The Development of Self-Instructional Materials to Enhance English Listening Skills for Engineering Students

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Abstract

The main objective of this study was to develop self-instructional materials to enhance English listening skills for engineering students. The initial phase was needs analysis where questionnaires were distributed to 300 students from year 1-4 of academic year 2015 in the School of Engineering, University of Phayao in order to conceptualize materials and their academic specifications, e.g. language use and the organization of activities in each unit and physical specifications (printing and layout, the recorded sound quality of a CD). The second phase examined the results from the needs analysis along with a Six T's approach developed using Stroller and Grabe (1997) where the contents of commercial textbooks' and authentic materials were adapted as listening activities and learning lessons for self-instructional materials. In the last phase, the developed self-instructional materials were tested for 8 weeks with a group of 30 engineering students from years 1-4 who failed the TOEIC mock exam. The findings indicated that after exposure through activities and lessons in the developed materials, students' mean scores of their post listening achievement test significantly improved from their pretest score at a significance level (α) .05 and students also expressed their positive opinions towards both academic contents and physical contents of the developed self-instructional materials.

Keywords: English listening skills, Self-Instructional Materials, Six-T's approach

การพัฒนาสื่อการเรียนรู้ด้วยตนเองเพื่อพัฒนาทักษะการฟังภาษาอังกฤษสำหรับนิสิตวิศวกรรมศาสตร์

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บทคัดย่อ

งานวิจัยนี้มีจุดประสงค์เพื่อพัฒนาสื่อการเรียนรู้ด้วยตนเอง เพื่อใช้ในการพัฒนาทักษะการฟังสำหรับนิสิตคณะวิศวกรรมศาสตร์ ในช่วงแรกของการวิจัยได้ใช้แบบสอบถามสำรวจและวิเคราะห์ความต้องการจำเป็นจากนิสิตคณะวิศวกรรมศาสตร์ตั้งแต่ชั้นปีที่ 1-4 ปีการศึกษา 2558 ของมหาวิทยาลัยพะเยาจำนวน 300 คน เพื่อใช้เป็นกรอบพัฒนาสื่อการเรียนรู้ด้วยตนเองในลักษณะของหนังสือและซีดี กรอบการพัฒนาสื่อฯจะครอบคลุมทั้งในด้านวิชาการ เช่น ความเหมาะสมของภาษาที่นำมาใช้ในบทเรียน การจัดเรียงกิจกรรมของแต่ละหน่วยการเรียน เป็นต้น

และด้านกายภาพ เช่น รูปแบบการตีพิมพ์และคุณภาพของเสียงที่บันทึกในซีดี เป็นต้น ช่วงที่สองของการวิจัยได้นำผลสำรวจความต้องการมาเป็นแนวทางในการคัดสรรเนื้อหาจากตำราเรียนเชิงพาณิชย์และสื่อการเรียนของจริงต่างๆที่เหมาะสม มาประยุกต์สร้างบทเรียนเพื่อพัฒนาทักษะการฟังภาษาอังกฤษตามแนวทางการสร้างสื่อการเรียนแบบ Six T ของสตรอเลอร์และเกรบ (1997) ช่วงสุดท้ายของการวิจัยได้นำสื่อการเรียนรู้ด้วยตนเองที่พัฒนาขึ้น มาทดลองใช้กับนิสิตคณะวิศวกรรมศาสตร์ตั้งแต่ชั้นปีที่ 1-4 ที่ไม่ผ่านเกณฑ์การทดสอบการฟังภาษาอังกฤษจากข้อสอบ TOEIC เสมือนจริง จำนวน 30 คนเป็นเวลา 8 สัปดาห์ผลการวิจัยพบว่าหลังการใช้สื่อฯ นิสิตมีคะแนนทดสอบผลสัมฤทธิ์การฟังภาษาอังกฤษโดยเฉลี่ยสูงกว่าก่อนการใช้สื่อฯอย่างมีนัยสำคัญทางสถิติที่ระดับความเชื่อมั่น (α).05 และยังมีความเห็นเชิงบวกต่อสื่อการเรียนฯที่ได้พัฒนาขึ้นทั้งด้านวิชาการและด้านกายภาพ

คำสำคัญ: ทักษะการฟัง ภาษาอังกฤษสื่อการเรียนรู้ด้วยตนเอง กระบวนการ Six-T

1. Introduction

The number of people who can speak English with at least some degree of proficiency exceeds any other languages day by day so it is widely recognized that such language is now the prime means for communication and serves as the global language of peoples from different cultures where English is not the native tongue (El-Raghy, 1999). English communication skills become a crucial qualification for a successful engineering job seeker to be hired in Thailand or abroad as the language is used in most international organizations and publications in engineering field and considered one of the best career enhancers and the essential factor in determining career's success or failure (Polack-Wahl, 2000) (cited in Reimer, 2007). Most engineers whose native language is not English would find disadvantages in their professional terms (Orr, 2002). In the workplace, engineering graduates are increasingly required English communication skills especially skills of listening since 45% of human communication is based on listening skills (Kline, 1996).

In the context of educational settings, however, many listening courses, especially for engineering students, have been relegated to more manageably hasty topic-driven sessions like speaking, reading, and writing (Field, 2008: 1). Many scholars in the arena have gone against such practice and provided several reasons to support listening skills to be the primary modalities achieved for learning second language (L2) like English. Underwood (1989) and Buck (2001) noted that learning a language, listening should be firstly achieved like a child learns a mother language and

receives a large amount of verbal input through listening prior to developing speaking, writing, and reading skills. Krashen (1989) (cited in Loewen, 2015) further mentioned that listening helps draw learner's attention to new forms of the language i.e. vocabulary, grammar, and interaction patterns. Thus, listening comprehension provides appropriate conditions for language acquisition and the development of other language skills.

In the context of educational settings, the materials provide the basis for the content of lessons, the balance of skills taught, and the kinds of language practice students take part in. In other circumstances, materials serve primarily to supplement the teacher's instruction. For learners, materials may provide the major source of contact they have with the language apart from the teacher. Hence the role and uses of various learning sources besides their textbooks in a classroom are a significant aspect of education reform especially in Thailand (Sadiman, 2004).

Effective materials used in English classrooms especially as a foreign language classes (EFL) are a crucial aspect to develop English communication skills. English instructional materials in an ESP course like engineering should seek up to provide exposure to the specialized genres and registers of English for engineering purposes, to support learning through stimulating cognitive processes and providing a structure and progressions for learners to follow, to motivate learners through providing achievable challenges and interesting content, and to provide a resource for self-study outside of the classroom (Brenes, 2012).

Although there is a wide variety of commercial textbooks (created materials) aimed at assisting ESP populations, specially produced materials or original materials should also be created based on authentic samples of oral and/or written discourse. By implementing the use of original materials, instructors will try to meet the learners' specific needs identified in the needs analysis. Within an ESP context, Richards (2001: 252) has indicated that "authentic materials are preferred over created materials because they contain authentic language and reflect real-world uses of language compared with the contrived content of much created material". Additionally, the findings from the research conducted by Detaramani and Chan (1999) indicated that great advantage of using specially produced materials over textbook activities relies on

the fact that students possessed more English listening skills and value self-instruction to improve their English since the first type of resources can be easily modified throughout the course depending on the improvement and progress made by students and on the pacing of the course. On the contrary, the use of a series of lessons taken from textbooks in an ESP course constrains the possibility of making changes in the curriculum.

Therefore, the aim of the study was to produce self-instructional materials from the background of the stakeholders' needs namely engineering learners and then are recorded and offered to learners on a CD with paper and pencil exercises to examine to what extent these materials help the learners achieve their English listening skills.

2. Research Questions

This paper aims at examining the effectiveness of the developed self-instructional materials on English listening skills of engineering students and attempts to answer the following questions:

1. What are the needs of English listening skills for engineering students?

2. How can self-study materials that help enhance English listening skills for engineering students be developed?

3. How effective are the developed self-study materials?

4. What is the attitude of engineering students towards the developed self-study materials?

3. Research Hypothesis

To examine the effectiveness of the self-instructional materials to enhance listening skills for engineering students, the following hypotheses are formulated.

1. The developed self-study materials are at a standard criteria of efficiency at E_1/E_2 = 80/80.

2. The English posttest scores are significantly higher than the pretest score ($p \leq 0.05$)

3. The engineering students have a positive attitude towards the developed self-study materials. ($\overline{X} \geq 3.50$)

4. Literature Review

This section provides models of listening process and roles of self-instructional materials to EFL learners. Details are as follows.

4.1 Models of Listening Process

Top-down and bottom-up process

When learners learn to listen to a foreign language, both top-down and bottom-up are types of processes applied to the emerging interpretation of a message, and the interaction between these processes (Vandergrift and Goh, 2012). Top-down processing strategies emphasize the macro-features of texts such as the speaker's purpose and the topic of the message (Nunan, 1991). Listeners can apply different types of knowledge to the task, including: prior knowledge, pragmatic knowledge, cultural knowledge about the target language, and discourse knowledge. Therefore, listeners are rather possible to comprehend the meaning of a word prior to decoding its sounds (Chaudron and Richards, 1986) (cited in Habibi, Jahandar & Khodabandehlou, 2013).

On the other hand, bottom-up processing strategies accentuate the individual components of spoken languages. It is a rather mechanical process in which listeners segment the sound stream and construct meaning by accretion, based on their knowledge of the segmentals (individual sounds or phonemes) and suprasegmentals (patterns of language intonation, such as stress, tone, and rhythm) of the target language. Top-down and bottom-up processes, therefore, operate dependently (Vandergrift and Goh, 2012).

Research in L1 speech perception provides evidence for the interactive nature of these processes, particularly regarding how information from top-down processing drives and constrains interpretation. A listener who needs to verify a specific detail such as the price of an item or driving directions may engage in more bottom-up processing than a listener who is interested in obtaining an overview of what happened at a particular event (Davis and Johnsrude, 2007). On the contrary, research on these cognitive processes suggests that L2 listeners need to learn how to use both processes to their advantage, depending on the purpose of listening, learner characteristics (e.g.

language proficiency, working memory capacity, age) and the context of the listening event (Vandergrift and Goh, 2012). Therefore, an understanding of the role of top-down and bottom-up processes in listening is the heart of listening comprehension. Even though the cognitive process of listening cannot be observed, comprehending the listening process is still useful in rethinking the methods of teaching listening (Richards, 2001).

4.2 Roles of self-instructional materials to EFL learners

Language instruction has five important components--students, a teacher, materials, teaching methods, and evaluation. At the end of 1970s, there has been a movement to make learners rather than teachers the center of language learning. According to this approach to teaching, learners are more important than teachers, materials, curriculum, methods, or evaluation. As a matter of fact, curriculum, materials, teaching methods, and evaluation should all be designed for learners and their needs. It is the teacher's responsibility to check to see whether all of the elements of the learning process are working well for learners and to adapt them if they are not. In other words, learners should be the center of instruction and learning Self-instructionis a learner-oriented instruction in which learning tasks place without requiring the physical presence of teachers. It is based on the principles of programmed learning which in turn are founded on the concept of operant conditioning given by Skinner in 1954. Programmed instruction is “a process of arranging materials to be learned in a series of small steps designed to lead learners through self-instruction from what they know to the unknown of new and more complex knowledge and principles. Some features of self-instruction consist of unit’s objectives, division of content into steps, frequent feedback, self-check questions and answers” (Sharma, n.d.). Kitao (1997) mentions that materials are textbooks, video and audio tapes, computer software, or visual aids that influence the content and the procedures of learning. The choice of deductive or inductive learning, the role of memorization, the use of creativity and problem solving, production or reception, and the order in which materials are presented are all influenced by the materials. Therefore, it is important for teachers to know how to select suitable materials for instruction, how to make supplementary materials for the class, and how to adapt materials.

Self-instructional materials (SIMs) play vital roles for foreign language learning in the last decades (Kitao, 1997). They contain exercises which enable learners to work on that they need in their own time and at their own pace without interference of a teacher. Such materials attempt to achieve the desirable objective of learner center. Typically they are used to supplement classroom learning activities and usually they focus on providing extra practices in the use of specific language items or language skills which are problematic for learners. Such activities can usefully contribute to the development of explicit declarative knowledge i.e. conscious knowledge or the forms, meaning, and system of the language (Tomlinson, 1998).

Yeung and Hyland (1999) further mention that learners from English business course in Hong Kong can enhance their English communication skills because such materials gave them more interesting form of learning than the traditional classroom. Barker (2010) also states that no university course in Japan can give students sufficient learning time for them to develop communicative competence. His suggestion is to encourage unstructured learner interaction outside the classroom through, for example, social clubs in which the medium of interaction is always English.

Self-instructional materials, therefore, can be an effective means to bridge the gap between teachers' need and learners' actual needs and possibly motivate learners to acquire more language and to develop abilities to use English effectively in a variety of contexts, modes, and genres (Tomlinson, 2007) (cited in Tomlinson, 2010).

5. Research Methodology

This research was initially started at reviewing related literatures to form tools for measuring listening competencies. Tasks specifications of the questionnaire in the needs analysis relied on demands of linguistic characteristics of specialists of arena in which 'real' language can be reflected. Later, another two main phases including the phase of materials development and the phase of implementation and evaluation in which English listening skills and attitudes of the participating students towards the materials were also investigated. Each of these phases is explained as follows.

Phase 1: Needs Analysis

Survey “needs”

Needs refer to demands for skills of listening in English to comprehend any English spoken forms of information that the students who are participants of the study would like to have. After the document analysis, a validated questionnaire were distributed to 300 students at the School of Engineering, University of Phayao academic year 2015 as the target group to draw out their profiles of skills needed of English listening for further development.

This questionnaire was applied and mostly contained similar items from Kumar (n.d.)’s materials evaluation criteria frame. The form used Likert’s scale from 5 (the most need) to 1 (the least need) in which students (respondents) were asked to rate their level of need of both academic and physical aspects of the self-instructional materials.

Phase 2: Materials development

2.1 Designing self-instructional materials

Self-instructional materials are considered student-oriented materials where learning is taken place without physical assistance of teachers. The process of designing these kind of materials, therefore, mainly consisted of reviewing the literature on theories and frameworks for developing self-instructional materials, exploring and collecting data from needs analysis to find out the most preferred English listening skills to develop self-instructional materials.

In the questionnaire, participants were asked to rate listening skills based on the earlier document analysis. These skills were tallied and ranked from the most interesting to the least interesting. Later, needs assessment was conducted to scope the specification of academic contents and physical contents inside the materials. Information obtained from the questionnaire indicated that recognizing vocabulary related to the basic science of engineering was the most needed skill of all while the major problem affecting listening in English was guessing unknown words or phrases and all aspects in terms of both academic contents and physical contents were in great demand.

In order to emphasize the multiple benefits of integrating language and content instruction for second language (L2) students, a content-based instruction (CBI) was promoted. CBI promotes student involvement in content learning, provide opportunities for student negotiation of language and content tasks, allow for cooperative learning, and use content materials that should motivate students (Stoller and Grabe, 1997).

Given the broad interpretation of content-based instruction mentioned above, the Six-T's approach primarily pays attention to student needs, student goals, institutional expectations, available resources, teacher abilities, and expected final performance outcomes as with any curricular approach to language learning. When these criteria are specified, informed decisions can be made about the six curricular components which define the Six-T's Approach: Themes, Texts, Topics, Threads, Tasks, and Transition (Chetsadanuwat, 2012: 34).

Therefore, contents and activities were selected from books, textbooks, the Internet, journals, magazines both written and aural and adapted and compiled into Book and a CD as a set of self-instructional materials based on Six T's approach in which content-based instruction (CBI) emphasizes the multiple benefits of integrating language and content instruction for second language (L2) students. This approach has three basic goals including 1. the specification of theme-based instruction as central to all CBI 2. the extension of CBI to support any language-learning context, including those in which teachers and program supervisors have the freedom to make major curriculum (and content) decisions 3. the organization of coherent content resources for instruction and the selection of appropriate language learning activities.

Therefore, this approach allowed connections that maintain student involvement and allowed for the completion of meaningful materials writing. Specific tasks were designed to teach the language knowledge and content information central to the texts for a given theme unit, thereby meeting student needs and achieving curricular priorities. Transitions and threads created additional linkages throughout the curriculum, a sense of coherence, and seamlessness. Owing to the expansive nature of the topic, examples were chosen selectively for their representativeness to show step by step how the Six T's Approach was at play in organizing the content inside the materials as follows.

- *Establishing Themes (1st T)*

Themes are the primary source for materials designing. They are central ideas that were chosen to be appropriate to student needs and interests and institutional expectations and interests. Hence, themes' contents of the materials designed were established based on 1) being on conceptually important and relevant to the students' instructional settings, location, etc.; 2) being relevant to the local context; 3) being depended on types and extent of available interesting and appropriate texts; and 4) being depended on the number of options for captivating topics within the unit.

Hence, themes that emerged were studying engineering, engineering designs, procedures and precautions, modern technologies, and helping the environment. On the other hand, they were adapted and came in five units including *Unit 1: I am taking six classes; Unit 2: That's so awesome!* ; *Unit 3: Would you mind?* ; *Unit 4: I couldn't believe that!* ; and *Unit 5: Let's go green!.* In unit 1, students listen to the vocabulary related to their school subjects in order to ask or talk about their routines. In unit 2, they learn to listen to specific information by listening to some engineering drawings' discussion in terms of dimensions, phases, and procedures. In unit 3, they listen and work with health and safety precautions, regulations, and standards of working as an engineers. In unit 4, they listen to some excerpts related to the new technology of engineering. This unit aims at categorizing and specifying some engineering properties. And in unit 5, they listen to some current issues of environmental problems and work with the solution to ease their mother. It could be entailed that with a coherent set of needed topics, the developed materials could stimulate students' interests and captivated their attention better.

- *Choosing Texts (2nd T)*

Texts are written or aural content resources which drive the basic planning of theme units. Selecting texts is depended on a number of criteria such as students' interests, instructional appropriateness, and etc. Criteria for choosing texts during this phase included 1) texts complemented institutional objectives; 2) genres and formats of texts were at appropriate level of difficulty; 3) texts were motivating; 4) texts were engaging and leading into theme; 5) texts were best at providing content resource; 6) texts created threads that link; and 7) texts culminated tasks or projects as natural

extension of contents. Table 1 provided a list of the listening texts chosen in the self-instructional materials.

Table 1 Listening texts used in the self-instructional materials

Theme	Texts	Text type	Resources
1. Studying engineering	- Enrolling in classes and subjects	From various sources	Listening of various genres, videos, audio CD, tables, graphs, and etc.
2. Engineering designs	- The clockwork radio - The two-stroke engine		
3. Procedures and precautions	- Construction site safety - Rules and regulation		
4. Modern technologies	- Modern medical equipment i.e. AbioCore artificial heart		
5. Helping the environment	- eco-friendly vehicle e.g. hybrid cars and green products		

- Formulating Topics (3rd T)

Topics or subunits of content explore more specific aspects of the theme. They are selected to complement student interests, content resources, and curricular objectives. In general, topics should be organized to generate maximum coherence for the theme unit and to provide opportunities to explore both content and language. Therefore, the topics selected in the materials were based on the following criteria: 1) being complemented student interests and content resources; 2) being organized to generate maximum coherence for the theme; and 3) providing opportunities to explore both content and language. To help adjust topics, themes fundamentally played a vital role and became thematically-related as presented in the following table.

Table 2 Topics used in the self-instructional materials

Themes	Topics
1. Studying engineering	Enrolling the classes in an engineering school
2. Engineering designs	Developing technological products
3. Procedures and precautions	Complying with the construction site rules
4. Modern technologies	Alternative power supplier
5. Helping the environment	Using eco-friendly products

- *Selecting Possible Threads (4th T)*

Threads or linkages across themes create the lesson unit's coherence. They linked, reviewed, created logical relatedness which promote an understanding of the development of ideas in the texts, and recycled important content and language themes that were tied up each strand in the lesson unit. Therefore, the logical relation of the aforementioned five themes including studying engineering, engineering designs, procedures and precautions, modern technologies, and helping the environment were considered threads in themselves as they hold some relevant engineering-oriented contents.

Later, the contents inside the materials were sequenced based on the difficulty of tasks, activities, and learn ability of students. All five units always started with a pretest to assess the proficiency level of English listening of students before going through another activity. An introductory task called 'Warming Up' was adapted to urge student's contents they should know and would know inside. A list of vocabulary or expressions from the earlier 'Warming Up' could prompt students to move to 'Listening Task 1' and 'Listening Task 2' respectively. The grammar aspects called 'Language Awareness' allowed students to self-study and practice their language competency with sample expressions and answers. The posttest was also administered at the end of each unit to assess the listening skills aimed. Finally, the 'checklist' provided an opportunity for students to validate their listening skills after they finished all tasks .In Table 3, a model sequence of tasks in Unit 1 is presented to enhance idea how the unit was designed.

Table 3 Sequencing the contents of Unit 1

Theme	Unit	Tasks
Studying Engineering	Unit 1: I am taking six classes	1. Pretest: to initially validate English listening skills aimed in each unit. 2. Warming Up: this task reminds students' background knowledge. 3. Listening task 1 and 2: these tasks allow students to listen to different inputsand fordifferentpurposes in order to practice different listening skills. 4. Language awareness: this section helps students analyze key concepts of grammar and vocabulary. 5. Posttest: to assess students' English listening skills after every tasks inside the unit are done. 6. Checklist: this section allows students to self-assess unit's objectives.

- Designing Tasks (5th T)

Tasks of the self-instructional materials developed were determined by the text materials which fit into two kinds of scaffolds i.e. reception scaffolds and transformation scaffolds. Reception scaffolds helped the engineering students gather information from the texts. Each unit had a highlight text that draws students' attention. They prompted the engineering students to organize and record what they see, for example, "Warming Up" in Table 3. With the provided illustration in Warming Up, the students would be able to recall their background knowledge and extract key information required. Transformation scaffolds, on the other hand, helped the engineering students change the information they received from the text into some other forms, for instance, a space which prompted students to categorize logically and chronologically the information they heard.

- Determining Transitions (6th T)

Transitions facilitated a natural and systemic flow of content of task inside the unit. Thus, to determine the transitions of all tasks, Bloom's taxonomy (1956) (cited in Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, et al., 2001) was applied. Table 4 presented transitions of Unit 1 and Unit 2 of the developed self-instructional materials.

Table 4 Example of the unit transition

Unit	Topical Transition	Tasks Transition
1	Topics move from a small department to a bigger department: a small classroom to a bigger educational environment in order to deal with more specific details of studying.	- Move from simple task to a more complex one, for instance, listening to specific information to giving advice to friends. - From listening a short conversation to writing a study's time table.
2	Topics move from the narrower personal practices to the wider standard practices in the real world.	- From listening to writing (*note taking*) - Move from simple to more complex: listening to general ideas of engineering and identify a proper qualification that all 'engineering developers' should possess.

In conclusion, a content-based course (CBI) is initially defined by specifying themes, assembling appropriate texts that support the themes, and designing/negotiating a coherent set of supporting topics yet the primacy accorded to text resources reflects the assumption that specific content materials can constrain possible language tasks, language structure awareness, and communicative uses. Following the SixT framework, various and plentiful content resources, therefore, can be adapted and suitably designed to provide opportunities for relevant second language learning activities. Besides, there are opportunities to use language and content for meaningful communicative purposes as well.

2.2 Designing an achievement test

Contents inside the package of developed self-instructional materials shape the test's specification. Topics and issues of the test were considered widely acknowledged and popular for engineering students. This listening achievement test was designed based on the first part of the TOEIC test. Three formats i.e. photographs, question-responses, and short talks were adapted with assessment task types based on Brown (2004). Therefore, the first version of the test contained 60 items of questions (60 marks) in the format of four-optional multiple choice with short monologues and both short and

long multinational-accent conversations and filling the gap format with impromptu caption of pictures.

2.3 Designing a materials evaluation form

A materials evaluation form was designed in accordance with the questionnaire form used during the needs analysis phase. The form used Likert's scale from 5 (strongly agree) to 1 (do not agree at all) in which students (respondents) were asked to rate their satisfactions of both academic and physical aspects of the developed self-instructional materials.

Phase 3: The implementation and evaluation

3.1 Materials implementation

300 students from year 1-4 in School of Engineering, University of Phayao were distributed a questionnaire form to survey needs and were assigned to have the TOEIC mock exam in the same room on February 1, 2015. Only 20 items of listening questions consisted of Part 1: Photographs (7 points); Part 2: Question-Response (5points); Part 3: Conversations (5 points); and Part 4: Short Talks (3 points) were used. The test's scores revealed that more than half of them received scores lower than 10. From this low-score group of student, the willing 30 of them including 5 students from 1^{st} year, 7 students from 2^{nd} year, 15 students from 3^{rd} year, and 3 students from 4^{th} year joined in this phase.

A package of self-instructional materials consisted of a book and a CD was distributed to an aforementioned 30 engineering students. They were asked to do the validated listening achievement test (pretest) in the same room on February 8, 2015. They were given 8 weeks (from March 1 - May 30, 2015) to finish their book and CD and were asked to do the posttest after finished using them in the same room on June 6, 2015. During the implementation period, students were asked to report their learning via facebook during 22.00-24.00 every other days or face to face on Mondays of each week in order to be given some pieces of advice or answer questions so that they could be kept track of their learning. Therefore, One Group Pretest-Posttest Design was employed in this phase as illustrated below.

Pretest	Treatment	Posttest
O_1	X	O_2

Where X is the treatment (materials implementation)
O_1 is Pretest scores
O_2 is Posttest scores

3.2 Materials evaluation

A materials evaluation form was distributed to all 30 study-group engineering students after they finished their posttest in order to rate their opinions after using the developed self-instructional materials. So the process was taking place on June 6, 2015, the same day the posttest was held.

6. Data Analysis

- Phase 1

As mentioned earlier, a wide variety of relevant documents of both English for Academic and Specific Purposes (EAP and ESP) in the field of listening and materials for listening in English were gather and analyzed to scope framework for designing a questionnaire and self-instructional materials by means of frequency (f). The panel of experts (two from ESP teaching specialist and one engineering content specialist) were invited to validate and evaluate the questionnaire's content validity via the IOC form. The items which received ≥ 0.5 were accepted and used while the items which received < 0.5 was rejected or revised accordingly.

Then, the needs survey was conducted. The results from this survey were then assessed by mean ($\overline{X}$) and standard deviation (SD) to conceptualize materials' aspects specifically academic specifications e.g. the language use, the organization of activities in each unit, and etc., and physical specification e.g. the printing and layout, the recorded sound quality, and etc. Each of these specifications rated 4.50-5.00 was 'the most need', 3.50-4.49 was 'very need', 2.50-3.49 was 'moderately need', 1.50-2.49 was 'less need', and 1.00-1.49 was 'the least need' (Srisa-ard, 2003).

- **Phase 2**

During this phase, the achievement test and the package of self-instructional materials were validated consecutively. Another panel of experts, one ESP teaching expert, one ESP assessment expert and one engineering content specialist, were

invited to validate and evaluate the test's contents and the materials' content to ensure their content validity via the IOC form. Items in the form which received ≥ 0.5 were accepted and used while the items which received < 0.5 were rejected or revised accordingly. For the achievement test, the revised version of the test was examined with other 10 low-score engineering students (non-study group) in School of Engineering at the University of Phayao. All of them shared similar characteristics with the group of 30 sample engineering students in terms of test's scores and willingness to participate in the study. This trial aims at finding degree of difficulty (p) and power of discrimination (r) of the test before the real use in Phase 3.

-Phase 3

The validated version of the achievement test was used in this phase. Paired sample t-test was initially employed to compare students' mean score of both pretest and posttest in order to see whether there is a significant difference between them ($p<0.05$) (Taweerat, 1987). Moreover, the standard criteria of effectiveness at E_1/E_2 = 80/80 was employed to test the effectiveness of this prototype package of self-instructional materials (Promwong, 1978). This criterion entailed the efficiency of both the materials and the learning of students as presented in the formula below

$$E_1 = \frac{\sum X_1}{NxA} x100$$

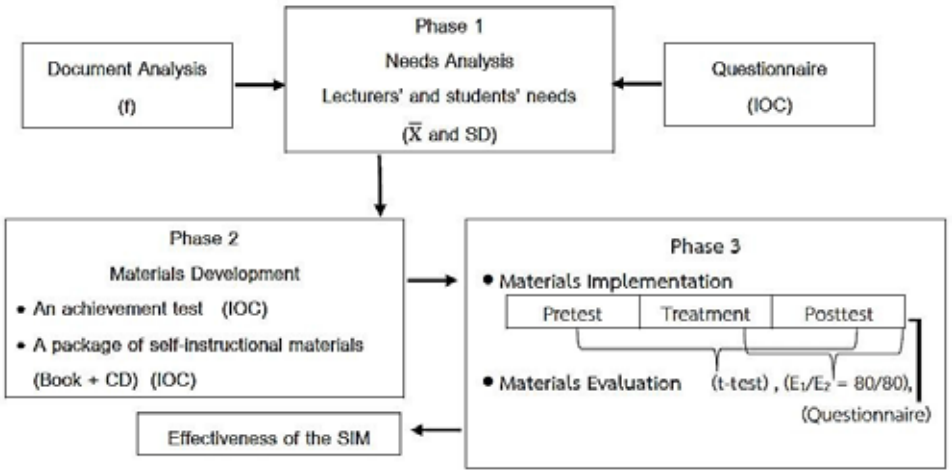
Where E_1 is the efficiency of the developed materials
X_1 is gained scores from each end-of-unit test
A is total scores of all end-of-unit tests
N is numbers of students

$$E_2 = \frac{\sum X_2}{NxB} x100$$

Where E_2 is the efficiency of students' learning
X_2 is gained scores from the posttest
B is total scores of the posttest
N is numbers of students

Finally, the investigation of students' opinions towards the materials was the last process to be conducted. Earlier, the same panel of experts in phase 1were invited to validate and evaluate a materials evaluation form which was designed in phase 2 to ensure its content validity via the IOC. The items which received ≥ 0.5 were accepted and used while the items which received < 0.5 was rejected or revised accordingly. The arithmetic mean and SD from the grading items in the questionnaire entailed the satisfaction level of both academic and physical specifications of the developed self-instructional materials. Each of these specifications rated 4.50-5.00 was 'strongly agree', 3.50-4.49 was'agree', 2.50-3.49 was 'neutral', 1.50-2.49 was 'less agree', and 1.00-1.49 was 'do not agree' (Srisa-ard, 2003). The data analysis of this study is summarized in the following figure.

Figure 1 Summary of data analysis



7. Findings

As the main objective of this study was to develop self-instructional materials to enhance English listening skills for students in the school of engineering, the findings from the study based on the research questions are as follows.

In response to the first research question, *what are the needs of English listening skills for engineering students?,* two main research instruments including a review of related literature and a validated questionnaire to survey needs were employed. Content analysis was used to analyze data from the relevant literature.

Besides, the questionnaire asked all 300 participants to rate their degree of needs for both academic and physical aspects of the self-instructional materials on a Five Likert's scale checklist from 5 (the most need) to 1 (the least need). The following table reveals the needs analyzed from the aforementioned survey.

Table 5 Needs of academic and physical aspects

Needs of Academic Aspects		$\bar{X}$	**SD**	**Interpretation**
1.	The English language use	4.54*	0.58	The most need
2.	Contents	4.36*	0.56	Very need
3.	The presentation of contents	4.21*	0.72	Very need
4.	Exercises and activities applied	4.43*	0.55	Very need
5.	The organization of contents	4.36*	0.56	Very need
Needs of Physical Aspect		$\bar{X}$	**SD**	**Interpretation**
6.	Quality of sound recording	4.49*	0.63	Very need
7.	Size of the materials	4.38*	0.75	Very need
8.	Durability of the materials	4.43*	0.59	Very need
9.	Printing and lay-out	4.13*	0.69	Very need

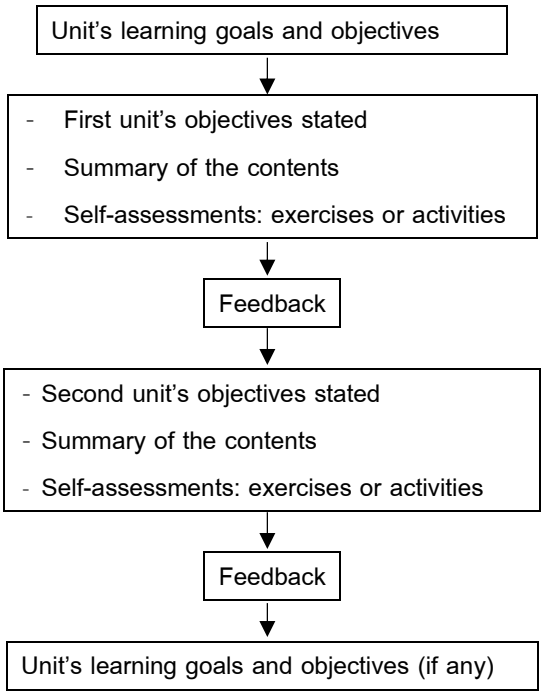
**scores are reevaluated from sub-items of its own category*

It was found that all aspects were at 'very need' level onwards ($\bar{X}$ > 4.00). In terms of academic aspects, the English language use was rated 'the most need' ($\bar{X}$ = 4.54) while the presentation of contents was the lowest ($\bar{X}$ = 4.21). In terms of materials' physical needs, quality of sounds recording was rated the highest ($\bar{X}$ = 4.49) whereas the aspect of the size of the materials was rated the lowest of the category ($\bar{X}$ = 4.13).

In response to the second research question, *how can self-study materials to enhance English listening skills for engineering students be developed?*, information for developing instructional materials was mainly derived and translated from the needs analysis. The content of the materials were adapted from several international and Thai documents. The general criteria for selecting those sources were relevance and appropriate e.g. being up-to-date and relevant to unit's objective. The sample unit along with the achievement test were verified and evaluate by the panel of experts. In terms of designing each lesson unit, a framework of Lockwood (1998) was taken into consideration. His suggestion was that each unit should be constructed carefully in the

way that self-study plans or guidelines are firstly presented. Then, goals or objectives, a list of activities, and self-assessment procedures were planned based on the Six T's framework. Finally, the self-instructional materials came out as a package of book and a CD with paper and pencil exercises to gauge their understanding. The learners' contract was also applied in order to activate and regulate the self-learning behavior. The following figure illustrates the sequence of the lesson unit.

Figure 2 the sequences of a lesson unit inside the developed self-instructional materials



In the meantime, the achievement test was developed based on the TOEIC test' format. The first version of the test from phase 2 was initially validated by the panel of experts via IOC form. From this validation process, 39 items were validated ≥ 0.5 and were suitable to be used in the test. Whereas, the rest 21 were rewritten and readjusted according to the experts' suggestions before the trial with the 10 non-study engineering students.

After the pilot test, 10 items of question were eliminated since their difficulty index or easiness was not in the range between 0.2-0.8 and the discriminant index or

divergent was lower than 0.2 (Nunnally, 1967) (cited in Viboonsri, 2009: 144-145). Therefore, the final format of the achievement test in English listening skills contained 50 items of questions and took approximately 60 minutes to finish and was composed of short monolog, short conversations, and long conversations that the test takers were instructed to select the best answer form multiple-choice questions.

In response to the third question, *how effective are the developed self-study materials?,* the standard criteria of effectiveness at E_1/E_2 = 80/80 was initially employed. The developed package of self-instructional materials was distributed to 30 engineering students. In the meantime, they were asked to report their scores of five end-of-unit tests to compare their efficiency of learning with their post test scores. The following table illustrates students' test scores.

Table 6 Students' end-of-unit tests' scores and posttest's scores

No. of students	Scores of end-of-unit tests					Total scores (50)	Posttest scores (Achievement Test) (50)
	1 (10)	2 (10)	3 (10)	4 (10)	5 (10)		
1.	8	9	8	9	9	43	40
2.	8	8	8	9	8	41	35
3.	9	8	8	9	8	42	39
4.	7	8	9	9	8	41	48
5.	7	8	8	7	8	38	38
6.	9	9	7	9	7	41	39
7.	8	8	8	8	8	40	43
8.	8	7	9	7	9	40	44
9.	9	8	8	8	8	41	45
10.	8	9	7	9	7	40	43
11.	7	8	8	8	8	39	48
12.	8	7	7	7	7	36	42
13.	9	8	9	8	9	43	35
14.	8	7	7	7	7	36	36
15.	7	9	8	9	8	41	38
16.	8	8	8	8	8	40	39
17.	7	9	9	9	9	43	40

No. of students	Scores of end-of-unit tests					Total scores (50)	Posttest scores (Achievement Test) (50)
	1 (10)	2 (10)	3 (10)	4 (10)	5 (10)		
18.	9	8	7	8	8	40	41
19.	9	7	8	8	8	40	44
20.	8	8	9	8	8	41	43
21.	8	9	8	8	8	41	42
22.	9	8	7	9	7	40	41
23.	8	7	8	8	8	39	35
24.	7	8	7	7	8	37	48
25.	8	7	9	8	8	40	41
26.	6	8	7	8	7	36	35
27.	8	7	8	8	9	40	38
28.	8	8	8	7	9	40	39
29.	9	8	9	8	8	42	48
30.	8	9	8	8	9	42	47
			Total scores			1,203	1,234
			%			80.20	82.27

Later, their scores of both tests were compared to indicate the effectiveness of the developed self-instructional materials as presented in the following table.

Table 7 Effectiveness of the developed self-instructional materials against criteria E_1/E_2 = 80/80

No. of students		Score of end-of-unit test (E1)	Posttest score (Achievement Test) (E_2)	Effectiveness of the developed SIMS (E_1/E_2)
30	Total score	$\sum x = 1{,}500$	50 x 30 = 1500	80.20 / 82.27
	Accumulative score	1,203 (80.20%)	1,234 (82.27%)	

Table 7 revealed the effectiveness of the developed self-instructional materials against the criteria of efficiency at E_1/E_2 = 80/80 where E_1 is the efficiency of the developed materials and E_2 is the efficiency of the learning. The findings revealed that

the effectiveness of the developed self-instructional materials after conducted the experiment with a study group of 30 engineering students was at E_1/E_2 = 80.20/82.27. Thus, this statistic scores indicated that the developed self-instructional materials were effective in enhancing their English listening skills and the hypothesis 1 'the developed self- instructional study materials are at a standard criteria of efficiency at E_1/E_2 = 80/80 was accepted.

Later, the independent t-test was applied to test a difference between two independent scores of pre-and posttest on the means of a continuous variable. Their pretest and posttest score of an achievement test were presented in Table 8.

Table 8 Difference of the pretest and posttest scores

No. of students	Scores of the achievement test		Difference (D)	No. of students	Scores of the achievement test		Difference (D)
	Pretest (50)	Posttest (50)			Pretest (50)	Posttest (50)	
1.	40	40	0	16.	38	39	1
2.	32	35	3	17.	42	40	-2
3.	38	39	1	18.	45	41	-4
4.	43	48	5	19.	43	44	1
5.	40	38	-2	20.	38	43	5
6.	42	39	-3	21.	37	42	5
7.	44	43	-1	22.	39	41	2
8.	43	44	1	23.	31	35	4
9.	42	45	3	24.	42	48	6
10.	41	43	2	25.	40	41	1
11.	44	48	4	26.	38	35	-3
12.	40	42	2	27.	31	38	7
13.	32	35	3	28.	38	39	1
14.	35	36	1	29.	41	48	7
15.	34	38	4	30.	45	47	2

For statistical measurement, paired sample t-test was employed to compare student's test scores before and after using the develop materials and to see if there is a significant difference between them. The results and presented in the following table.

Table 9 Independent paired t-test value

Pretest		Posttest		$\bar{D}$	S.D. $\bar{D}$	t_{cal}	Sig.
$\bar{X}$	SD	$\bar{X}$	SD				
39.27	4.12	41.13	4.13	1.86	2.90	3.51*	.00

The findings showed that there was an improvement in the engineering students' posttest scores ($\bar{X}$ = 41.13) compared with those of the pretest ($\bar{X}$ = 39.27). Though mean scores of both pretest and posttest were relatively high, the standard deviation (SD) had measured how spread out of the score was among the study group of engineering students. After the developed self-instructional material was implemented, their mean scores of the posttest were higher ($\bar{X}$ = 41.13) but the variability or the spread of the posttest scores was almost the same (SD = 4.12). This situation clearly showed that after using the developed self-instructional materials, the engineering students, in general, made higher scores in the posttest as well as improved their English listening skills at about the same level.

Moreover, the result of 3.51 from t-calculation (t-test) also indicated that the study group of engineering students had higher scores of listening comprehension test after using the developed self-instructional materials at significant level 0.00. These two results indicated that the developed self-instructional materials were effective and were able to enhance English listening skills of the participating engineering students and hypothesis 2 'the English posttest scores are significantly higher than the pretest score ($p \leq 0.05$)' was accepted.

In response to the final research question, *what is the attitude of engineering students towards the developed self-study materials?,* a materials evaluation form was applied. As mentioned earlier, the questionnaire entailed the satisfaction level of both academic and physical specifications of the developed self-instructional materials. Each of these specifications rated 4.50-5.00 was 'strongly agree', 3.50-4.49 was 'agree', 2.50-3.49 was 'neutral', 1.50-2.49 was 'less agree', and 1.00-1.49 was 'do not agree'. The results are summarized in the following table.

Table 10 Results from materials evaluation survey

Criteria for evaluating	No.	Min	Max	$\bar{X}$	SD	Interpretation
1. Content						
1.1 Content is aligned to learning aims and/or learning objectives.	30	5.00	5.00	5.00	0.00%	strongly agree
1.2 Each unit has goals and objectives, introduction, self-study guide, contents, self-assessment, summary, model answers for activities and exercises.	30	5.00	5.00	5.00	0.00%	strongly agree
1.3 Content is in accordance with backgrounds and experiences of the students e.g. medical and nursing.	30	5.00	5.00	5.00	0.00%	strongly agree
1.4 Content is appropriate keeping in view of students' background knowledge and experiences.	30	5.00	5.00	5.00	0.00%	strongly agree
1.5 Content is culled from authentic sources.	30	5.00	5.00	5.00	0.00%	strongly agree
1.6 The selected content is up to date.	30	5.00	5.00	5.00	0.00%	strongly agree
1.7 Visual aids are provided to represent important themesof each unit.	30	5.00	5.00	5.00	0.00%	strongly agree
2. The organization of content						
2.1 Precise and easy to understand.	30	2.00	5.00	4.06	1.04%	agree
2.2 The content is divided into sections and sub-sections.	30	3.00	4.00	3.73	0.45%	agree
2.3 Clear numbering.	30	5.00	5.00	5.00	0.00%	strongly agree
2.4 There is a link between sections and units in each unit.	30	3.00	4.00	3.73	0.45%	agree
2.5 The length of each unit is	30	4.00	5.00	4.53	0.51%	strongly agree

Criteria for evaluating	**No.**	**Min**	**Max**	$\bar{X}$	**SD**	**Interpretation**
appropriate keeping in view of the theme and title.						
2.6 A self-use orientation is provided in the beginning of each unit.	30	4.00	5.00	4.53	0.51%	strongly agree
2.7 Enough space is provided for writing useful informationor the answers to self-assessment questions.	30	3.00	5.00	3.83	0.83%	agree
3. The presentation of content						
3.1 The presentation of content is in accordance with learning objectives.	30	5.00	5.00	5.00	0.00%	strongly agree
3.2 The important points of content are highlighted for easy references.	30	3.00	4.00	3.73	0.45%	agree
3.3 Illustrations included in the text are clear and help create interests and also increase comprehension and retention of information / knowledge.	30	5.00	5.00	5.00	0.00%	strongly agree
3.4 References are given wherever appropriate to the use of supporting media.	30	4.00	5.00	4.53	0.51%	strongly agree
4. The language use						
4.1 The language use is simple, precise, correct, unambiguous, and comprehensible.	30	5.00	5.00	5.00	0.00%	strongly agree
4.2 The language use is appropriate to activities and units.	30	5.00	5.00	5.00	0.00%	strongly agree
4.3 The vocabulary and expression use is relevant to students' background knowledge and experiences.	30	2.00	5.00	3.63	0.88%	neutral

Criteria for evaluating	**No.**	**Min**	**Max**	$\bar{X}$	**SD**	**Interpretation**
4.4 The vocabulary and expression in the texts is commonly used in the field of medical and nursing.	30	5.00	5.00	5.00	0.00%	strongly agree
5. The self-assessments and activities applied						
5.1 Self-assessments and activities are appropriate to unit objectivesand listening skills.	30	5.00	5.00	5.00	0.00%	strongly agree
5.2 Texts in self-assessment and activities are appropriate to unit contents.	30	5.00	5.00	5.00	0.00%	strongly agree
5.3 Activities are included in the text to promote interests, comprehension, and retention of information/knowledge.	30	4.00	5.00	4.53	0.51%	strongly agree
5.4 Activities and self-assessments engage students in critical and creative thinking while listening.	30	3.00	5.00	3.83	0.83%	agree
5.5 Activities and exercises support the development of English listening skills for students after listening.	30	4.00	5.00	4.53	0.51%	strongly agree
5.6 Model answers are provided at the end of each unit.	30	5.00	5.00	5.00	0.00%	strongly agree
5.7 Scoring rubrics are provided for students.	30	5.00	5.00	5.00	0.00%	strongly agree
Physical Aspects						
6. The printing and layout						
6.1 The design of the cover page is attractive and appealing.	30	5.00	5.00	5.00	0.00	strongly agree
6.2 The font size of the main text, chapter headings, sub-headings, captions, exercises, etc., is appropriate.	30	5.00	5.00	5.00	0.00	strongly agree

Criteria for evaluating	**No.**	**Min**	**Max**	$\bar{X}$	**SD**	**Interpretation**
6.3 The layout is appropriate for reading.	30	4.00	5.00	4.53	0.51%	strongly agree
6.4 The number of pages included in the handbook is clear and easy to be noticed.	30	5.00	5.00	5.00	0.00%	strongly agree
6.5 Spacing between the lines is proper.	30	5.00	5.00	5.00	0.00%	strongly agree
6.6 Words and lines are aligned properly.	30	5.00	5.00	5.00	0.00%	strongly agree
6.7 Printing is clear and easy to read.	30	5.00	5.00	5.00	0.00%	strongly agree
7. Durability						
7.1 The binding of the book is durable.	30	5.00	5.00	5.00	0.00%	strongly agree
7.2 The cover page is durable.	30	5.00	5.00	5.00	0.00%	strongly agree
7.3 The paper used to produce the materials is durable.	30	5.00	5.00	5.00	0.00%	strongly agree
7.4 The cassette tape or CD is durable.	30	5.00	5.00	5.00	0.00%	strongly agree
8. Size of the materials						
The size of the materials is appropriate and user friendly.	30	4.00	5.00	4.33	0.48%	agree
9. The quality of sounds recording						
9.1 The spoken voice and tape scripts are clear.	30	5.00	5.00	5.00	0.00%	strongly agree
9.2 The spoken voice and tape scripts are accurately put according to unit contents and activities.	30	5.00	5.00	5.00	0.00%	strongly agree
9.3 Background music is clear with appropriate volume.	30	5.00	5.00	5.00	0.00%	strongly agree

The results reveal a positive result in all aspects as every criterion was rated > 3.50. However, the lowest mean goes to item 4.3 'the vocabulary and expression use is relevant to students' background knowledge and experiences' ($\bar{X}$ = 3.63). As every criterion was rated above 3.50, it can be concluded that the students were satisfied with

the developed self-instructional materials and hypothesis 3 '*the engineering students have a positive attitude towards the developed self-instructional materials'* was accepted.

8. Discussion

As the main objective of this study was to develop self-instructional materials to enhance English listening skills for students in the school of engineering, needs analysis was initially conducted. Most of the time the learning needs is primarily concerned so that insights into the target instructional situation will allow the development of materials that are responsive to and capable of fitting in harmoniously with local conditions (Tudor, 1996). Examining students' needs is, therefore, considered the distinguishing feature of instructional materials design. Once learning materials are designed from their exact need, students will develop conducive learning habits and feel a greater commitment in learning (Gardner and Miller, 1999).

It is apparent that engineering students, especially in this particular setting, considered all aspects of self-instructional materials essential and necessary for enhancing their listening skills. Therefore, results from the needs survey may not generalize the needs of the whole engineering students in Thailand. Materials that are aimed to be developed, likewise, will suit the needs from only a particular group of students in the School of Engineering at the University of Phayao in academic year 2015.

Although the course of the developed materials was very short (two-month period), it appears that with five lesson units in the developed self-instructional materials, students could possess the freedom to set their learning schedule according to their preference; to choose what, where, when, and how to study to suit their learning habits. These features were in line with Detaramani and Chan (1999)'s findings of impacts of self-study center. The findings revealed that students consider the major roles of self-access centers an independent means to help them learn English and equip them for their studies and future careers. Therefore, sometime is needed to be spent making sure students understand how activities help them learn, in other words, teaching learning strategies (Wachob, 2006).

A learner's contract plays a vital role in regulate the self-instruction. Knowles (1975) (cited in Chetsadanuwat, 2012: 133) mentioned that this binding agreement was a vehicle for making the planning of learning a mutual undertaking between

learners and teachers. Therefore, such contract was applied in this self-instructional materials to serve as a mean for negotiating a reconciliation between the materials developer's needs and the engineering students' needs in terms of what learning objectives should be worked toward, when to use resources inside the materials, and how the learning objectives or goals should be evaluated.

Moreover, students may take advantage consulting their learning needs and reporting their learning progress through the social medium namely facebook to communicate and receive feedback during their study. Nonetheless, motivation and self-efficacy received may suffer if students cannot feel in control of their own learning. It is, therefore, left to not only the material designers but also the teachers to make sure that students are oriented and prepared to take full advantage of such specially produced materials.

9. Conclusion

This study provides a picture of how self-instructional materials for ESP could be design and implemented. Needs analysis provides the pathway to design materials in accordance with the real needs of the students. In most educational contexts, the maticorcontent-based instruction is the foundation (Stoller and Grabe, 1997). Professionals in many instructional settings are developing approaches to content-based instruction (CBI) which emphasize the multiple benefits of integrating language and content instruction for second language (L2) students.

The Six-T's Approach is exploratory in nature that materials designers can apply since tasks relate to theme units and transitions across topics, the concept of threads and their contributions are connected to curricular coherence; the connections between topics and themes can support and extend the latter; activities can assess students' language content; and students see their learning progress and curricular success overall. Despite the need for further refinement of the Six-T's Approach, it offers language educators means for devising coherent curricula that will facilitate both content and language learning. The motivation and student engagement with learning that result from this approach can provide students with more successful classroom experiences and- prepare them for the rigors of mainstream classes.

However, the study primarily took needs from engineering students' side but the lecturers' or other stakeholders'. Results from the study focused on only group of

students and cannot generalize. Therefore, it should be a revision from factors related to the field of engineering. For example, there should be more research on the need of lecturers' or workplaces, revising English materials focusing on other communication skills. Furthermore, futures studies may look into the impact and effectiveness of self-instructional materials with different settings, proficiency levels, and learning styles on different basis of materials.

The wealth of accessible and free technology enables teachers to help student develop their language skills with remarkable ease and effectiveness. No longer are students dependent on only aural modes; the visual impacts of videos in all formats and channels could prove to be more effective in enhancing students' listening skills, and would probably be more realistic in academic and professional contexts where sound and vision interplay. Therefore, during managing the 2^{nd} *T* 'choosing texts', texts or materials might be extended to choosing or producing videos or other multimedia to enhance students' listening skills.

10. Limitation of the study

To understand the findings of the study, it should be acknowledged that the study was conducted with a specific group of engineering students from the University of Phayao. The sample students were mostly from 3^{rd} year whose potential of listening in English might be better than the majority of participants which were from 1^{st} and 2^{nd} year since they already had completed many English course required during 1^{st} and 2^{nd} year. Thus, these students do not represent the general population of Thai engineering students, and the results cannot be generalized to other population either. Future research should consider students from more diverse educational background and institutions. Moreover, this study was primarily based on self-efficacy which may not indicate the whole picture. Participants may not be entirely honest or truthful in reporting their scores. Data from other sources is needed to provide a more complete picture on their self-instruction.

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