.48). The least important skill was writing essays or journal articles in BME ($\bar{x}$ = 4.41). Apart from their perceived necessities, the respondents evaluated their proficiency in English writing skills for BME as low to moderate. Their highest proficiency was in writing experimental results ($\bar{x}$ = 2.67). Other writing skills, including writing descriptions of

technical terms used in the field ($\bar{x}$ = 2.50), writing summaries ($\bar{x}$ = 2.43), and writing BME essay or journal articles ($\bar{x}$ = 2.24) were stated as low. As a consequence, writing essays or journal articles in BME was the most problematic (MDF = 2.17), while the least problematic skill was writing experiment results (MDF = 1.81).

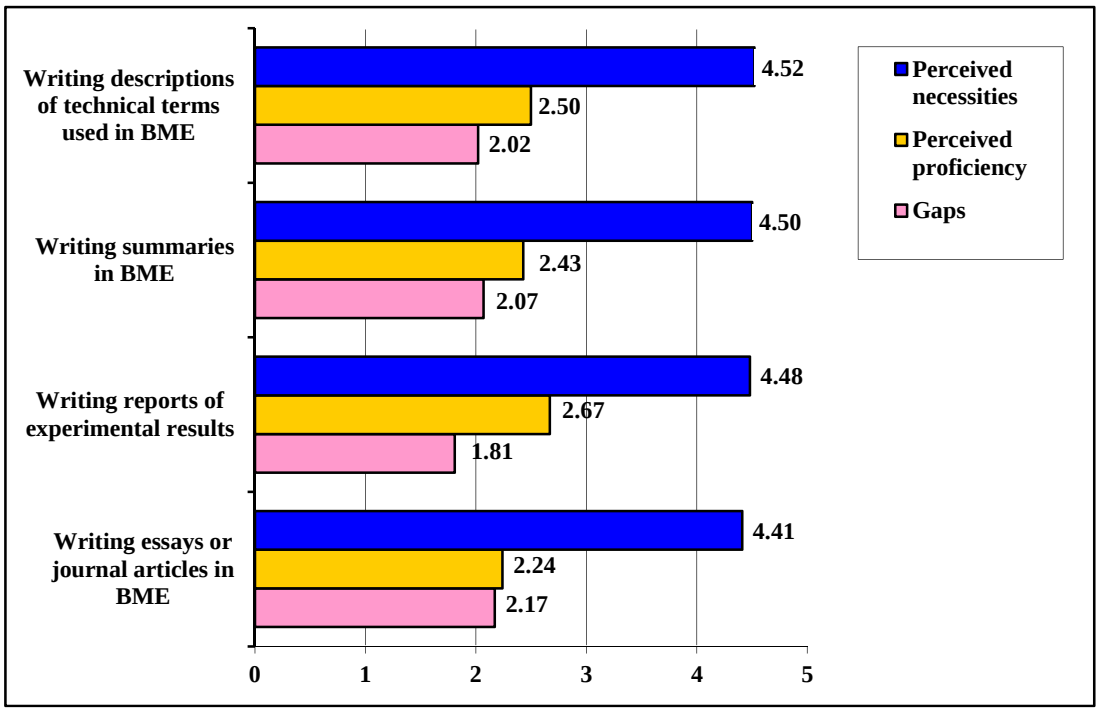

Figure 4.21 Students' self-assessment toward English writing sub-skills for BME

According to the focus group interviews, the interviewees realized the necessity of English for academic purposes rather than specific English for Biomedical Engineering. An interviewee stated that, in terms of studying in BME programs, students needed to read many English journal articles and texts. Students were taught in English lectures and assigned oral presentations in English. However, the interviewee had problems with the listening to English lectures and writing in English. Moreover, because of various sub-fields in BME, he preferred to practice academic English skills which were more advantageous and flexible for all students. The interviewee explained as follow:

Extract 5

A teacher assigned me English journal articles and textbooks to read. Teachers try to lecture on some subjects in English and assign students presentations in English as well. Sometimes, I don't understand the lecture and my writing is not good, so I think all academic English skills are very essential.

Another interviewee preferred to take English for Academic Purposes courses rather than courses specifically for BME. He considered that academic English skills are more beneficial for studying in the BME program and for working in this field.

Extract 6

There are various sub fields in Biomedical Engineering; thus, academic English courses are more useful and flexible than specific English courses. I prefer English for Academic Purpose courses. I think they are widely useful and beneficial for education and careers.

To conclude, the most necessary specific English skills for BME was summarizing from listening. Reading technical terms in the field was perceived as the most proficient academic English skill. Besides, giving oral presentations was considered the main problem according to the highest difference in mean scores. In addition, respondents considered that English for Academic Purposes was more advantageous and widely useful than specific English for Biomedical Engineering courses. Regarding studying through English lectures and text books as well as giving English presentations in class, the respondents described academic English skills as very important for their learning in this program.

4.2 Students' language needs in English courses

This section aims to show data which answers the second research question: "What are the needs of English skills that will be relevant for developing English for Biomedical Engineering courses for Thai undergraduate students?" The findings revealed the students' learning needs, showing the researcher and instructors effective ways of studying and practicing the language. The data tabulating students' desires and suggestions toward the courses were collected through questionnaires and focus group interviews. The findings were divided into three parts: (1) objectives of academic English courses for engineering, (2) course contents, and (3) other suggestions.

4.2.1 Objectives of academic English courses for engineering

The respondents considered the highest desired purpose of studying academic English for engineering was to prepare themselves for work ($\bar{x}$ = 4.56). Other purposes were stated as most desirable, namely to communicate in academic engineering topics ($\bar{x}$ = 4.54), to prepare themselves for postgraduate studies ($\bar{x}$ = 4.50), to listen to academic engineering topics ($\bar{x}$ = 4.46), to prepare themselves for studying through research ($\bar{x}$ = 4.37), to write journal articles ($\bar{x}$ = 4.28), and to read journal articles ($\bar{x}$ = 4.24). Lastly, the purpose of preparing themselves for writing resumes was stated as high ($\bar{x}$ = 4.07) (see Figure 4.22).

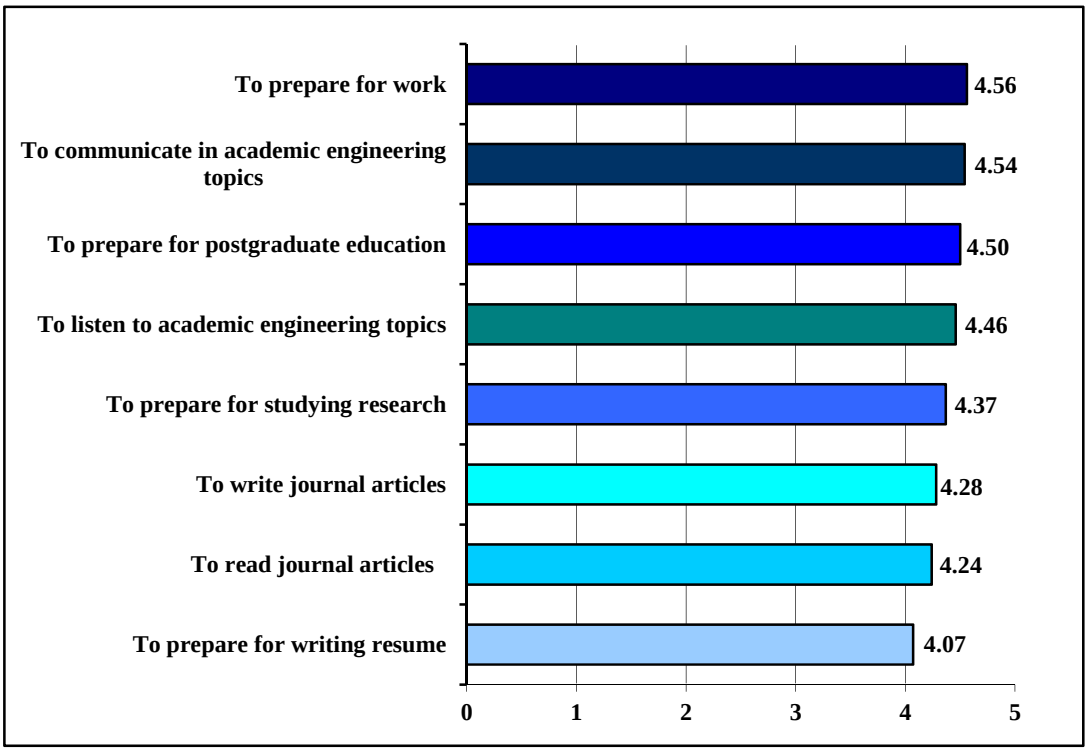

Figure 4.22 Students' desires toward purposes of studying academic English for engineering

In addition, according to focus group interviews, the interviewees expressed other perspectives toward the objectives of the English courses for BME as follow:

> ***Extract 7***
>
> *I expect to practice speaking in the English course. Speaking and other communication skills are necessary for works. I also want to practice academic writing and oral presentations for preparing myself for my senior project and future works.*

This extract relates to the findings of the questionnaire in which the respondents stated their highest English course objective was to prepare themselves for work. This participant desired English courses which allow him to increase his English proficiency to help him cope with senior projects and future work.

4.2.2 Course contents

Based on the questionnaire, the respondents identified their desires, including practicing general English skills, emphasizing skills of English for BME, and focusing on English texts in science and engineering fields. According to Figure 4.23, the respondents stated speaking as their most desired skill ($\bar{x}$ = 4.56), followed by listening ($\bar{x}$ = 4.48), writing ($\bar{x}$ = 4.30), and reading ($\bar{x}$ = 4.00) (see Figure 4.23).

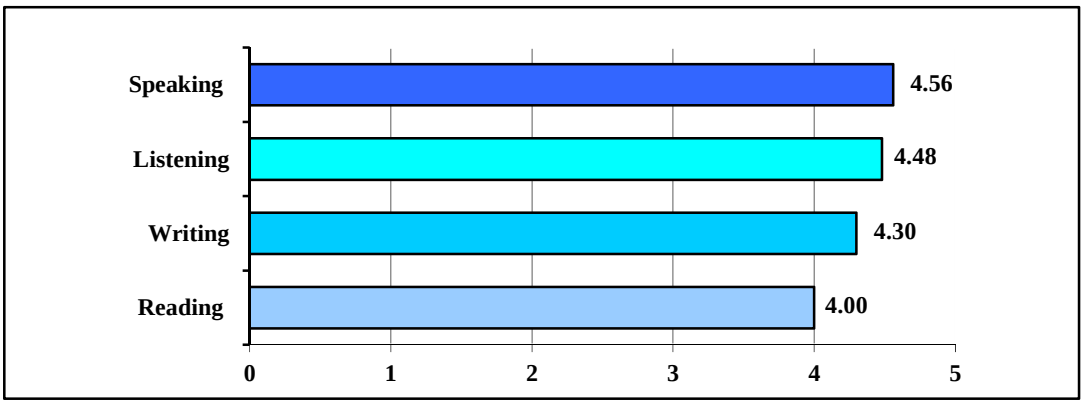

Figure 4.23 Students' demands of practicing general English skills

On the other hand, in terms of English course for BME, the respondents identified the BME workshops ($\bar{x}$ = 4.48) as the most desired of all class activities. Giving oral presentations about BME ($\bar{x}$ = 4.39), attending lectures and seminars ($\bar{x}$ = 4.31), writing journal articles in English ($\bar{x}$ = 4.26), and reading journal articles ($\bar{x}$ = 4.24) were stated as highly desired skills for the English course contents. In addition, the respondents also indicated learning technical terms of BME ($\bar{x}$ = 4.06), and writing reports on the results of experiments ($\bar{x}$ = 3.76) as highly desired. The data are presented in Figure 4.24 as follows.

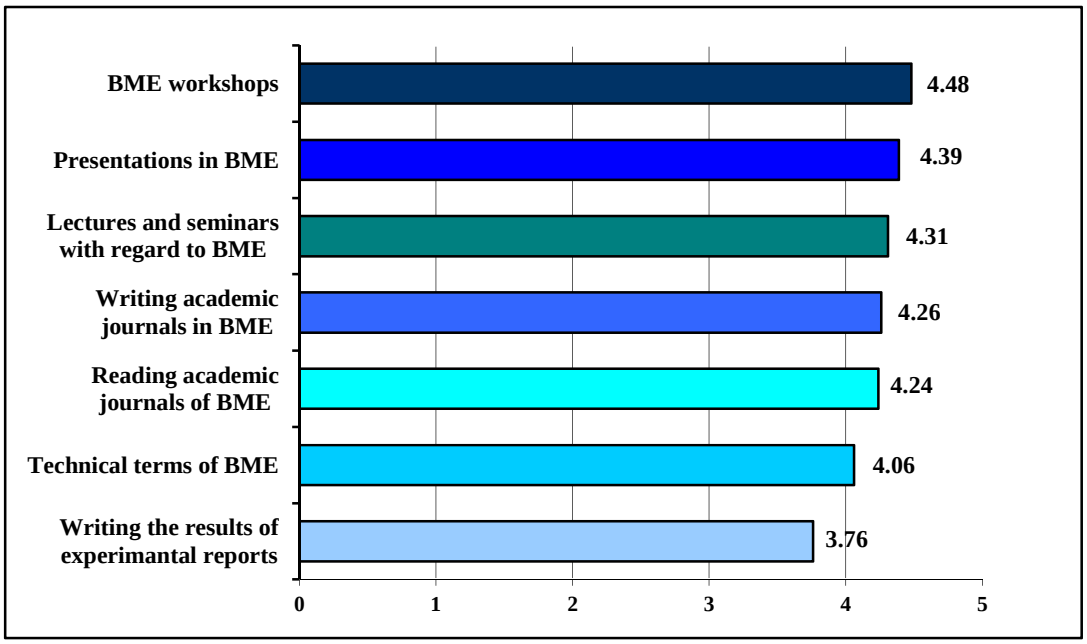

Figure 4.24 Students' desires toward English for BME course contents

Besides the student's needs of English for BME, most of them preferred academic English courses in which the content emphasizes science and engineering. Some participants also expected to practice academic English techniques such as scanning, skimming, and summarizing from reading. Participants mentioned the following:

Extract 8

I prefer the contents of academic English courses which are involved in science and engineering. General English courses in which the content is Liberal Arts are not very useful for our field.

Extract 9

The Biomedical Engineering program highlights reading journals and texts in English, along with teaching through English lectures and media. Reading English texts is not problematic because we can use dictionaries to translate. I also

learn technical terms from journals. I need to practice reading techniques such as speed reading and summarizing.

These extracts clearly show that the interviewees realize the advantages of practicing academic English skills. They consider that academic English skills could help them cope with tasks involved studying in BME and working in this field. Although reading English journal articles was not problematic, they stated their needs in practicing the academic techniques of reading, illustrating, skimming, scanning, and summarizing from reading. The interviewees agreed that academic reading techniques could aid them in reading English texts, journal articles, and research where they can familiarize themselves with technical terms from the English texts. Moreover, they considered that the content of English courses should be based on scientific and engineering fields that would be useful for application in their education and occupations.

4.2.3 Teaching materials and class atmosphere

Apart from the English courses' objectives and contents, teaching materials and class activities cannot be overlooked for language instruction. In terms of increasing the students' learning, teaching materials and activities in classroom are necessary. Likewise, the findings about class atmosphere can help course designers and instructors contribute to the most appropriate and effective means of achieving course objectives. The respondents expressed their needs toward teaching materials, class activities, and class atmosphere of English courses for BME students as follows:

1) Teaching materials

In terms of teaching materials, the respondents identified types of teaching materials and methods of teaching in a range from somewhat to highly desired. In the category of teaching materials, they indicated using English skills in the classroom as most important ($\bar{x}$ = 4.50) followed by a high demand for students' participation ($\bar{x}$ = 4.04). Using authentic and modern instructional media ($\bar{x}$ = 3.48) was also ranked as highly desired. Nevertheless, the respondents stated their expectations in using various instructional technologies ($\bar{x}$ = 3.37) and lectures ($\bar{x}$ = 3.22) as moderately desired (see Figure 4.25).

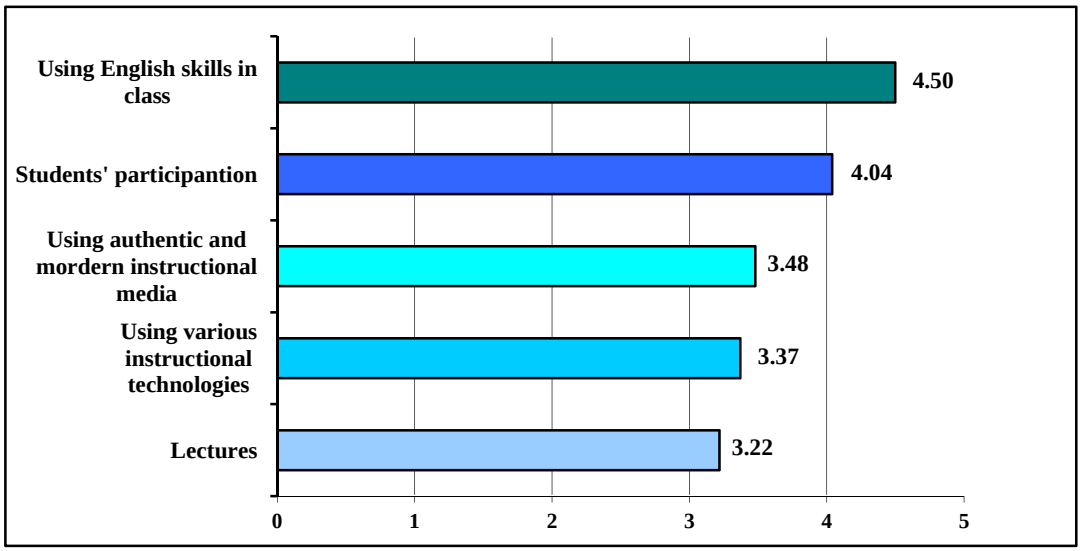

Figure 4.25 Students' demands toward teaching materials

2) Class activities and atmosphere

Class activities ($\bar{x}$ = 3.61) were identified as highly desired in English courses included desired class activities which emphasized academic English ($\bar{x}$ = 3.96, class presentations ($\bar{x}$ = 3.94), class discussions ($\bar{x}$ = 3.93), group discussions ($\bar{x}$ = 3.83), and public presentations ($\bar{x}$ = 3.69). Furthermore, the respondents identified highly demand of individual activities ($\bar{x}$ = 3.61), pair-work activities ($\bar{x}$ = 3.56), and group activities ($\bar{x}$ = 3.59).

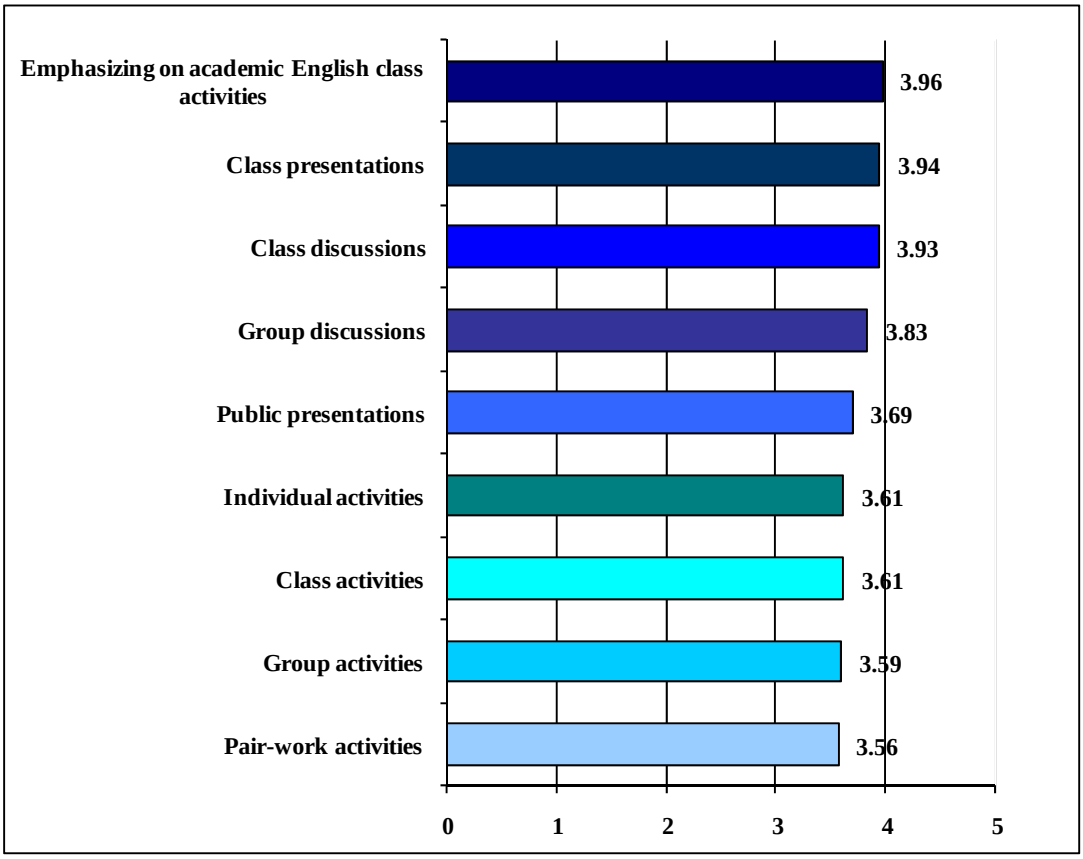

Figure 4.26 Students' demands toward class activities

Finally, in Figure 4.27, the respondents identified the class atmosphere as a highly desired element in language learning. The respondents' most desire was to limit a number of students in each classroom ($\bar{x}$ = 4.28). The respondents preferred that the lecturers were both Thai and foreigners ($\bar{x}$ = 4.15). Further, the seating of lecturers and students should be arranged face-to-face ($\bar{x}$ = 4.06), and the factor of class atmosphere is high desire in the course ($\bar{x}$ = 3.93). In the case of lecturers, the respondents expressed that their desire for classes taught by foreign lecturers ($\bar{x}$ = 3.70). However, they were also somewhat in favor of Thai lecturers ($\bar{x}$ = 2.44).

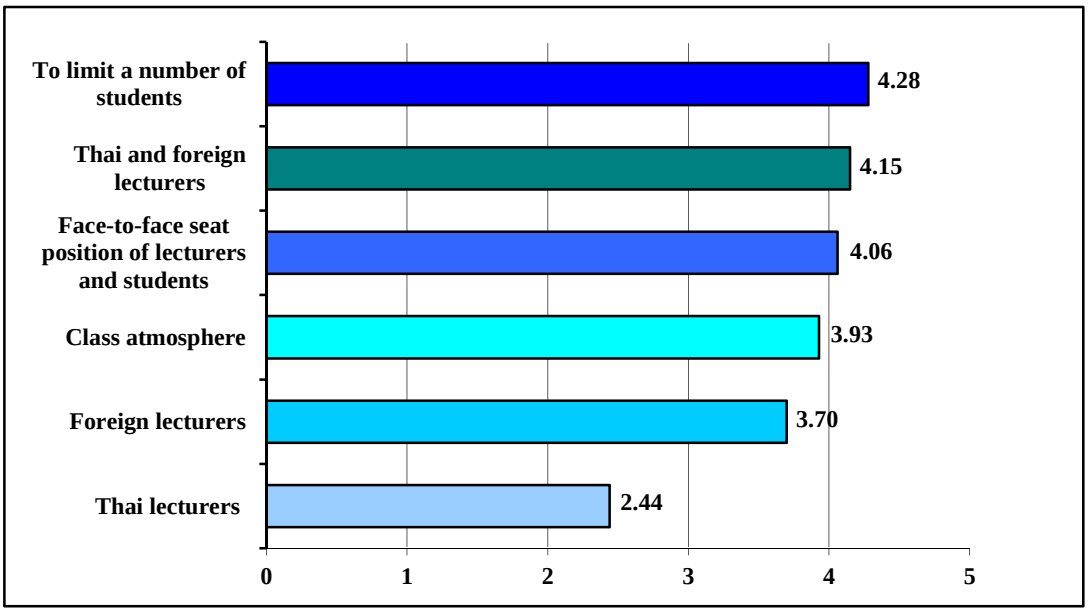

Figure 4.27 Students' demands toward class atmosphere

4.2.4 Other suggestions

Apart from the students' expectations toward objectives of the English courses, course contents, teaching materials, and class atmosphere, the focus group interviews revealed various suggestions for improving the courses. Firstly, because the current English course is made up of the a large number of students with diverse levels of English proficiency, one student suggested limiting a number of students and dividing the English courses into classes (sections) in which instructors could focus on each learner more effectively. The student stated:

Extract 10

The current English Communication for Engineering course has too many students in class who study in various engineering majors. The teacher cannot focus on each student to give feedback. Even though we study in the same field, we have different knowledge in English. It will be better if the English course is divided into sections which limit the number of

students. I think it will be helpful for the teacher in focusing on each student in the classroom.

Secondly, in Extracts 11 and 12, the interviewees claim that academic English skills are useful for studying in the BME program. Academic English courses should be provided for students in the second and the third academic years. Learning academic English techniques at this time helps to prepare the students both for studying in the context of BME and for their senior projects. Moreover, academic English courses should be designed as electives in order for the students to enroll in the courses which meet their needs.

Extract 11

The content of the English course should be academic English. The English course is better divided into sub-skill courses such as academic reading and writing. It should be provided for students in early academic years, probably in the second year to the third year so students will be prepared for studying and reading English content in the third year and for the senior project in the fourth year.

Extract 12

English courses have to be designed as elective academic English courses, such as academic reading, speaking, and writing courses. I think that students have their own needs, so that they can choose to enroll in the course which matches with their wants.

Lastly, most interviewees agreed that to design English specific courses for BME is difficult because of the multidisciplinary nature of BME sub-fields. However, one interviewee considered that English for Academic Purposes was more beneficial for students in variously applying the skills to both education and career. The interviewee mentioned that:

Extract 13

I think that it is hard to offer specific English courses for the Biomedical Engineering program. There are various contents of Biomedical Engineering which are different sub fields. English for Academic Purposes seems to be more suitable for us. Academic English skills will be useful for applying the skills in postgraduate studies and for works.

In conclusion, the students considered the purposes of attending academic English courses as most of them aim to prepare themselves for works and postgraduate education, and to practice their proficiency in English communication. The students also stated their desire to practice all general English skills, and realized the value of practicing English communication through class activities integrated with workshops. Likewise, the students suggested designing the English course for BME students as an academic English course which would be divided into sub-courses, including academic writing and reading, and academic listening and speaking. In addition, the students commented on the problems of existing English courses in which classes are large and students are at different levels of English proficiency.

4.3 Academic staff and stakeholders' expectations

This study employed semi-structured interviews to achieve in-depth information of aspects of insiders including academic staff and stakeholders. The findings aimed to answer the third research question: "What are the expectations of the program chair, subject teachers, English teachers, and stakeholders, in order to develop English for Biomedical Engineering courses?" The research question focused on the expectations of program chair and involved instructors toward undergraduate BME students' proficiency in English, and stakeholders' requirements of biomedical engineers' occupational English language skills. According to semi-structured interviews, authentic language uses in BME careers was identified through viewpoints of the biomedical engineering academic staff and stakeholders. The findings of the

academic staff's and stakeholders' expectations were related to the discussion of target situation analysis in order to specify authentic language uses in both education and occupations. This section includes two main parts: (1) academic staff's expectations toward the undergraduate BME students' English proficiency in terms of education and occupation, and (2) stakeholders' expectations toward occupational English skills which were needed in workplaces.

4.3.1 Academic staff's expectations

First of all, all academic staff realized undergraduate BME students' English proficiency. They agreed that the main problematic English skill of the students was writing skills, especially writing research papers for journal articles in English. Besides, the academic staff were concerned that the students were not yet capable of giving oral presentations in English. However, the academic staff offered different opinions about students' abilities. The English teacher was concerned about the students' lack of grammar knowledge including mistakes in sentence structure and ineffective writing in English. The English teacher said that:

> ***Extract 14***
>
> *Writing is a problematic skill for Thai students who often write using Thai grammar patterns. Sometimes, I cannot understand the content they write in English. Students have limited vocabulary, so they use words inappropriately which is also an obstacle in English communication.*

This teacher was concerned that the students' limited vocabulary interfered with their English communication. Similarly, a subject teacher stated that Thai engineering students usually make many grammatical mistakes in their writing, particularly in English academic writing. Many subject teachers agreed with the English teacher that English writing skill was the main obstacle for students resulting from mistakes in grammar, word choices, and sentence structure were the main obstacles for students. The subject teachers stated as follows:

Extract 15

English writing is the main problematic skill for them. There are a lot of mistakes in grammar, word choices, and sentence structure when they write their senior projects.

Extract 16

Students have problems in most English skills. In terms of writing, grammar structure is the most problematic for students. Few of them are capable of applying English grammar correctly.

Extract 17

Another problematic English skill is writing which the students usually make mistakes in which grammar and sentence structure. Sometimes, neither Thai nor foreign teachers can understand what the students aim to communicate though their English sentences.

Another subject teacher describe that although the students seemed to have fewer difficulties in oral presentations, they could not effectively answer questions in English even when the questions were discussed in their presentations.

Extract 18

The students have problems in speaking English, especially giving oral presentations. Most students remember scripts instead; however, some of them cannot answer the questions about their presentations in English.

In addition, one subject teacher mentioned that BME students initially had problems with academic reading; however, they could improve these skills after they were familiar with reading English assigned tasks.

Extract 19

Initially, students had problems in reading English articles and speaking English, but they can develop those skills to be more proficient when they study in upper academic years.

Besides the academic staff's perspectives toward students' present English proficiency, all academic staff agreed that all English skills are necessary for students' language needs in both postgraduate studies and occupations. The program chair concerned the importance of all English communicative skills; however, she suggested that English speaking and listening skills were the most necessary for graduates. The program chair claimed that:

Extract 20

All English skills are essential for biomedical engineering students. I expect the students to be high proficiency in the four English skills, namely speaking, listening, writing and reading, in order to apply these skills in national and international labor markets. However, speaking and listening skills are the most essential because students must use these skills for face-to-face communication.

Further, the program chair stated that the teaching strategies were designed to encourage undergraduate students to study main subjects in BME through English texts and journal articles, English media, and sometimes through English lectures. As a result, the students will familiarize themselves with technical terms and practice reading and listening. However, the program chair expected the students also to perform effectively in other English skills namely writing senior projects, and giving oral presentations in English. The program chair said that:

Extract 21

In terms of education in the undergraduate Biomedical Engineering program, this curriculum has strategies which train

students to read English textbooks and journals, to write a senior project in English effectively, and to present their project in English. The students will be familiar with technical terms through reading English textbooks and journals, in addition to studying recent innovations which are usually published in English. These strategies will be useful for the students by helping them to develop their academic English skills, knowing technical terms, and being confident in oral presentations.

Apart from the expectations of the program chair, the subject teachers realized the importance of all English skills for BME students, in spite of differing expectations toward English sub-skills. Similar to the program chair's expectations, the subject teachers indicated English speaking as the most necessary skill for BME careers, followed by listening, reading, writing skills. The subject teachers mentioned that:

Extract 22

All English skills are important for careers; however, speaking and listening are more important than writing and reading. In Thailand, many agencies and companies import medical instruments from abroad. Thus, English speaking and listening skills are necessary for graduates in order to apply for occupations which need contact with holding companies abroad. Other skills, such as reading English data sheets, manuals, technical terms, and presenting research in English are also essential for this field, particularly in research and postgraduate studies.

In addition, another subject teacher claimed that all English skills were necessary although the importance of each skill depended on job descriptions and education. The subject teacher claimed that:

Extract 23

All English skills are necessary, depending on students' future occupations or education. In case of postgraduate studies, listening, speaking, and reading academic English are important. The students need to be able to read texts and journals, along with writing reports, and present their projects in English. Speaking, particularly in oral presentations, is essential for conveying their research or projects. Reading manuals, replying to e-mails, and other communicative skills are also necessary for the workplace.

Even though all English skills were perceived as essential for students, the English teacher focused on the essential roles of oral presentations and writing projects in engineering for conveying their research and work to audiences or consumers. Moreover, the English teacher claimed that other English writing sub-skills, such as writing resume, were also needed for applying for a job. The English teacher stated that:

Extract 24

I am concerned with the importance of all English skills; notwithstanding, speaking is highly necessary for students. After they graduate, they must know how to communicate and present effectively. Although their grammar is wrong, what audiences care about is the content. I try to prepare students to be confident in presentation without too much concern for grammatical structure. Engineers have to present their ideas through oral presentations and writing reports or projects. Students should effectively transmit their ideas to co-workers and customers. In addition, they have to know how to write resumes for presenting themselves to employers.

Nonetheless, the English teacher suggested that English courses have to focus on practicing professional English communication, along with designing course content that is involved in scientific and engineering fields. English courses should be offered to students in academic years two and three. The existing two English courses which are offered in the curriculum are not enough. The English teacher commented that the large number of students in a classroom becomes an obstacle to language instruction and classroom management. The English teacher suggested as follow:

> ***Extract 25***
> *Offering academic English courses for students in second and third year students is appropriate. Courses designed for engineering students should be based on scientific and engineering contents. The existing English course is a big section comprising fourth-year engineering students from all programs. Students have different English levels so it's quite hard to manage class activities, but it helps stimulate students who are weak in English. Biomedical Engineering students are better in English compared to other students.*

To conclude, the academic staff considered that although all English skills are necessary. Most academic staff stated that English speaking skill was the most important for BME students in terms of working in this field. The academic staff expected the students to be proficient in speaking and listening skills. As a result of the strategies, academic staff trained the students to read BME journal articles, write reports and project proposals, and listen to English lectures. The staff suggested that teaching through English materials could increase their academic English proficiency, supporting them in their undergraduate education, postgraduate studies, and research.

4.3.2 Stakeholders' expectations regarding students' English proficiency

The findings of semi-structured interviews of six stakeholders who are Human Resource (HR) of each organization revealed the employers' expectations toward undergraduate BME students' English proficiency. The information from

stakeholders identified different competencies depending on occupational descriptions; however, English communication skills, including general speaking, listening, reading, and writing were essential in most careers in this field. Other sub-skills of English communication and academic English are additionally needed in some careers. The following extracts present the perspectives of stakeholders. The stakeholder of an agency of imported medical equipment emphasize employees' proficiency in all English communication skills, abilities of reading English technical manuals and oral presentation (see Extract 26).

Extract 26

The biomedical engineering staff employed as product specialists should be good at English communication, as well as reading medical product manuals in English, and be capable of presenting to customers.

Likewise, other stakeholders of other agencies of imported medical instruments supported the employers' demand of BME staff's proficiency in reading English technical manuals and English communication. According to the job positions and descriptions in the field, the employees who applied for work as service engineers, product specialists, and sales representatives were mainly expected to able to communicate in English effectively, to read medical manuals in English, and to present information about products to customers. The following stakeholders stated:

Extract 27

Our company is an agency for imported medical products to Thailand. The positions which require a bachelor's degree in biomedical engineering are sales representatives, service engineers, and product specialists. Their job descriptions mainly include abilities in effective English communication, especially reading and speaking.

Extract 28

Employees need to read manuals which certainly are English. The staff has to familiarize themselves with the product details because they need to present the information to customers and clearly explain how to use the product.

Another stakeholder of a subsidiary from a medical equipment and supplies company in Singapore stated that Thai biomedical engineering staff have an opportunity to attend training programs with holding companies abroad; therefore, the staffs' proficiency in English communication is essential. This stakeholder claimed that:

Extract 29

The staff should be able to reply to e-mails from the holding company in Singapore, and to inform them about problems with products, so English writing skills are needed. Moreover, staff is required to attend training programs abroad sponsor by the holding company, so the ability to communicate in English essential.

Furthermore, other stakeholders, especially medical product agencies and imported companies, require similar qualifications of general English communication and reading English medical product manuals. In contrast, Thai public hospitals do not concentrate on employees' proficiency of spoken communication in English. Nonetheless, the skill of reading English manuals and writing skill were necessary. A stakeholder of Thai public hospital emphasized that:

Extract 30

Our work focuses on academic English for research, including reading articles, writing reports, and sometimes listening to English seminars. Regarding spoken communication in English, there are few opportunities to communicate with foreigners.

Yet another stakeholder of an technology institute in Thailand whose career is based on research, experiments, and innovating technology for medical equipment, requested that BME graduates have language proficiency of general English communication and academic English skills such as reading and writing journal articles and writing reports. In addition, employees who are able to read English journal articles and research have more opportunities in learning up-to-date innovations. The stakeholder claimed that:

> ***Extract 31***
> *The job description for biomedical engineering staff includes synthesizing chemical polymer for medical instruments. I need staff who have are proficient in listening, speaking, reading, and writing English, especially in reading journals and writing experiments. Employees who can read scientific and medical journal articles benefit both themselves and their careers because new innovations and research are generally published in English.*

In summary, most stakeholders focused on the graduates' proficiency of English communication, along with the ability to read English manuals as the most necessary skills. Other stakeholders emphasized academic English skills, including writing reports and reading journal articles. However, the stakeholders realized the importance of employees' abilities in English communication, whereas the requirements of other English competencies depended on each job description.

4.4 Chapter summary

In conclusion, results from data collected from the four groups were interrelated. Most participants viewed English writing skills as the most problematic, especially writing essays and journal articles, followed by giving oral presentations. Although all groups perceived all English skills as essential, most participants

specifically indicated that speaking was the most necessary in terms of occupations. In addition, the English teacher and students suggested that more English courses should be offered and should be based on scientific and engineering content. The courses need to be offered in the second and third academic years so students can read English texts and journals articles, write their senior projects, give oral presentations and understand lectures in English.

CHAPTER V
DISCUSSIONS AND CONCLUSIONS

This study aimed to conduct a needs analysis of English for undergraduate Biomedical Engineering students through investigating the students' actual language needs and the perceptions of academic staff and stakeholders in order to meet the needs of all parties. The findings offer course designers and English teachers relevant data to establish and improve the English for Biomedical Engineering courses. This chapter presents discussions of research findings on the pedagogical aspects of needs analysis and recommendations for English courses for undergraduate BME students. There are three main parts of this chapter, comprising the discussions of the results, recommendations for English courses for BME students, and conclusions.

5.1 Discussions of the results

According to the purposes of this study, a needs analysis was conducted to reveal the undergraduate BME students' needs for English and the perceptions of academic staff and stakeholders toward the students' English proficiency. The study offers guidelines for course designers and English teachers to improve the current English course and establish future English courses for undergraduate BME students. The researcher employed the triangulation data obtained from the participants and mixed methods for obtaining the findings from three research questions in order to compare results from different sources and methodologies. The findings of this study were discussed into two main aspects. Firstly, regarding the last research question, the results were analyzed as the target situations which the target language is used in the circumstances. The language needs in the target situations were analyzed first, and were discussed in the aspect of occupational factors. Consequently, the findings of the first and the second research questions were discussed in terms of educational factors which focused on students' needs, lacks, and wants toward English for BME.

Therefore, the discussion and implication of findings on the pedagogical aspects of needs analysis consist of two main factors: (1) occupational factors and (2) educational factors.

5.1.1 Occupational factors

According to Hutchinson and Waters' (1987), necessity is the target proficiency which is indicated in the Target Situation Analysis (TSA). The TSA starts by discussing the target needs (what learners need to perform in the target situation) which are the stakeholders' expected language proficiencies from their staff. The lacks between necessities (target proficiency), the learners' existing knowledge, and their wants (learners' desired skills or activities to access the target situation) are defined as the gaps.

The findings of stakeholders' and academic staff's expectations toward students' English proficiency in occupations resulted from the last research question: "What are the expectations of the program chair, subject teachers, English teacher, and stakeholders in order to develop English for Biomedical Engineering courses?" Most stakeholders identified job positions of biomedical engineering staff as product specialists, technicians, and sales representatives. In addition, some stakeholders required researchers from BME fields. As a result, most stakeholders expected BME students to be good at general English communicative skills, including speaking, listening, writing, and reading. The stakeholders anticipated that BME employees would be effective in communicating with foreigners, contacting holding companies in order to report problems of products, and training in foreign countries. Because medical products are invented and imported from abroad, the most necessary skill was reading medical instrument manuals in English. Apart from that, oral presentation was the essential sub-skill in terms of explaining product information to customers. Other sub-skills, such as replying to e-mails, writing reports, writing essays and journal articles, reading essays, and reading journal articles, were required depending on specific fieldwork. Therefore, in this study, the needed English skills for working in BME are various depended on job descriptions. Nevertheless, most careers of BME graduates are product specialists, technicians, and sales representatives; hence, most

stakeholders required BME staff to be effective in English communication skills and reading English manuals.

The present research findings of occupational needs (in the target situation) were relevant to previous research showing that English communicative skills are an important requirement in the workplace, although there are differences in various sub-skills depending on the type of fieldwork. The present research findings are relevant to previous studies' findings in terms of English language needs in workplaces. Kaewpet (2009) indicates from the findings of needs analysis that employers recommend communicative circumstances, reading manuals, and writing process reports for Thai Civil Engineering students. Similar to Dragoescu and Stefanovic (2010), graduate Mechanical engineers are required to have additional soft skills such as communication, entrepreneurship, IT, and business. Lastly, Kassim and Ali's (2010) findings reveal that English communication is considered important for engineers, such as presenting new ideas and strategies, networking for advice and contacts, and teleconferencing. As a result, English communicative skills are essentially for careers in BME and other engineering fields.

Apart from the stakeholders' expectations, all academic staff expected BME students to be proficient in all English communicative skills. Moreover, the program chair suggested that the graduates of the BME program should be highly proficient in all English skills, including speaking, particularly in oral presentations, listening, writing reports, and reading English journal articles. The program chair expects students to be able to communicate in English effectively in the reasons of competition with other engineers in worldwide labor markets. These aspects relate to Kassim and Ali's (2010) findings that fluency in English provides an opportunity for students to advance to positions as global engineers.

In addition, the undergraduate BME students recognized the importance of all English communicative skills. They are related to the target needs requested by the stakeholders. The students had a few gaps in reading skills; however, English writing skills were their lowest ability, including writing essays and journal articles in English, resulting from grammatical mistakes. Subsequently, the students had lacks in listening skills, speaking in oral presentations, and speaking in seminars resulting from limited knowledge of English vocabulary. Most students identified their purpose of practicing

English as preparing for future careers. Moreover, in terms of motivations which play an essential role in language learning, the students desire practicing English communication in the classroom, developing their skills of giving oral presentations, and attending workshops in BME as class activities. In the case of participating in class activities which encourage students to present their ideas and experiences, Lichtenstein (2005) states that students will enhance their communication skills, together with exchanging their experiences and viewpoints among classmates.

As the same time, the undergraduate BME students recognize the necessity for English proficiency in their future careers. They stated their main desires related to the English course objectives were to be able to practice and prepare their English skills for future works. The students also requested other class activities including English communication in the classroom, workshops, and oral presentations for practicing their English proficiency and reducing gaps between their current competency and target necessities.

5.1.2 Educational factors

Based on Hutchinson and Waters (1987), target needs are what the learners need to perform in the target situation for achieving the objectives of the course, while instructors employ the strategies and materials to hold the learners' motivation. The academic staff specified the target needs of English for Thai undergraduate BME students in terms of educational factors. Although English communicative skills and the skill of reading English manuals were categorized as essential abilities for careers, academic English skills were considered necessities in terms of BME education. The academic staff stated that all English skills were important for the students; however, most of them considered English speaking skills, especially oral presentations, as the most necessary. All academic staff expected the students to give oral presentations effectively. Other skills i.e. reading journal articles in BME, writing reports and project proposals, and listening to English lectures were also recognized as vital skills. In the case of postgraduate education, academic writing and reading English essays, journal articles, and research were considered highly necessary skills.

All academic staff stated that, in terms of writing skills, students made grammatical mistakes and wrote English sentences in the form of Thai structure; thus,

instructors were unable to understand the students' writing. However, with speaking skills, the academic staff were not concerned as much about students' grammatical mistakes but focused on their spoken content. Despite students' lack of self-confidence, the academic staff tried to encourage them to practice their speaking skills. This circumstance is relevant to Chooi et al. (2006) who discovered that grammatical mistakes in communication give employees in scientific and technology industries problems in speaking and writing due to their lack of confidence. Most students who had work experiences in BME as apprentices or research assistants realized that all communicative English skills were important in workplaces.

Besides the students' necessities and lacks in English for BME, their wants in language learning take an important role as motivators in the learning process. The undergraduate BME students expressed their various desires toward English course objectives, course contents, teaching methodology, classroom environment, and course syllabus as follows.

1) Objectives of the English courses

Regarding the findings of this study, the BME students recognized the skills related to future occupations such as English speaking skills. The undergraduate BME students indicated their high demand for improving all general English skills, especially speaking, followed by listening, writing, and reading in that order. Most students expect English courses which prepared them for work and postgraduate education. In addition, most students stated that they preferred to take academic English courses rather than general English or specific English for the BME field. The students realized that academic English was the most beneficial for them because academic English skills are necessary for the BME program. At the same time, they need English courses which help them practice English communicative skills for their future careers.

2) Course content

Most students need English for Academic Purposes (EAP) courses which are more advantageous for their postgraduate education and future occupations. The undergraduate BME program requires students to study BME content through English

textbooks and journal articles and sometimes through English lectures and media. The program is designed to encourage students to conduct their senior projects, write reports, and present them in English. By learning through English lectures and reading English textbooks, students become familiar with BME journals and technical terms. Thus, they pay attention to academic English skills more than general English or specific English for BME. The students prefer to take academic English courses which focused on science and engineering content. Some of them stated their need for improving academic English skills such as scanning, skimming, and summarizing from reading. Moreover, the specific contents which students viewed as the most necessary were participating in workshops in BME, followed by giving oral presentations, attending English lectures and seminars, writing academic English journal articles, and reading English academic journals in BME.

3) Teaching methodology and classroom environment

Regarding teaching methodology, the students requested both Thai and foreign instructors, classroom participation, using English communication in the classroom, attending seminars and workshops in BME, studying academic English through science and engineering contents, and practicing academic writing and reading essay and journal articles. Students' wants toward teaching methodology of English courses for BME should be emphasized because their wants impact their motivation in language learning. Moreover, appropriate class activities and classroom atmosphere enhance their proficiency in language skills and other skills in the learning process. Murray and Summerlee (2007) state that to select appropriate pedagogy, such as class discussions, debate, dialog, presentations, and group works, helps stimulate students' classroom experience. In addition, designing tasks and classroom activities to meet the students' wants can increase their academic development (Cheng, 2004).

Apart from that, the students specified the importance of class atmosphere to stimulate their language learning process including face-to-face seating between an instructor and students, and limiting the number of students in the English classroom. Classroom atmosphere and classroom size affect students' class participation; therefore, instructors should consider the importance of the ambience in the classroom suitable for students' wants. Limiting the number of students in the English classroom

increases opportunities for feedback and prompt evaluation from the instructor. Hatziapostolou and Paraskakis (2010) claim that students like to get feedback immediately; nevertheless, some students are not concerned with formative feedback but more interested in getting summative feedback and in the form of the final grade. Furthermore, Morrison (2008) argues that small class size may increase students' participation because they have more opportunities to share ideas and experiences; however, the small class size may also discourage class participation and motivation due to students' limited experiences and lack of information to exchange with classmates. Ezzedeen (2008) suggests that small class size can be boring for students; in contrast, large class size may be better because students have various interests, different language abilities, and intellectual diversity which can stimulate classroom discussions. Moreover, class activities including group discussions and oral communication promote students' inter-relationships and critical thinking.

4) Course syllabus

In this study, most students and the English teacher similarly consider that more English courses should be provided in the curriculum. The research findings are relevant to Koetpo-kha's (1994) findings that students, teachers of English, and subject teachers recognize the importance of English courses. In this current study, most students suggested that academic English courses ought to be offered in the second and third academic years to prepare them for deeper course content and senior project presentation. Moreover, the students suggested that English courses, focusing on academic English, should be provided as elective courses. Furthermore, the students suggested that the number of students in each classroom should be limited and that feedback from the English teacher is necessary for improving their English skills.

According to the findings of this study, there is a high correlation in terms of students' problematic English skills from the four groups of research participants, including students, the program chair, subject teachers, and the English teacher. All groups viewed the writing skill as the most problematic, especially writing journal articles, followed by oral presentations. The four groups perceived all English skills as important for both education and occupation; yet they indicated that speaking was the

most necessary skill for the BME field. Students and academic staff agreed that the speaking skill, especially in oral presentations, was highly essential for deliberating ideas and discussing research with audiences. Due to the necessity for English speaking and writing skills, the program chair, subject teachers, and the English teacher ask their students to write and present their senior projects in English. In addition, although reading was the least problematic skill for the students, the program chair and subject teachers tried to encourage students to read English academic journals. The academic staff expected that reading English academic journal articles could provide up-to-date information relating to innovations and BME technical terms for the students.

5.2 Recommendations of English courses for BME students

The current study employed needs analysis to discover ways for designing and improving English courses for undergraduate BME students which would achieve the needs of all relevant participants: learners, academic staff, and stakeholders. In order to meet the purposes of this study, the researcher conducted needs analysis through investigating actual students' language needs and the perceptions of academic staff and stakeholders in order to offer relevant data for establishing English for Biomedical Engineering courses. Course syllabi should be based on the students' needs and the opinions of academic staff and stakeholders. They cover many elements as follow.

5.2.1 Course framework

In order to design the English courses in a way that promotes students' engagement and interest, instructors should design methods based on students' lacks and wants in English learning. Based on the results of this study, students need to develop their English communication and other academic skills such as giving oral presentations, academic writing, and academic reading. In terms of the students' perspectives, English courses for undergraduate BME students should be designed for class participation and class activities which use English communicative skills in the

classroom. Class activities should not only offer students opportunities to enhance their English communication, but also increase their leadership and critical thinking through sharing ideas and experiences with classmates. At the same time, class participation helps stimulate the students' motivation in language learning.

5.2.2 English course contents

Regarding the results of the current study, English courses for undergraduate BME students should focus on academic English involving scientific and engineering content. The students emphasized the techniques of academic English skills rather than general English or English for Specific Purposes courses. The students desired to improve their academic speaking skills, especially oral presentations. In terms of writing for academic purposes, they expected to practice the techniques of writing academic journals and reports. In case of reading for academic purposes, the students expected to learn techniques of scanning, skimming, summarizing, reading academic essays and journal articles. Moreover, they wanted to practice summarizing from listening to BME lectures, and needed to attend BME presentations and seminars. However, the students also wanted to practice their general English communicative skills through using English in class activities and workshops. Even though the students emphasized English for academic purposes, they perceived the high necessity and importance of all English skills.

5.2.3 English courses in the curriculum

As a result of this study, academic or specific English courses should be offered early in the curriculum, preferably in the second and the third academic years. Moreover, the English courses ought to be continuously offered, but as electives due to variations in students needs, namely writing and reading for academic purposes, English speaking and listening, and communicative English courses. Subsequently, English for communication or for professional purposes i.e. writing resume, giving oral presentations, replying to e-mails, and communicating in workplaces, should be provided for students in the fourth year students in order to prepare them for employment.

5.3 Conclusions

This is a study which investigates undergraduate Biomedical Engineering students' actual language needs of English and perceptions of academic staff and stakeholders in order to meet the needs for all parties. In addition, based on its results, the study offers guidelines for establishing English for Biomedical Engineering courses for a course designer and English teachers. It employed needs analysis to reveal insights into authentic needs from the relevant subject groups toward the English courses in the curriculum. Besides the students' perspectives and expectations toward EAP course content, the students proposed class activities rather than focusing on lectures. Instructors should design the teaching-learning process to stimulate classroom interaction, maintain sustainability for improving students' English proficiency, and match students' motivations.

5.4 Suggestions for future studies

Regarding the results and limitations of the current study, the following suggestions for further studies can be made as follows:

1) Because this study involves only a particular university in Thailand, in further studies, it would be interesting to gather data from all Thai universities and institutes which offer an undergraduate BME program.

2) The research methodology of this study is mainly based on Hutchinson and Waters' (1987) framework of target situation analysis and learning needs analysis, together with applying the Jordan's (1997) needs analysis approach in the data collection process. However, due to the purposes and limitations, the researcher did not employ the procedure of students' achievement evaluation in this study. Therefore, the researcher suggests course designers and instructors employ the process of the evaluation in the future studies.

3) Using focus-group and semi-structured interviews and questionnaires as the research instruments, this study is limited to the opinions of the participants. For future studies, the researcher suggests employing classroom observation and in-depth interviews for gathering wider and deeper information from participants.

4) There are many expectations of stakeholders and academic, as well as various students' desires in the English course. Hence, in the future studies, the researcher suggest studying the appropriate ways and strategies in designing English courses, including materials, activities, and tasks, to meet the various needs of all involved participants.

5) Careers in biomedical engineering based in Thailand seem to be limited as sales representatives, product specialists, and technicians. In future studies, it would be interesting to survey perspectives from stakeholders in worldwide labor markets with additional job opportunities in the field.

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APPENDICES

APPENDIX A
QUESTIONNAIRE FOR THE THIRD YEAR AND THE FOURTH YEAR BIOMEDICAL ENGINEERING STUDENTS

แบบสอบถามเกี่ยวกับผู้เรียน

วันที่เก็บข้อมูล_____ เดือน_____ ปี พ.ศ._____

สถานที่_____ ฉบับที่_____

แบบสอบถามสำหรับนักศึกษาสาขาวิศวกรรมชีวการแพทย์ ชั้นปีที่ 3-4

เรื่อง การวิเคราะห์ความต้องการจำเป็นของวิชาภาษาอังกฤษสำหรับวิศวกรรมชีวการแพทย์: กรณีศึกษาของนักศึกษาไทยในระดับปริญญาตรี

คำชี้แจง แบบสอบถามฉบับนี้เป็นแบบสำรวจความคิดเห็นเกี่ยวกับความสามารถ ความจำเป็น และความต้องการในการใช้ภาษาอังกฤษเชิงวิชาการของนักศึกษา คำตอบของท่านทุกข้อจะเป็นประโยชน์อย่างยิ่งต่อการวิเคราะห์ข้อมูล เพื่อเป็นแนวทางในการพัฒนาหลักสูตรภาษาอังกฤษเชิงวิชาการสำหรับนักศึกษาวิศวกรรมชีวการแพทย์ และเป็นแนวทางสำหรับหลักสูตรภาษาเพื่อวัตถุประสงค์เชิงวิชาการอื่น ๆ ดังนั้น**การให้ข้อมูลตามความเป็นจริงและการตอบคำถามตามความคิดเห็นที่แท้จริง**ของท่านจะเป็นประโยชน์อย่างยิ่งต่องานวิจัยครั้งนี้

ขอรับรองว่าคำตอบของท่านจะถือเป็นความลับ การนำเสนอข้อมูลจะนำเสนอโดยรวม

จึงขอความกรุณาให้ตอบตามความเป็นจริง

หวังเป็นอย่างยิ่งว่าจะได้รับความร่วมมือจากทุกท่านเป็นอย่างดี และขอขอบคุณมา ณ โอกาสนี้

สวภัทร เตชะพันธุ์
นักศึกษาหลักสูตรศิลปศาสตร์มหาบัณฑิต
สถาบันวิจัยภาษาและวัฒนธรรมเอเชีย มหาวิทยาลัยมหิดล

แบบสอบถามประกอบด้วยเนื้อหาทั้งหมด 3 ส่วน ได้แก่

ส่วนที่ 1 ข้อมูลเบื้องต้นของนักศึกษา

ส่วนที่ 2 ความคิดเห็นของนักศึกษาที่มีต่อความจำเป็นในการใช้ทักษะและความสามารถในการใช้ภาษาอังกฤษเชิงวิชาการและภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์

ส่วนที่ 3 ความคิดเห็นของนักศึกษาที่มีต่อความต้องการในวิชาภาษาอังกฤษเชิงวิชาการ

ส่วนที่ 1 ข้อมูลเบื้องต้นของนักศึกษา

<u>คำชี้แจง</u> กรุณาทำเครื่องหมาย ✓ ลงใน◯ หน้าคำตอบที่ท่านเลือก หรือเขียนคำตอบลงในช่องว่าง

1. เพศ ◯ ชาย ◯ หญิง อายุ _____ ปี

2. ความคาดหวังหลังจากจบการศึกษาสาขาวิศวกรรมชีวการแพทย์

◯ ทำงาน โปรดระบุ ◯ ทำงานในสาขาวิศวกรรมชีวการแพทย์ ◯ ทำงานในสาขาอื่น

◯ ศึกษาต่อ โปรดระบุ ◯ สาขาวิศวกรรมชีวการแพทย์ ◯ สาขาอื่นๆ _____

3. นักศึกษาต้องการช่วงเวลาที่เหมาะสมในการเรียนการสอนวิชาภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรแบบใด

3.1 ควรจัดหลักสูตรให้มีการสอนวิชาภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรฯชั้นปีใด

◯ ปี 1 ◯ ปี 2 ◯ ปี 3 ◯ ปี 4

โปรดอธิบาย _____

3.2 ควรจัดให้มีการสอนวิชาภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรจำนวนกี่คอร์ส

◯ 1 คอร์ส ◯ 2 คอร์ส ◯ 3 คอร์ส ◯ 4 คอร์ส ◯ อื่นๆ (โปรดระบุ)____

โปรดอธิบาย _____

3.3 ท่านคิดว่าการเรียนการสอน English Communication for Engineers สำหรับนักศึกษาวิศวกรรมศาสตร์ทุกสาขาวิชา สามารถตอบโจทย์ความต้องการในการใช้ภาษาอังกฤษเฉพาะด้านของท่านได้หรือไม่

◯ ได้

◯ ไม่ได้

3.4 ควรจัดการสอนวิชา**ภาษาอังกฤษเฉพาะสำหรับวิศวกรสาขาวิศวกรรมชีวการแพทย์**หรือไม่

◯ ควร เน้นด้านใดบ้าง

- ◯ คำศัพท์
- ◯ บทความวิชาการ
- ◯ การสื่อสารภาษาอังกฤษทั่วไป
- ◯ การสื่อสารภาษาอังกฤษเฉพาะสาขาวิศวกรรมชีวการแพทย์
- ◯ อื่น ๆ (โปรดระบุ) _____

◯ ไม่ควร โปรดอธิบาย _____

3.5 หลักสูตรควรจัดให้มีการสอนภาษาอังกฤษสำหรับวิศวกรแบบใด

3.5.1 ควรมีการจัดสอนภาษาอังกฤษสำหรับวิศวกรอย่างต่อเนื่องหรือไม่

◯ ควร ◯ ไม่ควร

โปรดอธิบาย _____

3.5.2 ควรมีการแบ่งการสอนภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรออกเป็นคอร์สย่อยหรือไม่ (เช่น วิชาการเขียนภาษาอังกฤษเชิงวิชาการ การอ่านภาษาอังกฤษเชิงวิชาการ ฯลฯ)

◯ ควร ◯ ไม่ควร

โปรดอธิบาย _____

3.5.3 นักศึกษาคิดว่าหลักสูตรควรเน้นให้มีการเรียนการสอนภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรมากกว่าปัจจุบันหรือไม่

◯ ควร ◯ ไม่ควร

โปรดอธิบาย_____

3.6 หลักสูตรควรจัดให้มีรายวิชาสหกิจศึกษาหรือไม่

◯ ควร ◯ ไม่ควร

โปรดอธิบาย _____

3.7 ประสบการณ์การทำงานสายวิศวกรรมชีวการแพทย์

◯ เคย ได้แก่ ◯ ฝึกงาน ◯ อื่นๆโปรดระบุ_____

◯ ไม่เคย (ข้ามไปทำส่วนที่ 2)

3.8 จากประสบการณ์ทำงาน/ฝึกงาน ท่านคิดว่ามีความจำเป็นต้องใช้ทักษะภาษาอังกฤษทั่วไปทักษะใดบ้างในการทำงาน/ฝึกงาน

◯ จำเป็น ได้แก่ ◯ การฟัง ◯ การพูด ◯ การอ่าน ◯ การเขียน

◯ ไม่จำเป็น

3.9 จากประสบการณ์ทำงาน/ฝึกงาน ท่านคิดว่ามีความจำเป็นต้องใช้**ทักษะภาษาอังกฤษเฉพาะสาขาวิศวกรรมชีวการแพทย์**ในการทำงาน/ฝึกงานหรือไม่ อย่างไร

◯ จำเป็น โปรดอธิบาย _____

◯ ไม่จำเป็น

ส่วนที่ 2 ความคิดเห็นของนักศึกษาที่มีต่อความสามารถและความจำเป็นในการใช้ทักษะภาษาอังกฤษเชิงวิชาการและภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์ของตนเอง

<u>คำชี้แจง</u> กรุณาทำเครื่องหมาย ◯ ล้อมรอบหมายเลข 1-5 ของแต่ละข้อความเพื่อระดับความจำเป็นในการใช้ภาษาอังกฤษตามความคิดของท่านและระบุระดับความสามารถที่เป็นอยู่จริงในขณะนี้ หรือเขียนคำตอบลงในช่องว่างที่กำหนดให้

1	2	3	4	5
น้อยที่สุด	น้อย	ปานกลาง	มาก	มากที่สุด

รายการ	**ความจำเป็นในการใช้**	**ความสามารถในปัจจุบัน**
1. ทักษะการใช้**ภาษาอังกฤษทั่วไป**ของนักศึกษา		
1.1 การฟัง	1 2 3 4 5	1 2 3 4 5
1.1.1 การฟังการสนทนาทั่วไปในชีวิตประจำวัน	1 2 3 4 5	1 2 3 4 5
1.1.2 การฟังประโยคสั้น ๆ	1 2 3 4 5	1 2 3 4 5
1.1.3 การฟังประโยคยาว ซับซ้อนต่อเนื่อง	1 2 3 4 5	1 2 3 4 5
1.1.4 การฟังอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
1.2 การพูด	1 2 3 4 5	1 2 3 4 5
1.2.1 การพูดสนทนาทั่วไปในชีวิตประจำวัน	1 2 3 4 5	1 2 3 4 5
1.2.2 การพูดประโยคสั้น ๆ	1 2 3 4 5	1 2 3 4 5
1.2.3 การพูดประโยคยาว ซับซ้อนต่อเนื่อง	1 2 3 4 5	1 2 3 4 5
1.2.4 การพูดอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
1.3 การอ่าน	1 2 3 4 5	1 2 3 4 5
1.3.1 การอ่านสื่อสิ่งพิมพ์ทั่วไป เช่น หนังสือพิมพ์ จดหมาย ประกาศต่างๆ โฆษณา e-mail website blog ฯลฯ	1 2 3 4 5	1 2 3 4 5
1.3.2 การอ่านข้อความสั้น ๆ	1 2 3 4 5	1 2 3 4 5
1.3.3 การอ่านข้อความยาว ซับซ้อนต่อเนื่อง	1 2 3 4 5	1 2 3 4 5
1.3.4 การอ่านอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
1.4 การเขียน	1 2 3 4 5	1 2 3 4 5

รายการ	ความจำเป็นในการใช้	ความสามารถในปัจจุบัน
1.4.1 การเขียนสิ่งพิมพ์ทั่วไป เช่น บันทึก จดหมาย ประกาศต่างๆ e-mail website blog ฯลฯ	1 2 3 4 5	1 2 3 4 5
1.4.2 การเขียนข้อความสั้น ๆ	1 2 3 4 5	1 2 3 4 5
1.4.3 การเขียนข้อความยาว ซับซ้อนต่อเนื่อง	1 2 3 4 5	1 2 3 4 5
1.4.4 การเขียนอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
2. การใช้ทักษะ**ภาษาอังกฤษเชิงวิชาการ**ของนักศึกษา		
2.1 การใช้ทักษะ**<u>การฟัง</u>**ในภาษาอังกฤษเชิงวิชาการของนักศึกษา		
2.1.1 การฟังจับใจความจากการบรรยายเป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
2.1.2 การฟังคำถาม-คำตอบในการบรรยายโดยใช้**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
2.1.3 การฟังนำเสนอการรายงาน	1 2 3 4 5	1 2 3 4 5
2.1.4 การฟังการอภิปราย	1 2 3 4 5	1 2 3 4 5
2.1.5 การฟังการสัมมนา	1 2 3 4 5	1 2 3 4 5
2.1.6 การสรุปความจากการฟัง	1 2 3 4 5	1 2 3 4 5
2.1.7 การฟังอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
2.2 การใช้ทักษะ**<u>การพูดใ</u>**นภาษาอังกฤษเชิงวิชาการของนักศึกษา		
2.2.1 การถามคำถาม-ตอบคำถามในการบรรยายเป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
2.2.2 การพูดนำเสนอ/ รายงานเป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
2.2.3 การพูดอภิปราย	1 2 3 4 5	1 2 3 4 5
2.2.4 การพูดสัมมนา	1 2 3 4 5	1 2 3 4 5
2.2.5 การพูดอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
2.3 การใช้ทักษะ**<u>การอ่าน</u>**ในภาษาอังกฤษเชิงวิชาการของนักศึกษา		
2.3.1 การอ่านเรียงความ หรือบทความวิชาการ	1 2 3 4 5	1 2 3 4 5

รายการ	ความจำเป็นในการใช้	ความสามารถในปัจจุบัน
2.3.2 การสรุปเรื่องจากการอ่าน	1 2 3 4 5	1 2 3 4 5
2.3.3 การอ่านเนื้อหาอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
2.4 การใช้ทักษะ**<u>การเขียน</u>**ในภาษาอังกฤษเชิงวิชาการของนักศึกษา		
2.4.1 การเขียนจับใจความการบรรยายเป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
2.4.2 การเขียนเรียงความ หรือบทความทางวิชาการ	1 2 3 4 5	1 2 3 4 5
2.4.3 การเขียนบันทึกการอ่าน (note-taking)	1 2 3 4 5	1 2 3 4 5
2.4.4 การเขียนสรุปใจความสำคัญ (summarizing)	1 2 3 4 5	1 2 3 4 5
2.4.5 การเขียนถอดความ (paraphrasing)	1 2 3 4 5	1 2 3 4 5
2.4.6 การเขียนสังเคราะห์ (synthesizing)	1 2 3 4 5	1 2 3 4 5
2.4.7 การเขียนอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
3. การใช้ทักษะ**ภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์**ของนักศึกษา		
3.1 การใช้ทักษะ**<u>การฟัง</u>**ภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์ของนักศึกษา		
3.1.1 การฟังคำศัพท์เฉพาะทางวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.1.2 การฟังคำถาม-คำตอบในการบรรยายที่มีเนื้อหาเกี่ยวกับวิศวกรรมชีวการแพทย์เป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
3.1.3 การฟังจับใจความจากการฟังบรรยายที่มีเนื้อหาเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.1.4 การฟังนำเสนอ/รายงานการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.1.5 การฟังการอภิปรายเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.1.6 การฟังการสัมมนาเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5

รายการ	ความจำเป็นในการใช้	ความสามารถในปัจจุบัน
3.1.7 การสรุปความจากการฟังเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.1.8 การฟังอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
3.2 การใช้ทักษะ**<u>การพูด</u>**ภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์ของนักศึกษา		
3.2.1 การพูดโดยใช้คำศัพท์เฉพาะทางวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.2.2 การพูดบรรยายเครื่องมือต่างๆ เป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
3.2.3 การถามคำถาม-ตอบคำถามในการบรรยายที่มีเนื้อหาเกี่ยวกับวิศวกรรมชีวการแพทย์เป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
3.2.4 การพูดนำเสนอ/ รายงานเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.2.5 การพูดอภิปรายเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.2.6 การพูดสัมมนาเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.2.7 การพูดอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
3.3 การใช้ทักษะ**<u>การอ่าน</u>**ภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์ของนักศึกษา		
3.3.1 การอ่านคำศัพท์เฉพาะทางวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.3.2 การอ่านคำสั่งและข้อบ่งใช้เครื่องมือต่างๆ เป็น**ภาษาอังกฤษ**	1 2 3 4 5	1 2 3 4 5
3.3.3 การอ่านเรียงความ หรือบทความวิชาการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.3.4 การสรุปเรื่องจากการอ่านเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.3.5 การอ่านเนื้อหาอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5
3.4 การใช้ทักษะ**<u>การเขียน</u>**ภาษาอังกฤษเฉพาะทางวิศวกรรมชีวการแพทย์ของนักศึกษา		

รายการ	ความจำเป็นในการใช้	ความสามารถในปัจจุบัน
3.4.1 การเขียนบรรยายโดยใช้คำศัพท์เฉพาะทางวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.4.2 การเขียนจับใจความการบรรยายเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.4.3 การเขียนรายงานผลการทดลอง	1 2 3 4 5	1 2 3 4 5
3.4.4 การเขียนเรียงความ หรือบทความวิชาการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5	1 2 3 4 5
3.4.5 การเขียนอื่น ๆ (ระบุ) _____	1 2 3 4 5	1 2 3 4 5

ส่วนที่ 3 ความคิดเห็นของนักศึกษาที่มีต่อความต้องการในวิชาภาษาอังกฤษเชิงวิชาการของตนเอง

<u>คำชี้แจง</u> กรุณาทำเครื่องหมาย ◯ ล้อมรอบหมายเลข 1-5 ของแต่ละข้อความเพื่อระบุระดับความต้องการของท่านที่มีต่อการเรียนการสอนวิชาภาษาอังกฤษเชิงวิชาการสำหรับวิศวกรหรือเขียนคำตอบลงในช่องว่างที่กำหนดให้

1 2 3 4 5

น้อยที่สุด น้อย ปานกลาง มาก มากที่สุด

รายการ	ความต้องการ
1. นักศึกษาต้องการพัฒนาทักษะการใช้**ภาษาอังกฤษทั่วไป**ในด้านต่อไปนี้มากน้อยเพียงใด	
1.1 การฟัง	1 2 3 4 5
1.2 การพูด	1 2 3 4 5
1.3 การอ่าน	1 2 3 4 5
1.4 การเขียน	1 2 3 4 5

รายการ	ความต้องการ
1.5 ทักษะอื่น ๆ (ระบุ) _____	1 2 3 4 5
2. นักศึกษามีความต้องการในการเรียนวิชา**ภาษาอังกฤษเชิงวิชาการ**สำหรับวิศวกร เพื่อวัตถุประสงค์ใด	
2.1 เพื่อการอ่านบทความทางวิชาการ	1 2 3 4 5
2.2 เพื่อการเขียนบทความทางวิชาการ	1 2 3 4 5
2.3 เพื่อการฟังเกี่ยวกับเนื้อหาทางวิชาการ	1 2 3 4 5
2.4 เพื่อการพูดสื่อสารเกี่ยวกับเนื้อหาทางวิชาการ	1 2 3 4 5
2.5 เพื่อเตรียมความพร้อมในการเขียนจดหมายสมัครงาน	1 2 3 4 5
2.6 เพื่อเตรียมความพร้อมในการประกอบอาชีพ	1 2 3 4 5
2.7 เพื่อเตรียมความพร้อมในการศึกษาต่อระดับบัณฑิตศึกษา	1 2 3 4 5
2.8 เพื่อเตรียมความพร้อมในศึกษางานวิจัย	1 2 3 4 5
2.9 เพื่อวัตถุประสงค์อื่น ๆ (ระบุ) _____	1 2 3 4 5
3. นักศึกษาคิดว่าการเรียนการสอนวิชา**ภาษาอังกฤษเชิงวิชาการ**สำหรับวิศวกรควรเน้นลักษณะการเรียนการสอนในด้านต่อไปนี้มากน้อยเพียงใด	
3.1 เน้นฝึกทักษะการใช้ภาษาอังกฤษของผู้เรียน เช่น ฟัง พูด อ่าน เขียน	1 2 3 4 5
3.2 เน้นการบรรยายของครูผู้สอนเป็นหลัก	1 2 3 4 5
3.3 นักศึกษามีส่วนร่วมในการเรียนการสอน	1 2 3 4 5
3.4 ใช้เทคโนโลยีประกอบการสอนที่หลากหลาย เช่น คอมพิวเตอร์ ฯลฯ	1 2 3 4 5
3.5 ใช้สื่อประกอบการสอนที่สมจริงและทันสมัย เช่น internet วีดีทัศน์ เอกสาร ฯลฯ	1 2 3 4 5
3.6 ลักษณะของการทำกิจกรรมในห้องเรียนของนักศึกษา	1 2 3 4 5
3.6.1 กิจกรรมเดี่ยว	1 2 3 4 5
3.6.2 กิจกรรมคู่	1 2 3 4 5
3.6.3 กิจกรรมกลุ่ม	1 2 3 4 5
3.7 เน้นการให้นักศึกษาทำกิจกรรม (เชิงปฏิบัติ) ทางวิชาการเป็นภาษาอังกฤษ	1 2 3 4 5
3.7.1 นำเสนองานในชั้นเรียน	1 2 3 4 5
3.7.2 นำเสนองานในต่อหน้าสาธารณะ	1 2 3 4 5

รายการ	ความต้องการ
3.7.3 อภิปรายแลกเปลี่ยนความคิดเห็นในชั้นเรียน	1 2 3 4 5
3.7.4 การอภิปรายกลุ่ม	1 2 3 4 5
3.7.5 อื่น ๆ (ระบุ) _____	1 2 3 4 5
3.8 ลักษณะห้องเรียนและสิ่งแวดล้อมในห้องเรียน	1 2 3 4 5
3.8.1 จำนวนนักศึกษาควรมีจำนวนไม่มากนัก	1 2 3 4 5
3.8.2 ลักษณะการจัดที่นั่ง ควรจัดให้ผู้เรียนและผู้สอนเห็นหน้ากัน	1 2 3 4 5
3.8.3 ครูผู้สอน/ ผู้บรรยายเป็น**ชาวไทย**เท่านั้น	1 2 3 4 5
3.8.4 ครูผู้สอน/ ผู้บรรยายเป็น**ชาวต่างชาติ**เท่านั้น	1 2 3 4 5
3.8.5 ครูผู้สอน/ ผู้บรรยายเป็น**ชาวไทย**และ/ หรือ**ชาวต่างชาติ**	1 2 3 4 5
4. นักศึกษาคิดว่าการเรียนการสอนวิชา**ภาษาอังกฤษเฉพาะทางสำหรับวิศวกรรมชีวการแพทย์**ควรเน้นลักษณะการเรียนการสอนในด้านต่อไปนี้มากน้อยเพียงใด	1 2 3 4 5
4.1 คำศัพท์เฉพาะทางวิศวกรรมชีวการแพทย์	1 2 3 4 5
4.2 การเขียนบันทึกผลการทดลอง	1 2 3 4 5
4.3 การเขียนบทความวิชาการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5
4.4 การอ่านบทความวิชาการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5
4.5 การนำเสนองานเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5
4.6 เข้าร่วมฟังบรรยายและสัมมนาวิชาการเกี่ยวกับวิศวกรรมชีวการแพทย์	1 2 3 4 5
4.7 การประชุมเชิงปฏิบัติการ/ การทดลองปฏิบัติงานจริง (workshop)	1 2 3 4 5
4.8 กิจกรรมอื่น ๆ (ระบุ) _____	1 2 3 4 5

5. ข้อเสนอแนะอื่น ๆ

_____

_____

ขอขอบคุณเป็นอย่างยิ่งที่ให้ความร่วมมือในการตอบแบบสอบถามครั้งนี้

Questionnaire for students

Date of data collection_____ Month_____ Year_____

Place_____ No._____

Questionnaire for the third year and the fourth year Biomedical Engineering students

Topic Needs Analysis of English for Biomedical Engineering Students: A Case Study of Thai Undergraduate Students

Description The following questionnaire is the survey about proficiency, necessities, and needs of using academic English of students. All of your information will particularly useful for analysis in approaching development of Academic English course for Biomedical Engineering (BME) students and to approach in development of other academic English courses. Therefore, **giving truthfully information and answers** will be effective for this study.

Certify that your answers will be unseen.

The results of this study will present in general.

Look forward to get the cooperation from all of you and thank you.

Sawapat Techapun
Master of Arts Program student
Research Institute for Languages and Cultures of Asia

The questionnaire consisted of three parts.

Part 1 Student's general information

Part 2 Student's opinions toward perceived necessities and proficiency of academic English and English for BME skills

Part 3 Student's opinions toward needs of academic English courses

Part 1 Student's general information

Description Tick ✓at your selected answer or fill the answer in the blank

1. Gender ◯ Male ◯ Female Age_____ years old

2. The expectation after graduated from Biomedical Engineering (BME) program

◯ Working specify ◯ BME field ◯ Other fields_____

◯ Studying specify ◯ BME program ◯ Other programs____

3. How do you think toward proper academic year for teaching English for engineering?

3.1 Which year of studying in university do you think is proper for teaching academic English for engineering?

◯ 1st Year ◯ 2nd Year ◯ 3rd Year ◯ 4th Year

because_____

3.2 How many courses of academic English for engineering should be taught?

◯ 1course ◯ 2 courses ◯ 3 courses ◯ 4 courses ◯ Others (specify)__

because_____

3.3 Do you think teaching English Communication for Engineers for all engineering programs would be achieve your expectation of specific English in engineering ?

◯ Yes

◯ No

3.4 Do you think **English for Biomedical Engineering courses** should be specifically provided?

◯ Yes Which skills should be concentrated?

◯ Vocabulary

◯ Journal articles

◯ General English communication

◯ English communication for engineers

◯ Others (specify) _____

◯ No because_____

3.5 What kind of English courses for engineering should be taught?

3.5.1 Should English courses be continually provided for engineering?

◯ Yes ◯ No

because _____

3.5.2 Should English for Engineering courses be divided into sub-courses? (For example, English academic writing, English academic reading etc.)

◯ Yes ◯ No

because _____

3.5.3 At present, do you think academic English for engineering course should be more emphasized?

◯ Yes ◯ No

because _____

3.6 Do you think the cooperative education courses necessary?

◯ Yes ◯ No

because _____

3.7 Do you have any BME work experience?

◯ Yes Such as ◯ Apprentice ◯ Others (Specify) _____

◯ No (Skip to part 2)

3.8 From your working experience, do you think general English skills are necessary? Which skills?

◯ Yes Such as ◯ Listening ◯ Speaking ◯ Reading ◯ Writing

◯ No

3.9 From your working experience, do you think English for BME skills are necessary? Please specify.

◯ Yes because _____

◯ No

Part 2 Student's opinions toward problems and necessities of using academic English skills and English skills for BME

Description Please ◯ the appropriate number 1 to 5 to describe your competency and perceived necessities of using English skills or fill answers in the blank.

1 2 3 4 5

Least Low Moderately High Most

Classification	Necessity	Proficiency
1. Using of general English skills		
1.1 Listening	1 2 3 4 5	1 2 3 4 5
1.1.1 Listening to general conversation	1 2 3 4 5	1 2 3 4 5
1.1.2 Listening to short sentences	1 2 3 4 5	1 2 3 4 5
1.1 .3 Listening to complex sentences	1 2 3 4 5	1 2 3 4 5
1.1.4 Other (specify)_____	1 2 3 4 5	1 2 3 4 5
1.2 Speaking	1 2 3 4 5	1 2 3 4 5
1.2.1 Speaking general conversation	1 2 3 4 5	1 2 3 4 5
1.2.2 Speaking short sentences	1 2 3 4 5	1 2 3 4 5
1.2.3 Speaking complex sentences	1 2 3 4 5	1 2 3 4 5
1.2.4 Other (specify)_____	1 2 3 4 5	1 2 3 4 5

Classification	Necessity	Proficiency
1.3 Reading	1 2 3 4 5	1 2 3 4 5
1.3.1 Reading general printing medias such as newspaper, letter, announcement, advertisement, e-mail, website, blog etc.	1 2 3 4 5	1 2 3 4 5
1.3.2 Reading short sentences	1 2 3 4 5	1 2 3 4 5
1.3.3 Reading complex sentences	1 2 3 4 5	1 2 3 4 5
1.3.4 Other (specify)_____	1 2 3 4 5	1 2 3 4 5
1.4 Writing	1 2 3 4 5	1 2 3 4 5
1.4.1 Writing general printing medias such as newspaper, letter, announcement, advertisement, e-mail, website, blog etc.	1 2 3 4 5	1 2 3 4 5
1.4.2 Writing short sentences	1 2 3 4 5	1 2 3 4 5
1.4.3 Writing complex sentences	1 2 3 4 5	1 2 3 4 5
1.4.4 Other (specify)_____	1 2 3 4 5	1 2 3 4 5
2. Using of academic English skills		
2.1 Using of academic English **listening** skills		
2.1.1 Listening to core content from **English** lectures	1 2 3 4 5	1 2 3 4 5
2.1.2 Listening to questions and answers of **English** lectures	1 2 3 4 5	1 2 3 4 5
2.1.3 Listening to presentations	1 2 3 4 5	1 2 3 4 5
2.1.4 Listening to discussions	1 2 3 4 5	1 2 3 4 5
2.1.5 Listening in seminars	1 2 3 4 5	1 2 3 4 5
2.1.6 Summarizing from listening	1 2 3 4 5	1 2 3 4 5
2.1.7 Others (specify)_____	1 2 3 4 5	1 2 3 4 5

Classification	Necessity	Proficiency
2.2 Using of academic English **speaking** skills		
2.2.1 Questioning and answering of lectures in **English**	1 2 3 4 5	1 2 3 4 5
2.2.2 Oral presentations in English	1 2 3 4 5	1 2 3 4 5
2.2.3 Giving a speech	1 2 3 4 5	1 2 3 4 5
2.2.4 Speaking in seminars	1 2 3 4 5	1 2 3 4 5
2.2.5 Others (specify)_____	1 2 3 4 5	1 2 3 4 5
2.3 Using of academic English **reading** skills		
2.3.1 Reading essays or journal articles	1 2 3 4 5	1 2 3 4 5
2.3.2 Summarizing from reading	1 2 3 4 5	1 2 3 4 5
2.3.3 Others (specify)_____	1 2 3 4 5	1 2 3 4 5
2.4 Using of academic English **writing** skills		
2.4.1 Writing core content of lectures in **English**	1 2 3 4 5	1 2 3 4 5
2.4.2 Writing essays or journal articles	1 2 3 4 5	1 2 3 4 5
2.4.3 Note-taking	1 2 3 4 5	1 2 3 4 5
2.4.4 Summarizing	1 2 3 4 5	1 2 3 4 5
2.4.5 Paraphrasing	1 2 3 4 5	1 2 3 4 5
2.4.6 Synthesizing	1 2 3 4 5	1 2 3 4 5
2.4.7 Others (specify)_____	1 2 3 4 5	1 2 3 4 5

Classification	Necessity	Proficiency
3. Using English skills for BME		
3.1 Using English **listening** skills for BME		
3.1.1 Listening to technical terms in BME	1 2 3 4 5	1 2 3 4 5
3.1.2 Listening to the questions and answers of BME lectures in English	1 2 3 4 5	1 2 3 4 5
3.1.3 Listening to core content of BME lectures	1 2 3 4 5	1 2 3 4 5
3.1.4 Listening to presentations in BME	1 2 3 4 5	1 2 3 4 5
3.1.5 Listening to discussions in BME	1 2 3 4 5	1 2 3 4 5
3.1.6 Listening to seminars in BME	1 2 3 4 5	1 2 3 4 5
3.1.7 Summarizing from listening in BME	1 2 3 4 5	1 2 3 4 5
3.1.8 Others (specify)_____	1 2 3 4 5	1 2 3 4 5
3.2 Using English **speaking** skills for BME		
3.2.1 Speaking technical terms in BME	1 2 3 4 5	1 2 3 4 5
3.2.2 Describing various tools in English	1 2 3 4 5	1 2 3 4 5
3.2.3 Questioning and answering in BME lectures in English	1 2 3 4 5	1 2 3 4 5
3.2.4 Oral presentations in BME	1 2 3 4 5	1 2 3 4 5
3.2.5 Discussions in BME	1 2 3 4 5	1 2 3 4 5
3.2.6 Speaking in BME seminars	1 2 3 4 5	1 2 3 4 5
3.2.7 Others (Specify)_____	1 2 3 4 5	1 2 3 4 5
3.3 Using English **reading** skills for BME		
3.3.1 Reading technical terms in BME	1 2 3 4 5	1 2 3 4 5

Classification	Necessity	Proficiency
3.3.2 Reading manuals of tools in English	1 2 3 4 5	1 2 3 4 5
3.3.3 Reading essays or journal articles in BME	1 2 3 4 5	1 2 3 4 5
3.3.4 Summarizing of reading in BME	1 2 3 4 5	1 2 3 4 5
3.3.5 Others (Specify)_____	1 2 3 4 5	1 2 3 4 5
3.4 Using of English **writing** skills for BME		
3.4.1 Writing descriptions of technical terms used in BME	1 2 3 4 5	1 2 3 4 5
3.4.2 Writing summarizing in BME	1 2 3 4 5	1 2 3 4 5
3.4.3 Writing experimental results	1 2 3 4 5	1 2 3 4 5
3.4.4 Writing essays or journal articles in BME	1 2 3 4 5	1 2 3 4 5
3.4.5 Others (specify)_____	1 2 3 4 5	1 2 3 4 5

Part 3 Student's opinions toward needs of academic English course

Description Please ◯ the appropriate number 1 to 5 to describe your needs toward teaching of academic English for Engineering or fill answers in the blank.

1	2	3	4	5
Least	Low	Moderately	High	Most

Classification	Needs
1. Which general English skills do you want to improve? How?	
1.1 Listening	1 2 3 4 5
1.2 Speaking	1 2 3 4 5
1.3 Reading	1 2 3 4 5
1.4 Writing	1 2 3 4 5
1.5 Other skills (specify) _____	1 2 3 4 5
2. What are your purposes of studying academic English for Engineering?	
2.1 To read the journal articles	1 2 3 4 5
2.2 To write the journal articles	1 2 3 4 5
2.3 To listen to the academic English of engineering topics	1 2 3 4 5
2.4 To communicate in academic English of engineering topics	1 2 3 4 5
2.5 To prepare yourself for writing resume	1 2 3 4 5
2.6 To prepare yourself for works	1 2 3 4 5
2.7 To prepare yourself for postgraduate education	1 2 3 4 5
2.8 To prepare yourself for studying the research	1 2 3 4 5
2.9 Other purposes (Specify) _____	1 2 3 4 5

Classification	Needs
3. Do you think which skills of academic English for Engineering need to be emphasized curriculum? How?	
3.1 To emphasize students' using English skills such as listening speaking reading and writing	1 2 3 4 5
3.2 To emphasize the lecturers	1 2 3 4 5
3.3 Students participations	1 2 3 4 5
3.4 Using various instruction technologies (such as computer etc.)	1 2 3 4 5
3.5 Using authentic and modern instruction medias such as Internet, video, document etc.	1 2 3 4 5
3.6 Class activities	1 2 3 4 5
3.6.1 Individual activities	1 2 3 4 5
3.6.2 Pair activities	1 2 3 4 5
3.6.3 Group activities	1 2 3 4 5
3.7 Emphasizing academic English in class activities	1 2 3 4 5
3.7.1 Class presentations	1 2 3 4 5
3.7.2 Public presentations	1 2 3 4 5
3.7.3 Class discussions	1 2 3 4 5
3.7.4 Group discussions	1 2 3 4 5
3.7.5 Others (specify) _____	1 2 3 4 5
3.8 Classroom atmosphere	1 2 3 4 5
3.8.1 To limit a number of students	1 2 3 4 5
3.8.2 Seat position of instructor and students should be face-to- face	1 2 3 4 5
3.8.3 The lecturers must be **Thai** only.	1 2 3 4 5
3.8.4 The lecturers must be **foreigners** only.	1 2 3 4 5
3.8.5 The lecturers must be **both** Thai and foreigners.	1 2 3 4 5

Classification	Needs
4. What should be emphasized instruction of English for BME?	
4.1 Technical terms of BME	1 2 3 4 5
4.2 Writing experimental reports	1 2 3 4 5
4.3 Writing journal articles of BME	1 2 3 4 5
4.4 Reading journal articles of BME	1 2 3 4 5
4.5 Oral presentations in BME	1 2 3 4 5
4.6 Attend to the BME lectures and seminars	1 2 3 4 5
4.7 Workshops	1 2 3 4 5
4.8 Other activities (specify) _____	1 2 3 4 5

5. Other suggestions

_____

_____

Thank you for your cooperation

APPENDIX B
RESULTS OF THE QUESTIONNAIRE

Table 1

Students' proficiency and necessities of using general English skills

General English skills	N	Perceived necessities	Perceived proficiency	Problems (gaps)
		$\bar{x}$	$\bar{x}$	MDF
Listening	54	4.35	3.02	1.33
Speaking	54	4.30	2.83	1.47
Reading	54	4.24	**3.07**	1.17
Writing	54	**4.46**	2.59	**1.87**

Note: **Bold** = highest value for each variable

Table 2

Students' self-assessment toward proficiency and necessities of using general English
sub-skills

General English sub-skills	N	Perceived necessities	Perceived proficiency	Problems (gaps)
		$\bar{x}$	$\bar{x}$	MDF
Listening to general conversation	54	**4.37**	3.31	1.06
Listening to short sentences	54	4.07	**3.87**	0.20
Listening to complex sentences	54	4.26	2.33	**1.93**
Speaking general conversation	54	**4.37**	3.26	1.11
Speaking short sentences	54	4.04	**3.57**	0.47
Speaking complex sentences	54	4.24	2.61	**1.63**
Reading general printed media	54	4.04	3.31	0.73
Reading short sentences	54	3.81	**3.83**	-0.02
Reading complex sentences	54	**4.44**	2.70	**1.74**
Writing general printing media	54	4.22	2.80	1.42
Writing short sentences	54	3.81	**3.43**	0.38
Writing complex sentences	54	**4.39**	2.41	**1.98**

Note: **Bold** = highest value for each variable

Table 3

Students' proficiency and necessities of using academic English skills

Academic English skills	N	Perceived necessities	Perceived proficiency	Problems (gaps)
		$\bar{x}$	$\bar{x}$	MDF
Listening				
Listening to core content from **English** lectures	54	4.50	2.52	1.98
Listening to the questions and answers of **English** lectures	54	4.50	2.56	1.94
Listening to presentations	54	**4.54**	2.52	**2.02**
Listening to discussions	54	4.41	2.48	1.93
Listening to seminars	54	4.35	2.44	1.91
Summarizing from listening	54	**4.54**	**2.61**	1.89
Speaking				
Questioning and answering of in English lectures	54	4.44	2.52	1.92
Oral presentations in English	54	**4.63**	**2.57**	2.06
Giving a speech	54	4.48	2.39	**2.09**
Speaking in seminars	54	4.39	2.31	2.08
Reading				
Reading essays or journal articles	54	**4.67**	**2.91**	**1.76**
Summarizing from reading	54	4.57	2.85	1.72

Academic English skills	**N**	**Perceived necessities**	**Perceived proficiency**	**Problems (gaps)**
		$\bar{x}$	$\bar{x}$	MDF
<u>Writing</u>				
Writing core content of **English** lectures	54	4.44	2.50	1.94
Writing essays or journal articles	54	**4.65**	2.30	**2.35**
Note-taking	54	4.41	**3.06**	1.35
Summarizing	54	4.44	2.87	1.57
Paraphrasing	54	4.20	2.76	1.44
Synthesizing	54	4.24	2.44	1.80

Note: **Bold** = highest value for each variable

Table 4

Students' proficiency and necessities of using English for Biomedical Engineering (BME) skills

English for Biomedical Engineering (BME) sub-skills	N	Perceived necessities	Perceived Proficiency	Problems (gaps)
		$\bar{x}$	$\bar{x}$	MDF
<u>Listening</u>				
Listening to technical terms in BME field	54	4.41	2.59	1.82
Listening to the questions and answers of BME lectures in **English**	54	4.59	2.54	2.05
Listening to core content of BME lectures	54	4.56	**2.65**	1.91
Listening to presentations in BME	54	4.52	2.52	2.00
Listening to discussions in BME	54	4.39	2.59	1.80
Listening to seminars in BME	54	4.39	2.46	1.93
Summarizing from listening in BME	54	**4.72**	2.52	**2.20**
<u>Speaking</u>				
Speaking technical terms in BME	54	4.56	2.50	2.06
Describing various tools in **English**	54	4.54	**2.59**	1.95
Questioning and answering in BME lectures in **English**	54	4.59	2.44	2.15
Oral presentations in BME	54	**4.65**	2.44	**2.21**
Discussions in BME	54	4.46	2.39	2.07
Speaking in BME seminars	54	4.39	2.43	1.96

English for Biomedical Engineering (BME) sub-skills	**N**	**Perceived necessities**	**Perceived Proficiency**	**Problems (gaps)**
		$\bar{x}$	$\bar{x}$	MDF
<u>Reading</u>				
Reading technical terms in BME	54	4.54	**3.00**	1.54
Reading manuals in **English**	54	4.43	2.98	1.45
Reading essays or journal articles of BME	54	4.56	2.74	1.82
Summarizing of reading in BME	54	**4.61**	2.70	**1.91**
<u>Writing</u>				
Writing description of BME technical terms	54	**4.52**	2.50	2.02
Writing summarize in BME	54	4.50	2.43	2.07
Writing experimental results	54	4.48	**2.67**	1.81
Writing essays or journal articles in BME	54	4.41	2.24	**2.17**

Note: **Bold** = highest value for each variable

Table 5

Students' needs of academic English in Biomedical Engineering course

Groups	N	Needs
		$\bar{x}$
Practicing general English skills		
Listening	54	4.48
Speaking	54	**4.56**
Reading	54	4.00
Writing	54	4.30
Purposes of studying academic English for Engineering		
To read journal articles	54	4.24
To write journal articles	54	4.28
To listen to academic English for Engineering topics	54	4.46
To communicate in academic English for Engineering topics	54	4.54
To prepare yourself for writing resume	54	4.07
To prepare yourself for work	54	**4.56**
To prepare yourself for postgraduate education	54	4.50
To prepare yourself for studying the research	54	4.37

Groups	N	Needs
		$\bar{x}$
Teaching materials and class activities		
Students' using English skills in class	54	**4.50**
Lectures	54	3.22
Students' participation	54	4.04
Using various instructional technologies	54	3.37
Using authentic and modern instruction medias	54	3.48
Class activities	54	3.61
Individual activities	54	3.61
Pair-work activities	54	3.56
Group activities	54	3.59
Emphasizing academic class activities in English	54	3.96
Class presentations	54	3.94
Public presentations	54	3.69
Class discussions	54	3.93
Group discussions	54	3.83
Classroom atmosphere	54	3.93
To limit a number of students	54	4.28
Seat position of instructor and students should be face-to-face.	54	4.06
The lecturers must be **Thai** only.	54	2.44
The lecturers must be **foreigners** only.	54	3.70
The lecturers must be **both** Thai and foreigners.	54	4.15

Groups	N	Needs
		$\bar{x}$
Emphasized skills of English for Biomedical Engineering		
Technical terms of BME	54	4.06
Writing the experimental reports	54	3.76
Writing journal articles in BME	54	4.26
Reading journal articles in BME	54	4.24
Presentation about BME	54	4.39
Attend to the BME lectures and seminars	54	4.31
Workshops	54	**4.48**

Note: **Bold** = highest value for each variable

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