การพัฒนาแบบจำลองบทเรียนคอมพิวเตอร์สื่อผสมเพื่อพัฒนาความสามารถในการออกเสียงเน้นในภาษาอังกฤษของนักศึกษาไทยระดับปริญญาตรี

นางสาววิชุรา วินัยธรรม

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต
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THE DEVELOPMENT OF A MULTIMEDIA COURSEWARE PRODUCTION MODEL FOR ENHANCING ENGLISH STRESS PRONUNCIATION ABILITY OF THAI UNDERGRADUATE STUDENTS

Wichura Winaitham

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

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THE DEVELOPMENT OF A MULTIMEDIA COURSEWARE PRODUCTION MODEL FOR ENHANCING ENGLISH STRESS PRONUNCIATION ABILITY OF THAI UNDERGRADUATE STUDENTS

Suranaree University of Technology has approved this thesis submitted in partial fulfillment of the requirement for the Degree of Doctor of Philosophy.

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วิชุรา วินัยธรรม : การพัฒนาแบบจำลองบทเรียนคอมพิวเตอร์สื่อผสมเพื่อพัฒนาความสามารถในการออกเสียงเน้นในภาษาอังกฤษของนักศึกษาไทยระดับปริญญาตรี (THE DEVELOPMENT OF A MULTIMEDIA COURSEWARE PRODUCTION MODEL FOR ENHANCING ENGLISH STRESS PRONUNCIATION ABILITY OF THAI UNDERGRADUATE STUDENTS) อาจารย์ที่ปรึกษา : อาจารย์ ดร.สุขสรรพ์ ศุภเศรษฐเสรี, 236 หน้า

งานวิทยานิพนธ์ฉบับนี้มีจุดมุ่งหมาย 4 ประการ ได้แก่ (1) เพื่อพัฒนาแบบจำลองการสร้างบทเรียนคอมพิวเตอร์สื่อประสมสำหรับส่งเสริมความสามารถด้านการออกเสียงและการเน้นเสียงภาษาอังกฤษให้กับนักศึกษาระดับปริญญาตรี มหาวิทยาลัยราชภัฏกำแพงเพชร (2) เพื่อทดสอบประสิทธิภาพบทเรียนเรื่องการออกเสียงและการเน้นเสียงภาษาอังกฤษจากการเรียนรู้ผ่านการใช้บทเรียนคอมพิวเตอร์สื่อประสม (3) เพื่อศึกษาเปรียบเทียบประสิทธิภาพของผู้เรียนจากแบบทดสอบก่อนเรียนและหลังเรียน หลังจากได้ใช้บทเรียนคอมพิวเตอร์สื่อประสมนั้นแล้ว และประการสุดท้าย (4) เพื่อสำรวจและรับทราบมุมมองและความคิดเห็นของผู้เรียนที่มีต่อบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้

กลุ่มตัวอย่างเป็นนักศึกษาระดับปริญญาตรีมหาวิทยาลัยราชภัฏกำแพงเพชรที่กำลังศึกษาอยู่ในภาคเรียนที่ 2 ปีการศึกษา 2555 การผลิตบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้ได้พัฒนาแบบจำลองการสร้างบทเรียนโดยศึกษาและผลิตตามกระบวนการและระบบการออกแบบการเรียนการสอน เครื่องมือที่ใช้ในการวิจัยประกอบด้วย (1) แบบจำลองการสร้างบทเรียน (2) บทเรียนคอมพิวเตอร์เรื่องการการออกเสียงและการเน้นเสียงภาษาอังกฤษ (3) แบบทดสอบก่อน-หลังเรียน (4) แบบสอบถาม (5) แบบสัมภาษณ์กึ่งโครงสร้าง การวิเคราะห์ข้อมูลใช้ค่าสถิติบรรยายสำหรับข้อมูลเชิงปริมาณ และการวิเคราะห์เนื้อหาสำหรับข้อมูลเชิงคุณภาพ สำหรับการประเมินประสิทธิภาพบทเรียนคอมพิวเตอร์สื่อประสม ใช้เกณฑ์มาตรฐาน 80/80 จากสูตร E_1 / E_2 ของพรหมวงศ์ เพื่อคำนวณค่าประสิทธิภาพ ได้ผลจากการวิเคราะห์ข้อมูล ดังนี้

1. จากการประเมินแบบจำลอง ปรากฏว่า คะแนนเฉลี่ยจากการประเมินของผู้เชี่ยวชาญ 3 ท่าน ที่มีต่อการพัฒนาแบบจำลองและความเหมาะสมของแบบจำลองต่อการนำไปสร้างบทเรียนคอมพิวเตอร์สื่อประสมเพื่อส่งเสริมความสามารถในการออกเสียงและการเน้นเสียงภาษาอังกฤษสำหรับนักศึกษาปริญญาตรี เท่ากับ 4.77 ($\overline{X}$)

2. จากการทดลองใช้บทเรียนคอมพิวเตอร์เบื้องต้น เมื่อนำไปทดลองกับกลุ่มตัวแทนประชากร พบว่า คะแนนเฉลี่ยที่ได้ของกลุ่มตัวอย่างทั้งหมดสูงกว่าคะแนนจากกลุ่มทดลองเบื้องต้น โดยค่าร้อยละของคะแนน E_1 / E_2 ของกลุ่มตัวแทนประชากรที่ทำได้จากหน่วยการเรียนที่ 1 เท่ากับ

81.60/82.31 หน่วยการเรียนที่ 2 ได้เท่ากับ 81.13/81.75 และหน่วยการเรียนที่ 3 ได้เท่ากับ 82.20/82.50 แสดงให้เห็นว่าบทเรียนคอมพิวเตอร์สื่อประสมเพื่อพัฒนาการการออกเสียงและการเน้นเสียงภาษาอังกฤษมีประสิทธิภาพตามเกณฑ์มาตรฐาน 80/80

3. สำหรับคะแนนจากแบบทดสอบก่อนเรียนและหลังเรียน คะแนนเฉลี่ยก่อนเรียนของกลุ่มตัวแทนประชากร ทำได้ 36.95 (ร้อยละ 61.58) และคะแนนเฉลี่ยหลังเรียนได้เท่ากับ 41.18 (ร้อยละ 68.63) จากคะแนนเต็ม 60 คะแนน เมื่อคำนวณค่าทางสถิติแล้ว คะแนนทั้งสองครั้งมีความแตกต่างกันอย่างมีนัยสำคัญที่ระดับ .05 แสดงให้เห็นว่ากลุ่มตัวอย่างมีการพัฒนาด้านการออกเสียงและการเน้นเสียงภาษาอังกฤษเพิ่มมากขึ้นหลังจากที่ได้ใช้บทเรียนคอมพิวเตอร์สื่อประสมชุดนี้

4. ผลจากการตอบแบบสอบถามจำนวน 27 รายการ พบว่าคะแนนเฉลี่ยที่มีต่อบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้เท่ากับ 4.23 ($\overline{X}$) ซึ่งหมายความว่ากลุ่มตัวอย่างเห็นด้วยต่อการออกแบบกระบวนการเรียนการสอนโดยใช้บทเรียนคอมพิวเตอร์สื่อประสมชุดนี้ โดยเห็นด้วยมากที่สุดว่า บทเรียนชุดนี้ช่วยส่งเสริมทักษะด้านการฟัง ($\overline{X}$ = 4.48) บทเรียนประกอบมีรูปแบบการปฏิสัมพันธ์ระหว่างผู้เรียนกับคอมพิวเตอร์ที่หลากหลาย ($\overline{X}$ = 4.45) บทเรียนมีการประเมินผลให้ผู้เรียนทราบในทันที และมีวิดิทัศน์ส่งเสริมการเรียนรู้และการฝึกฝน ($\overline{X}$ = 4.38) และจากการตอบแบบสอบถามปลายเปิดและการสัมภาษณ์ ส่วนใหญ่กลุ่มตัวอย่างมีทัศนคติและมุมมองที่ดีต่อบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้

สาขาวิชาภาษาต่างประเทศ ลายมือชื่อนักศึกษา_____

ปีการศึกษา 2555 ลายมือชื่ออาจารย์ที่ปรึกษา_____

WICHURA WINAITHAM : THE DEVELOPMENT OF A MULTIMEDIA COURSEWARE PRODUCTION MODEL FOR ENHANCING ENGLISH STRESS PRONUNCIATION ABILITY OF THAI UNDERGRADUATE STUDENTS. THESIS ADVISOR : SUKSAN SUPPASETSEREE, Ph.D., 236 PP.

INSTRUCTIONAL DESIGN MODEL/MULTIMEDIA COURSEWARE/ PRONUNCIATION/STRESS/THAI UNDERGRADUATE STUDENTS

The purposes of the study were to (1) develop a multimedia courseware production model for enhancing the English pronunciation and stress abilities of Thai undergraduate students in Kamphaeng Phet Rajabhat University (KPRU), (2) determine the efficiency of the multimedia courseware, (3) compare students' English pronunciation and stress abilities before and after they used the multimedia courseware, and (4) explore the students' views towards the use of the multimedia courseware.

The subjects were KPRU undergraduate students in semester 2 of the 2012 academic year. The courseware production and the model were developed by following the theory of instructional system design. The research instruments included (1) an instructional production model, (2) the courseware of English pronunciation and stress lessons, (3) a pre-test and a post-test, (4) a questionnaire, and (5) a semi-structured interview. Descriptive statistics were used to analyze the quantitative data, and content analysis was employed for the qualitative data. The courseware evaluation for efficiency was conducted relying on the Brahmawong E1/E2 formula with a Standard criterion of 80/80. The results indicated that:

1. The three experts' verification recorded an overall mean ($\overline{X}$) of **4.77** toward the SPMC Model development and appropriateness for the multimedia

courseware production to enhance the English language pronunciation and stress ability of Thai undergraduate students.

2. The results of the courseware evaluation showed that the efficiency score results from the research sample met the criteria of an 80/80 Standard, and higher than the score results from a prototype tryout. The E1 / E2 scores of the sample were 81.25/82.50 from Unit 1, 81.13/81.75 from Unit 2, and 82.20 / 82.50 from Unit 3, indicating that the Stress and Pronunciation Multimedia Courseware (SPMC) had efficiency at the criteria of the 80/80 Standard.

3. The average pre-test score was 36.95 (61.58%) while it was 41.18 (68.63%) from the post-test from 60 score total. According to the statistical data analysis and results, there were significant differences between pre-test and post-test at the level of .05. The results indicated that the participants' pronunciation and stress in English had improved after they used the Stress Pronunciation Multimedia Courseware (SPMC).

4. The results of the questionnaire with 27 items demonstrated that the average mean toward the SPMC design was 4.23 ($\overline{X}$), indicating that the subjects agreed with the multimedia courseware instructional design. The subjects most agreed that the instruction enhanced English listening skills *($\overline{X}$ = 4.48*), a variety of different multimedia prompted ($\overline{X}$ *= 4.45*), providing instant feedback after responding ($\overline{X}$ *= 4.38*) and the videos enhanced tutoring and practice resulting in a mean of ($\overline{X}$ *= 4.38*). The findings from the open-ended questionnaire and the semi-structured interview were shown through optimistic views and opinions towards the use of SPMC by students.

School of Foreign Languages Student's Signature_____

Academic Year 2012 Advisor's Signature_____

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Wichura Winaitham

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CHAPTER 1

INTRODUCTION

1.1 Background and Statement of the Problem

Language is a complex system comprising structural features which are almost entirely focused on communication. Learning the English language is not a piece of cake for non-native speakers including Thai people. Ways to master a foreign language include learning and understanding its structured system across language use, grammar, words and lexicon, as well as its sound system (Foley & Thompson, 2003). Meanwhile, the goal of learning another language is to succeed in communication; pronunciation is a fundamental skill for accuracy and comprehension in oral situations. In contrast, incomprehension and non-standard pronunciation elevate non-native speakers' anxiety and silence and seem to breakdown communication. Pronunciation models are pedagogic means to achieve effective communication for specific language learners. Teachers should consider and provide appropriate pronunciation norms and models for learners to use during interaction and to assist in the international context too (Jenkins, 2000). In general, in ESL/EFL classes, English pronunciation, including the speech science required to deliver the content phonology, is not the focus since teachers lack confidence and avoid teaching about them (Carey, 2002). This problem likewise exists in Thai EFL classes. Thai students have few chances to memorize and to pronounce vocabulary like a native-speaker and rarely learn basic pronunciation and phonemics at the outset. Also, the

students are not encouraged to engage in intensive pronunciation training (Jukpim, 2009; Varasarin, 2007). What makes Thai L2 learners and Thai EFL students unsuccessful in English pronunciation may be that the pronunciation instruction is not focused on the specific context of a Thai L1 learner, but rather the mixed standard of an international context (Carey, 2002). For instance, there are some English sounds that should be concentrated on like the /r/, /th/, /z/, and /v/ sounds that do not exist in the Thai language. Also, suprasegmental features merit more concentration such as stress, pitch, and intonation that also impact Thais speaking English. These are reasons why English instruction and pronunciation teaching and learning should be designed and developed to meet learners in particular, not in general.

In Thailand, students have to study English as the first foreign language based on the national curriculum. They study hard to know about English principles and usage, and expect to obtain a high score or to pass the course examination. This is a factor that pushes Thai students, who are fearful to use English, to worry too much about grammatical rules. Because learning grammar is the main focus for Thai teachers, rather than the communicative aspect of language, Thai EFL students have learnt a great deal of English grammar and writing with limited improvement in speaking and listening. Hence, Thai EFL learners have faced difficulties in using English for communication and end up with a limited ability to speak English with intelligible pronunciation.

Kamphaeng Phet Rajabhat University **(**KPRU) is a government university providing several fields of study such as Education, the Sciences, the Arts, and Business Administration and the university serves both local people and students coming from further away. KPRU provides mandatory general educational courses

which includes English. The general courses are required courses for all Bachelor degree curriculums. English language teaching (ELT) at KPRU has become a stronger concentration in recent years in response to the national curriculum, which requires English language courses for all educational levels, to prepare students for the ASEAN community where each member nation needs to use English as the inter-language within the community (Office of the Higher Education Commission, 2009). Besides, KPRU provides English courses to promote learners' abilities to communicate in daily life and in their careers by offering undergraduate students at least three English courses with credits, such as Fundamental English, English for Communication (1 – 2), Listening – Speaking (1 – 2), Language and Communication for Specific Purpose (KPRU, 2011). According to the English course descriptions (KPRU, 2011), the purpose of most courses is to improve to English communicative competence, particularly listening and speaking skills. Unfortunately, these tutorial classes are only offered to undergraduate students for three hours a week for fifteen weeks a term. Class size is approximately for forty to sixty students with one lecturer. The classes are traditional with limited use of technology assisted instruction. Also, the large class size and limited time does not encourage language learning as well as individual practice.

With the fast growth of technology, language teachers could enrich the class environment by using innovative instruction and tools. The key at this point is for teachers to learn how to integrate computer use with their lessons; teachers would find their experience in the classroom transformed if the technology infrastructure could be improved (Hewer, 1997). Technology tools today include computers, mobile phones and tablets, each of which could assist pronunciation teaching and learning.

Instruction via technology enhances various learning styles by providing interactive functions and instant feedback. Multimedia enables learners to learn within virtual situations. They can listen to voices, model and repeat, watch instructional videos and demonstrations of mouth movement, play interactive games, and receive instant feedback, etc.

There are numerous pronunciation oriented commercial software available for non-native speakers to help learners improve and master their English pronunciation. During the digital decade, teaching and learning methods have paralleled changes in technology (Por & Fong, 2011). The result is that instructional tools are available and convenient for educators and include devices such as computers, Smartphones and tablets. Courseware and technology are provided for a fee or sometimes for free. After payment, learners can use the courseware on their own device to access online lessons or they can download lessons for free from some Websites.

The researcher searched and found several examples of courseware that provided lessons on pronunciation teaching and learning for non-native English speakers. Most programs are designed for ESL/EFL and specific learners. The most commercially popular program is *Clear Pronunciation1, 2* for all students, modified as a new version from *Pronunciation Power1, 2* for Chinese speakers (Clarity, 2012). The user needs to buy the courseware and access the program from the Internet or through a network connection. It can be utilized via a computer or a mobile device. The *Clear Pronunciation 1, 2* programs provide lessons on pronunciation, listening and speaking for learners from elementary to intermediate. The contents cover phonemics/phonetics including charts, consonant and vowel sounds, sentence and

syllable stress, and intonation. The program is integrated with multimedia which includes audio, video, photography and text within the English version.

Oxford University Press also provides the program *New English File*, interactive online courseware providing several exercises and activities for practicing English grammar, listening, vocabulary, reading and pronunciation (Oxford University Press, 2012). The pronunciation exercises cover English vowels, diphthongs, consonant sounds, sound charts, and pronunciation games. The users are able to access the software free at the Website *http://elt.oup.com*, and use it via the computer with the Adobe Flash Program installed. Oxford University Press also provides the *New English File* software as a mobile application (App) with the name *English File Pronunciation (Version 1.1)*. This application enhances learners ability to speak by practicing sounds, words and sentences, using an interactive sound chart with click and listen, and pronunciation games including a record and play function for repeated practice. The App has both British and American English versions (Oxford University Press ELT, 2012). The user can buy it at the Website *https://itunes.apple.com/us/app/english-file-pronunciation/*. The limitation of this application is that it is only supported by Apple devices like iPhones, iPod and iPads.

Similarly, Cambridge University Press provides *Phonetic Focus* devoted to English phonemics and the phonetics drills and practice (Cambridge English Online, 2011). The program enables users to use it for free through a computer connected to the Internet, and/or buy the mobile application for smartphones or tablets at the Website *http://cambridgeenglishonline.com/Phonetics_Focus/*.

Another software example is *WordBanker* (SoftTonic, 2012). It provides pronunciation practice and tests with a number of words for learners to listen to and

repeat. Students have many chances to listen to a British English (BE) native speaker. The student can record their own voice as a MP3. The program then prepares a small report for them. In the test mode, there are three main sections including multiple choice, listening and type the answer. *WordBanker* provides a package in variety of languages (i.e. Chinese, French, German, Italian, Spanish, and Swedish) designed for beginner to intermediate learners. The *WordBanker* is available on the Website *http://wordbanker.en.softonic.com/*. *WordBanker* allows users to download and install the courseware on the computer for free.

In addition, during the research only one program was found designed specifically for Thai learners. The courseware is called *English Pronunciation Made Easy for Thai Speakers* (Accent Master, 2011). *English Pronunciation Made Easy for Thai Speakers* is a commercial software program provided in CD-Rom format. The program covers word stress, linking and the patterns and sounds that effect Thais when attempting to speak English,. The language used is English with an American intonation. The software also promotes interactive learning through the use of games, video instructions, animated graphics, waveform graphs, and instant recording. The users can buy it at the Website *http://accentmaster.com/Software/Thai.htm*.

Although there are many technologies for pronunciation teaching and learning that are available free or paid, offline and online, that can be used on PCs and mobile devices, these are not responding to or satisfying the problems and needs of Thai undergraduate students. As seen in the details of the programs mentioned in previous paragraphs, a few programs are designed for specific learners, such as, *Pronunciation Power* which was developed for Chinese speakers; *WordBanker* was designed

specifically for some foreign speakers like Chinese, French, German, Italian, Spanish etc. As stated by Tamburini (1999), pp. 139

…good courseware should be focused only on the student's needs, and should be designed in a clear and well organized way in order to achieve the learning goal.

Furthermore, some are expensive and need a specific device or software to support them; for example, the *Clear Pronunciation 1/2* price is $199 (5,700-5,900 Thai Baht) per computer, and $1,699 (50,700-50,900 Thai Baht) for 40 computers. The program needs the *Adobe Flash Player* program to function on the computer. The *English Pronunciation Made Easy for Thai Speakers English File Pronunciation* costs $129 (3,500 – 3,800 Thai Baht). The *English File Pronunciation* Application needs *iTunes* software to download. *Phonetic Focus,* and *English File Pronunciation* Apps are supported only on Apple mobile devices (i.e.iPhone/iPad/iPod). The *WordBanker*, the *Phonetic Focus,* and the *New English File* software need an Internet connection to access. The *English Pronunciation Made Easy for Thai Speakers* requires Windows 7/XP/Vista.

According to the stated limitation, most Thai undergraduate students at KPRU are not able to afford these costly programs and devices. The Internet connection is often not available to them so they have to buy an Internet package or a 3G/4G connection to use those programs. Also, the programs mentioned are not designed for Thai EFL learners and do not provide for the wide range of students' proficiency levels of English and pronunciation.

The SPMC (Stress Pronunciation Multimedia Courseware) was developed to satisfy the purpose of the current study. It was designed for Thai undergraduate

students and developed based on the instructional system design (ISD) theory, with well-organized and planned production. SPMC is an offline program operable on PCs and mobile computers. KPRU students can use it at the university computer laboratory or on their own computer. The contents focus on English stress, which is one problem that affects pronunciation errors. SPMC has interactive instruction and uses multimedia like animated graphics, voice models of native speakers, video instructions, and text. The SPMC program also can be revised and edited when it is time to modify depending on the learners' problems and requirement.

Based on the research background and problems, the current study attempted to use instructional technology for language teaching and learning in the EFL classroom. The goal was to construct effective courseware of English pronunciation and word stress using pedagogical methods to enhance the ability of Thai undergraduate students. The title of the present study is

The Development of a Multimedia Courseware Production Model for Enhancing the Ability of Thai Undergraduate Students in Pronunciation and Stress of English

1.2 Purposes of the Study

The purposes of the present study include:

1. To develop a multimedia courseware production model for enhancing English pronunciation and stress ability of Thai undergraduate students in Kamphaeng Phet Rajabhat University

2. To examine the efficiency of the multimedia courseware for enhancing English pronunciation and stress abilities of Thai undergraduate students based on the criteria of 80/80 Standard
3. To compare English pronunciation and stress ability before and after receiving English stress and pronunciation treatment by the multimedia courseware
4. To explore students' views toward the multimedia courseware for enhancing English pronunciation and stress ability

1.3 Research Questions

In order to achieve the purposes mentioned above, the study focuses on the following questions:

1. Is the development of the instructional design model appropriate for multimedia courseware production for the enhancement of English pronunciation and stress ability of Thai undergraduate students?
2. Do the efficiency of a process (E1) and a product (E2) of the multimedia courseware production meet the criteria of 80/80 Standard?
3. Are there any significant different achievement scores between pre-test and post-test after the students' use of the multimedia English pronunciation and stress courseware?
4. What are the students' views and opinions towards the multimedia English pronunciation and stress courseware?

1.4 Scope and Limitations of the Study

This current study aimed to develop a multimedia courseware production model for enhancing Thai undergraduate students' English pronunciation and stress abilities, and evaluate the efficiency of the pronunciation lessons by comparing students' pre-test and post-test achievement scores. The sample was KPRU students only. Therefore, the subjects of this study may not be representative of the undergraduate students in other universities in Thailand because the sample selected from Kampheang Phet Rajabhat University may have different learning backgrounds, problems and needs. Following upon the preliminary study and needs analysis of the target population, the present study designed a multimedia courseware production model to develop the instruction to improve students' ability in English pronunciation and stress. The findings of this study are limited to the subject of this study only. They should not be generalized to other environments.

1.5 Significance of the Study

The findings of this present study could have potential implications in developing new instructional technology for enhancing the English pronunciation and stress ability of ESL/EFL learners, particularly Thai undergraduate students. The product from this current research might be useful in the improvement of students' learning achievement in English pronunciation and word stress. Furthermore, this study could enrich the information for further research and studies in the development of technology tools for teaching and learning English pronunciation. The instructional model developed in this study might be applied to develop any course, teaching material or curriculum. Lastly, the students' views and opinions toward the

multimedia courseware of English pronunciation and stress might provide useful guidelines for English language teaching and learning in the EFL/ESL class environment.

1.6 The Definitions of Key Terms

1.6.1 Multimedia courseware production model refers to a model for producing multimedia courseware for English pronunciation and stress. The model was developed as a guideline or strategy on how to organize appropriate pedagogical scenarios to achieve instructional goals based on learning theories. The model assisted the researcher to visualize the problem, to break it down into discrete, manageable units.

1.6.2 Multimedia courseware is instructional software that includes multimedia used in the process and systems of instruction. This courseware was designed and developed particularly to improve Thai undergraduate students' pronunciation and stress in English.

1.6.3 English pronunciation and stress refers to two topics; (1) English pronunciation; and (2) word stress that includes loudness, pitch, and duration, which specific words are emphasized or pronounced louder.

1.6.4 Thai undergraduate students are the students are studying for a bachelor degree at Kamphaeng Phet Rajabhat University in Thailand. In this case, the students were taking courses in Kamphaeng Phet Rajabhat University in the 2012 Academic Year.

1.6.5 Views are students' attitudes or opinions toward the use of multimedia courseware for enhancing English pronunciation and stress ability.

1.6.6 80/80 Standard is a criterion used to evaluate the efficiency of any instructional process and outcome (product). In this case, it tests the efficiency of the English pronunciation and stress multimedia courseware lessons.

1.7 The Outline of the Thesis

Chapter 1 states the background and problems of the study and the significance of the study. This is followed by the purpose of the study, and the research questions. The scope and limitations of the study and the definitions of key terms are presented. Lastly, the outline of the thesis is presented.

Chapter 2 mentions literature and related researches and studies. This chapter includes literature review on (1) English language learning, principles and instructional approaches; (2) the importance of pronunciation learning including stress in English; (3) Computer assisted language learning (CALL) and multimedia, the process of multimedia instruction and the principles of multimedia instruction; and (4) instructional design and instructional system design models. Lastly, previous research studies related on technology and computer enhancing pronunciation learning are included.

Chapter 3 identifies research methodology. It describes the research design and method used for data collection and analysis including variables, samples, instruments, construction and efficiency evaluation of the instruments.

Chapter 4 presents research results and findings with a discussion of the findings based on the research purposes and questions.

Chapter 5 describes the multimedia courseware production model that was designed and named SPMC by the researcher, including the lessons of English pronunciation and stress on the multimedia courseware.

Chapter 6 presents an overview of the current research including research methodology, findings, limitations and recommendations for future study.

1.8 Summary

The current thesis was conducted to enrich technology instruction designed to assist language learning and teaching in Thai EFL class. The aim was concentrated on English pronunciation for Thai undergraduate students, a case study in Kamphaeng Phet Rajabhat University, Thailand. The current chapter describes the background and problems of the study, followed by the purpose of the study, research questions, scope and limitations of the study, significance of the study, definitions of key terms, and an outline of the thesis and summary.

CHAPTER 2

LITERATURE REVIEW

This chapter presents the literature review with a discussion of the theories, key terms, and other principles including related research that are useful and relevant to the present study. The following areas are discussed and divided into seven sections:

2.1 English Language Learning and Teaching

2.1.1 Language learning approaches

2.1.2 Learning principles and instructional approaches

2.2 The Importance of pronunciation learning and teaching

2.3 The Importance of learning about stress in English

2.4 Computer assisted language learning and multimedia instruction

2.4.1 Computer assisted language learning

2.4.2 Multimedia instruction

2.4.3 The process of multimedia instruction

2.3.4 Principles of multimedia instruction

2.5 Instructional System Design and Model

2.5.1 Instructional design

2.5.2 Instructional design system

2.5.3 Instructional models

(1) Dick and Carey Model

2.1 English Language Learning and Teaching

This section reviews language learning and teaching, and theories on how language instruction can help instructors or learners to succeed in learning. The following consists of language learning approaches, principles, and essential instructions that provided useful guidance for this present study.

2.1.1 Language Learning Approaches

Ellis (2005) suggests three general approaches to teaching a second or foreign language. The three approaches include the oral-situational approach, the notional-functional approach and the task-based approach.

The oral-situational approach was developed by British applied linguists. It is an alternative approach to the audio-lingual approach which is based on a structural syllabus but emphasizes the meanings of the different structure. The oral-situational approach was based on a behaviorist learning theory, and it has drawn on skill-building theory (Anderson, 1993, cited in Ellis, 2005) which shows the distinction between declarative knowledge and procedural knowledge. In this approach, learners

engage in activities that emphasize form-meaning mapping that are repeated in everyday communication. The oral-situational approach employs three main activities which include 'present', 'practice', and 'produce'. These three activities are defined as the PPP (present-practice-produce) versions. ‘Present’ refers to providing information about grammar rules, ‘practice’ refers to exercises that control production of the target structure and ‘produce’ refers to task performance that engages learners’ behavior in real-life.

The notional-functional approach presents theories and descriptions of language emphasized on competence in functional and social aspects. This approach attempts to define clearly the content and what is to be taught, for instance, the notional syllabuses consist of a list of functions (e.g. apologizing and requesting) and notions (e.g. past time and possibility) accompanied with the linguistics required in communication. The methodology used in the notional-functional approach uses PPP like the oral-situational approach, but it is different in the content. While the oral-situational approach is related to linguistic competence, the notional-functional approach is based on communicative competence (Hymes, 1971).

The task-based approach focuses on language teaching without attempting to define the language form, but the content shows the holistic in terms of ‘tasks’ or activities in which meaning is primarily related to the real world, task completion has some priority and the assessment is the task outcome. Tasks are provided for listening, speaking, reading or writing or combinations of these skills. However, tasks are not parts of exercises, so they should be distinguished. The important purpose of task-based approach is that learners learn language best if they engage in authentic activities linked to an international context.

From these three approaches, Ellis suggests general principles for successful instructed learning. He expresses these in terms of a set of ten general principles (as a guideline for effective instructional practice):

Principle 1: Instruction needs to ensure that learners develop both a rich repertoire of formulaic expressions and a rule-based competence

Principle 2: Instruction needs to ensure that learners focus predominantly on meaning

Principle 3: Instruction needs to ensure that learners also focus on form

Principle 4: Instruction needs to be predominantly directed at developing implicit knowledge of the L2 while not neglecting explicit knowledge

Principle 5: Instruction needs to take into account learners 'built-in syllabus'

Principle 6: Successful instructed language learning requires extensive L2 input

Principle 7: Successful instructed language learning also required opportunities for output

Principle 8: The opportunity to interact in the L2 is central to developing L2 proficiency

Principle 9: Instruction needs to take account of individual differences in learners

Principle 10: In assessing learners' L2 proficiency it is important to examine free as well as controlled production.

The task-approach emphasizes the behaviorist learning theory and mixed PPP versions. This approach supports ideas of the oral-situation approach. In contrast, the notional-function approach focuses on the functional and social aspects of

competence based on the communication approach theory. The task-based approach specifies the content in activities or tasks that contain meaning, relationships to the real world, task completion and performed task assessment, or task outcomes, but not in language form like the oral-situation approach and notional-functional approach.

2.1.2 Learning Principles and Instructional Approaches

This section is related to psychology principles as an approach to educational instruction and also as an essential component in instructional design. Alessi and Trollip (2001) divide the approaches into three paradigms; behavior psychology principles, cognitive psychology principles and constructivist psychology principles. Alessi and Trollip (2001) identify *behavioral psychology principles* based on theories of behavioral psychologists like Pavlov, Thorndike, and B. F. Skinner, which include the behavioral theory of reward and punishment. The important implication of this theory is that humans learn behaviors motivated by their needs and responses to elements such as food, sleep, reproduction etc. In language learning, this theory led to the development of programmed textbooks and classrooms (Ayllon & Azrin, 1968, cited in Alessi & Trollip, 2001).

As the field of instructional design has matured, the Instructional System Design (ISD) approach was developed to provide effective instruction and to promote mastery learning and was designed primarily for teaching skills and adult knowledge. The ISD is produced based on behavioral objectives (learners' outcomes or things that they will be able to do at completion), learning tasks and activities and teaching analyzed from the performance of learners' levels.

The ISD model provides guidelines for responding to the curriculum and course design since the ISD model contains the steps of content analysis, definitions

of overall objectives, and curriculum consequences. The procedure selects instructional methods and media for individual lessons based on learners' objectives and ends with the evaluation of the lessons and the whole system. An observation target behavior is a measurement for ISD evaluation. However since ISD is widely used, ISD models ignore important aspects of learning like thinking, reflection, memory and motivation or other outcomes of learners. They emphasize the instructor and instructional materials. So there is a current criticism that Instructional Design (ID) and Instructional Systems Design (ISD) have the same equally strong behavioral emphasis. The ISD is considered one type of ID model that includes cognitive and constructivist elements (Reigeluth, 1999, cited in Alessi & Trollip, 2001).

Cognitive psychology principles means the process of knowing which is not observable such as the mind, memory, attitudes, motivation, thinking, reflection and other presumed internal processes. This paradigm describes the relationship of how information in the world enters through human senses, becomes stored in memory, is maintained or forgotten, and is used. This implies that information is stored initially in short-term memory while it is organized to become stored in long-term memory. Most information-processing approaches include memory and thinking concepts that are limited in the capacity which includes an executive control (learner's perception, memory, processing, and application of information).

This approach is concerned with the theory of cognitive psychology which is concerned with semantic networks and distinguishes how biologists view the connections of the human brain. Each brain cell is connected to many others, in a vast spider web or network. The theory which is closely related to semantic network theories is Schema Theory (initially used by Sir Bartlett in 1932), which is highly

organized information collection and relationships. Learning occurs when schemas are varied to combine new knowledge.

Alessi and Trollip (2001) suggest that cognitive psychology can be a primary guide for the major methodologies of interactive multimedia and the design of multimedia programs. The areas of cognitive theory that are most important to multimedia design relate to perception and attention, the encoding of information, memory, comprehension, active learning, motivation, the locus of control, mental models, metacognition, the transfer of learning, and individual differences. When interactive multimedia is designed and evaluated, these categories are the most important in reflection.

Despite this, learning psychology has faded away since the 1970s (Alessi & Trollip, 2001), the study of instructional design has been maintained and cognitive principles began to take hold in ISD models created by instructional designers. For example, in computer-based instruction and interactive multimedia, screen design and presentation strategies reflected theories of attention and perception. Moreover, individual needs and differences are considered as important instructional strategies and user control. Even though behavioral principles equally meet active learning principles, the cognitive approach puts more emphasis on active learning and on learners' activities which are designed and selected to enhance learning.

Alessi and Trollip (2001) describe *constructivist psychology principles* through senses of constructivism. Constructivism suggests that reality or knowledge is an individual interpretation from human perception, not coming from outside. However some constructivists thought that the function of social norms and interpretation are what humans learn and knowledge is constructed by social groups,

not by the individual. While moderate constructivists believe that a real world is truly, very individual and changeable, more radical constructivists do not identify what the exact nature of real world is, but only that it is interpreted by human thoughts. With regard to instruction, designers hold that learning with individual notions is a process of knowledge constructed actively by people and they disregard traditional methods such as memorizing, demonstrating, and imitating.

The constructivist goal is that learners themselves actively construct their knowledge while teachers act like coaches, facilitators, or learners' partners. The designers of the constructivist approach suggest that the following principles could facilitate the construction of knowledge and might lead to the goal. The following points are selectively presented as they might impact and be useful for the present study:

- Learning is emphasized over teaching.
- Learners' actions and thinking are emphasized over teachers.
- Active learning is the focus.
- The learner is encouraged to engage in gathering information and project construction.
- Situated learning and anchored instruction are promoted as a basis of constructivist thinking.
- Purposeful or authentic learning activities are used.
- Choices, negotiations of the goal, autonomous learning, strategic thinking, and reflection or evaluation methods are emphasized for the learners.
- Learning and activities support the learner‘s ownership.

- Learners are encouraged to participate in authentic tasks and individual activities.

Alessi and Trollip (2001) implied that these three learning principles and approaches to design are appropriate for computer instruction and multimedia pedagogy and that they could be a good way to learn and teach. Other educators also suggest that the educational approach used should depend on goals, learners and content, and those most educational environments must include a combination of behavioral, cognitive, and constructivist elements.

On the other hand, it was recommended that the educators should use a variety of multimedia and approaches, which can be flexible in the learning environment and most meet the needs of learners. Designing and developing educational software is time consuming and difficult, so the beginning multimedia designer should select and use a variety of software methods which are more straightforward to develop. However, considering what is appropriate should depend on the designer's experience, subject area, learners' needs and skills and include the teacher's educational philosophy. Alessi and Trollip (2001) advised that the novice designer may start with simple and more directed methodologies, such as tutorials and drills before using more complicated methods like hypermedia, simulations, or open-ended learning environments.

The current study presents the principles of language learning and teaching approaches that were useful and took advantage of the approaches that the researcher could apply and implement to develop an effective pronunciation instructional pedagogy in conjunction with a multimedia courseware as an element learning and teaching method.

2.2 The Importance of Pronunciation Learning and Teaching

Last decade, many ESL/EFL classes neglected to teach pronunciation since it was claimed that there was a small relationship between teaching in the classroom and accomplishment in pronunciation proficiency. In the 1970s and 1980s it was claimed as a rather outdated activity which learners attempted to master in native-speaker voice, but failed at communicative competence. The instruction of pronunciation discouraged learners through difficult and repetitive exercises. Some strong factors like mother tongue and a lack of learners' motivation also affected learners ability to succeed in intelligible pronunciation. In recent years, teaching and learning pronunciation for L2 speakers has increased since communicative competence has become a goal of language learning and a primary skill for oral communication and an essential component of communication competence (Hişmanoğlu, 2006). In recent years, pronunciation teaching has been more interested with easier drills and exercises whereas students got more effective practice in using clearly intelligible speech for communication (Roach, 2002).

In an oral communication, mastering the sound features of the target language and using it to convey meaning correctly contributes to situational understanding (Dale & Poms, 2005).Previous studies indentified pronunciation of English as having two features which affects the speaker's pronunciation consisting of segmental and suprasegmental features (Collins & Mees, 2003; Dale & Poms, 2005; Jenkins, 2000; McKay, 2002). Bamgbose (1992, cited in McKay, 2002) stated that it is essential for English language learners to master pronunciation if they are to be able to identify the unique consonant and vowel sounds (segmental features) as well as understand stress, pitch, rhythm and intonation (suprasegmental features) of English. Collins & Mees

(2003) and Dale & Poms (2005) agreed that a good way to help English learners was to study speech science (phonetics) and phonology (how sounds pattern and function in a given language). The first language background of the speakers reflects the distinct phonological features of another language which in this case is the English language. Dale and Poms (2005) also pointed out that the learner might be perfect in English grammar or even able to pronounce L2 sounds correctly, but a noticeable accent in the target language should not be neglected until he or she masters articulation. Jenkins (2000) pointed out a similar suggestion that the pronunciation lecturer should provide productive focus of pronunciation teaching on three areas; segmentals, nuclear stress, and the use of articulatory settings. While English is used as an international language among non-native or bilingual speakers who may use English as the second or foreign language, learners of another language should be provided with appropriate pronunciation norms and models when they are not able to replicate the native-speaker sounds and context.

Given that, the study of the two features plays an important role in achieving L2 learners' communicative goals and psychosocial development (Hardison & Sonchaeng, 2005). In a basic pronunciation class, the ESL/EFL class should provide both areas, particularly focusing on problem sounds and features that affect English pronunciation errors of non-native speakers. For instance, in the Thai language, the speaker does not use stress patterns in the same way that English language speakers use, which makes it difficult to pronounce and to listen to that the English language. Studying stress should be a part of English lessons or offered in a direct course on English pronunciation.

In the present study, word stress in English was the focus and an expected difficulty for Thai EFL learners since stress in English is different from stress in the Thai language. Word stress used in the English language is unfamiliar to Thai speakers trying to speak English and is neglected in English class. Indeed, understanding stress in the English language is essential for L2 learners in order to correctly convey meaning, so, it is a learner need and problem. For instance, the Thai language contains a lot of vocabulary with the same spelling and pronunciation, but different meanings such as the word ‘saaw /saʊ/’ meaning ‘a young lady’ as a noun and ‘pull’ as a verb. Meanwhile, English has stress to interpret meaning in a word of the same spelling, but pronounced differently, such as ‘present’ /p’reznt/ is a noun meaning ‘a gift’, and /prɪ ’zent/ is a verb meaning ‘to propose’.

2.3 The Importance of Learning about Stress in English

English sounds can be affected by several vocal features; stress, rhythm, and intonation. English speakers put stress on word syllables and words in a sentence and if not used appropriately misunderstanding can occur or the language might sound strange. Stress is the sound volume that a speaker gives to a particular sound, syllable, or word (Dale & Poms, 2005). Using stress, one syllable or more in a word is pronounced louder, or longer than the other syllables. Stress in English is important because it can change the meaning in a word or a sentence. Thus, proper stress use allows the listener to clearly understand the speaker’s purpose in what they intend to say. In English, syllable stress has three features; loudness, pitch change and syllable length. In pronunciation class, the introduction in how to make stressed and

unstressed sounds should be the focus since it could help students to develop and master their English pronunciation (Morley, 1999; Kelly, 2003).

The stressed syllables contain external vowels whereas the unstressed syllables contain central vowels. Duration of vowels is another factor that can point out stress. In addition, distinguished stresses are divided into two levels; a primary stress is the strongest stress; a secondary stress is the next level; but anything else is defined as unstressed (Collins & Mees, 2003). Roach (2002) suggested, stress in English should be learnt from the sense of production and perception. To identify the characteristics of stressed syllables, Roach (2002) suggests two ways of approaching this. Ways to understand word stress might be; attempting to listen to a speaker's stress on a word (which syllable has the primary stress); and learn how to make stress sounds (pronouncing stress). Although the curriculum is devoted to the English language and the Thai EFL class is a required course, and the curriculum also promotes the communicative approach, Thai undergraduate students still have limited training in oral communication and pronunciation (Varasarin, 2007; Wei & Zhou, 2002). As mentioned in the previous chapter, the pronunciation study has not been the focus for Thai students since English teachers in EFL classes have had limited knowledge of English speech science and phonology. As a result the teachers are not confident in teaching pronunciation. Furthermore, in general EFL classes in Thailand, a direct course in pronunciation are not provided in school at the outset. One way to assist teachers and learners is to use computer enhanced learning in the classroom and providing training to teachers in teaching and learner learning (Chomphuboot 2005; Phon-Ngam, 2008; Potisompapwong, 2002; Varasarin, 2007). An obvious advantage of a computer-assisted instruction is that it saves the time and energy of the teacher

while students can use it to study individually anytime and anywhere. The next topic discusses the use and the benefits of computer assisted language learning and multimedia.

2.4 Computer Assisted Language Learning and Multimedia

2.4.1 Computer Assisted Language Learning

While the world has changed and is different, the same goes for kids. Learning and teaching must be different too, and thus classroom teachers should provide technology-supported learning opportunities for the students (Duffy, McDonald & Mizell, 2005). When looking back at the traditional classroom the teacher does the talking and writing while the learners take notes on what was said. This lecture or presentation teaching method might challenge many students trying to follow the presentation if the teacher uses this method and does not stop to write or show a graphic on overhead projector. Like most methods of teaching, the use of technology might enhance this common teaching strategy (Duffy et al., 2005).

Today, technology instruction has been used broadly by educators. It includes media that can be used for active instruction such as printed media, models, visuals, and audio, video, and digital media (Duffy et al., 2005). Those who wish to present a variety of media are basically confined to computers and software to use for education and to develop courseware or technology instruction. Computer hardware is able to incorporate any type of media elements such as audiovisual tools. Meanwhile, CALL has been a major tool for language learning and teaching. Using computer assisted language learning (CALL) is not new today. The term “CALL” came into favored use in the early 1980s and there is evidence of CALL usage beginning in a large

numbers of schools in the UK and the rest of Europe (Davies, 2007). CALL had replaced the older term CALI (Computer Assisted Language Instruction), which originated in the USA, but CALI fell out of favor because the programmed learning became associated with a teacher-centered rather than learner-centered approach.

CALL was developed in three phases; originally its use was as a tool in language teaching in the late 1960s; by the late 1970s it was confined mainly to universities who had large mainframe computers, and then in the 1980s the more widely used CALL programs embraced the communicative approach and included new technologies, particularly multimedia and communication technology (Warschauer, 1996). The first CALL used mainframes as a tool for aiding language teaching, and the approach was based on the grammar-translation and audio-lingual paradigms. The view of language was as a formal structural system and the principal use of computers were to provide drills and practice tasks. With the development of PCs (Personal Computers), in 1980s-1990s, the dominant style of language teaching and learning was based on communicative approaches. Thus computers were used for communicative exercises. The nature of language during this period was viewed as a mentally constructed system subject to social contexts. In the 21st century, CALL is becoming more integrative; English for specific purpose (ESP), English for academic purpose (EAP), and language learning is developing skills in social interaction or socio-cognitive understanding. Thus, the computer is being called upon to use authentic discourse for practicing and learning.

The past research in CALL has shifted from investigating if CALL is worthwhile to ways that CALL can be used effectively in language learning. Some studies have shown how CALL software can be designed according to the principles

of second language acquisition theory in an authentic setting (Volker, 2003). Harless, Zier & Duncan (1999) stated that computer programs that offer students opportunities for interaction may help learners begin to use the target language effectively and draw closer to understanding how to use the language in actual environments. Interactive teaching methods have long been considered a superior approach for language teaching, such as discussion, case studies, and role playing. Since computers have become more widely used, computer supported presentation methods and computer assisted instruction (CAI) have shown to be effective tools in language teaching. They have been employed to enhance in-class instruction and to support autonomous learning (Bigelow, 1993). CALL is useful not only in providing activities but also in assisting students in better understanding content, particularly in the main subjects. (Klassen & Milton 1999). Therefore the use of interactive multimedia or CALL programs should strengthen student beliefs in their ability to improve their English performance.

Klassen and Milton (1999) refer to positive attitude changes of L2 students to the multimedia-enhanced mode of language learning used with CALL. Some students who were subjects stated that CALL helped them avoid embarrassment when they made errors during exercises, and it raised their interest in learning while they were quite bored with lectures and tutorials. Hegelheimer and Tower (2004) mentioned that computer programs offer opportunities for interaction that can help learners begin to use the language effectively and draw closer to understanding how to use the language in actual environments.

Even though the environment is changing CALL, has mostly been implemented in developed countries where there is greater access to technology.

Technology in terms of CALL has recently been growing in use in developing countries such as Thailand. In the classroom context, KPRU students prefer hearing teachers speak in their first language (L1) than the second language (L2) because they feel uncomfortable communicating in the target language. At the same time, Thai-teachers of English did not use English in the classroom as much as they should. From both directions, English language learning and teaching for Thai people is incomplete, and motivation is a major cost.

CALL has great potential for KPRU undergraduate students. Interesting programs on CALL might motivate them to have positive attitudes towards learning English and encourage them to become autonomous learners. KPRU undergraduate students might have higher proficiency in English after using and working on CALL tasks. However, because of insufficient authentic resources and the need to use the target language, KPRU students generally encounter difficulties developing their English competence. CALL is gradually being adopted; however, due to many factors such as face-to-face interaction, learners' personalities, learning and response pace, CALL poses a challenge to teachers to maximize their implementation in English classrooms.

2.4.2 Multimedia Instruction

EFL classes in Thailand have been limited to traditional methods, where students usually meet non-native English teachers, listen to them lecture and then complete class activities provided by the teacher. In a big class, they lack the opportunity to practice individually and to repeat content that they struggled with. Computer-based instruction including multimedia might be one way to assist English language teaching and learning. Software operated on a computer based-system

contains a database of text, audio, and video that allows learners to look, listen and speak to the computer (Chapelle, 1998).

Chapelle suggested why multimedia and the computer could assist language learning. First, multimedia software allows linguistic features and activities to be transcribed and displayed on the screen including text being shown in both L1 and L2 languages. Second, multimedia computer assisted language learning (CALL) can provide linguistic input through written and or oral language and be modified in various forms such as repetition, non-verbal cues, decreased speed, and change of input mode. Third, written or spoken comprehensible output may be produced with the expectation that they be understood by learners. Practicing by using English language forms and patterns on an authentic task could improve their skills.

Fourth, L2 learners can see their output and the errors they made during the instruction and activities, which are analyzed by the computer. Meanwhile, the learners have the opportunity to recheck the activity directions or questions to make sure of their decision. Fifth, the software system enables learners to notice their mistakes and errors, then to correct themselves with the help function of the program. For example, in exercises or tests, the program might prepare a clue or highlight in what could be right before or after making an answer. Sixth, multimedia CALL supports modified interaction between the learner and the computer with mouse clicks and hypertext links through the software system. These interactions may stop learners' progress or make them move toward a task goal of the language focus. Seventh, L2 learners use multimedia instruction and CALL as their interactive task that can be designed to focus the learners' attention on reaching a goal by using language rather than solving problems of linguistic form. Multimedia activities could

contribute to the learners use of language to communicate and negotiate within a group while making decisions, participating in discussions, and so on.

The next topic is multimedia instruction and the production process useful in the development of multimedia instruction to enhance English pronunciation and stress teaching and learning for ESL/EFL learners.

2.4.2.1 The Process of Multimedia Instruction

Multimedia is a combination of different forms of media in a computer based system, and it is one of the most exciting developments in recent years (Britton & Doake, 1996). Britton and Doake (1996) identified that a system of multimedia use including text, graphics, sounds, photographs and videos, both separately and in varying combinations can be used to present information in different and interesting ways. Considering the constructivist and instructivist educators, instruction is an approach in which knowledge is given to people, while learning is an approach in which people obtain knowledge for themselves. Instruction is the creation and use of environments to facilitate learning, e.g. instruction in an institution which facilitates the learning materials that can be combined with a variety of approaches with several essential activities.

Alessi and Trollip (2001) suggest a model consisting of four instructional phases :

Phase 1: Presenting information

Phase 2: Guiding the learners

Phase 3: Practicing

Phase 4: Assessing learning

At the beginning of lesson and before teaching something new, the instructor first must present information or rules through different examples. The instructor might have several ways to present them, e.g. with speech and/or pictures. While presenting the information in the first phase, the instructor or media are at the center guiding the learner into the second phase, which is more interactive both for the learner and through the medium. The learner might perform following the instructor's guidance. For example, the instructor can indirectly give students guidance by asking questions that the students need to answer. Although the learner's performance or demonstration may show that they can do something once or understand the material, they must be able to perform quickly and fluently under difficult conditions, with errors. This means that repeated practice is required to maintain and become familiar with the information. During the third phase, practice, the learner becomes the center. The last (fourth) phase requires learning assessment, with tests or rubrics in order to provide information about the level of learning, the teaching quality, and a reflection on what future instruction is needed.

Although this 4-phase model is derived from research on successful classroom instruction, it can be applied to interactive multimedia. Since the computer is one element in the learning environment, along with teachers, other learners and other media, it may serve or combine the four phases. The computer can be used for total instruction, with the entire four phases. It is easy for the computer to provide practice (drills) and be expected to carry the load of total instruction. So Alessi and Trollip (2001) present the following eight methodologies for Interactive Multimedia (IMM) for the facilitation of learning:

1) Tutorials. Tutorial engages the first two phases of instruction by presenting information and guiding initial acquisition for the learner.

2) Hypermedia. Hypermedia programs present or obtain information but are designed for a more open-ended or constructivist learning experience. They allow learners to choose their own paths through the material.

3) Drills. Drill engage learners in the third phase and helps them to practice fluency and memorization. Drills require learners to repeat and learn material until they have mastered it. Drills and game methodologies are often used as motivation.

4) Simulations. Simulation may present information and guide the learner in how to practice and do the first three phases, or to assess a learner's knowledge. It might be used for direct instruction of a more constructivist approach.

5) Games. Game can be combined with drills or simulations. However games might also be combined with other learning activities that are not drills or simulations.

6) Tools. A tool is computer software that learners use in conjunction with other media or activities to achieve an educational goal.

7) Environments. Open-ended environments provide an environment that supports exploration which can include Tool software too.

8) Tests. Most tests are presented in the last (fourth) phase to assess what the learners have learned. Tests do not include practice tests or quizzes used during the practice phase of instruction.

These methodologies could be employed in interactive lessons, for instance, the lesson can start in tutorial mode or a presentation followed by drill(s)

and or enjoyable practice with games. Actually a software program cannot be used with only one methodology. The methodologies discussed above provide the basics for developing good interactive multimedia of either the instructivist or constructivist varieties.

2.4.2.2 Principles of Multimedia Instruction

During the development phase of a multimedia project, the course design specification document is implemented, team members become involved, story boards are written; video is recorded, edited, and logged; audio is recorded, edited, and logged; graphics are created, edited, and logged; and initial versions of web pages are developed, tested, and reviewed (Lee & Owens, 2000). To develop effective multimedia instruction it is important that the development phase is well managed. Team meetings are also important and necessary in order to coordinate the various activities. Team members must know their roles and responsibilities, understand the project timeline, and accomplish their tasks. During the review cycle, Lee and Owens (2000) suggest that the developer or reviewer should clearly understand what should be reviewed and how to do it. They should record approvals, decisions, and changes. In addition, each media element must be integrated and coordinated. The following section is the basic principles for multimedia development by Lee and Owens:

1st Establish a framework of templates, models, and development specifications.

2nd Develop media elements that fit into the framework.

3rd Review and revise the product.

4th Implement the finished product.

They also suggest the development of multimedia components which includes: *1) design-time prototyping* (to review, test, and approve the interface design, media elements, script, or map), *2) evolutionary development* (each stage of prototyping and development is used to evolve the next prototype), *3) use of models and templates* (modeling is used in an iterative process for parallel development projects whereas templates are used as a framework for content). The following is a list of the screen frames developed at the same time including final changes to the software.

- Title screen (with music)
- Main menu
- Help/ Course introduction
- Credits screen
- Topic: level one (What is this topic about?)
    - Title and objectives (with animation and music)
    - When will I do the task?
    - What do I need to know?
    - What are the steps to take?
    - Are there any special hints?
- Summary and transition (with music)
- Topic: level two (How is it done?)
    - Title (with animation and music)
    - Video sequence of the steps, audio, text
    - Summary and transition (with music)
- Topic: level three (Let’s try)

- Title (with animation and music)
- Functionality; screen for clicking, with feedback.
- Functionality; screen for text entry, with feedback
- Summary and transition (with music)

This production prototype is a topic-level model that serves as a template for the follow-up development. This training development can be revised along with the new software. This development approach is useful if the content is changed or revised, and using prototyping methodologies reduces the risk, increases the consistency between lessons, ensures acceptance from those authorized to approve the project, and uncovers any production problems or issues when they are at a manageable level.

2.5 Instructional System Design and Model

2.5.1 Instructional Design

Instructional design is defined as the process of learning arranged to happen safely, certainly, thoroughly and expeditiously (Allen, 2007). Allen states that successful target behavior in education and training can be employed by the same systematic design approach, which eclectic and systematic design approach is needed. The instructional design is referred to as the systematic process to transform learning and instruction principles into plans for instructional materials and activities (Smith & Ragan, 1993). The term ‘instruction’ is indicated as the delivery of information and the activities that facilitate learners’ accomplishments, and the development of activities that are focused on learners learning specific things. Effective instruction is designed and articulated by thoroughly thought out ideas developed by a skillful and

creative educator (Duffy, McDonald & Mizell, 2005). Duffy et al. (2005) emphasize that the educator must envision a well-conceptualized learning environment in which teaching and learning will occur and carefully plan, step-by-step design, create, evaluate, and revise instruction. This concept is called a system approach to instruction. Novice instructional learners should advocate one single learning theory, but stress the content addressed depending on the level of learners, for instance, a behavioral approach can facilitate mastery of the content of a profession (knowing what); a cognitive approach is useful in teaching using problem solving tactics where defined facts and rules are applied in unfamiliar situations (knowing how); a constructivist approach is suited to deal with ill-defined problems through reflection-in-action (Ertmer & Newby, 1993). In addition, instructional design (ID) may be combined with one particular theory like combining to school or the real world. Instructional design needs a system that has one or more output to produce a product, which can be a material product.

Many educators expect that developing and providing learners with excellent instructional components would motivate students' learning. They might conclude that a student's poor performance is due to a lack of background knowledge, poor motivational habits, not being smart enough or being a low performance student. In contrast, instructional design would positively affect the students' ability to improve. So a systematic process in which every component is crucial to successful learning is very important to a productive approach to purposeful teaching and learning (Dick, Carey L. & Carey O., 2005). Dick et al. also indicated that the interaction and collaborative functioning of each component such as the instructor, learners, materials, instructional activities, delivery systems, and learning and performance

environments bring the target learning outcome to the students; however, changes in one component can affect outcomes. This leads to the conclusion that a single component predetermines the entire instructional process. On the other hand, educators or instructional designers should return back to systems thinking, or a system points of view, in order to provide a system overview approach to instructional design and then to analyze performance problems and eventually design instruction.

2.5.2 Instructional Design and System

The term '*system'* used in instructional design is a technique of setting interrelated components to work together towards a defined goal, and each part of the system depends on each other for input and output (Dick et al., 2005). The system can be modified again and again until it reaches the goal. The instructional process itself can be viewed as a system in which the purpose is to bring about learning. So the instructional system's components consist of learners, the instructor, the instructional materials, and the learning environment. The result of using the system approach is to see the important role of component evaluation to determine what, if anything went wrong, and how it can be improved. In another point, a system is a set of concepts or parts that work together to present a particular function (U.S. Army Field Artillery School, 1984). Effective instruction is instruction in which the educator has a well-conceptualized learning environment that is carefully planned, uses a step-by-step process, is creative, able to be evaluated, and has revisable instruction. Duffy et al. (2005) suggest three planning processes: 1) design instruction (Design process), 2) plan specific lesson plans (Plan process), 3) developing an instructional action plan (Act process). This system is called the Design-Plan-Act (D-P-A).

Furthermore, the term instructional design covers all phases of the instructional system development, or design (ISD) process, which uses a model as a base (Dick et al., 2005). Instructional design modeling can assist instructional designers in completing the design or development process, such as preparing instruction and strategy objectives and evaluating and revising the instructional materials (Smith & Ragan, 1993). An effective instructional design model can be flexible and adaptable to accommodate changes in strategies while guiding the designer to create an effective learning environment for students and serving as a lesson planner and instructional action planner in the classroom. As already mentioned, the model is an essential tool for instructional development. The following paragraph describes the model for instructional system design.

2.5.3 Instructional System Design Models

This section presents and demonstrates examples of effective instructional design models which provided useful guidance for this present study.

(1) Dick and Carey Model

The Dick and Carey Model is a representation of components in the discipline of instructional design. The Dick and Carey Model is designed to help instructional designers learn, understand, analyze, and improve the practice of the discipline, which is a developmental concept for obtaining skills or competencies (Senǵe, 1990, quoted in Dick, Carey L.& Carey O., 2005). Dick et al. (2005) designed the Model based on three learning theories: behaviorism, cognitivism and constructivism along with practical experience in its application. The model includes ten interconnected boxes representing sets of theories, procedures, design techniques, development, evaluation, and the revision of instructions. The components of the systems approach model

proposed by Dick and Carey (2005) in ISD are described in the following model chart in figure 2.1.

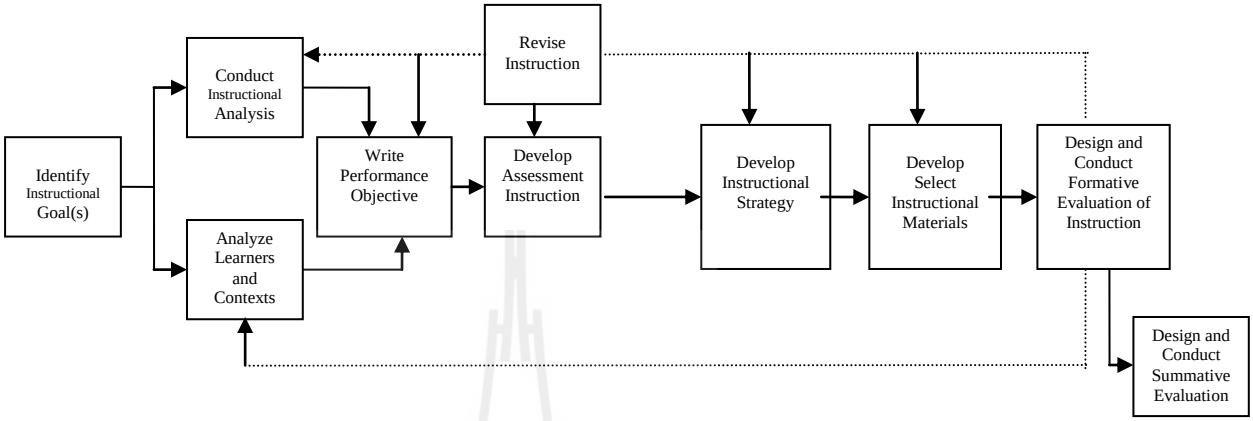

Figure 2.1: Dick and Carey Model

(Adopted from Dick & Carey Model, 2005)

1. Identify instructional goal(s). The designers determine what students should be able to do at the end of learning. The instructional goal should be analyzed from students' performance and needs based on their learning difficulty experience.

2. Conduct Instructional Analysis. The designers determine the instructional step-by-step of learners' performance to attain their goal. The instructional analysis process includes learners' skills, knowledge, and attitudes known as entry behaviors identified at the beginning of the instruction.

3. Analyze Learners and Contexts. The designers analyze learners and contexts in parallel while the instructional analysis is in progress. Learners' prior skills, preferences, and attitudes are determined along with the instructional setting and the setting in which the skills will be used. Information gained at this stage is

crucial and helps develop successful steps in the model, particularly the instructional strategy.

4. Write Performance Objectives. Based on the instructional analysis, findings of entry behaviors, and prior skills, the learning objectives are listed. Skills to be acquired, learning conditions, and criteria for successful performance will be considered while framing the objectives.

5. Develop Assessment Instruments. Based on the performance objectives, the instructional designers should develop the assessments. These assessments will measure the learners' progress throughout the course. The assessments are framed to bring out the behavior defined in the objectives.

6. Develop Instructional Strategy. Based on the information gained from the previous five steps, designers may identify instructional strategy in which components are emphasized and include student's pre-instructional activities, content presentation, learner participation, assessment, and follow-up activities. These strategies will be based on the current learning theories and research, content to be taught, learners' characteristics, and the medium through which instruction will be delivered.

7. Develop and Select Instructional Materials. Instructional strategy is used to produce instruction. This is done using learner manuals, tests, and instructional materials such as instructor guides, student modules, videotapes, computer-based multimedia formats, and web pages for distance learning. Original materials will be created based on the content being taught, availability of existing relevant materials, and other resources available. Based on a set of criteria, existing materials are selected.

8. Design and Conduct Formative Evaluation of Instruction. Several evaluations are conducted to improve instruction. Three types of evaluation are one-to-one evaluation, small-group evaluation, and field evaluation. These provide insights into how the instruction can be improved.

9. Revise Instruction. The findings from formative evaluation are used to revise the instruction. The obstacles in learning are related to the specific deficiencies/drawbacks in the instruction. Instructional analysis, assumptions about entry behaviors and learner profile is validated again. The learning objective, assessments, and instructional strategies are modified as per these findings.

10. Design and Conduct Summative Evaluation. After revision of instruction, evaluation of the absolute worth of the instruction takes place.

The Dick and Carey Model suggest that breaking down the model into smaller components, a reductionist process, appropriate conditions for learning, and a systems approach containing related components with an input and an output. At present, the Dick and Carey Model has evolved into other models and is used in classroom instruction.

(2) ADDIE Model

The ADDIE Model is an instructional design (ID) model for instructional designers and ID training developers. ADDIE is served alternative and rapidly with a variety of systematic design that emphasizes holistic, repetitive approach, and providing continual or formative feedback. The generic ADDIE model has five steps: analysis, design, development, implementation, and evaluation which will be clarified in the following paragraph. See ADDIE Model in Figure 2.2.

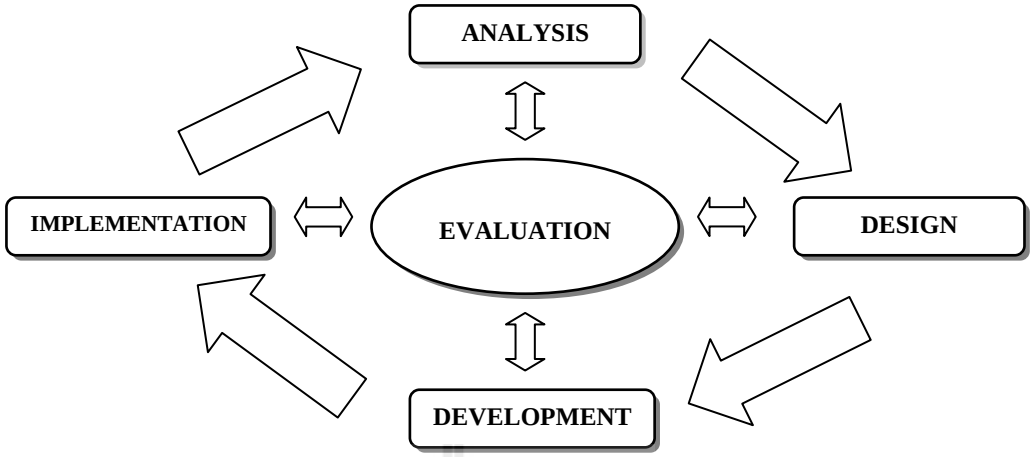

Figure 2.2: ADDIE Model

(Adopted from Barrett, 2000)

1. Analysis. In this phase instructional designers clarify the problem, establish goals and objectives of the instruction, and identify the learning environment and the learner's knowledge and skills. The designers address the following questions during the analysis; 'Who is the student audience?', 'What is the new outcome?', 'What are the delivery options?', 'What is the timeline for completion of the project?'.

2. Design. The goal of the design phase is to achieve instructional goals that address learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning and media selection (Molanda, 2003). This phase involves the designed strategies of instruction, the application of visual aid techniques including the design of learner interfaces and experiences.

3. Development. The design process and content are applied and the learners become performers. In this phase technologies such as storyboards and graphics are designed (Liu, 2008) and product outcome or courseware is involved in training, and then the project is reviewed and revised according to feedback.

4. Implementation. A procedure for training or new tools, such as courseware (software or hardware), is developed for learners. The facilitators' training covers course curriculum, learning outcomes, methods of delivery, and testing procedures.

5. Evaluation. The performers, trainers or learners, facilitators or tools (courseware, software or hardware) throughout the four phases are evaluated and revised if problems in any phases are found until the instruction can reach the desired results.

The five phases of ADDIE Model are ongoing activities that continue the life-cycle of a learning process. Each phase does not end once the learning process begins, but is continually repeated, in order for the designers to step back and solve many types performance problems.

(3) Dynamic Instructional Design (DID) Model

The Dynamic Instructional Design Model was selected for presentation in this present study because the DID Model presents flexible and adaptable steps to accommodate the continual changes in strategies that are supported and enhanced by technology. The DID model was most influenced by the system model originally developed by Robert Gagné who is the leading figure in instructional design systems, and who first promoted and developed a comprehensive system view of instructional design, a system of steps that provide a logical systematic foundation for designing instruction (Duffy, McDonald & Mizell, 2005). While the Gagné model and other models were developed as a foundation for today's instructional design system, DID model differs primarily in its emphasis on dynamic design, which represents the capability for continuous adjustment and change.

The DID model was designed to be flexible enough to embrace and use data provided by ongoing feedback from learners, maintaining the logical sequencing of the design process. The feedback in the DID model can be found in two different processes: 1) formative feedback (occurs while learning event is in progress), and 2) summative feedback (occurs at the end of the learning event). This feedback from the DID model encourages designers to create a dynamic instructional process that remains in the instruction planning and implementation. The next paragraph describes each step of the DID model. See the model chart in Figure 2.3.

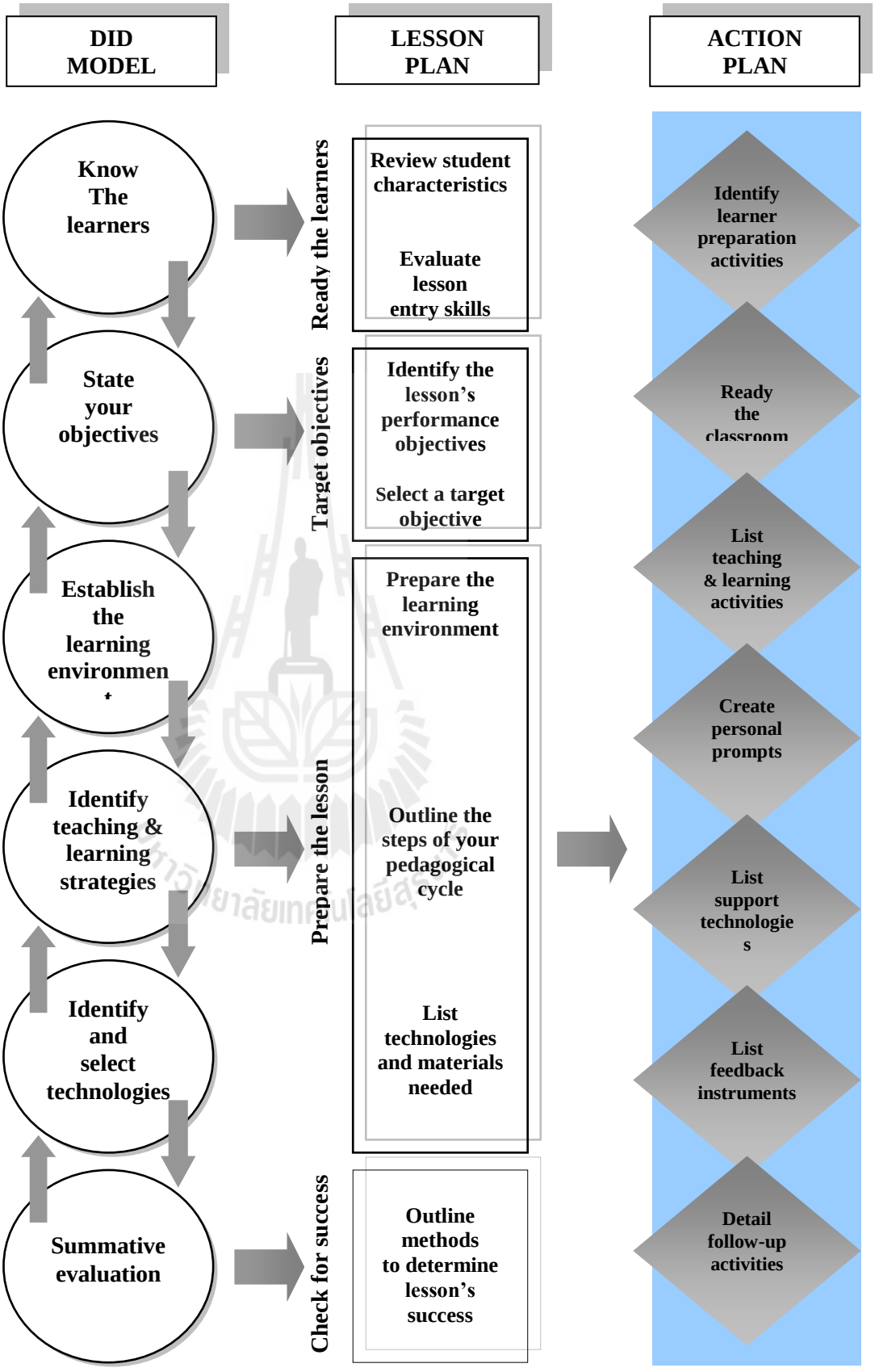

Figure 2.3: DID Model and design Plan-Act! Element

Step 1: Know the learners. The instructional designers must know exactly who the instruction is being created for in order to make adjustments to ensure that the designed sequence of events is appropriate for the target learners. In this step the designers must carefully examine the characteristics of the learners and identify the learners' physical and cognitive developmental stages, cultural or language background, incoming skills and knowledge, individual characteristics (learning styles, cognitive and types of intelligence), group characteristics, and characteristics which affect the design of the provided instruction.

Step 2: State your objectives. The designers state performance objectives which learners will be able to complete with the intended instruction. To help learners achieve competences, the designers should include a step which provides an expected outcome of the learners' performance and includes three components: target performance, a description of the method for assessing the intended performance and criteria for measuring success. The objectives should be addressed at different levels of thinking. Blooms (1956, cited in Duffy, McDonald & Mizell, 2005) provides guides for the six levels of thinking: 1) knowledge (memorizing and recognizing), 2) comprehension (organizing, describing and interpreting concepts), 3) application (applying information to new situations), 4) analysis (higher-level thinking skills such as the competence of recognizing and identifying or distinguishing), 5) synthesis (creating new ideas from the data provided, 6) evaluation (making resolutions and implementation).

Step 3: Establish the learning environment. In this step the designers should take an inventory of the physical space in which learning occurs, encouraging a positive classroom climate that includes a feeling of safety, confidence, a positive

attitude to keep learners active and engaged, and finally organize the nonphysical learning environment of the learning process that is well-conceived and clearly articulated in instructional plans.

Step 4: Identify teaching and learning strategies. The designers must be able to analyze learners' needs in order to state clearly the instructional objectives in terms of the expected learner outcomes and to establish the learning environment. In this step the teacher must consider teaching strategies to help students achieve the instructional objectives. He or she might utilize the steps of the Pedagogical Cycle to determine strategies, providing pre-organizers, using motivators, bridging to past knowledge and sharing objectives and expectations. The following steps of the Pedagogical Cycle also include:

- Introducing new knowledge via varied teaching methods
- Reinforcing knowledge
- Providing practice experiences
- Offering a culminating review

Step 5: Identify and select support technologies. Instructional technologies or tools can support and enhanced teaching and learning strategies for the teacher. In this step instructional designers should identify types of technology he or she needs to support the instruction, and then select those from available and suitable sources. Nevertheless, the teacher should know the advantages and disadvantages of different technology tools, know how to use it including understanding that technology's primary role in supporting the teacher's strategies.

Step 6: Plan a summative evaluation. The instructional designers will successfully end their instructional design with an effective plan and appropriate

revisions. The results from summative evaluation or feedback can help them to improve the design. So the final evaluative step in which the instructional design and process, through multiple implementations, evaluations, and revisions is continually improved to come closer to the instructional goals.

(4) The 7 Step Model

The Seven-Step (the 7 Step) Model was designed for research and development (R&D) of innovative / prototype development by Brahmawong (1999). The 7 Step Model is appropriate for a PhD project of innovative pedagogy development. The 7 model steps are described in the following paragraph and shown in Figure 2.4

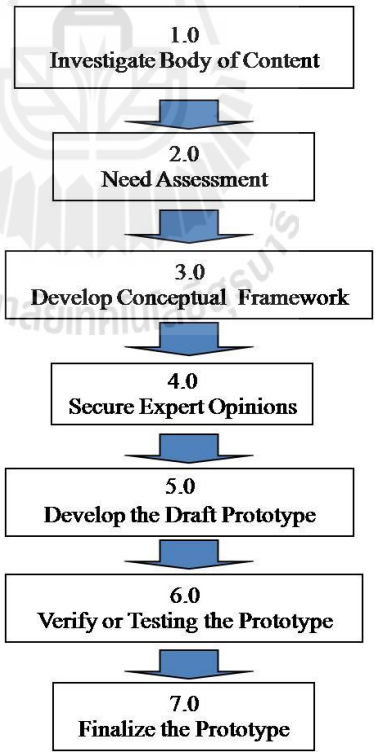

Figure 2.4: The 7 Step Model

Step 1.0 Investigate Body of Content. Content and data for documentary research is collected by reviewing related topics, interviewing experts and authorities in the topic, conducting study visits and getting involved in the field such as attending classrooms, seminars or conferences.

Step 2.0 Need Assessment. Conduct need assessment based on the project or research topic by determining existing needs, desirable characteristics and attributes of the innovative prototype. Then, conduct survey research on need assessment and write a survey report based on the results of the need assessment.

Step 3.0 Develop Conceptual Framework. Develop conceptual framework of the R&D prototype by writing a concept, objectives, components, production steps, technical attributes or characteristics, usages, and other relevant information to describe the proposed prototype. Then, develop and try out instruments such as questionnaires, interview guides, observation forms, and so on for gathering expert's opinions on the prototype.

Step 4.0 Secure Expert Opinions. Conduct a survey of experts' opinions using the developed research instruments. Then, write a survey report on the experts' opinions and summarize the critical points recommended for incorporation into the conceptual framework of the prototype. Finalize the conceptual framework of the prototype for use as the prototype blueprint.

Step 5.0 Develop the Draft Prototype. Draft the prototype in two phases: 1) planning and preparation based on the data and information collected from the survey of experts' opinion, review of the contents and the results of the survey, and 2) designing and developing based on the data and information collected from the survey

of experts' opinion, a review of the contents, results of the survey, and the summary on peer-reviews of Phase 1.

Step 6.0 Verify or Testing the Prototype. Verify technical and content quality of prototype by seeking the experts' opinion before using it in the development process. Then, verify the expense and time-consumption of the prototype. Some prototypes are too costly to conduct the experiments or put into practice. Then, present the prototype draft for peer comments, and summarize recommendations and suggestions. Finally, conduct the developmental testing of the prototype in two stages: Tryout (during the development of various stages of the prototype) and Trial Run (after the whole prototype is completed and used in a real life situation for a period of time).

Step 7 Finalize the Prototype. Conduct experimental research by putting the prototype into practice in a real situation through a process of experimental design accordingly to the research objectives.

(5) SREO Model

The SREO (Suppasetseree's Remedial English Online) Model was designed by Suppasetseree (Suppasetseree, 2005), designed for teaching remedial English to Thai undergraduate students at Suranaree University of Technology, Thailand. The steps of SREO Model are described in the following paragraph. See SREO Model in Figure 2.4

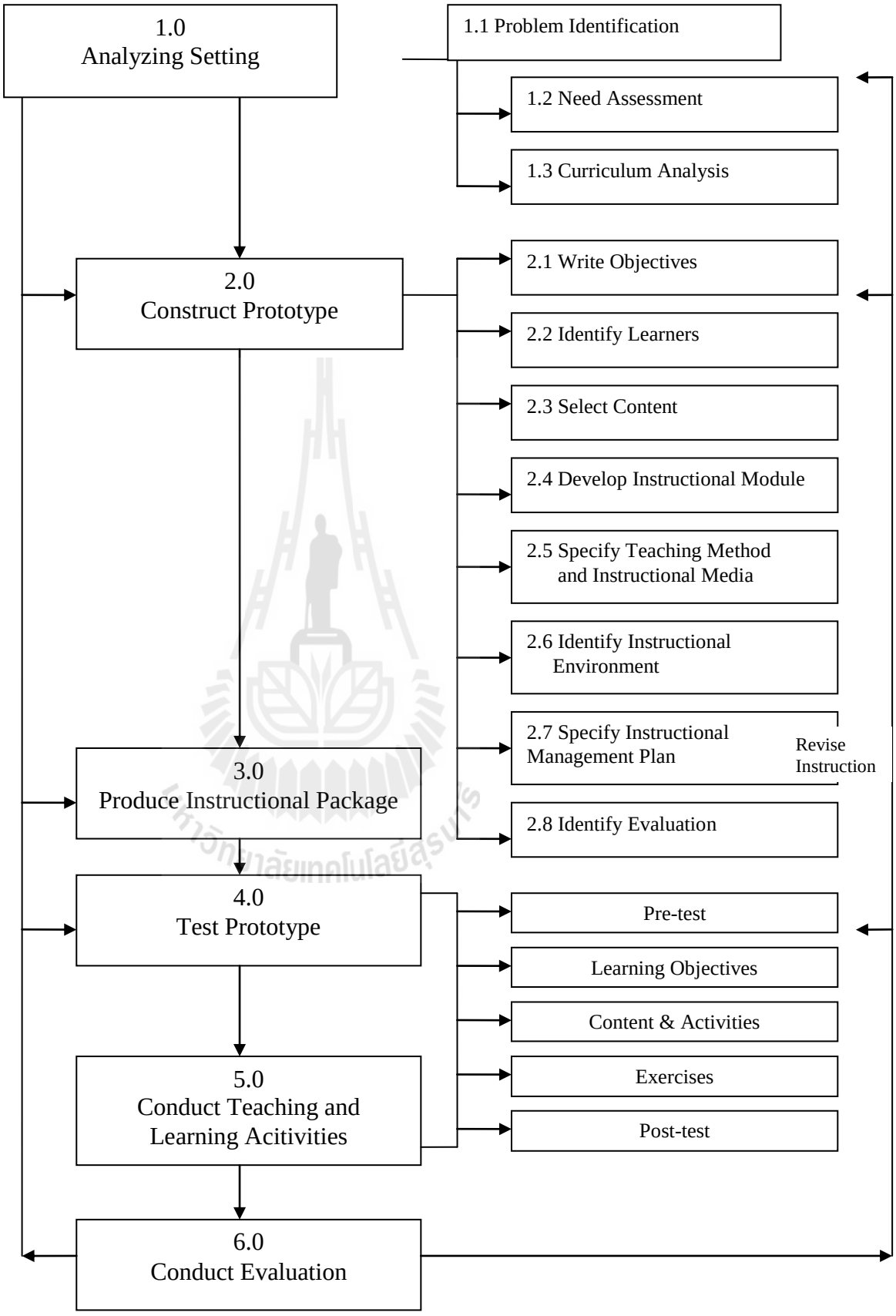

Figure 2.5: SREO Model

Step 1.0 Analyze Setting. Before any program is launched, a survey is conducted to identify problems, needs, and expectations of learners in order to set a framework for developing curriculum of the program of study.

Step 2.0 Conduct Prototype. There are 8 steps to conduct prototype including to write objectives (based on needs and goals), to identify learners (skills and levels), to select content (based on objectives and learners), to develop an instructional module (focused on audience and logical sequence of information setting), to specify teaching method and instructional media, to identify instructional environment (self-pace learning), to specify the instructional management plan (focused on units' structuring and relationships), and to identify evaluation (formative and summative phases).

Step 3.0 Produce Instructional Packages. Lesson plans are created to support each objective and learning activities are designed based on the content associated with the learning objectives.

Step 4.0 Test Prototype. An iterative process that enables each step to be tested and evaluated until the ISD model has been followed for all objectives.

Step 5.0 Conduct Teaching and Learning Activities. The learning package is delivered in web-based form via the Internet and other on-line components such as e-mail and web boards.

Step 6.0 Conduct Evaluation and Revision. Student observations and surveys are used to collect data. Grades are analyzed to determine what components of the class worked best. Instructors may have found an objective that was consistently hard for students to grasp. Revisions could help instructor to know what should be fixed and improved.

(6) AIOU Model

The AIOU model was developed for the instructional Design for Allama Iqbal Open University (AIOU) and distance education that included teaching and learning strategies. The instructional process served students who were at a distance from the institution with the need for them to choose time, place and the learning environment. The process requires design, development production, and the delivery of self-instructional material (Iqbal, 2003).

The AIOU model was designed based on related literature in various fields that support instructional system design for distance education. Related literature included theories of interaction and communication, models of distance education including the system model, the holistic model and the transactional model, instructional system design, course design process, models of the instructional design of open universities, instructional design and media, and media's effects on models of instruction. The AIOU model was reviewed to study how the conduction model was developed.

AIOU was developed according to five questionnaires to collect and elicit suggestions, recommendations and evaluation by experts, academics and others. Findings from the questionnaires suggested the development of an instructional model in distance education at AIOU. The model was developed using the following findings:

1. The design process is systematic, and the design considers specific learning needs, general purposes, examines characteristics of the learners, states goals, objectives, design activities, and selects resources to support activities.

2. The media producers should have knowledge of distance education, and the role of producers and target groups. The producers are able to provide on the type and duration of script along with the media which is to be used, check the voice of the presenter and are also responsible for the production of A.V. aids.

3. Tutors should have knowledge of distance education and the instructional design process. Tutors should help the students by motivating them, elaborating different words, solving exercises and giving an overall view.

On the basis of findings, conclusion and recommendations were applied to develop the instructional design model for AIOU. The steps of instructional model for distance education at AIOU are identified as steps by titles presented next to Figure 2.6.

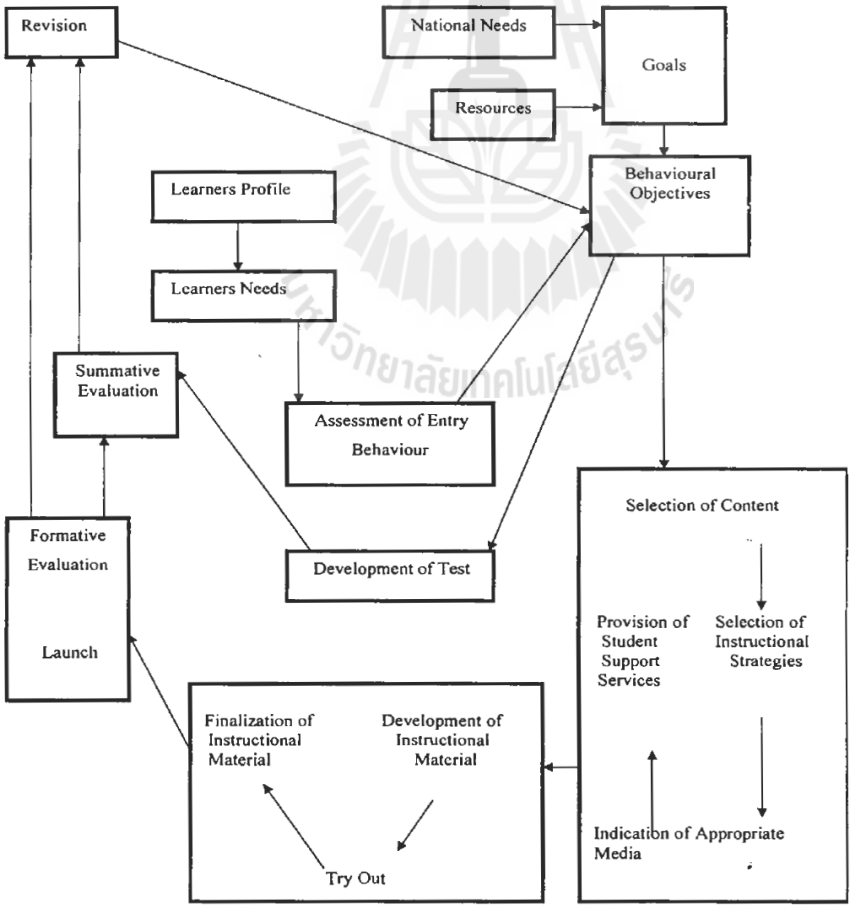

Figure 2.6: AIOU Model

The steps of the instructional design model for AIOU include the following:

1) Establishing goals
2) Determination of national needs.
3) Allocation of resources
4) Developing behavioral objectives
5) Consideration of learners needs
6) Assessment of entry behavior
7) Development of test
8) Selection of content
9) Selection of instructional strategies
10) Indication of appropriate media
11) Provision of student support services
12) Development of instructional material
13) Tryouts
14) Finalization of instructional material
15) Launch
16) Formative evaluation
17) Summative evaluation
18) Revision

The primary approach to the development of the instructional design model was focused on design and the promotion of effective instruction based on behavioral objectives, which expects learner's outcomes or things they will able to do at the end, learning tasks and activities and teaching analyzed from the performance of learners'

levels. Models mentioned in this chapter employ steps that respond to the course, instructional process, lessons with analysis learners, contents, knowledge objectives, pedagogic methods, and ends with the assessment of the lessons. The ISD model is essential and emphasizes plans and steps including the methodology of teaching, learning, and instructional materials. Hence, the development of the model for multimedia courseware was required to approach the goal of the current study.

2.6 Related Studies on Technology and Computer Assisted Language Learning and Pronunciation Instruction

There has been much research and study relevant to pronunciation problems or errors, the causes and solutions, particularly the attempt to use technology as a tool to enhance pronunciation teaching and learning. Previous studies mentioned in the following paragraphs present the results of utilizing computer and technology to assist language learning with the aim to develop pedagogy of pronunciation for the English language.

Potisompapwong (2002) constructed and developed Computer-Assisted Language Learning “CALL” exercises for practicing pronunciation in problem sounds of English. The study was focused on suprasegmental features in stress, pitch, loudness, rhythm, intonation and tempo. It was found that the “CALL” program is effective in improving students’ pronunciation in problem sounds and also in improving their listening ability. Moreover students were happy to practice their English and had positive attitudes to the program.

Chomphuboot (2005) also constructed and developed Computer-Assisted Language Learning (CALL) materials for practicing words stress and intonation in

English and to test the efficiency of the CALL materials. The results were found that the students' pronunciation ability increased after using the program and were higher than the expected criterion. The students also had positive opinions towards the CALL materials.

Phon-Ngam (2008) studied pronunciation problems of Thai and Lao students with the analysis of English consonants to develop innovative materials for improving students' pronunciation abilities with these sounds. In the study it was found that the problem sounds falls in 'Affricate' and 'Fricatives', and the use of innovative instruction for practicing pronunciation can improve students' problem sounds. The results of the study included awareness that students learn fast with the use of innovative instruction because the program was designed to meet their needs and problems directly.

Carey (2002) studied an L1-specific using computer assisted language learning (CALL) pedagogy for the instruction of pronunciation for a Korean learner of English. The study used a research methodological approach in interdisciplinary quantitative research methods and qualitative methods using action research to develop pronunciation software focused on the pedagogical content for Korean English learners. The study found that the program and pedagogy showed a statistically significant improvement in the Korean's ability to modify their pronunciation. Since the internal movement of the articulators is not viewed and not analyzed the corresponding acoustic effects of the second language production of vowels, a visual display of the acoustic creation was provided to provide accurate feedback for instructional purposes. The developed CALL replaced other types of traditional classroom and CALL feedback.

Seferoğlu (2005) integrated accent reduction software (Pronunciation Power 2002) in advanced English language classes at the university level and found that the students in an experimental group who used the software came closer to full communicative efficiency, whereas the students in the control group displayed a change in the opposite direction. It was concluded that the accent reduction software was useful in improving students' pronunciation, and EFL learners may be provided with exposure and practice/ interaction opportunities in the target language through specific software programs.

Tsubota, Dantsuji and Kawahara (2004) developed a CALL system designed to detect and diagnose English pronunciation errors in Japanese learners' speech for practicing English speaking. The system covers English learning in two phases: 1) role-play conversation and 2) practice of individual pronunciation skills. In the results the speech data from the first trial were analyzed using spectrograms, and the errors were categorized into five categories. Improper configuration of the headset microphone, a cause of three-quarters of the errors, was solved by instructing students in advance to properly configure their settings in the second trail. As a result, the number of recording and recognition errors dramatically decreased.

Munro and Derwing (2005) conducted the research to test the usefulness of the theoretical notion of functional load (FL). The results found that high FL errors had relatively large effects on both perceptual scales, while low FL errors had only a minimal impact on comprehensibility. The only cumulative effects of errors seen in the data occurred with high FL errors in the judgments of accentedness. These results not only shed light on the distinction between accentedness and comprehensibility,

but also suggest that the functional load principle can be effectively employed in guiding some aspects of pronunciation instruction.

Levis and Pickering (2004) studied teaching intonation in discourse using speech visualization technology to examine and compare the intonation of four readers between reading out-of-context sentences and the same sentences as part of coherent discourse-level texts. The recordings were made using a Kay Elemetrics *Computerized Speech Laboratory* (CSL). In the results it was concluded that computer-based instruction in classes is offering newer and better opportunities for their incorporation. This is particularly true in the use of speech visualization technology, which has recently become widely available. Speech visualization may finally fulfill the decades-long hope of using intonation to effectively communicate meaning.

Wang and Munro (2004) studied the use of computer-based training for learning English vowel contrasts and to test the effectiveness of computer-based training on three English vowel contrasts – /i/-/i/, as in *beat* vs. *bit*, /u/-/ ʊ/, as in *Luke* vs. *look*, and /ɛ/-/æ/, as in *bet* vs. *bat*. The participants were assigned to one of two groups: a trainee group, and a control group. In the results it was found that the trainees showed improved perceptual performance, transferred their knowledge to new contexts, and maintained their improvement three months after training. These findings support the feasibility of computer-based, learner-centered programs for second language pronunciation instruction.

The above mentioned related studies and research helped the researcher to have a clear paradigm including, preparing outlines and concepts that could enhance the research topic and methodologies. The literature review of previous studies related

to the current study improved the researcher's ideas for the design of a new instructional design model. The new model helped to develop an innovative course that integrated computers and multimedia to enhance the English pronunciation and word stress of Thai undergraduate students. Also, the literature review of other research and studies promoted other research instruments competency that were used included pronunciation and word stress lessons, a pre-test and a post-test, questionnaires and a semi-structured interview.

2.7 Summary

In this chapter, the researcher reviewed related literature and previous research on English language learning and teaching, language learning approaches, learning principles and instructional approaches, the importance of pronunciation learning including English pronunciation and stress. The next part describes pedagogical methods of computer assisted language learning (CALL), the process of multimedia instruction and principles of multimedia instruction. After that instructional design including instructional system design models are presented. Lastly, previous research studies on computer and technology enhancing pronunciation learning are mentioned.

CHAPTER 3

METHODOLOGY

The research methodology is presented in this chapter to clarify what methods and procedures were used. The statement of research design includes the population, procedure and variables. Then, the research instruments and the associated strategies used in the construction and the efficiency evaluation are described. The methods of data collection and analysis used in the thesis are described. In the last part, the courseware tryouts and the results are explained.

3.1 Research Methodology

The study uses a quasi-experimental approach with one group of subjects pre-tested and post-tested; the subjects who participated in the experiment are measured by a pre-test, subjected to the instructional manipulation, and then measured again by a post-test (David & Sutton, 2004). In the present study, prior to the experiment, the subjects were measured in their ability to use proper English pronunciation and stress by taking a pre-test. Then they received a 15 hour treatment through the multimedia courseware (SPMC). After that the subjects were measured in their ability to use proper English pronunciation and stress again by taking a post-test. Both tests were used to compare and evaluate the students' change in English pronunciation and stress after using the multimedia courseware (SPMC).

In addition, the participants expressed their views and opinions towards the use of the multimedia courseware through a questionnaire and a semi-structured interview.

3.1.1 Population

Population of this study was 350 Kamphaeng Phet Rajabhat University (KPRU) Thai undergraduate students, who enrolled and passed the first KPRU English compulsory course and were taking the second compulsory English course in semester 2 of the 2012 academic year.

3.1.2 Samples

1) *Pilot sample* (Tryout groups). Forty-nine KPRU students who had enrolled and passed the first compulsory English course volunteered as the sample for the courseware try out steps. The samples had different proficiency in English and were selected based on grade point average from the KPRU English course that they had taken. The samples were divided into three groups; 3 samples in the first tryout (individual testing), 6 samples in the second tryout (small group testing), and 40 samples in the final tryout (field study testing).

2) *Actual sample* (Trial Run group). Forty KPRU students who were taking the second compulsory English course at KPRU were asked to participate in English pronunciation and stress treatment through the multimedia courseware (SPMC) for 10 hours, taking the pre-test and post-test, and then completing a questionnaire. There were six samples from the group were intentionally selected to attend in semi-structured interview.

3.1.3 Research Procedure

The sample in the actual group in the Trial run phase were given a pre-test of pronunciation and word stress both with paper and speaking tests. Their results were recorded. Then the sample group received pronunciation and stress treatment via the use of SPMC for 10 hours within a 4 week period. After that, the subjects were measured for their stress and pronunciation again with a post-test. Finally the results from the pre-tests and post-tests were compared.

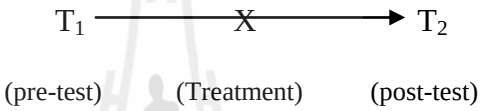

Figure 3.1: Quasi-experimental one Group Pre-test and Post-test

After the manipulation, the samples' feedback and reflections on the use of the multimedia courseware for enhancing pronunciation and stress abilities were identified. To elicit further in-depth information, six participants were purposively selected for a semi-structured interview. The following illustrates the research procedure:

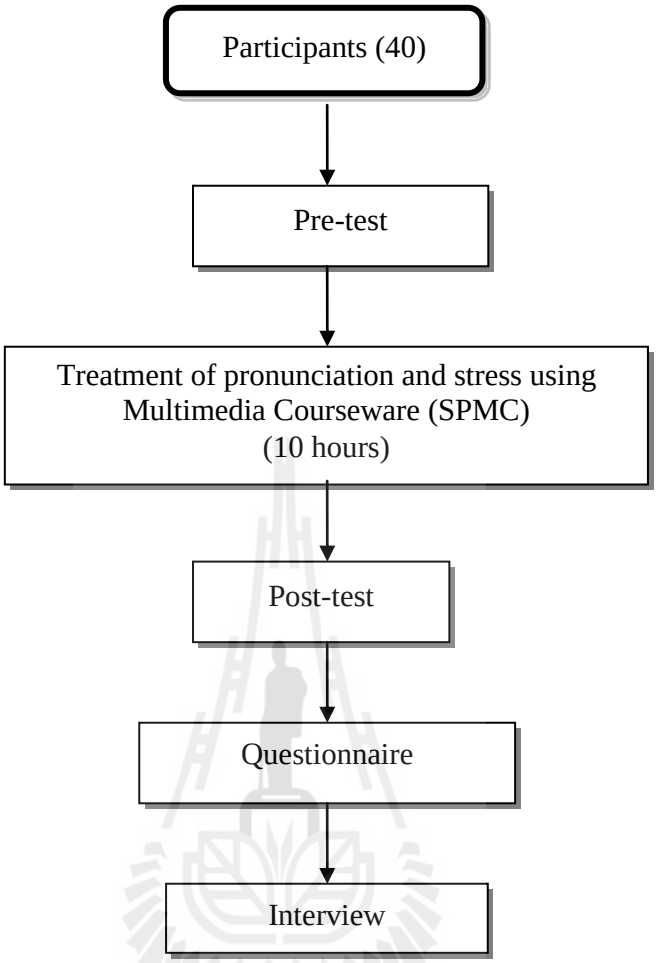

Figure 3.2: The Overview of the Research Procedure

3.1.4 Variables

(1) Independent variable

Multimedia courseware for enhancing pronunciation and stress abilities

(2) Dependent variables

Students' pronunciation and stress improvement, their ability, and the students' views and feedback after the use of multimedia courseware

3.2 Research Instruments

3.2.1 Multimedia Courseware

A multimedia courseware was designed and constructed step-by-step by the researcher. The instruction focus was to enhance pronunciation and stress abilities for Thai undergraduate students at KPRU. The multimedia courseware manipulation was assigned to the subjects for approximately 10-12 hours.

3.2.2 An Evaluation Form of SPMC Model

An evaluation form was constructed to evaluate the instructional design and the model used in the Stress Pronunciation Multimedia Courseware (SPMC). The evaluation form and SPMC production model with descriptions were sent to experts with experience in instructional design, educational technology and English language teaching. They were asked to evaluate whether the SPMC production model was appropriately developed for the learning process and to satisfy the subjects' learning requirements.

3.2.3 Pronunciation and Stress Tests

The pronunciation and stress tests include a pre-test and a post-test using the same specifications and contents. The test included paper and speaking components that contained 6o questions focused on English syllables and stress marks. The test and an IOC (Items Objective Congruence) form (See Appendix B for details) were sent to three experts in Linguistics, English language testing development, and English language teaching, each of whom had over 10 years experience in the field. They were asked to examine the content validity. The purpose of the pre-test and the post-test was to compare students' abilities before and after learning and practicing English language pronunciation and stress through instruction via SPMC.

3.2.4 Questionnaire

The questionnaire used after the post-test consisted of checklist and open-ended questionnaires. After the questionnaire was examined by the thesis supervisor and edited, it was first tested for content reliability by using a pilot sample from the tryout group. The purpose of the questionnaire was to explore students' views and opinions toward the use of the multimedia courseware for learning and practicing their English pronunciation and stress.

3.2.5 Semi-Structured Interview

The semi-structured interview was conducted to elicit the depth of the students' knowledge after they had learnt about English stress using the SPMC. The interview was set in a silent room with a video camera. The selected six participants were individually interviewed using 15 questions in the week following the treatment.

3.3 Construction and Efficiency of the Instruments

In the current thesis, the instruments were developed and constructed under the supervision of the thesis supervisor, research professionals and experts in related fields of language teaching, linguistics, educational technology, instructional design, language testing, as well as software and media production. The following section describes the procedures and the construction of the instruments previously mentioned including a determination of the instruments' efficiency.

3.3.1 The Multimedia Courseware Production Model

The multimedia courseware was constructed based on the theory, process, and principles of instructional system design (ISD). The following statement describes the researcher's construction plans for the multimedia courseware production for

enhancing the stress and pronunciation abilities of Thai undergraduate students in Kamphaeng Phet Rajabhat University. The following construction of the multimedia courseware is as follows:

1) The researcher reviewed and studied the instructional design process which covers the instructional system design (Smith & Ragan, 1993). Also reviewed and studied were useful models such as the Dick and Carey Model, the ADDIE Model, the Brahmawong 7-Step Model, the SREO Model, and the Instructional Model for AIOU.
2) The researcher reviewed literature related to language learning and teaching, teaching pronunciation, English phonology and phonetics, and previous studies relevant to the pronunciation problems of Thai learners.
3) The researcher designed and constructed a model of multimedia courseware for enhancing the stress and pronunciation abilities of Thai undergraduate students at Kamphaeng Phet Rajabhat University.
4) The designed model was examined for appropriateness by the supervisor and by experts in instructional design and educational technology.
5) The model was revised based on the supervisor and experts' suggestions.
6) The researcher then constructed the multimedia courseware following the model and appropriate plans discussed earlier.

3.3.2 An Evaluation Form of SPMC Model

An evaluation form of the SPMC production model was used to evaluate the model in order to examine the appropriateness of the designed model before the production of the multimedia courseware for enhancing pronunciation and stress

abilities of Thai undergraduate students. The following statements are the constructional plans for the evaluation form.

1) The researcher reviewed evaluation forms from the ISD model development from previous studies.
2) The researcher developed an evaluation form describing the development of the SPMC production.
3) The evaluation form and SPMC model were sent to experts in educational technology, instructional design, and English teaching.
4) The model was revised according to the experts' suggestions.

3.3.3 The Lessons of English Pronunciation and Stress

The pronunciation and stress lesson was expected to assist Thai undergraduate students at KPRU for the reasons mentioned in Chapter 1 – 2. The key points in the development of this multimedia courseware were to respond to the students' needs and problems in English pronunciation. English stress seems strange and unfamiliar to Thai students. Stress in English is a suprasegmental feature that assists speakers and listeners in interpreting the exact meaning of words, phrases, and sentences. The English pronunciation and stress multimedia courseware therefore was developed to enhance pronunciation learning and teaching focusing on word stress for KPRU English lecturers and undergraduate students. The lessons were constructed as follows:

1) The researcher reviewed the principles of pronunciation and stress and pedagogy integrated computer and technology. Instructional content and topics were selected to enhance learner's abilities and to respond to their needs and problems in the field.

2) The instructional methods and strategies were designed and set in a separate unit (See the lesson details in Chapter 5).

3) The instructional design including the content, exercises, activities and quizzes, was examined by an expert in Linguistics, and two lecturers who have been teaching the English language in Thai EFL classes for more than five years.

4) The media component production included the development of text, graphics, sound compositions, voice models, and video clips.

5) The courseware prototype was used in trials and evaluated for efficiency by using the Brahmawong E_1/E_2 formula based on the criteria of an 80/80 Standard. The criteria of an 80/80 standard are calculated on E_1/E_2 formula as follows:

Formula 1:

$$E1 = \frac{\left[\frac{\sum X}{N}\right]}{A} \times 100$$

E1 = Efficiency of the instructional process

ΣX = Average score from the whole exercise

N = Population number

A = Exercise total score

Formula 2:

$$E2 = \frac{\left[\frac{\sum F}{N}\right]}{B} \times 100$$

E2 = Efficiency of the learning outcomes

ΣF = Average score from the post-test

N = Population number

B = Post-test total score

3.3.4 Pronunciation and Stress Tests (Pre-test & Post-test)

In the current study, the same content and questions were constructed for both the pre-test and the post-test. The test contents were derived from the lessons provided in SPMC. The tests were checked for validity and reliability by experts' evaluation and the tests taken during the pilot sample. The English pronunciation and stress tests contained two sections with two skills.

In the first section, the students were tested for word stress knowledge by listening to sound models. In section two, they were tested on their pronunciation and word stress by speaking word by word, but their skill rating was based on word stress. They would get a point whenever they stressed a word correctly while speaking. The construction of the tests follows:

1) The researcher studied phonetics and word stress pronunciation
2) The researcher reviewed related literature on common English pronunciation errors and the problems of Thai EFL learners.
3) The researcher developed the pronunciation tests which consisted of listening and speaking tests of word stress. The test development design follows:
    3.1) The pronunciation and stress tests were provided with 85 items contained the vocabulary and words selected from pronunciation textbooks e.g. 'Pronunciation Plus', 'Four Corners 1-2', the BBC Website and videos for pronunciation practice.

3.2) The test contents were checked for validity by asking three experts in Linguistics and English teaching in EFL classes to examine each question item. The IOC (Index of Item Objective Congruence) statistical analysis was used for this step. The items with IOC value of ≥ 0.5 were acceptable while deleted the others with the value < 0.5 (See Appendix C for more details).

3.3) The test reliability was checked by asking forty pilot samples to take the test. The calculation of Coefficient Alpha of Cronbach (α) was used to determine level of item difficulty (p) and discrimination index (r). An acceptable level is between 0.2 – 0.8 (Cronbach, 1951). The cronbach formula for test difficulty is as follows:

$$p = \frac{H + L}{N}$$

p = the difficulty of the test

H = the proportion of students who correctly answer in the highest group

L = the proportion of students who correctly answer in the lowest group

N = the proportion of students from H and L

The cronbach formula for discrimination index is as follows:

$$r = \frac{H - L}{N}$$

r = the discrimination of the test

H = the proportion of students who correctly answer in the highest group

L = the proportion of students who correctly answer in the lowest group

N = the proportion of students from H and L

4) The reliability of the tests was analyzed by SPSS for Window. The results showed that the test reliability was .810. The value level of item difficulty (p) and discrimination index (r) are shown in Appendix D.

5) The final version of the pronunciation and stress tests contained 60 items with multiple choices. The tests were divided into three parts;

Part 1: Listening to word syllables and primary stress (29 items)

Part 2: Marking the primary stress of a word (13 items)

Part 3: Pronouncing words with an appropriate stress (18 items)

(See the pronunciation and stress tests in Appendix E)

3.3.5 Questionnaire

A questionnaire was used to explore students' views and opinions towards the use of multimedia courseware for enhancing pronunciation and stress abilities. The questionnaire was constructed by the researcher as follows:

1) The researcher reviewed related studies in which questionnaires were used to explore views, opinions, and attitudes of the target users in using computer instruction for English language learning and teaching.

2) The researcher constructed the questions based on the research purpose and questions.

3) The questions were reviewed by the thesis advisor.

4) The questionnaire had 35 checklist items and 10 open-ended questions and was tested using 40 pilot samples.

5) The internal consistency reliability was analyzed by Coefficient Alpha of Cronbach (α) method. The satisfactory level should be ≥ .70 (Cronbach, 1947). The cronbach formula for the internal reliability is as follows:

$$\alpha = \frac{K}{k-1}\left[1-\frac{\Sigma S^2}{S^Z}1_t\right]$$

α = reliability

S^2 = variance of items

S^z = variance of the test

K = Number of items

6) The internal consistency reliability of the checklist questionnaire was analyzed by SPSS for Window. The results showed that the reliability of the checklist questionnaire was .857 (See Appendix F for more details).

7) The final version of the questionnaire consisted of two sections; the items included 27 rating scale questions, and 7 open-ended questions.

7.1) Twenty-seven questions presented the principal concepts of SPMC design in three areas:

- Multimedia used and instructional design (13 items)
- Exercise and activity design (9 items)
- The preference toward using SPMC (5 items)

7.2) The seven open-ended questions asked students to write their view and opinion towards SPMC

8) The questionnaire provided the five rating criteria of the Likert's scale to measure students' agreement ranging from highest to lowest degree towards SPMC design and instruction.

The 5 rating criteria were:

5	=	Strongly agree
4	=	Somewhat agree
3	=	Uncertain
2	=	Somewhat disagree
1	=	Strongly disagree

3.3.6 Semi-Structured Interview

A semi-structured interview was used in the qualitative data collection and analysis. The semi-structured interview was conducted individually to elicit the samples' depth of information with 15 questions with topics and subtopics to ask about students' opinions relating to learning through the multimedia courseware for enhancing pronunciation and stress abilities.

3.4 Data Collection

The present study used mixed method design with pre-test and post-test quasi-experiment. The procedure of data collection was as follows:

1) The pre-test was assigned to the subjects who were to be manipulated by the instructional process of the multimedia courseware.
2) The courseware prototype was used in two phases; tryout and trial run. The tryout study was conducted three times; (1) individual testing with

three participants, (2) small group testing with six participants, (3) field study testing with forty participants. Then the final version of the courseware was used for a trial run with forty target samples.

3) The participants attended class to use the courseware for 10 hours within a 4 week period while the researcher also attended the class to provide guidance during the subjects' treatment.
4) During the treatment, the participants had to record score feedback from every exercise and activity as well as the quiz results on their score log.
5) The post-test was given to the subjects after they had finished the entire multimedia courseware lesson.
6) The subjects then were asked to respond to the questionnaire with the 27 checklist items and the seven open-ended questions.
7) The researcher selected six students from the treatment to elicit for in-depth information. Video recording was used to record the interviewees' voice while the interview took place.

3.5 Data Analysis

Mixed method design was used in the present study. The collection and analysis of quantitative data was initially used to report results. This was followed by an analysis of the collected qualitative data which assisted in interpreting the findings of the quantitative data. The quantitative and qualitative methods and strategies conducted in the current study are presenting in the following.

3.5.1 Quantitative Data Analysis

1) Descriptive statistics were used to determine the mean score of the SPMC production model evaluation and the SPMC questionnaire.
2) Statistical calculation of Coefficient Alpha of Cronbach was used to determine the reliability and difficulty of the pronunciation and stress tests.
3) Statistical calculation of Coefficient Alpha of Cronbach was used to identify internal consistency reliability of the tests and the questionnaire.
4) Statistical calculation of IOC measurement was used to check the validity of the test content.
5) The Brahmawong E_1/E_2 formula based criterion of 80/80 Standard was used to evaluate the multimedia courseware learning process and product (outcome).
6) Paired T-test sample statistics were used to compare students' abilities between pre-test and post-test.

3.5.2 Qualitative Data Analysis

The qualitative data analysis included the data obtained from the open-ended questionnaire and the interviews. The data obtained from the open-ended questionnaire, and the semi-structured interviews were translated and transcribed first from Thai to English, coded, categorized and interpreted to investigate students' views and opinions toward the use of multimedia courseware for enhancing English pronunciation and stress abilities.

3.6 Courseware Tryouts

In the present study, the courseware was used to evaluate its efficiency in two phases; the tryout and trial runs (Discussed in Chapter 4). In the tryout phase, the multimedia courseware prototype utilized three steps with three sample groups; (1) individual testing with three participants (1:1), (2) small group testing with six participants (1:10), and (3) field study testing with forty participants (1:100).

(1:1) indicates one teacher and one, two or three students with different proficiency levels; (1:10) indicates one teacher and six, seven, eight, …or ten students with different proficiency levels; and (1:100) indicates one teacher and the whole class of students (at least thirty) (Brahmawong, 1999).

The samples in the tryout phase were from undergraduate students at different English proficiency levels. The following topics and paragraph present the tryout process and results.

3.6.1 Results of the Individual Testing

The first step of the courseware tryout was the individual testing, conducted with three samples selected based on having different English proficiency levels from the students' previous grade in the compulsory English course. The grades represented able, moderate, and less able students. These three participants were asked to use SPMC to gain more knowledge and to improve skills in English stress. Then at the end of the course, the participants talked about the use of SPMC and made some suggestions. After that the courseware was revised and modified according to the participants' feedback from E_1/E_2 scores, as well as further reflection from the participants. Table 3.1 shows E_1/E_2 of each unit. See more details of the participants' score in Appendix I.

Table 3.1: E_1/E_2 Scores of the Individual Testing

Individual Testing (1:1)		
Courseware Unit	**E1 Score (%)**	**E2 Score (%)**
Unit 1: Syllables	74.51	75.56
Unit 2: Word Stress	71.67	73.33
Unit 3: Word Stress Patterns	74.07	76.67

According to Table 3.1, the tryouts of the SPMC learning process and outcome (E_1/E_2), not every unit in the individual testing met the 80/80 Standard. All participants scored an E1 in the range between 74% - 76% and an E2 in the range between 73% - 77%. The results indicate participant scores of E_1/E_2 as **74.51/75.56** in Unit 1, **76.67/73.33** in Unit 2, and **74.07/76.67** in Unit 3.

The score results from the individual testing with the three participants with different English proficiency levels shows that the courseware learning process needed to be revised because the E_1/E_2 score percentage did not meet the Standard of 80/80. The E_1/E_2 scores should have a minimum and maximum close to the 80 criterion, but it is acceptable if the scores vary from 80 by plus or minus 2.5 points. (Brahmawong, 1999). The courseware weaknesses were found and needed to be modified. After conversations between the researcher and the participants, it was found that the courseware failure included; not providing basic knowledge of English pronunciation and stress, using overly long explanations on one page, using linguistic terms unfamiliar to the students, and the need to develop exercises and quizzes appropriate to the students' background, particularly in Unit 2. The courseware was revised to respond to the above listed failures. The next tryout step was conducted using small group testing.

3.6.2 Results of the Small Group Testing

After the individual testing, the courseware had been modified and was used for the second tryout in a small group of six participants; two able, two moderate, and two less able in English proficiency as determined from the students' previous grades in the compulsory English course. The same procedure was conducted in this group. The six participants used SPMC, and then the researcher and the participants talked about the use of SPMC. After that the courseware was revised and modified according to the participants' feedback from their E_1/E_2 scores as well as from their reflections on the scores. Table 3.2 shows E_1/E_2 of each unit. See more details of the participants' scores in Appendix J.

Table 3.2: E_1/E_2 Scores of the Small Group Testing

Small Group Testing (1:10)		
Courseware Unit	**E1 Score (%)**	**E2 Score (%)**
Unit 1: Syllables	80.39	81.11
Unit 2: Word Stress	75.00	78.33
Unit 3: Word Stress Patterns	81.48	81.67

Table 3.2 shows the results of the SPMC learning process. The outcome (E_1/E_2) from the small group testing resulted in scores of **80.89/81.11** for Unit 1, **75.00/78.33** for Unit 2, and **81.48/81.67** for Unit 3.

The resulting E_1/E_2 scores show a more significant improvement than with the individual testing. According to the results on Table 3.2, the E_1/E_2 scores met the criteria of 80/80 Standard except for the exercise score (E1) in Unit 2. It could be interpreted that the unit instruction included in the lesson and the exercises and quiz needed further revision. Furthermore, other graphic design and media component

modifications were suggested. As a result the some of the courseware components were further modified including the voice models, a glossary, and videos. Then, the revised version was utilized again in the field study tests.

3.6.3 Results of the Field Study Testing

In the present study, the courseware tryout was examined three times, and the final tryout step was the field study testing of 40 volunteers who had already enrolled in at least one KPRU compulsory English course. The same procedure was conducted in this step. The forty participants were asked to attend the treatment of English stress and pronunciation using SPMC for 10 hours. After the treatment end, the questionnaire on the use of stress pronunciation multimedia courseware (SPMC) was assigned to the whole class. They were asked to write their views and opinions freely. Table 3.3 presents E_1/E_2 of each unit. (See more details of the participants' scores in Appendix K.

Table 3.3: E1 / E2 Scores of the Field Study Testing

Field Study Testing (1:100)		
Courseware Unit	**E1 Score (%)**	**E2 Score (%)**
Unit 1: Syllables	80.88	82.17
Unit 2: Word Stress	80.13	80.25
Unit 3: Word Stress Patterns	81.67	82.50

According to Table 3.3, the E_1/E_2 scores for every unit ranged from approximately 80 – 82 for E1 and from approximately 80 – 82.50 for E2 and the scores met the criteria of 80/80 Standard. The participants from the whole class scored **80.88/82.17** on Unit 1, **80.13/80.25** on Unit 2, and **81.67/82.50** on Unit 3.

The score results on the table 3.3 shows that E_1/E_2 of every unit met 80/80 Standard while the lowest score was still in Unit 2. From this result, it could be assumed that the courseware would be successful for Thai undergraduate students at KPRU in improving English pronunciation and stress. However, the 'word stress' lesson may be too difficult while the quiz for Unit 3 might be too easy for the students. However, those sections were modified again based on suggestions, requests, and comments. Even the instructional process and outcome of SPMC met the Standard and could be suitable for the target sample. What was modified and further developed included the tutor's voice, the graphic designs, the Thai subtitles, the videos, the courseware manual, etc. After that, the final version was utilized for a trial run with forty target samples. See the trial run results and more details in Chapter 4.

The results of the courseware tryout phase showed that the courseware efficiency in the individual testing did not reach the 80/80 standard. The instruction, including exercises, and the quizzes, were revised according to the samples' scores, feedback and suggestions. After the courseware had been revised it was used in the small group testing. The E_1/E_2 score results were higher than those of the first group. The instruction, including exercises, and the quizzes were modified again. After the courseware revisions, the E_1/E_2 scores in the field study testing were higher and approached the 80/80 Standard.

Even though the courseware shall be evaluated to improve its efficiency again, the contents, exercises, quizzes, and the design, including multimedia such as fonts, backgrounds, tutor animations and voices, audio, and videos were modified to use again in a trial run. Table 3.4 presents the pilot samples' opinions and suggestions

from the open-ended questionnaire. In this section, the content analysis method was used to analyze the data, and the suggestions are as follows:

Table 3.4: Participants Suggestion in the Field Study Testing

Statements	Participant Frequency (%)
1. They needed more contents and various exercise design.	20%
2. They needed a vocabulary list.	40%
3. They needed Thai subtitles in the tutorial section.	62%
4. They needed more contents and various exercise design.	20%
5. They needed a vocabulary list.	40%
6. They needed Thai subtitles in the tutorial section.	62%
7. They were still less able to identify correctly the position of the word stress.	30%
8. They were still less able to properly use stress and pronunciation.	20%
9. They suggested adding several videos to the courseware.	44%
10. They suggested editing the tutor voice and the sound model.	65%
11. They suggested to have both male and female voices, and that the voices not be older people.	20%
12. The directions in some exercises and quizzes were confusing.	37%
13. They suggested adding more sound effects and some icons.	15%

According to the findings shown on the table above, most desired by the pilot samples from the field study testing included a new tutor voice and sound model (65%), Thai subtitles in the tutorial section (62%), adding more useful videos (44%), and adding a vocabulary list (40%). Besides the above opinions and suggestions, the participants' interaction was observed by the lecturer during the treatment who noted:

1) Most participants really liked the video clips in the courseware.
2) Most participants liked to practice stress and pronunciation with other participants.
3) Many participants had trouble with English descriptions presented both in text and vocally.
4) Most participants had no background in the lexicon of English phonetics and linguistics.
5) Some students skipped pages of the tutorial section to go to the exercises and quizzes.
6) Some students had problems on the technical use of the courseware.
7) Some students always looked at other participants' answers in the exercises and quizzes.
8) Some students always asked the teacher for help without trying by themselves beforehand, such as asking for vocabulary meanings, asking how to do exercises and quizzes, and asking how to go to the next page and exiting pages.

An overview on the revisions and modifications in the three steps of the courseware tryouts is presented in Table 3.5.

Table 3.5: The Overview of the Three Steps of Courseware Tryout (1)

Phase 1 **After Individual Testing**	**Phase 2** **After Small Group Testing**	**Phase 3** **After Field Study Testing**
1. Exercises were edited to be more understandable and easier. 2. The English descriptions in the tutorial section were revised to be shorter and simpler. 3. The lessons and units were revised and edited.	1. A few exercises were edited again. 2. There was one unit that would not be assigned to the next group. 3. A vocabulary list was added. 4. More model vocabulary and sounds were added.	1. Some exercises and quizzes were edited to provide more variety and to increase interest. 2. There were Thai subtitles in the tutorial section. 3. A demonstration of word pronunciation was added. 4. A phonetic diagram was added. 5. A video about using stress was added. 6. The tutors' voice in units2-3 was newly recorded. One was changed to a female voice and the other one was changed to a younger male voice.

Table 3.5: The Overview of the Three Steps of Courseware Tryout (1) (Cont.)

Phase 1 After Individual Testing	Phase 2 After Small Group Testing	Phase 3 After Field Study Testing
		7. The woman tutor cartoon animation was redesigned and used in Unit 2. 8. Thai subtitles were edited and added. 9. Some activity directions were edited. 10. A few items were added to the exercises in Unit 1. 11. The font size was edited. 12. A new voice was recorded and substituted in some of the exercises and quizzes. 13. The courseware manual written and would be used in the next group.

3.7 Summary

This chapter presents the research methodology including the research design. The research design included population research, research procedures, variables, instruments and the construction used in the present study, the methods used for data collection and analysis. Also included are the courseware tryout steps including the results.

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter provides two sections that present the results as the basis for the research purposes and questions, and a discussion of the results. The discussion aims to interpret the meaning of the research results as well as to justify how the experimental work was improved and approached for research purposes. The main results presentation and the discussion focus on the efficiency of the multimedia courseware and production model, the students' English pronunciation and stress abilities before and after using SPMC, and views toward the use of SPMC.

4.1 Results

4.1.1 Results of an Evaluation of a Stress Pronunciation Multimedia Courseware (SPMC) Model

The production model of the Stress and Pronunciation Multimedia Courseware (SPMC) was designed based on instructional system design (ISD) and model step principles. It was created as a systematic, step-by-step, creative, and carefully planned model serving both the process of learning arrangement and the process of producing the product. The process of SPMC design leads to plans and future action, is able to be modified and revised anytime responding to learning goals and outcomes. The production model element phases for SPMC include six steps; 1) analyze the learners

2) select the instructional strategy, 3) design the courseware, 4) produce the courseware, 5) conduct the implementation, and 6) conduct the evaluation. (Specific details are described in Chapter 5).

After the final draft of SPMC production model, the model step was checked and evaluated by three experts in educational technology, instructional design and English language teaching (ELT) areas. They were asked to evaluate the model step in an evaluation form of the Stress and Pronunciation Multimedia Courseware (SPMC) production model (See SPMC Evaluation Form in Appendix A). There were five rating criteria for rating and evaluation toward the SPMC Model steps; band 5 is described as most appropriate; band 4 was somewhat appropriate; band 3 was moderately appropriate; band 2 was identified as inappropriate; and band 1 was mentioned as most inappropriate. The criteria range of mean was interpreted based on the criteria; 4.50 – 5.00 = most appropriate, 3.50 – 4.49 = appropriate, 2.50 – 3.49 = moderate appropriate, 1.50 – 2.49 = inappropriate, and 1.00 – 1.49 = most inappropriate (Adapted from SILL Version 7.0 (ESL/EFL), Oxford, 1989).

The evaluation items were analyzed and calculated by descriptive statistics, and Table 4.1 presents the results of the experts' evaluation toward the model step design and its appropriateness.

Table 4.1: Mean Scores of an Evaluation of the SPMC Model by Three Experts toward the Model Development and Appropriateness

Evaluation Items	Mean	S.D.
1. SPMC production model steps are appropriate for multimedia courseware production.	5.00	.000
2. SPMC production model are developed according to instructional system design.	5.00	.000
3. Each step of SPMC production model is well organized.	5.00	.000
4. Each step of SPMC production model is not complicated and is suitable for a new instructional designer.	4.33	.577
5. SPMC production model steps have suitable titles.	5.00	.000
6. SPMC production model is designed for language learning and pronunciation pedagogy.	4.33	.577
Overall Average	**4.77**	**0.192**

From Table 4.1, the experts recorded an overall mean ($\overline{X}$) of **4.77** toward the SPMC model development and appropriateness. The experts rated band 5 for four items; 1) the appropriateness of the SPMC production model steps to multimedia courseware production (Mean = 5.00), 2) the appropriateness in using ISD theory to design the SPMC production model (Mean = 5.00), 3) well organized The SPMC model steps (Mean = 5.00), and 4) the appropriate title in each step (Mean = 5.00). The experts rated band 4 for two items; 1) the appropriateness of the SPMC model to a novice instructional designer (Mean = 4.33), and 2) the appropriateness of the SPMC model approach to language learning and pronunciation pedagogy (Mean = 4.33).

The results of SPMC production model evaluation show that steps of the model were appropriate for the development of a multimedia courseware for

enhancing language learning including the study of English pronunciation and stress. According to the evaluation by three experts, the SPMC models strength was in the appropriate use for the development of language and English pronunciation pedagogy. The model integrated multimedia in the courseware and it would be easy to design other language instructions by new designers since the SPMC model uses suitable steps and titles according to ISD theory.

4.1.2 Results of the Efficiency Evaluation of SPMC

After the courseware had been modifying three times in the tryout test, the final version was utilized for a trial run. An actual prototype experiment was to be run with a target sample group of forty KPRU undergraduate students who volunteered to participate in the trial run phase of the prototype. The trial run included the participant pre-test, the treatment of English pronunciation and stress via the courseware for 10 hours, the post-test, a questionnaire and a semi-structured interview. The calculation to test SPMC efficiency using E_1/E_2 formula based on Brahmawong criteria of 80/80 Standard (Brahmawong, 1978) was still used in this phase. It was found that the overall average E_1/E_2 score of the participants in this group met the criteria of the 80/80 Standard and was higher than the score in the prototype tryout phase. Table 4.2 reports E_1/E_2 scores of SPMC lessons unit by unit. (See also the participants' score in details in Appendix L).

Table 4.2: Score Results of E1 / E2 in the Trial Run

SPMC Trial Run Results		
SPMC Lessons	**E1 Score (%)**	**E2 Score (%)**
Unit 1: Syllable	81.25	82.50
Unit 2: Word Stress	81.13	81.75
Unit 3: Word Stress Patterns	82.20	82.50

Table 4.2 shows that the scores of E_1/E_2 every unit had ranged from approximately 81.00 – 82.20 in E1 and 81.00 – 82.50 in E2, and they all met the criteria of the 80/80 Standard. According to the Table, the whole class participants' score in Unit 1 was **81.25/82.50**, **80.13/80.25** in Unit2 and **81.67/82.50** in Unit 3.

The score results of the trial run show that the SPMC learning process and outcome had efficiency to the criteria of 80/80 Standard. It was suitable for Thai undergraduate students at KPRU to use SPMC for the improvement of their English pronunciation and stress. Although other populations might not generally use the instructional design and lesson contents, the production steps can be revised and modified to respond to other learners.

4.1.3 Results of the Pre-test and Post-test Scores

In the present study, the English pronunciation and stress tests (pre-test and post-test) were assigned to the participants before and after the treatment of English pronunciation and stress via the computer multimedia courseware. The aim of using pre-test and post-test was to check the students' English pronunciation and stress abilities and their improvement. The test development was examined by experts and initially used by pilot samples for content validity and a reliability check. The final draft of the test contained sixty items divided into two main sections; (1) listening and (2) pronunciation (See more detail in Appendix E). After the test was taken by the target sample, a paired sample statistics (t-test) was used to calculate and compare the mean of one group pre-test and post-test. With analysis using this method we can determine whether there was a significant difference between the pre-test and post-test results. The following table shows the results for the pre-test and post-test (See individual pre-test and post-test scores in Appendix H). Table 4.3 shows the mean

scores compared between pre-test and post-test as well as a determination if there was a statistically significant (sig.) difference.

Table 4.3: T-test Results of Pre-test and Post-test

Paired Samples Statistics			**Paired Samples Test**		
Overall average score	**Mean ($\bar{X}$) Total 60**	**S.D.**	**Mean ($\bar{d}$)**	**T**	**Sig.(2tailed) (p)**
Pre-test	36.95	4.977	-4.225	-6.729	.000
Post-test	41.18	3.882			

As shown in Table 4.3, the results indicate that the overall pre-test mean was **36.95** (61.58%) while the post-test mean was **41.18** (68.63%) out of a total of 60 marks. According to statistical data analysis and results, there is a significant difference in value between pre-test and post-test at the level of .05 (sig = 0.000). The increased value could be interpreted as an improvement and progression of the participants in English pronunciation and stress after they had received the English pronunciation and stress treatment through the use of SPMC.

4.1.4 Results of the Questionnaire

The current study used a questionnaire to explore students' views and opinions towards using SPMC to increase their knowledge and practice their English pronunciation, particularly in word stress. The questionnaire contained three main sections consisting of the identification the subjects' personal information, a 27 item checklist questionnaire that had three main concepts, and seven open-ended questions. The results of the three sections of the questionnaire are reported separately.

In section 1, the identification of the subjects' personal information was analyzed by using descriptive statistics that showed the frequency of the subjects' characteristics. The frequency number and percentage are presented in Table 4.4.

Table 4.4: Subjects' Personal Information

Personal Information	Frequency (N = 40)	Percent (100%)
1. Sex		
- Male	10	25%
- Female	30	75%
2. Age		
- 18 years old	3	7.5%
- 19 years old	18	45%
- 20 years old	9	22.5%
- 21 years old	5	12.5%
- More than 21 years old	5	12.5%
3. Year of study		
- First year	25	62.5%
- Second year	14	35.0%
- Others	1	2.5%
4. Field of study		
- English	25	62.5%
- Hotel Management and Tourism Industry	15	37.5%

From Table 4.4, descriptive statistics showed that of the 40 participants who were KPRU undergraduate students studying in the 2/2012 academic year, the students could be divided into; first year (62.5%), second year (35%), and fourth year (2.5%); English majors (62.5%) and Hotel Management and Tourism Industry majors (37.5%); aged eighteen years (7.5%), nineteen years (45%), twenty years (22.5%), twenty-one years (12.5%), and more than twenty-one years (12.5%); and (25%) were male and (30%) were female.

In section 2, the Likert's Scale was used for participants to rate their views and opinions toward the use of SPMC. The questionnaire allowed the subjects to rate their

views and opinions with 5 rating criteria in which band 5 represented *strongly agreed*; band 4 represented *somewhat agreed*, band 3 represented *uncertain opinion*, band 2 represented *somewhat disagreed*, and band 1 represented *strongly disagreed***.** Table 4.5 shows the details of bands and their meaning including the range of the mean scores.

Table 4.5: Likert's Scale and Rating

Band	Statements	Ranges of Mean
5	Strongly agreed	4.50 to 5.00
4	Somewhat agreed	3.50 to 4.49
3	Uncertain	2.50 to 3.49
2	Somewhat disagreed	1.50 to 2.49
1	Strongly disagreed	1.00 to 1.49

*Note***:** The criteria range of mean was interpreted and adapted from SILL (Strategy Inventory for Language Learning) Version 7.0 (ESL/EFL), Oxford, 1989).

Section 2 contained 27 questions on the three principal concepts of SPMC design. The concept 1 asked about the multimedia and SPMC design (items 1 – 13), concept 2 asked about the lesson exercises and activities (items 14 -22), and concept 3 explored the users' preferences toward using the courseware as a tool for learning (items 23 – 27). Table 4.6, 4.7 and 4.8 showed the results of the participants' ratings, the mean score (Mean) and the standard deviation (S.D.) of each item.

Table 4.6: Multimedia and SPMC Design (Item 1-13)

Question items	Mean	S.D.
1. Displayed screen and graphics stimulate and captivate learners.	4.17	.594
2. Displayed screen has clear, readable text and suitable font styles, background and colors.	4.27	.640
3. The designed pages always show the title to recall learners' attention.	4.32	.572
4. The courseware design uses proper technical quality for text, images, sounds, and video.	3.90	.810
5. The videos encourage learners' learning and skills.	4.32	.616
6. The videos enhance tutoring and practice.	4.38	.586
7. The tutor's voice is clear and understandable.	3.70	1.137
8. The recorded sounds of words and sentences are clear and understandable.	388	.939
9. The instruction encourages the learners' interactive learning through a simulated environment.	4.18	.636
10. The instruction encourages learners' self-performance.	4.10	.591
11. The instruction accommodates multiple learning activities.	4.13	.686
12. The instruction enhances English listening skills.	4.48	.640
13. The instruction enhances English speaking and pronunciation skills.	4.27	.554
The overall average	*4.16*	*.692*

Table 4.7: The Lesson Exercise and Activity in SPMC (Item 14 - 22)

Question items	Mean	S.D.
14. The directions for the exercises are clear and understandable.	4.22	.698
15. Exercises in SPMC include interesting activities and multiple styles.	4.10	.632
16. Exercises in SPMC match the contents and are not too difficult.	4.32	.572
17. Exercises in SPMC use the appropriate vocabulary and text for the learners' ability.	4.37	.628
18. Exercises in SPMC develop learners' problem solving ability.	4.22	.620
19. Instant feedback is available after responses.	4.38	.586
20. Learners are allowed to return to the lesson and correct their wrong response.	4.37	.586
21. The availability of multiple styles for reflection is prompted (mouse to click, point, and drag).	4.45	.597
22. Printing out feedback (score) is available.	4.27	.640
The overall average	*4.30*	*.617*

Table 4.8: Preference View toward Using the Courseware for Learning

(Item 23 – 27)

Question items	Mean	S.D.
23. I prefer learning stress and pronunciation through SPMC rather than with a textbook.	4.30	.687
24. I can manage my schedule to use and learn via SPMC anytime anywhere.	4.12	.686
25. SPMC encourages me towards autonomous learning.	4.22	.577
26. I will return to SPMC whenever I want to review and practice pronunciation.	4.37	.540
27. I would like to learn other subjects using multimedia courseware.	4.37	.586
The overall average	*4.28*	*.615*
Overall Mean (Item 1-27)	**4.23**	**.653**

The questionnaire items were analyzed and calculated by descriptive statistics and Table 4.6 – 4.8 present the results of the participants' views toward the use of

SPMC. The participants recorded an overall mean ($\overline{X}$) of *4.16* toward the multimedia used and design of SPMC. The participants recorded an overall mean ($\overline{X}$) of *4.30* towards the lesson exercises and activities of SPMC. The participants recorded an overall mean ($\overline{X}$) of *4.28* in their preference towards using the courseware for learning. These results show that the subjects had optimistic views toward SPMC, highly toward the concept 2 'exercise and activity', followed by concept 3 'preference view toward using the courseware for learning', and with concept 1 'the multimedia used and the design of SPMC' as last.

According to the whole questionnaire from item 1 - 27, the participants' perspective towards SPMC was **4.23** ($\overline{X}$), represented as **'somewhat agreed'**. The subjects had most highly agreed in; 1) item13 *'the instruction enhances English listening skills'* ($\overline{X}$ = *4.48*), 2) item21 *'available multiple styles to response are prompted'* ($\overline{X}$ = *4.45*), 3) item19 *'instant feedback available after responding'* ($\overline{X}$ = *4.38*) and item6 *'videos enhance tutoring and practice'* ($\overline{X}$ = *4.38*). Meanwhile, the subjects had less agreement toward; 1) item7 *'tutor's voice clear and understandable'* ($\overline{X}$ = *3.70*), 2) item8 *'word and sentence sound clear and understandable'* ($\overline{X}$ = *3.88*); and 3) item4 '*a proper and technical quality for text, images, sounds, and video'* ($\overline{X}$ = *3.90*). According to these results, it might be assumed that the subjects had highly optimistic attitudes towards SPMC.

4.1.5 Results of the Open-Ended Questionnaire and Semi-Structure Interview

4.1.5.1 Results of the Open-ended Questionnaire

The third part of the questionnaire contained an open-ended questionnaire with 7 questions. It was provided for the subjects to write about their views, opinions, other commentary, suggestions, and so on. As mentioned previously in Chapter 3, the content analysis method for qualitative data was used in this section to determine results and further findings. Figure 4.1 shows the questions in the open-ended questionnaire.

Part 3: Write your opinions in the following points.

1. Please discuss if you like or don't like using a multimedia courseware to learn English pronunciation and stress.
   ……
2. Please discuss how this multimedia courseware could improve your pronunciation and stress in English.
   ……
3. Please identify advantages of this multimedia courseware in enhancing your learning pronunciation and stress in English.
   ……
4. What are the problems you encounter when you use the multimedia courseware to learn English pronunciation and stress?
   ……
5. In your opinions, what should be added in this multimedia courseware?
   ……
6. In your opinion, what should be edited in this multimedia courseware?
   ……
7. Anything else you want to tell us?
   ……

Thank you very much for your cooperation

Figure 4.1: Open-ended Questionnaire

After the questionnaire was collected from the class participants, the results were interpreted using the content analysis method; first, any answers and comments from the questionnaire were translated and transcribed from Thai to the English

language; second, findings found in the English transcribed version were coded by numbers based on sharing similar points; finally the findings were grouped by topic and presented in categories.

The findings from the open-ended questionnaire could be categorized into six topics; (1) the participants' new knowledge and skill improvement, (2) useful knowledge, (3) SPMC advantages, (4) SPMC weakness and problems, (5) the participants' recommendations, and (6) other comments. The same method was used and similar results were found in both the open-ended questionnaire and the semi-structured interviews. Thus any details from the open-ended questionnaire and the semi-structured interview were combined and are presented in the same section later on.

According to the results of the questionnaire, the subjects were somewhat in agreement with each other and had a positive attitude towards SPMC for enhancing their English pronunciation and stress abilities. This corresponded well to the fourth research question about the students' views and opinions towards SPMC.

4.1.5.2 Results of the Semi-structured Interview

A semi-structured interview was conducted between the researcher and the selected six participants for the SPMC trial run. The interview took place after the participants completed the questionnaire. In the semi-structured interview, the participants were asked to be video recorded while giving further information on their background in English pronunciation learning, daily use of technology for education purposes, and so on. The researcher had developed 10 questions and generated further questions during the interview. The interview took 10-15 minutes for each interviewee. (See the interview questions and transcript in Appendix M).

As already mentioned, the data analysis was completed using the same methods for the open-ended questionnaire analysis. The first step was translation and transcribing texts from Thai to an English version; then the information in the answers were coded based on sharing similar points. After which the answers were grouped and categorized.

The findings from the semi-structured interview were divided into four topics; (1) the interviewees' learning background with English pronunciation, (2) personal views towards the SPMC design, (3) English knowledge and skills improvements, and (4) suggestions. Since the results from the open-ended questionnaire and the semi-structured interview were analyzed by the same method and gave similar findings the results were reported and concluded together. See the findings from the open-ended questionnaire and the semi-structured interview in Table 4.9.

Table 4.9: Topics of Open-ended Questionnaire and Semi-structured Interview

Topics of Open-ended Questionnaire Findings	Topics of Semi-structured Interview Findings
1. The users' preferences towards the courseware (SPMC)	1. Students' background in studying English pronunciation and stress
2. Useful knowledge	2. Students' views towards the SPMC Design
3. SPMC advantages	3. Students' progress and improvement in knowledge
4. Technical problems with the courseware	4. Students' suggestions for SPMC improvement
5. Recommendations	
6. General commentary	

The same data analysis method, the 'Content Analysis' method, was used to analyze data from the open-ended questionnaire and the interviews. The

questionnaires and the interviews both explored the students' views and opinions. After analyzing the data from the two sources the results were found to be similar, so the results for were discussed together in the same report section. Therefore, the findings from both were grouped and presented in the same section. Accordingly, findings from the students' views, opinions and attitudes towards SPMC included (1) students' educational background in English pronunciation, (2) students' preference towards using SPMC, (3) students' progress and their increase in knowledge, (4) advantages of SPMC, and (5) suggestions.

(1) Students' Educational Background in English Pronunciation

Among students who participated in the semi-structured interview, two English major students had taken a Phonetics course. In contrast, the other students, majoring in Hotel Management and Tourism Industry had no educational background in English pronunciation. However, most students (85%) stated that the lessons of SPMC were not too difficult for them. Although the students had little knowledge in the use of stress in English, they learnt fast with the interesting instructional strategies of SPMC, for example:

Questionnaire

S39: *"the multimedia in SPMC assisted me a lot to learn fast though I had no studied about English pronunciation and stress before"*

S7,S13,S28: *"SPMC lesson was understandable for me."*

Interview

IN5: *"… Although I didn't study about pronunciation, I learnt from my experiences. I like to listen to English sound and speak with foreigners. I learnt how to pronounce from them."*

IN6: *"No, it was not. There were several media on the courseware that could enhance my study and to assist me to understand easily. I always use a glossary to see vocabulary meaning."*

Twelve percent of the students stated in the questionnaire that while speaking English they had never focused on syllable or word stress and in fact they did not know using stress, but they tried to use stresses on words after they learnt about it while using SPMC. Although technology is booming and develops very quickly nowadays, most interviewees indicated that they seldom use technology for education, i.e. computer software, online-lessons, educational websites or applications on tablets and smart-phones. One interviewee stated that they used a mobile-phone application program to learn about English phonetics, and another two students said that they liked to use a dictionary application on their mobile-phones. Twenty-six percent of the students from the open-ended questionnaire and four from the interview mentioned that they always used Google Websites to search for anything and to increase their knowledge about English and other subjects.

Interview

T: *Do you use any Websites to learn pronunciation?*

IN3: *"No. Never"*

IN2: *"No. I sometimes learn English pronunciation from songs and movies."*

T: *What about using technology tools, like software program, Web-based online lessons, courseware, Websites, smart-phone and tablet application to study other subjects?*

IN1: *"I never use them."*

IN3: *"I usually go on Google page if I want to search something."*

IN6: *"No"*

(2) Students' Preference Towards SPMC

Eighty-five percent of the students answering the questionnaire noted their preference towards using SPMC for learning pronunciation. Most students said they really liked SPMC because they could learn the pronunciation of English words following native speaker voice models. They were able to listen to the voice model and repeat it again and again. They said that the SPMC lessons enhanced their pronunciation skills. They not only gained knowledge, but also enjoyed the lessons. The tutor voice and descriptive text displayed on the screen helped them learn quickly. They really liked the video clips in the courseware but would have liked more. They could easily go back to any page of the unit. The descriptions were simple and helped them to understand more easily by themselves. Another interesting point was that they got instant feedback after they had completed exercises and quizzes. A few students stated that they preferred learning pronunciation via the computer rather than from textbooks. Furthermore, audio and visual media and other graphics were stimulating them to pay attention and keep clicking. They felt comfortable with the lessons, exercises, and quizzes. The screen design and pattern, and the presentation content were very interesting and attractive to learners. One interviewee said that she really liked that the courseware had both a tutor voice and text descriptions. She said it interested her more than only reading text. Another interviewee was excited and impressed with the instant feedback from the exercises and quizzes.

Questionnaire

S16, S20: *"I could listen to word pronunciation many times. I did not ask the teacher to pronounce words for me. I just clicked again and again."*

S34: *"I really like studying through this kind of multimedia courseware. It could enhance my understanding and learning faster*."

Interview

IN5: *"...the video makes me fun and laugh, and I learn about what stress is from the video. I really like it."*

IN2: *"...when I study in class with a lot of paper, I feel very boring and tired. But I feel relax and fun when I learn English on this courseware."*

(3) Students' knowledge improvement and progress

77.50 % of the students noted that SPMC enhanced their knowledge and understanding of basic English pronunciation, particularly in using stresses. The students also stated that they not only gained knowledge but they also enjoyed themselves and had fun. They said that SPMC lessons could really help improve their pronunciation skills. They were able to change pitch and rhythm to create word stress. The lessons helped them to increase basic English pronunciation and stress. The students gained knowledge on how to count syllables and which syllable should be stressed. Most interviewees also indicated that they learned how to make primary stress from the courseware pedagogy.

Questionnaire

S2, S11, S35, S36: *"The lesson helped me to know well about pronunciation on word."*

S12: *"I learn how to make low and high pitch".*

Interview

T: *Do you think if your pronunciation has got improved after the use of SPMC?*

IN2: *"Yes. Particularly, I know more well about the position of word stress".*

IN5: *"I have learnt more about how to make syllable stress."*

One interviewee expressed his view on the importance of pronunciation in learning another language. He said that in making pronunciation errors and mistakes,

and especially misplaced word stress, the listener might misinterpret and or misunderstand the speaker's points. In contrast, suitable word stress could enhance communication success. The listener may better comprehend the speaker's points from intelligible pronunciation and stress.

Interview

T: Do you think if intelligible pronunciation is important and could help you in listening comprehension when facing with foreigners?

IN5: *"Sure. It's really important I think. From my experiences, I spoke with error pronunciation or even a bit mispronunciation; they didn't understand my point at all…."*

(4) Advantages of SPMC

Many students (77.50%) showed their positive views towards SPMC on the questionnaire. Some findings included the advantages of SPMC for practicing of English pronunciation.

S4: *"It sounds modern and new for me to use computer to study English pronunciation. I really like it because I could listen to voice model of a native speaker in several times."*

S2, S15, S24, S36, S39, S40:

"This courseware enhances pronunciation learning, and could help me to have better pronunciation and stress..."

The SPMC pedagogy is designed for interactive instruction and to enhance autonomous learning. Those advocating SPMC suggest that when students use different kinds of media like graphics, images, animated pictures, videos, and audio recordings they can achieve authentic learning. The media used for the pronunciation pedagogy stimulated and captured the learners' interests increasing their desire to

study something new. From the questionnaire, 80% of the students and all the interviewees expressed that they enjoyed using SPMC and felt comfortable learning about English pronunciation and stress with SPMC. They revealed that their improvement in English was not only limited to pronunciation, but also included improvements in listening perception skills.

Questionnaire

S14, S17: *"Learning on SPMC made me fun."*

S11: *"The lesson of SPMC is a good introduction for further study in English pronunciation."*

S12: *"Two language versions were very helpful for me. I used Thai sub-title description to translate and compare meaning of English text. It would be too difficult and boring if there is only English version."*

The students also said that the lesson content in the tutorial mode for each unit was not too difficult and was understandable. The process of learning and the instructional strategies helped them to learn rapidly. Using CD-ROMs for storage was very convenient allowing students to use it on a PC or laptop computer anywhere and anytime without an Internet connection.

(5) Problems and Suggestions

According to data analysis from the open-ended questionnaire and the semi-structured interview, most subjects expressed the same problems and suggestions.

a) Problems

Sixty-two percent of the subjects who responded in the open-ended questionnaire and three interviewees blamed SPMC for a technical problem with the sound composition. Many participants said that they could not hear the voice clearly

during the tutorial section of Units 2 and 3 and the voice models used in the practice test (exercise). Fifteen percent of the students claimed that while completing the exercises they encountered difficulties hearing the sound model, which as a result effected their ability to select answers. Ninety percent of the students suggested editing the audio and voice recordings.

Questionnaire

S5, S11, S16, S23, S24:

"I can't hear the tutor voice of Unit 2 and 3, but I read Thai sub-title instead of the tutor voice."

"The sound composed was very light,…."

"I tried to volume up, but it was still quiet."

S7, S31, S39:

"Sound models of Practice test 3.1 and 3.2 were very quiet, I couldn't decide to choose a correct answer in exercises."

T: Do you have any suggestion?

IN1: *"Sound! The sound was very silently. It should be edited."*

IN2, IN3: *"Yes. I think the sound needed improvement in sound recording."*

In addition, it was found that 15% of the subjects encountered problems with the exercises and quizzes because they could not understand the directions. Twelve percent of the students said it would be more interesting if SPMC provided an illustration or an interactive example on how to complete exercises and select the correct answers.

b) Suggestions

Almost half of the subjects suggested providing more units and exercises (46% of students). Subjects also suggested designing interactive activities with multiple types of media (23% of students); using several authentic and active

media like animated images with songs (7%), fun games (20%), video clips (38%), cartoon animation (25%), providing demonstrations of mouth movement (1 interviewee) and short dialogues (25%). There were two interviewees who recommended that SPMC should provide answer keys for the exercises and quizzes. Another interviewee complained about the classroom atmosphere. He said there were too many participants (40 students) who made noise and annoyed other people.

Findings from both the open-ended questionnaire and the semi-structured interviews indicated needs and requirements for improving the SPMC. Suggestions, requirements and comments were very valuable for the current research and for further study. The SPMC model steps were systematically designed as a revisable and modifiable process. The exploration of students' views and opinions were very useful in suggesting future instructional processes and the production could be edited following to the students' requirements. This corresponds well to the fourth research question in eliciting students' views and opinions towards the use of SPMC to enhance English pronunciation and stress abilities.

4.2 Discussions

4.2.1 Discussion about the Development of a Multimedia Courseware Production Model

From the results of the SPMC model evaluation, three experts agreed that the SPMC model was appropriate for producing English pronunciation and stress pedagogy in the form of multimedia courseware specifically designed for Thai EFL undergraduate learners. The statistical data analysis gave a mean score of 4.77 toward the evaluation of The SPMC model design. The three experts who evaluated and

examined the model agreed and rated the SPMC model a band 5 (Mean score = 5.00) for the following topics.

- The steps of the SPMC production model were appropriate for multimedia courseware production ($\overline{X}$ = 5.00)
- The steps of the SPMC production model were developed according to instructional system design ($\overline{X}$ = 5.00)
- The steps of the SPMC production model were well organized. ($\overline{X}$ = 5.00)
- Each step had a suitable title. ($\overline{X}$ = 5.00)

The topics above indicate that the SPMC model's strength lies in the steps that could be applied and used in the development of other technology instruction and courses. Since the SPMC model was created following ISD theory, it provided logical steps and titles that the instructional designer could follow and understand easily. SPMC also identified the steps for authoring the courseware program.

However, the experts rated smaller band in the SPMC evaluation form on two points;

- Each step of SPMC production model is not complicated and is suitable for a new instructional designer. ($\overline{X}$ = 4.33)
- The SPMC production model is suitable for the construction of language learning lessons. ($\overline{X}$ = 4.33)

From the evaluation, these two points could be assumed to be the SPMC model's weakness. The experts' identification might be interpreted that the SPMC

model would probably be complicated for a novice instructional designer in developing courseware for language learning pedagogy.

The SPMC (Stress Pronunciation Multimedia Courseware) model consisted of six steps for producing English language instruction in pronunciation and word stress. The model design employs concepts in the instruction so that teaching and learning occurred with careful, systematic, step-by-step, and revisable plans (Duffy, McDonald & Mizell, 2005; Allen, 2007). Although the SPMC model was developed following ISD theory and other models, the SPMC model had been designed for a specific purpose which involved specific learners (Thai EFL undergraduate students), specific lessons (English pronunciation and stress for Thai EFL learners), and specific instructional tools (multimedia and software). As indicated in the evaluation form, three experts strongly agreed that The SPMC model had suitable steps for developing multimedia courseware pedagogy of English pronunciation and stress, and the SPMC model provided sub-steps and details that could be administered easily by the researcher and other novice instructional designers. The following paragraphs discuss the advantages of the SPMC model and the step details.

Identified in the SPMC model step 1, the model begins with the analysis of learners on their knowledge requirements, needs and problems. These are analyzed to determine what the goal should be. For this study, the SPMC model was developed to produce technology instruction for Thai EFL undergraduate students at Kamphaeng Phet Rajabhat University who encountered difficulty in English pronunciation and mostly had problems with stress in English because of a lack of basic knowledge of English pronunciation and stress as well as not having participated in a pronunciation class.

The learners' educational backgrounds were analyzed including their problems (lesser skills in some areas of pronunciation such as vowel sounds, consonant sounds, stress, intonation); their preferences in teaching and learning styles/methods such as the use of technology, computers, videos, role playing; and attitudes towards English language learning, teaching, classes, teaching methods, etc. The analysis identified important factors to consider in the design of learning goals and outcomes to be used in the development of new lessons. These factors are important because they assist the courseware designer in developing the appropriate instructional strategy/method. These points were similarly provided in other models such as the Dick & Carey Model and the ADDIE Model, (Dick, Carey L. & Carey O., 2005; Barrett, 2000).

The SPMC model step 1 facilitated the development of step 2 on the selection of contents and instructional strategies that would fit and respond to the targets' needs and problems. Step 2 identified a selection of contents and instructional strategies providing researcher guidelines in the preparation of lessons based on the knowledge and instructional objectives as well as to establish media and other components like the pre-test and the post-test, the SPMC manual, and the class environment. Moreover, The SPMC model step 2 assisted the researcher to pre-organize and select instructional strategies with interesting multimedia that could motivate learner's curiosity. This step corresponded to the evaluation by the three experts. They agreed that the SPMC production model was suitable to create language learning pedagogy and English pronunciation instruction (Mean = 4.33) and that the production plans were well organized (Mean = 5.00). Also, the plans for the SPMC model step 2 were similarly used and stated in many previous instructional design models such as the Dick & Carey Model, the Seven-Step Model, the DID Model, the AIOU Model (Dick,

Carey L. & Carey O., 2005; Brahmawong, 1999; Duffy, McDonald & Mizell, 2005; Iqbal, 2003). However, the SPMC model is different from other instructional models because the model contains steps for software and multimedia production. The aim of using computer or CALL (computer assisted language learning) and multimedia was to enhance the instructional strategy knowing that computer and multimedia use could facilitate the presentation of lesson content and information (Duffy et al., 2005). This point made the SPMC model useful and it was appropriate to use it to develop CALL multimedia and courseware. The three experts strongly agreed with these advantages (Mean = 5.00).

SPMC and the SPMC model provided sub-steps which were suitable for novices of instructional design to follow systematically step-by-step. The SPMC model step 3 provided methods for a multimedia and courseware design while step 4 provided the production process. These were different from other models in that the instructional strategy of SPMC was based on integrating computer-systems and multimedia in order to develop interactive and authentic instruction. Thus, the SPMC model identified a step for producing computer software and other multimedia elements. The software production method required the researcher to study how to develop a software program and pedagogy. Step 3 and 4 of the model were very time consuming for the researcher and may be so for other new courseware designers if he or she is not skilled with technology and multimedia production.

However, one way to promote courseware production is to develop a project team that may include a course manager or a teacher, a courseware designer and other specialists in multimedia production and computer graphics design. These points have been suggested in previous studies (Heinich, Molenda, Russell & Smaldino, 2002;

Iver & Barron, 2006). In this thesis, the courseware and other media components were authored and edited using the software program Adobe Flash Professional CS. The researcher employed it with the assistance of technical specialists. Although the model steps were helpful for the researcher to follow, being step-by-step, time constraints were the limitation. This problem became an extraneous variable that the researcher could not control. This may be described as an SPMC model weakness since the researcher or instructional designer was not able to complete components in time according to the planned schedule. For instance, the content selection and multimedia could not be produced until the step of analyzing learners was finished.

The SPMC model delivered principles that led to plans and future actions and were able to be modified and revised anytime responding to learning goals and desired outcomes. Establishment of the learning tool and other materials was the most important factor and should be involved in the model steps. This action was in the SPMC model step 5 *'Conduct Implementation'* with three sub-steps that prepare the courseware prototype for actual environments. The plan used a tool in two phases; tryout prototype with three steps (individual testing, small group testing, field study testing), and a trial run for the final prototype. The implementation procedure was conducted several times in order to evaluate and improve the instruction and other elements. This step is a principal method suggested by Brahmawong (1999), Dick, Carey L., & Carey O. (2005) and Barrett, Lee & Owens (2000). Furthermore, the implementation step also facilitated the SPMC evaluation step identified in the SPMC model step 6. Step 6 was conducted as the final action of the SPMC utilization in order to evaluate its efficiency and to make improvements until it met the necessary standard. This action was mentioned in other models used in the development of

technology instruction, for example the DID Model, the SREO Model, the AIOU Model, and the Saitakham Model (Saitakham, 2010).

However, step 6 of the SPMC model provided and aided the researcher in conducting two types of evaluation; formative evaluation (step 6.1), for the assessment of the efficiency of the instructional process, and summative evaluation (step 6.2), for the assessment of the instructional product by learners' outcomes using the E1/E2 formula of Brahmawong for tryouts (individual testing, small group testing, field study testing) and Trial Run of innovation steps (Brahmawong, 1999). Similarly, other models, such as the Dick & Carey Model, divided the evaluation into two separate steps; 1) conducting formative evaluation by evaluating three phases (one-to-one, small-group, field), and 2) conducting summative evaluation after revising the instruction; the AIOU Model also used formative and summative evaluation, but in a step separated. Meanwhile, the DID Model provided only summative evaluation; the SREO Model provided an evaluation step using grade criteria or summative scores to determine what components should be improved.

The SPMC production model was designed for specific learners with specific lessons and environments in which the computer and multimedia would be employed as the most important instructional strategy. Although there are several models that can be used to develop English language learning instruction, there are some limitations that might prevent the researcher or other instructional designers from using them since they do not provide specific steps that fit into the process of developing instruction, learning goals and learners' outcomes. Therefore, the SPMC production model was selected because it had been developed to meet the desired

instructional approach and other specific components such as using multimedia and different learning strategies in the instruction.

4.2.2 Discussion about the Efficiency of SPMC Lessons

In the present study, the courseware contains three modes; tutorial, drill (practice), and assessment. The courseware, the multimedia interactive instruction, the presentation strategies and the screen design were designed to increase the learners' attention and learning perception. SPMC was designed using the constructivist approach that suggests learners themselves should be encouraged to actively construct their knowledge while teachers should act like a coach or facilitator. This point was also suggested in an earlier study in the development of multimedia learning (Alessi & Trollip, 2001).

The SPMC lesson was different from traditional methods and other instructional tools since it emphasized learning over teaching including active learning, authentic learning activities, autonomous learning, learners' reflection and evaluation, and authentic tasks and individual activities. SPMC employed the constructivist approach to the SPMC learning process in the following manner.

The *SPMC tutorial (presentation) mode,* the lesson, presented information on English pronunciation and stress. Content presentation in the tutorial mode provided learners with authentic settings like text with sound descriptions, phonetic diagrams, and tutor animation that acted like an instructor. During the presentation mode, learners can use the navigation control to pause the tutor or to go back or forward a page, and even to freely access and link to other modes and pages. The user can also open a new window while staying on the tutorial page. Three tutorial units were

developed with sub-lessons consisting of; Unit 1: Syllables, Unit 2: Word Stress and Unit 3: Word Stress Patterns (See more unit details in Chapter 5).

SPMC Practice (Drill) mode, a lesson exercise, prepared authentic tasks and individual activities that promoted learners' interactive and autonomous learning. Learners were given an opportunity to review content and check their understanding of authentic tasks, and completing exercises and quizzes that offered feedback and evaluation. An earlier study in the language learning approach (Ellis, 2005) suggested that SPMC learning activities should also employ an oral-situational approach that focused on the audio-lingual approach based on a structural syllabus but that emphasized the meaning of the different structures. The SPMC practice mode contained several types of activities that enhanced the practice and training for everyday communication. For example, learners can use a phonetic diagram to compare sounds, by listening and repeating them. They could use this function to train and evaluate themselves until they have improved or even mastered the skill. This mode also provides feedback showing their level so that the learner can check their successful and unsuccessful attempts. This was also pointed out by Ragan & Sheppard (1996, cited in Alessi & Trollip, 2001).

SPMC provided interactive activities to gain the learners' attention. They were designed to cover the learning process with activities such as listening to speech, making a recording of their own voice through specific software, and interactive multimedia via the computer-based function. All drill and practice activities on SPMC can be activated, before, after, or during the content presentation (See more details in Chapter 5). This encourages learners to feel free to use these activities without the pressure of time constraints that take place in a classroom.

The *SPMC assessment mode* was the last mode which is used to assess the learners' knowledge gains. A quiz was provided at the end of each unit. The design of the quiz mode created an interactive setting for the learner including hypermedia text, sound compositions, voice models, and animated graphics. According to findings from the interviews, many participants said they liked the quizzes and the exercise design of SPMC because received instant feedback after completion. However, in the trial run of SPMC, participants were guided during the exercises and quizzes once or twice if they were assessed as low level.

Ellis (2005) suggested that in assessing learners' L2 proficiency, it was important to examine free as well as controlled production. However, when it was found that most learners could not achieve the instructional goals, the exercises and/or quizzes would be revised. Brahmawong (1999) also indicated this same point.

The aim of producing SPMC was to assist English teachers and students at Kamphaeng Phet Rajabhat University. It was designed and produced to be used offline so that students could use it to study by themselves anywhere even if there was no Internet connection. The preliminary evaluation of SPMC was conducted and modified three times using different durations and participants. The evaluation of the SPMC efficiency was the main purpose of this current study. The evaluation relied on Brahmawong's instructional assessment using the E_1/E_2 formula based on criteria of the 80/80 Standard. The instructional evaluation was conducted in two phases; instructional tool tryout (individual testing, small group testing, field study testing); and a trial run.

SPMC was revised after the three steps of the tryout phase as presented in the methodology section in Chapter 3. When the scores in the tryout steps did not meet

the 80/80 Standard criteria, the SPMC needed improvements. The changes followed the participants' feedback and reflections that were given after the completion of all SPMC lessons. This stage of SPMC revision and modification frustrated the researcher and led to the assumption that the problem was the learners' background knowledge and personal habits in learning another language. The researcher questioned whether the learners' were prepared enough for the required learning actions. But after reflection, what was changed was the learning outcomes and the courseware including the lesson contents, practice and exercise activities and media elements. These were considered as advantages and weaknesses of the courseware. Dick et al. (2005) pointed out that the collaboration of components in the learning environment (such as the instructor, learners, instructional activities and materials, and the delivery system) aid in reaching the target learning outcomes. Any change to even one component may affect the learning outcomes. The following paragraph contains an overview of the revision of the SPMC tryout phase.

The SPMC was modified three times during the tryout phase. After individual testing, exercises and text descriptions were edited and modified following to the three participants' suggestions. Then, during the small group testing, the participants suggested two things; easier activities in the practice and assessment modes, as well as an English and Thai vocabulary list. Besides, the participants in this group suggested that the scores for the exercises and quizzes should be shown in percentages. SPMC was not revised substantially during the two-tryout steps since there were only three participants in the first tryout, and six in the second tryout. In contrast, the SPMC was improved substantially after receiving feedback and reflection from forty participants. The feedback consisted of a triangular data

collection that employed three methods; participant observation, pre-test and post-test analysis, and questionnaire responses. The participants in the field study recorded their opinions and suggested improvements for the SPMC. The participants suggested using multiple types of drills and practices and using Thai subtitles in the tutorial section. They also suggested including an English-Thai glossary which also included the terminology of phonetics and linguistics lexicon, a phonetic chart, videos about word stress in English, a new recording of the tutor's voice, and a courseware manual.

After the SPMC prototype was utilized three times in the tryouts, the final prototype was revised and used again in the trial run. Afterwards, the instructional process of SPMC (E1) and learners' outcomes (E2) scores met the criteria of the 80/80 Standard. The class participants scored an E_1/E_2 of **81.25/82.50** in Unit 1, **81.13/81.75** in Unit 2, and **82.20/82.50** in Unit 3.

The results show that the instructional process (E1) of Unit 1 (Syllable Count) and Unit 2 (Word Stress) were closest to the Standard criterion of 80% while Unit 3 was further from the Standard criterion. The SPMC instructional process of Units 1 and 2 could enhance the students' abilities since the E_1/E_2 scores were very close to the Standard criteria (80/80). Meanwhile the SPMC instructional process worked properly and responded to the target students who were Thai undergraduate students at Kamphaeng Phet Rajabhat University. Although the scores of the instructional process (E1) of Unit 1-2 were presented as suitable for the students, the Unit 3 E1 score varied from the 80 Standard criterion possibly because it was easy or easier than the other units. Also, it could be assumed that the students had gained initial knowledge and practice more from the previous units, so they obtained higher scores in the E3 Unit than on the E1 and E2 Units.

Similarly, the students' score in the Unit 2 quiz (E2) was closer to 80 than the other units while they got the highest scores (E2) in Units 1 and 3. These results could imply two possibilities; the quizzes of Unit 1 and 3 were easy and/or the students' learning process in Unit 1 and 3 enhanced their ability to meet learning outcomes. However, Brahmawong (1999) suggested that if the instruction is well designed and has efficiency, the E_1/E_2 equivalence should not vary from 5%, and be much closer to 80 ($\geq +2.5, \leq -2.5$ from 80) for both E1 and E2.

The scores of E_1/E_2 from the trial run showed that the multimedia courseware (SPMC) was effectively designed to improve ability in English pronunciation and word stress as well as being suitable for Thai undergraduate students at the 80/80 Standard criterion. It can be concluded that the revisions and modifications following the learners' needs, feedback and requirements were essential for instructional development.

4.2.3 Discussion about the Students' English Pronunciation and Stress Improvement after Receiving the English Pronunciation and Stress Treatment

The evaluation of students' improvement in English pronunciation and stress before and after the use of SPMC was one of the research purposes for this present study. The pre-test and post-test of English pronunciation and stress were used to examine whether the students had improved after receiving the English pronunciation and stress treatment by using the stress pronunciation multimedia courseware (SPMC). The quantitative method was used to calculate and compare the means of the pre-test and the post-test scores and to determine whether the differences were statistically significant. In the trial run phase of the SPMC, the participants were provided with activities according to the methodology of SPMC testing.

Firstly, the pre-test served to examine the participants' current knowledge and skills in English pronunciation and stress. It also may provide future activities and contents as well as providing the baseline for comparison with the post-test results. The pre/post test of pronunciation and stress contained the same content with 60 items aimed to test students in understanding the basic rules of English syllables and stress, listening perception, and pronunciation skills (See the details of the tests in Appendix D). As previously mentioned in Chapter 3, the test had been used beforehand in a pilot study for content validity and a reliability check as well as assessing the students' prior knowledge. The pre-test results also facilitated the researcher in meeting the students' problems and weaknesses and used the results to improve the courseware. According to the pre-test results, the classroom students scored 61.58% as a whole. They scored 39.23% in understanding the basic rules of English syllables and stress, 75.09% in listening perception, and 55.97% in pronunciation. It could be assumed that the students lacked the basic rules of English pronunciation including how to pronounce words and using appropriate stress. Meanwhile, they performed well in listening to words and primary stresses. However the students had been guided in syllable and stress sounds by the teacher before the test. This might be a factor that intervened in students' prior knowledge and assisted them in choosing the correct answer on the test. For instance, the teacher showed an example in which the students needed to select the best answer.

After administering the pre-test, the participants received treatment for 10 hours or 2-3 hours a week in the university computer sound laboratory for language learning. The treatment consisted of using the Stress Pronunciation Multimedia Courseware (SPMC) software program for enhancing English ability in pronunciation

and word stress. During the treatment, the participants used the courseware, learned and practiced themselves but with the teacher's guidance. Before the class started, a score log was given to the participants to record their scores from the practice tests and quizzes. The SPMC manual was also provided to them for additional guidance.

At the end of the course, the participants were assigned to take the post-test that contained the same content as the pre-test, except for the vocabulary which was changed in the pronunciation test mode. The vocabulary was changed because the students may absorb prior knowledge on how to pronounce those words from the pre-test. The post-test results showed higher scores than the pre-test results in every mode. The overall average score of the post-test was 68.63%; they scored 55% on understanding the basic rules of English syllable and stress, 78.88% on the listening perception mode, and 61.94% on the pronunciation mode. Figure 4.2 compares the results between the pre-test and post-test.

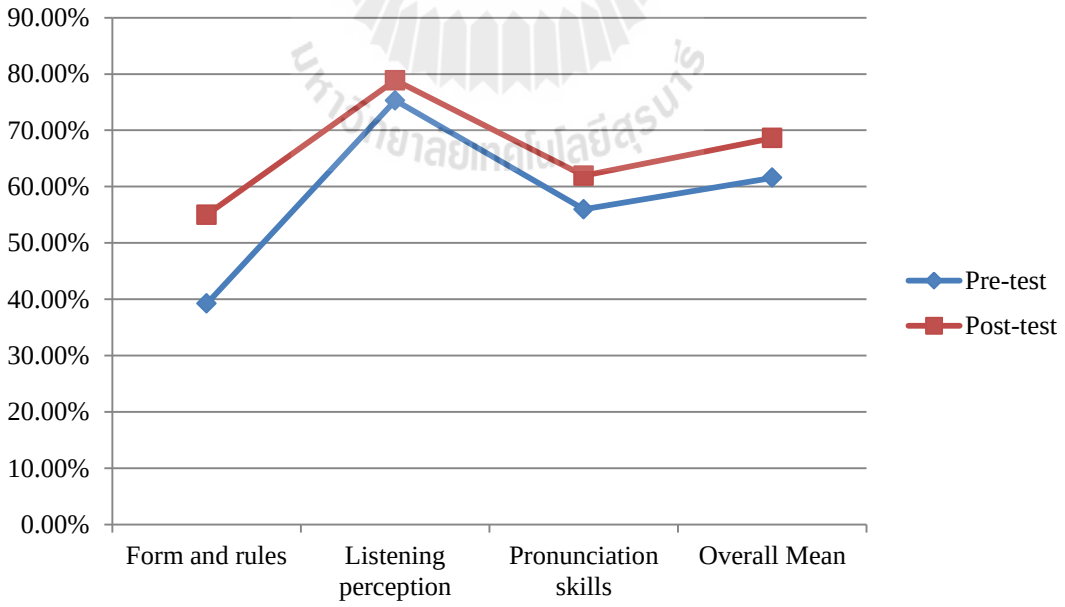

Figure 4.2: The Pre-test and Post-test Score Results

According to the results of pre-test and post-test comparison, the participants' pronunciation and stress in English had improved after they received treatment via SPMC. Listening perception indicated good performance both from the pre-test and the post-test. This result correlated with the questionnaire result. The students gave a rating that the SPMC instruction most enhanced their English listening skill ($\overline{X}$ = 4.48).

The participants indicated improvement three main points; (1) the efficiency of the SPMC lesson helped learners to improve English pronunciation and stress; (2) learning strategies used in the SPMC motivated and captured learners' interest and attention, and (3) providing interactive activities and tasks on the SPMC promoted autonomous learning. These advantages of SPMC were similar to those found in a study of computer-based training for learning English vowel contrast where the sample post-test scores were higher than the pre-test scores after participants used a computer to receive training on English vowel sounds (Wang & Munro, 2004).

As presented earlier, the results of the SPMC efficiency, the score results of E_1/E_2 met the criteria of the 80 / 80 Standard. It was found that the SPMC model might have advantages for the instructional design of English pronunciation and stress via the software program. Factors that promoted students to engage in pronunciation and stress learning was the use of a computer and/or technology, the SPMC lesson plans and content was developed carefully, the learning processes and activities were suitable for the target learners. The lesson development followed the instructional model steps that have been used in many previous studies in instructional system design for English language learning and teaching and had been found to enhance learners abilities to reach the instructional goals and outcomes (Brahmawong, 1999, Saitakham, 2010; Sucharitrak, 2012; Suppasetseree, 2004).

Another reason that may account for students' progress and improvement in English pronunciation and stress was the integration of technology and multimedia in the instruction. The strategic use of hypermedia that included multiple media elements such as text, sounds, images, videos, animated pictures and animated graphics were key elements and the highlight the strengths of SPMC. SPMC has the potential to motivate and capture learner interest and attention. This was also stated in an earlier study of computer-based training for learning English vowel contrast (Wang & Munro, 2004). They mentioned that the availability of multimedia in computer language learning (CALL) had led to growing interest in ways of improving second language learners' pronunciation skills using computer-based techniques. Sucharitrak and Seepho (2011) also stated similar points; learning lessons via computer really arouses learners to be excited and interested in language learning. Based on computer functions, SPMC could be used anywhere on the computer and anytime without an Internet connection. While using SPMC, learners may want to stop and continue later. This is in agreement with Saitakham's (2010) statement; learning via technology instruction was convenient since learners can review the lessons anywhere and anytime.

According to the open-ended questionnaire findings, most participants who used SPMC said they liked this kind of instructional tool (the courseware) because they were allowed to interact with multiple types of media simultaneously. This reason was also stated in the previous study of CALL pedagogy for the instruction of pronunciation with Korean learners of English (Carey, 2002). Lin (2010) also found that E-learning processes for constructive role-play in English speaking practice

became very interesting to learners since it made them more interactive and enjoyable for learning.

The last factor that may promote students' improvement in English pronunciation and stress, according to the score progress in the post-test, was that the learning process of SPMC promoted learners' autonomous learning. One goal of the instruction and/or course development was to assist learners and teachers in improving the outcomes of the educational process (AbuSeileek, 2007). The courseware provided various instructional techniques such as interactive and authentic learning, but learners did not need to use it within the limitation of time, place, resources and other material. As mentioned by Saitakham (2010) and Lin (2012), technology instruction assisted learners to learn anywhere and anytime.

4.2.4 Discussion about the Students' Views and Opinions towards the Use Of SPMC

In the present study, data collection was conducted using two research instruments; a questionnaire and semi-structured interviews. *In the questionnaire checklist*, the participants recorded their views and opinions towards the use of SPMC with an overall mean ($\overline{X}$) of **4.23** that suggests that the subjects agreed somewhat with the design of SPMC. In the questionnaire checklist, there were three principal parts to explore the subjects' views. First, the subjects rated their views towards the SPMC use of multimedia and the associated instructional design such as display screens, text, fonts, tutor voices, interactive activities, and skill improvement. Carey (2002) also identified multimedia as one of the benefits of integrating educational applications with computers in order to assist language learning. The subjects recorded an overall average of 4.16 ($\overline{X}$) with most subjects agreeing that the

instruction promoted listening skills (Mean = 4.48). The tutorial section of the courseware provided text and speech that the users were able to read and listen to. The subjects could use a mouse to click on words to listen their pronunciation. Thus, the subject had a chance to listen to a number of words, phrases and sentences in SPMC. These activities have been used in other English courseware and applications focusing on pronunciation improvement; such as the *Pronounce English AZ*, *HowJsay*, and *FORVO* that both allow users to look up a number of words and sentences and listen to them for practice (Fouz, 2012). The subject also agreed that providing videos enhanced the lessons and allowed them to practice pronunciation and stress (Mean = 4.38). The courseware provided three videos downloaded from the Youtube Website. In the current study, videos provided one more interesting element that motivated learners to pay attention to the lessons. This was an instructional strategy used in other studies (Sucharitrak & Seepho, 2011; Tsubota, Dantsuji, & Kawahara, 2004)

Second, the questionnaire asked about the exercises and activity design. In this section, the subjects presented their views and opinion with 4.30 being the mean score. They mostly agreed that SPMC provided several multiple styles that prompted responses by clicking or dragging with mouse movements (Mean = 4.45). They liked the instant feedback and scores (Mean = 4.38). These findings were stated similarly in the findings of Carey (2002), Saitakham (2010), and Sucharitrak & Seepho (2011).

Third, the subjects were asked to rate their views and opinions on their preference in using SPMC, and the overall average was 4.28 ($\overline{X}$) that represents that the students' agree somewhat on this point.

The subjects also indicated their views towards the use of SPMC to learn English stress and pronunciation rather than using a textbook (Mean = 4.30).

According to the results of the checklist questionnaire, it can be assumed that the SPMC motivated users in learning and they had an optimistic attitude toward the educational technology used to enhance English language learning and teaching including the instructional design, the screen design, and the activities that motivated subjects and responded to their needs and problems, including to meeting the goals and learning outcomes.

After completing the questionnaire, the subjects were individually asked to give in-depth information towards using SPMC in a semi-structured interview. The semi-structured interview took 7-10 minutes with 10-15 questions for each interviewee. The findings were mentioned earlier at the beginning of this Chapter in part 4 (Results). The subjects talked about their educational backgrounds in English pronunciation. Thirty percent of students had taken a course on English pronunciation in their first year. The course was titled Basic phonetics. However, the course did not contain much about stress in English. Thus the contents on SPMC provided new knowledge to the subjects. Many students had no educational background in English pronunciation (70%) yet they stated that the SPMC lessons were not too difficult and could be understood with the multimedia instruction provided by SPMC.

Although the use of technology devices are widely booming and used worldwide today, most students (85%) did not have much experience in using technology devices and resources like Websites, online lessons, and software to gain knowledge or study the specific areas. Sixty-five percent of the students said they use 3G (3^{rd} Generation mobile telecommunication) on their mobile phone to surf on the Internet, and ninety-five percent said they connect to the Internet and log in to their Facebook Website every day. Surprisingly, using technology to learn a specific

subject or field like using SPMC was quite new for them. Learning via computer was not familiar to them and they said they really liked this design of SPMC. They had fun and enjoyed the courseware instruction, videos and activities in each unit. They stated that they were very excited to know their scores after finishing the exercises and the quizzes.

However, this courseware had a big technical problem that intervened in the participants' learning process. It had to do with the sound recording and the speech description in two units that were either not audible or could not be heard clearly. This problem directly affected two exercises. When they could not hear the lesson they made more mistakes in their answers on those exercises. However, the problem with sound was fixed later on.

In summary, the SPMC production model was evaluated by experts and found to be appropriate for English language learning and pronunciation pedagogy. The SPMC model steps were designed to respond to specific learners, Thai undergraduate students at Kamphaeng Phet Rajabhat University. However, the SPMC model was developed according to ISD theory that provided revisable and modifiable steps. The model could be edited and applied to other studies and language instruction. SPMC lessons focused on using courseware and multimedia as an instructional strategy to promote interactive, authentic and autonomous learning. The user could access SPMC on a CD-Rom or after downloading on a computer without any connection to the Internet. This was very convenient and facilitated learners in using it anywhere and anytime. The students indicated optimistic views and attitudes towards using this kind of technology to enhance their English skills, particularly in pronunciation and stress.

Also, the SPMC Model and lessons are very useful and have advantages for Thai EFL learners and English teachers in Thai EFL classes.

4.3 Summary

The results and findings of the development of the SPMC production model and lessons are discussed including the subjects' views towards the SPMC are presented and discussed in this chapter. The steps and details of the SPMC production model for English pronunciation and stress instruction including the SPMC lessons are presented in Chapter 5.

CHAPTER 5

STRESS PRONUNCIATION MULTIMEDIA COURSEWARE (SPMC) PRODUCTION MODEL AND LESSONS

This chapter describes the SPMC designed model steps and SPMC lessons of English pronunciation and stress for Thai undergraduate students. Each step of the SPMC production model is discussed and explained in detail. The next topic presented is SPMC lessons including its components as displayed on the SPMC screen pages. The screenshots of each SPMC phase are also displayed.

5.1 The Design of Stress Pronunciation Multimedia Courseware Production (SPMC) Model

The multimedia courseware production model was constructed based on instructional design (ID) theories and principles. The steps for the production model were presented to describe constructional plans of the multimedia courseware for enhancing English stress and pronunciation ability for Thai undergraduate students at Kamphaeng Phet Rajabhat University. Before the model construction, the researcher undertook the following steps:

1. The researcher reviewed and studied the instructional design process which covers the instructional system design phase (Smith & Ragan, 1993) as well

as useful models such as the Dick and Carey Model, the ADDIE Model, the SREO Model, and the Instructional Model for AIOU.

2. The researcher reviewed literature and previous studies related to language learning and teaching, pronunciation teaching, English phonology and phonetics, and previous research relevant to pronunciation problems of Thai EFL learners.
3. The researcher designed and constructed a multimedia courseware production model for enhancing the English stress and pronunciation ability of Thai undergraduate students at Kamphaeng Phet Rajabhat University.
4. The designed model was examined by three experts in the fields of instructional design, educational technology and English learning and teaching.
5. The model was revised and edited in response to feedback from the supervisor and the experts.
6. The model was used to produce the stress pronunciation multimedia courseware (SPMC) which was divided into six steps (See the SPMC model on the next page).

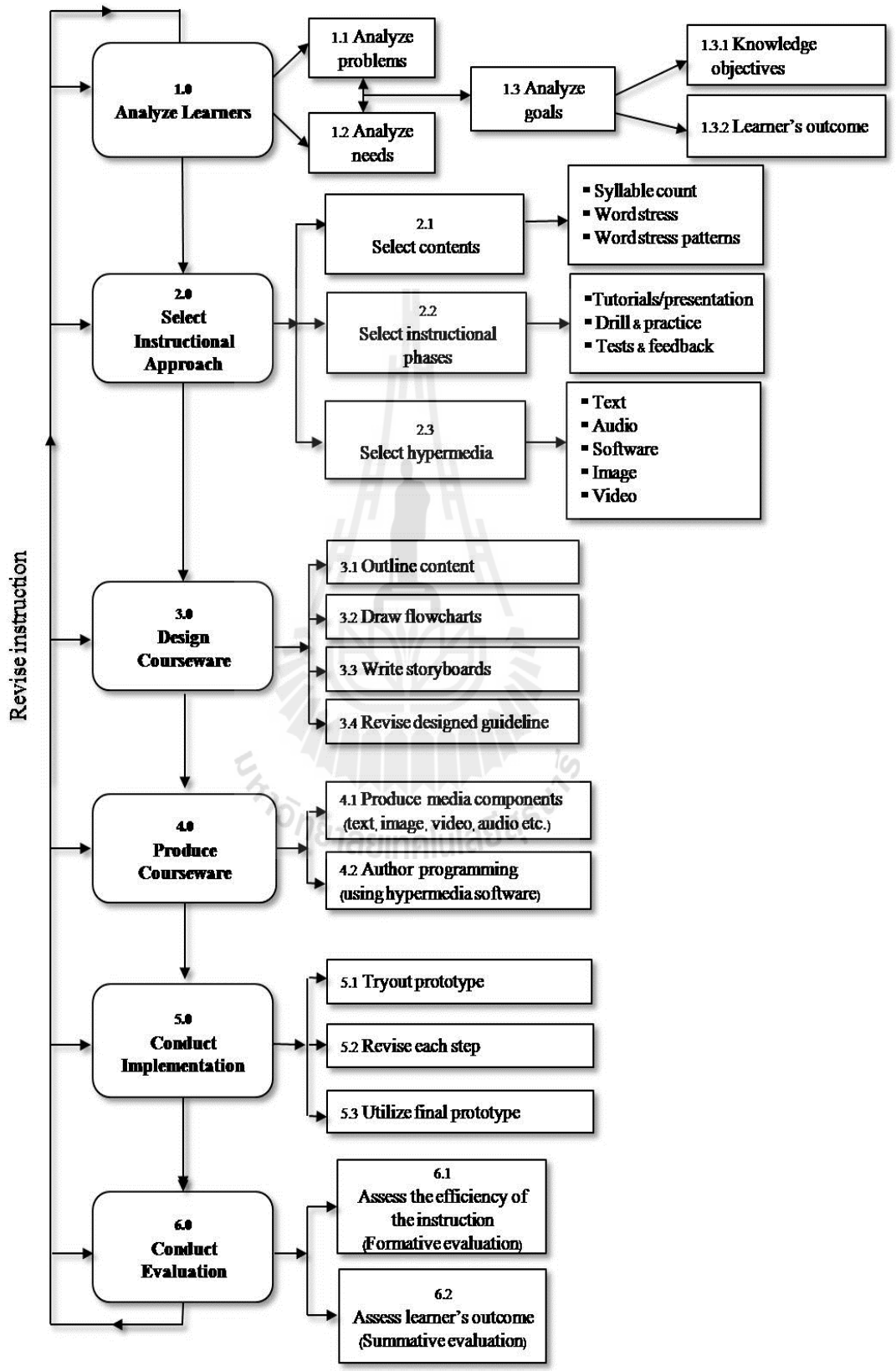
1.0 Analyze Learners
1.1 Analyze problems
1.2 Analyze needs
1.3 Analyze goals
1.3.1 Knowledge objectives
1.3.2 Learner's outcome
2.0 Select Instructional Approach
2.1 Select contents
▪ Syllable count
▪ Word stress
▪ Word stress patterns
2.2 Select instructional phases
▪ Tutorials/presentation
▪ Drill & practice
▪ Tests & feedback
2.3 Select hypermedia
▪ Text
▪ Audio
▪ Software
▪ Image
▪ Video
3.0 Design Courseware
3.1 Outline content
3.2 Draw flowcharts
3.3 Write storyboards
3.4 Revise designed guideline
4.0 Produce Courseware
4.1 Produce media components (text, image, video, audio etc.)
4.2 Author programming (using hypermedia software)
5.0 Conduct Implementation
5.1 Tryout prototype
5.2 Revise each step
5.3 Utilize final prototype
6.0 Conduct Evaluation
6.1 Assess the efficiency of the instruction (Formative evaluation)
6.2 Assess learner's outcome (Summative evaluation)
Revise instruction

Figure 5.1: SPMC Production Model

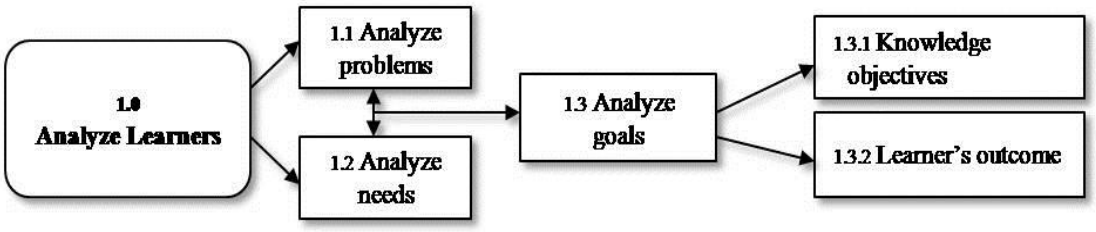

Figure 5.2: SPMC Model Step 1

Step 1: Analyze Learners

SPMC model step1 is the beginning of the courseware production. The researcher analyzed learners with a preliminary study. The study was conducted with thirty samples that were freshmen undergraduate students at Kamphaeng Phet Rajabhat University in the semester and academic year of 1/2010. In this step, the research analyzed the following issues;

1.1 Analyze students' problems in English pronunciation. The assessment of students' ability was conducted by using pronunciation tests focusing on listening to words and the pronunciation of several types of vocabulary such as general vocabulary used in everyday life, vocabularies familiar and unknown to students, and English borrowed words generally used in Thai context.

1.2 Analyze students' needs of English pronunciation improvement. This step used a pronunciation test and feedback and a questionnaire to explore their needs and requirements for pronunciation treatment and training including their preferences towards English language pedagogy and method.

1.3 Analyze Goals according to the problems and need analyses. The learning goal was divided into the following two points.

1.3.1 Knowledge objectives

1.3.2 Learner's outcome

According to the preliminary study, the investigation of pronunciation errors and factors affecting English pronunciation of Thai undergraduate students was the purpose of the study. Students' problems in English segmental features (consonant and vowel sounds) and suprasegments (stress, pitch and intonation etc.) were investigated. The study found that most errors in the students' pronunciation was in the suprasegmental features of making stress (50% - 73% frequently errors), vowel sounds; many with diphthongs (37.5% frequently errors), and some with difficult consonant sounds (23% frequently errors) (Winaitham & Suppasetseree, 2012).

Results of the data analysis from the questionnaire and interviews found that Thai undergraduate students lacked the English pronunciation and stress knowledge and skills. The school had not provided a class on English pronunciation. Also, the students usually learned English without an instructional approach to pronunciation skills. Another claim was that many Thai lecturers who took a role in English classes neglected using English in class communication. Thai undergraduate students indicated that they sometimes access the Internet to visit useful Websites for education and learning English. Most of them reported that they liked to stay on the computer connected the Internet to search everything they would like to know.

From the preliminary study and results, it could be assumed that Thai undergraduate students encountered problems in English pronunciation, particularly

making stress. Factors that effected their problems included the fact that they were not provided any course on English pronunciation and/or other special trainings. Therefore, it was essential to provide the necessary English pronunciation training course for Thai undergraduates to have the opportunity to improve in English pronunciation and stress (Winaitham & Suppasetseree, 2012).

Learning goals can be seen more clearly and were grouped into two objectives (knowledge and behavioral objectives) and learner's outcome. After the step of 'Analyze learners', the instructional goal was identified, and the instructional approach was English pronunciation and stress pedagogy based-function on a multimedia courseware. The pedagogy aimed to enhance learners' abilities in English pronunciation and stress.

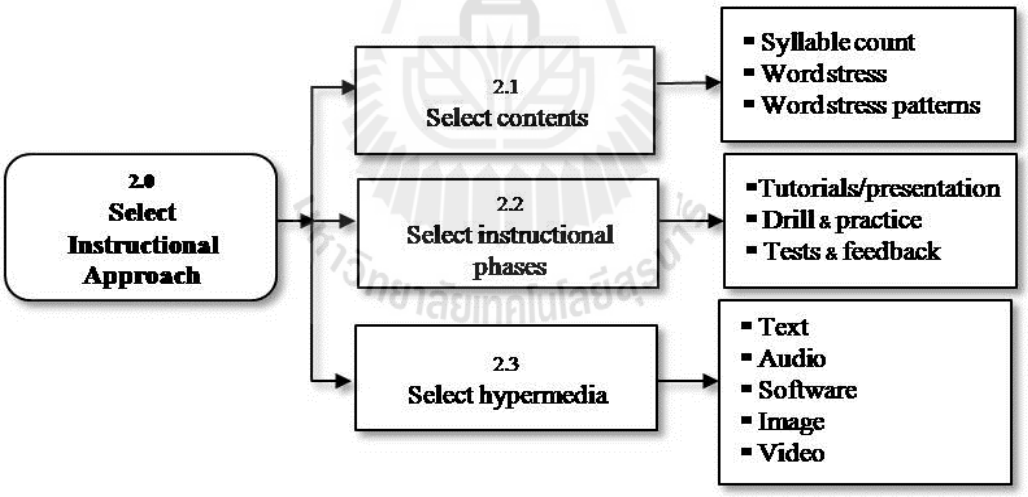

Figure 5.3: SPMC Model Step 2

Step 2: Select Instructional Approach

In this step, the selection of an instructional approach contained three sub-steps. In step 2.1, the selection of lesson contents related to the learning goal. The

pedagogy of English pronunciation and stress was carried out and suggested by peers in linguistics and a native English lecturer in an EFL class. Then, the lesson contents were compiled and divided by unit. The topic contents are as follows.

2.1 Content: The contents consisted of three topics;

2.1.1 Syllable count in English

2.1.2 Introducing word stress in English

2.1.3 Word stress patterns

This multimedia courseware production was the first time development of English pronunciation and stress pedagogy based on using computers to assist language learning and teaching in Kamphaeng Phet Rajabhat University. Basic pronunciation and word stress were the focus rather than providing too much content, such as sentence stress, word intonation and sentence question. However, the courseware may have grown to cover these topics with more lessons later on.

2.2 Instructional phases: Step 2.2 involved the selection of instructional strategies that would respond to learners' needs and preference. Preferable and suitable instructional strategies would assist learners in reaching learning goals and outcomes. The strategy used in SPMC instruction consisted of three element phases of multimedia and computer assisted instruction; 1) tutorial, 2) drill (or practice), and 3) assessment.

2.2.1 Tutorials, or content presentation. The tutorial mode is one-way communication that presents content. The tutorial consisted of text and speech, images, graphic, audio, and video.

2.2.2 Drill, or practice. After learners received an instruction in a tutorial mode, they would be asked to go to a series of practice tests and exercises.

During drills and practice tests, learners could get feedback to reinforce correct responses and check their errors or mistakes. Feedback was provided through media like audio recordings, audio scripts, or text. In this method, animated design helped motivate learners' learning.

2.2.3 Assessment, or quiz. Assessment at the end of each unit was provided as a quiz. This mode aimed to evaluate the learners' outcome and check if they increased in knowledge and skills from the lessons. Most quizzes were designed by integrated active media to motivate learners' interaction. The multimedia consisted of hypermedia such as text, sound models, audio recordings, and software programs.

2.3 Hypermedia: The selection of hypermedia was the final selection of this model step. According to multimedia courseware elements and learner preferences, the media on this courseware consisted of graphics like text, audio recordings, images, videos, and animated drawings. The media was interesting for the students to use and it could activate and facilitate learning by using various methodologies (Alessi & Trollip, 2001; Ivers & Barron, 2006).

The Adobe Flash Professional CS software program was used in the development of the multimedia courseware. The courseware could be used offline, without an Internet connection. It was design to be used as an instructional software program accessed by using a computer. The user was able to use it with a CD-Rom or already installed on the computer beforehand.

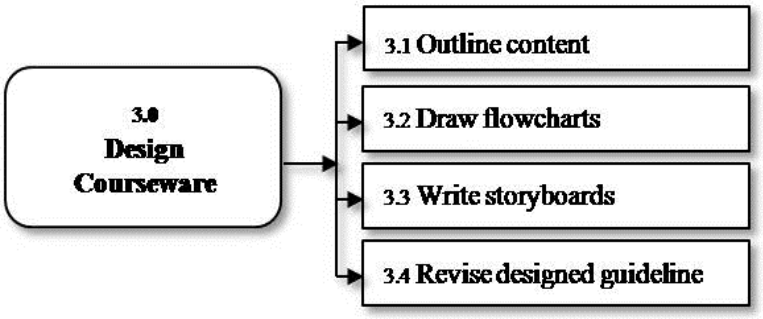

Figure 5.4: SPMC Model Step 3

Step 3: Design Courseware

This step was very time consuming because of the time limit, the lack of skill in computer and software fields by a new courseware designer, and the need for a courseware production team. Lee and Owens (Lee & Owens, 2000) suggested that the course designer should have and involve other experts in a team in order to prepare specification documents, to write story boards, to record and edit video, to record audio, to edit and log, to create graphics, to develop courseware pages, to test and review etc.

Since this present study was for a Ph.D. degree, the courseware production was mostly created and produced by the researcher with some guidelines, suggestions and recommendations from other experts. Guidelines for the courseware production included the following steps.

3.1 Outline content: The content was outlined in three units with sub-lessons. The lesson content was presented in the form of text and sounds that facilitated learners by reading while listening to a tutor's voice in a tutorial mode.

3.2 Draw flowchart: The flowchart drawing was created to design and illustrate the courseware's step-by-step sequence and structure.

3.3 Write storyboard: Storyboards were prepared and identified for screen and display design, details included template names, background designs, colors, and so on.

3.4 Revise design guidelines: The courseware production included graphic design and was revised and edited for the most appropriate use and promptness.

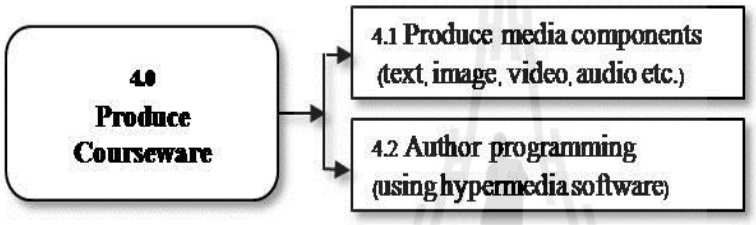

Figure 5.5: SPMC Model Step 4

Step 4: Produce Courseware

After the preparing the flowchart and storyboards, the media components such as text, pictures, videos and audio used in the courseware were produced and authored using a software program. Like the previous step, this step was time consuming. Help was needed from technical experts in computer and software design, drawing animation, and recording video and audio. The courseware production follows;

4.1 Produce media components: Text and speech was the main presentation on this courseware. On the displayed screen, the contents were presented in three paths; tutor animated cartoons, text and speech. ***Text and font*** objects were made using the Adobe Flash software program and were pasted on the screen page by page. In the tutorial mode, they were presented in English with Thai subtitles; learners were

able to read and/or listen. ***Sound*** components in the courseware consisted of; sound loops and effects to arouse learners' attention and interest. The sound files were recorded from a native speaker voice. It was made and recorded with a high quality sound recorder in a multimedia room. After the sound was edited it was converted into an .MP3 file using Audacity, free digital audio editor software. Then, the audio files were imported and authored using the Flash program. Most ***images*** shown in the lesson were downloaded from Websites on the Internet. They were usually saved as .JPG files and imported into the Flash program. There were some images and pictures that were taken and drawn as new objects using the Adobe Flash Program. The ***videos*** used for the SPMC lesson were downloaded from the YouTube Website. They were imported into the Flash program using the mode of loading external video with a playback component. The video files were imported and converted to Flash Video (.v) and then made into a Flash movie (.swf). ***Animation*** in SPMC was drawn as an object. Then it was converted to a symbol and created again as a symbol graphic so that it could have movement and be made into an animated video. In SPMC, there were two animated cartoons representing the tutor's voice.

4.2 Author programming: The multimedia courseware production was created using the Adobe Flash Professional software. The software was utilized to author the multimedia content, including the creation of new images and animated cartoons. The Adobe Flash software can aid graphic design with its interactive functions and it allows the presentation to be consistent across desktops and other devices including notebooks, tablets, smart phones and television. In this step, the Adobe Flash software was used to combine multiple symbols and animation into a single sheet for workflow processing (Adobe Systems Incorporated, 2013). Most instructional designers prefer using Adobe

Flash software because it is suited for an instructional design that can prepare the learner and instructor to plan, design, and develop lesson projects (NCS Pearson, 2013).

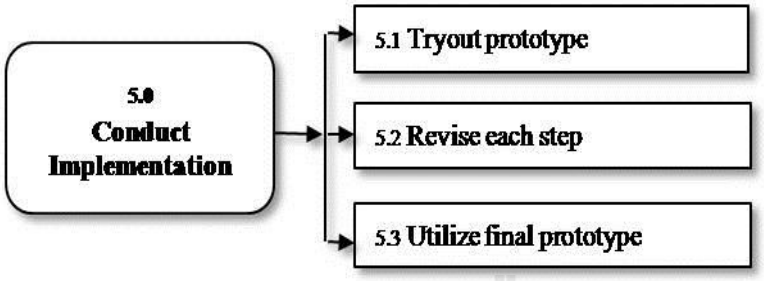

Figure 5.6: SPMC Model Step 5

Step 5: Conduct Implementation

In this step, the courseware prototype was utilized for a tryout study in three steps;1) an individual testing (with three pilot samples), 2) a small group testing (with six pilot samples), and 3) a field study testing (with forty pilot samples). The samples in each group were assigned to use the courseware for two weeks. After the treatment ended, the courseware was modified and edited following problems that occurred during the tryout prototype, and also from feedback and reflection from the pilot samples. It was reviewed and modified until it met the target needs and requirements. Then, the final prototype was assigned in a trial run study in which forty undergraduate students at KPRU were asked to participate as volunteers and received an English pronunciation and stress treatment using SPMC for ten hours. Results of the score feedback, questionnaire and interview were used to revise the steps again.

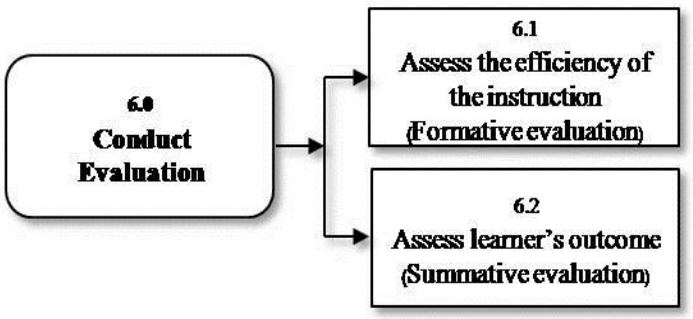

Figure 5.7: SPMC Model Step 6

Step 6: Conduct Evaluation

Evaluations were conducted at the end of each SPMC tryout. The assessment administered in this step was a formative evaluation for instructional efficiency and summative evaluation for learners' outcome. The Brahmawong E_1/E_2 formula based on criteria of 80/80 Standard was a proper method for SPMC efficiency evaluation. Nevertheless, students' pre-test and post-test scores were compared and were calculated and analyzed by T-test statistic methods to confirm the courseware efficiency and to examine students' improvement.

In addition, when it was found that formative and summative scores did not meet the 80/80 standard criterion, the courseware lessons and other components were revised until the students' scores met the Standard that meant the learning goals and outcomes were being approached. In the evaluation, the E_1/E_2 formula was a key to evaluate the courseware efficiency. E1 refers to an overall average formative score of the whole class that was calculated to check the instructional process and efficiency. E2 presents an overall average summative score of the whole class that was calculated to check learners' outcomes and progressive improvement. Finally, the instructional design steps were revised according to results from the data collection and analysis

including the scores of E_1/E_2. There were two assessments conducted for the courseware evaluation.

6.1 Assess the efficiency of the instruction: In this evaluation the overall average formative score of the exercises from the SPMC lessons were calculated as percentages. There were two exercises in unit 1, three exercises in unit 2, and two exercises in unit 3. During the treatment, score logs and the courseware manuals were assigned to each participant to record their scores at the end of the exercises.

6.2 Assess learners' outcome: In the evaluation, overall average summative score of the quizzes were calculated as a percentage. There was a quiz provided with each unit. During the treatments, the score logs used to record scores were the same for the formative scores and the quiz scores.

Finally, the two evaluations from steps 6.1 and 6.2 were compared to see whether they both approached the 80 /80 Standard criterion. The courseware production model steps would be revised until the scores meet the Standard.

Although SPMC production model was designed based on ISD principles and reflected the study of other models, the SPMC model had specific steps for multimedia and courseware production to enhance English pronunciation pedagogy that focused on stress. In addition, the SPMC model was developed to provide effective instruction appropriate for the target learners. Therefore, the SPMC model had advantages that other models did not provide, for instance, the SPMC model provided sub-steps and detailed step-by-step actions, promoted multimedia production and other technology elements, focused on pronunciation pedagogy, could be used by a novice instructional designer, and was a revisable model. The following section presents the SPMC lesson components and the instructional strategies including the captured screen shots.

5.2 Stress Pronunciation Multimedia Courseware (SPMC)

This section presents an overview of information from the SPMC lessons. The treatment package of SPMC is an instructional offline program produced using the Adobe Flash Professional CS5 software package. The users are able to use it via a CD-Rom or pre-installed on a computer and then they can use it instantly many times without an Internet connection.

SPMC contained three instructional phases; tutorial presentation, drill or practice tests (exercises), and assessment (quizzes). The courseware provided three learning units with sub-lessons including a practice test mode, or exercises and quizzes. In the tutorial mode, learners followed the lesson contents by reading text along with listening to speech descriptions. While receiving content in the tutorial mode, learners were provided with exercises to do in the practice test mode, and then at the end of the unit they took a quiz. Learners could see their level and knowledge improvement by instant score feedback from the exercises and quizzes. Indeed, exercises and quizzes were designed to facilitate learners taking them and repeating them without time constraint, but the participants were requested to do exercises and quizzes only once or twice in the prototype implementation.

Besides the three main phases, SPMC consisted of other elements such as orientation, a vocabulary glossary, videos relevant to English pronunciation and stress. A hard copy manual, score log and the courseware CD-Rom were contributed to the subjects in the experimental class (See SPMC manual, with Thai language and the score log in Appendix M). The SPMC components including the captured screen shots are described and shown in the following section.

5.2.1 SPMC Components (Menu)

The SPMC components were designed and shown on the Home page or main menu displayed on the first page. The page of Home/Main menu could be reached by a shortcut seen as the ‘Home’ symbol. SPMC consisted of three units and sub-lessons and shortcuts to the Practices, Videos, Orientation, Glossary, References, Credits and to Exit the program. Figure 5.8 shows the main menu page and SPMC element shortcuts.

(a) (b) (c) (d) (e) (f)

Figure 5.8: Screenshot of the SPMC Components (Main menu)

The letter (a) – (f) are shortcuts of the following paths.

(a) Home/ Main menu

(b) Orientation

(c) Glossary

(d) *References*

(e) *Credits*

(f) *Exit program*

5.2.1.1 SPMC Orientation

On the main menu page, the orientation mode was provided and shown as a *'Question Mark'* shortcut. Before getting started on the lessons, learners were encouraged to look at the orientation first. The orientation briefly preview sand introduces the courseware objectives, learning units, exercises and quizzes, and describes how to activate the courseware and other elements. The orientation script was provided in both English and Thai texts, both containing in 8 pages. Figure 5.9 and Figure 5.10 show the screenshot capture of the orientation mode with the English and Thai descriptions.

Figure 5.9: Screenshot of the Orientation Page (English Version)

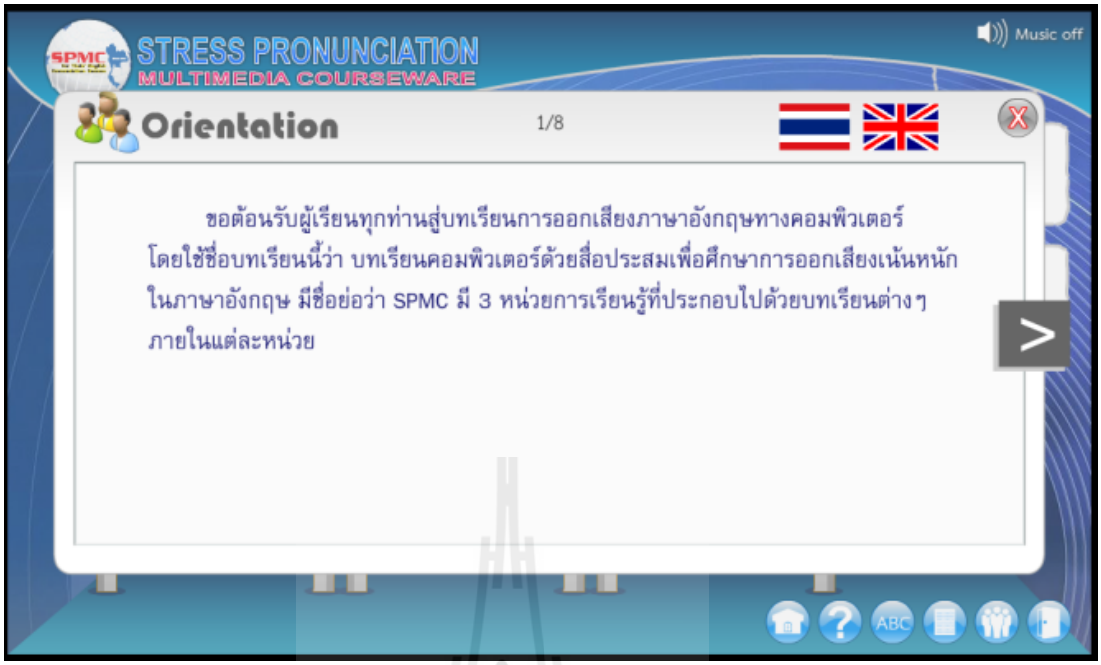

Figure 5.10: Screenshot of the Orientation Page (Thai Version)

5.2.1.2 Glossary

At the Home/main menu page, the glossary was shown as *'ABC'* shortcut. The glossary provided vocabularies used in the courseware, particularly the terminology of phonetics and linguistics. There were 141 vocabulary items provided in English with the associated Thai definition and organized in the English alphabet sequence. Figure 5.10 shows the glossary screenshot capture.

Figure 5.11: Glossary

5.2.1.3 References

The mode of references refers to resources that SPMC lessons, exercises, quizzes, glossary and others employed and adapted them to develop this courseware. Figure 5.12 shows the reference screenshot capture.

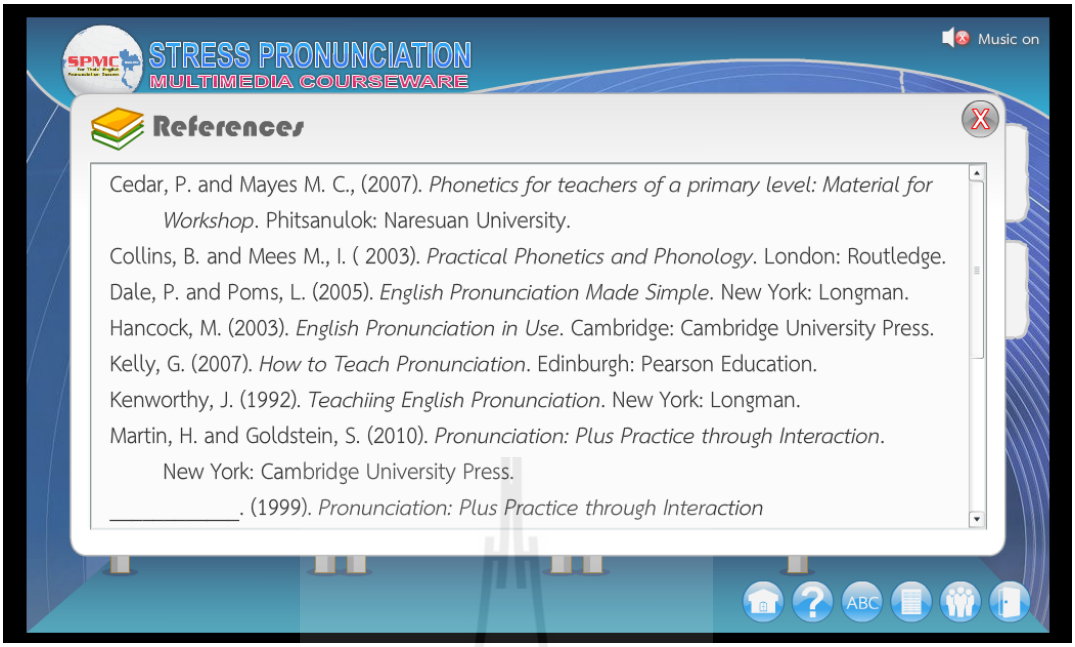

Figure 5.12: Screenshot of the Reference Page

5.2.1.4 Credits

The credit mode is shown as 'human' shortcut on the Home/main menu page and presents peoples names that were involved in SPMC production. Most of them are experts in technology instruction, linguistics, TESOL, specialists in computer graphic design, and native speakers. Figure 5.13 is a screenshot capture of the Credits.

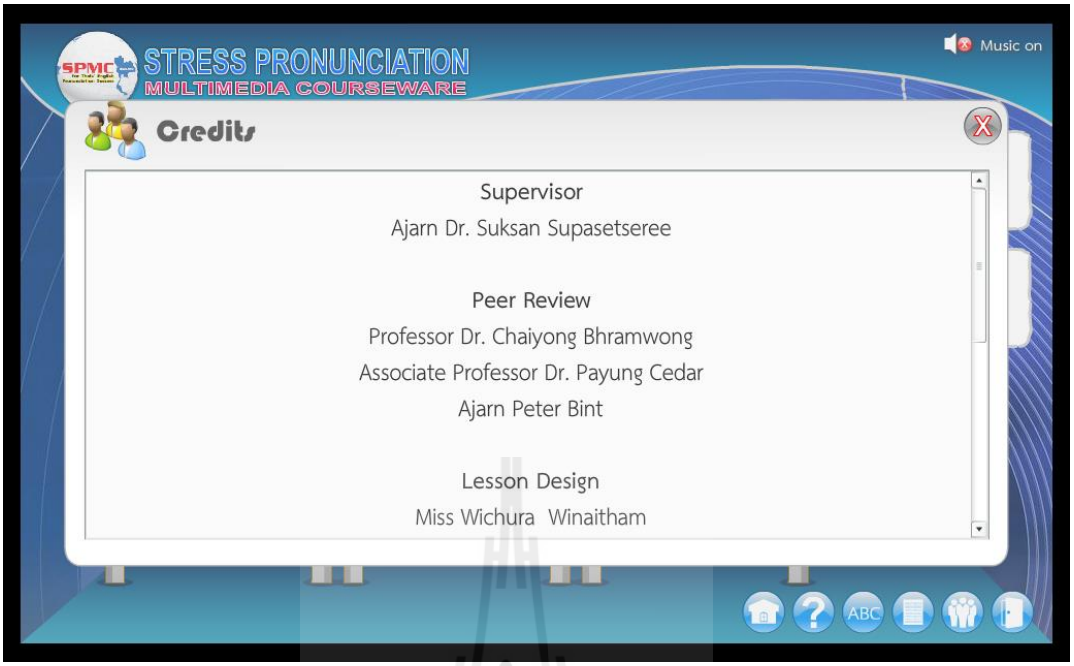

Figure 5.13: Screenshot of the Credit Page

5.2.1.5 Exit Program

The last shortcut shown on the page of Home/Main menu is Exit mode as can be seen as 'Opened-door' shortcut image. This shortcut is provided when the user would like to end and close the courseware program. Figure 5.14 shows the Exit program page screenshot capture.

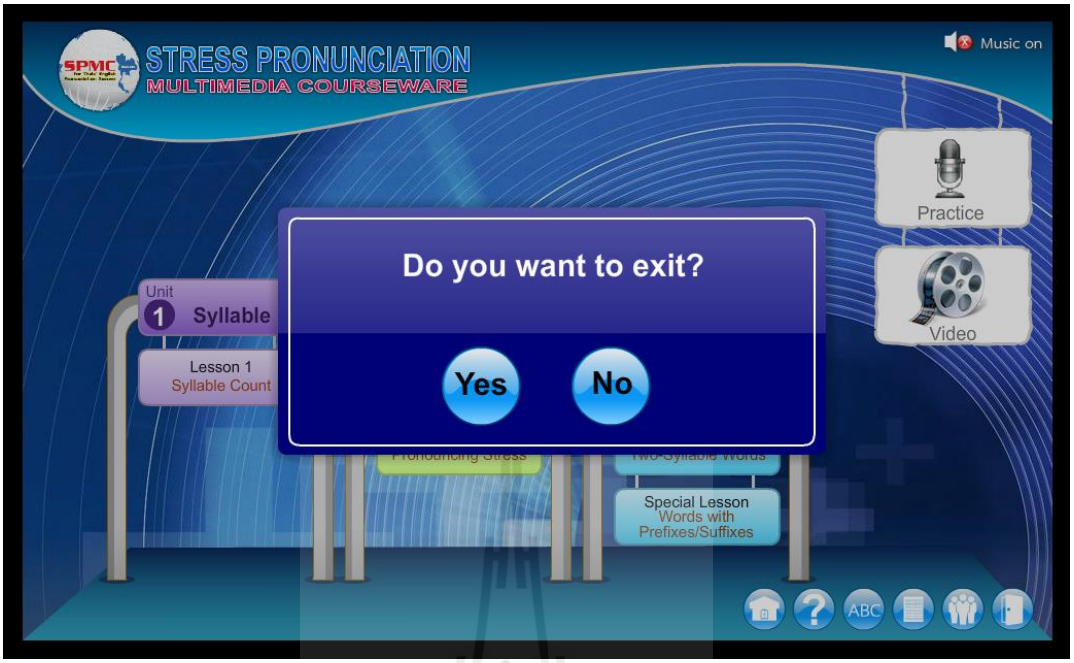

Figure 5.14: Screenshot of the Exit Program Page

5.2.2 SPMC Lessons

SPMC lessons are provided in three learning units with one lesson in Unit1, two lessons in Unit2, and three lessons in Unit3. The following paragraphs present contents and details of each unit including the screenshot capture figures.

Unit 1 provides the contents of English syllable focusing on syllable discrimination and how to count word syllables. Unit 1 contains lesson contents with practice tests (exercises) and assessment (quiz) over 27 pages. The beginning page of unit 1 identifies knowledge objectives which include learning objectives and behavioral objectives (Look at figure 5.15 in details).

Figure 5.15: Screenshot of the Unit 1 Knowledge Objectives

In unit 1, the lesson is contained by the following topics.

Unit 1: Syllable

Lesson 1: Syllable count

- *What is syllable in English?*
- *Syllable patterns*
- *Counting syllable*

Quiz 1: How many syllables do you hear?

Figure 15.16 – 16.18 show the screenshot of the lesson 1.

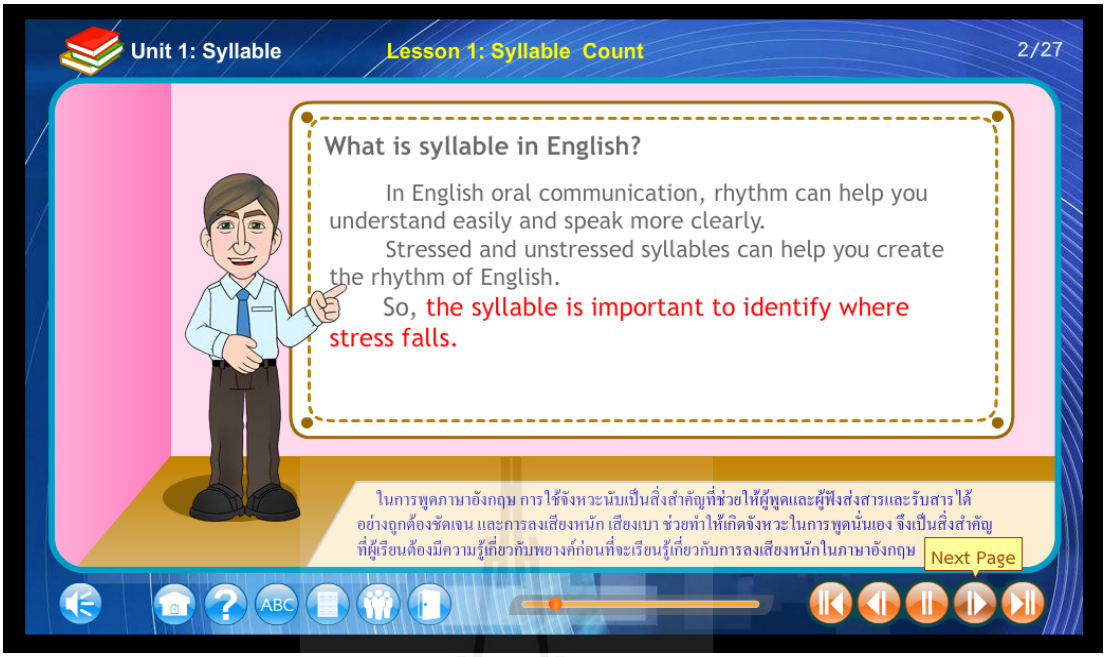

Figure 5.16: Screenshot of the Unit 1: Lesson 1 (1)

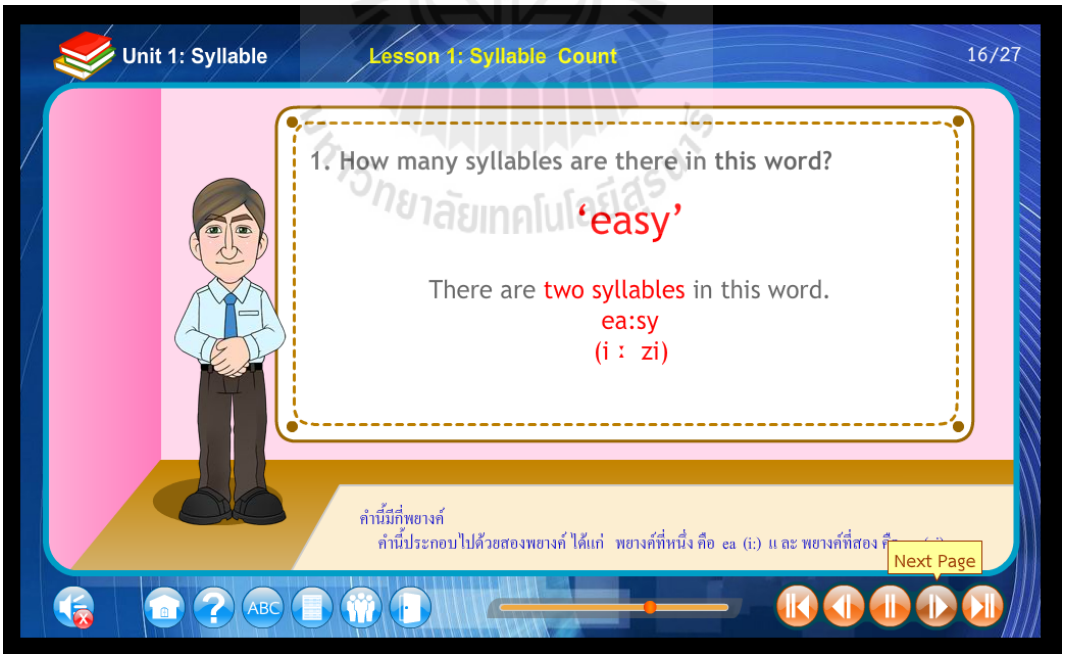

Figure 5.17: Screenshot of the Unit 1: Lesson 1 (2)

Figure 5.18: Screenshot of the Unit 1: Lesson 1 (3)

During the content presentation in tutorial mode, students may be assigned to do exercises in a practice test mode to check their understanding. If they found the score feedback unsatisfying they could repeat the lesson again. Figure 5.19 is an exercise provided in Unit 1, lesson 1.

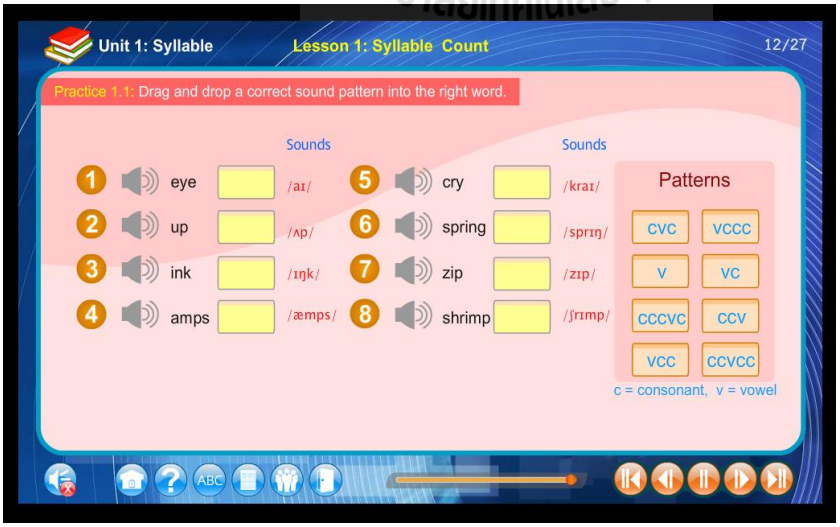

Figure 5.19: Screenshot of the Unit 1: Exercise

At the end of unit, the assessment mode provides a unit quiz to see whether the students gain knowledge and have improvement toward what they have learnt from the unit. Figure 5.20 shows the quiz of Unit 1 (Syllable Count).

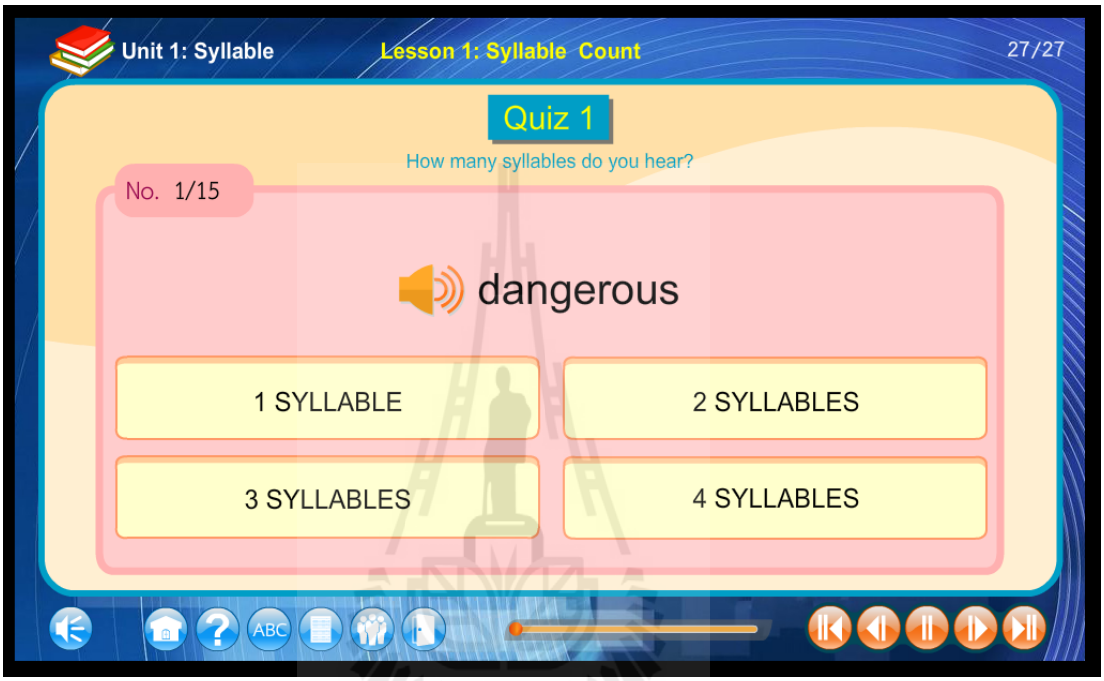

Figure 5.20: Screenshot of the Quiz 1

Unit 2 presents the contents of English word stress focusing on word stress and how to make stress in English. Unit 2 contains two lessons. There are 9 pages in lesson 1 and 7 pages in lesson 2. Each lesson also identifies knowledge objectives included learning and behavioral objectives (Look at Figure 5.21 for details).

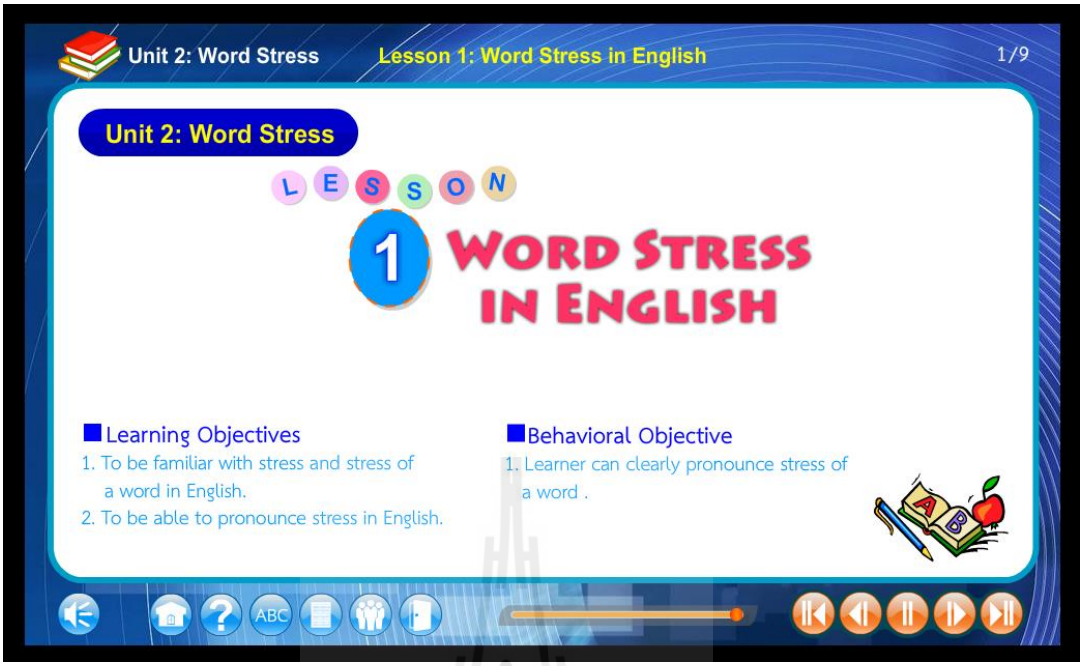

Figure 5.21: Screenshot of the Unit 2 Knowledge Objectives

The Unit 2 provides exercises and ends with a unit quiz. The following topics are presented in Unit 2.

Unit 2: Word Stress

Lesson 1: Word stress in English

- *What is stress in English?*

Lesson 2: Pronouncing stress

- *How to make stress*
- *Main stress and weak stress*

Quiz 2: Choose the correct stress of each word

(Figure 5.22 – 5.23 show the contents of Unit 2.**)**

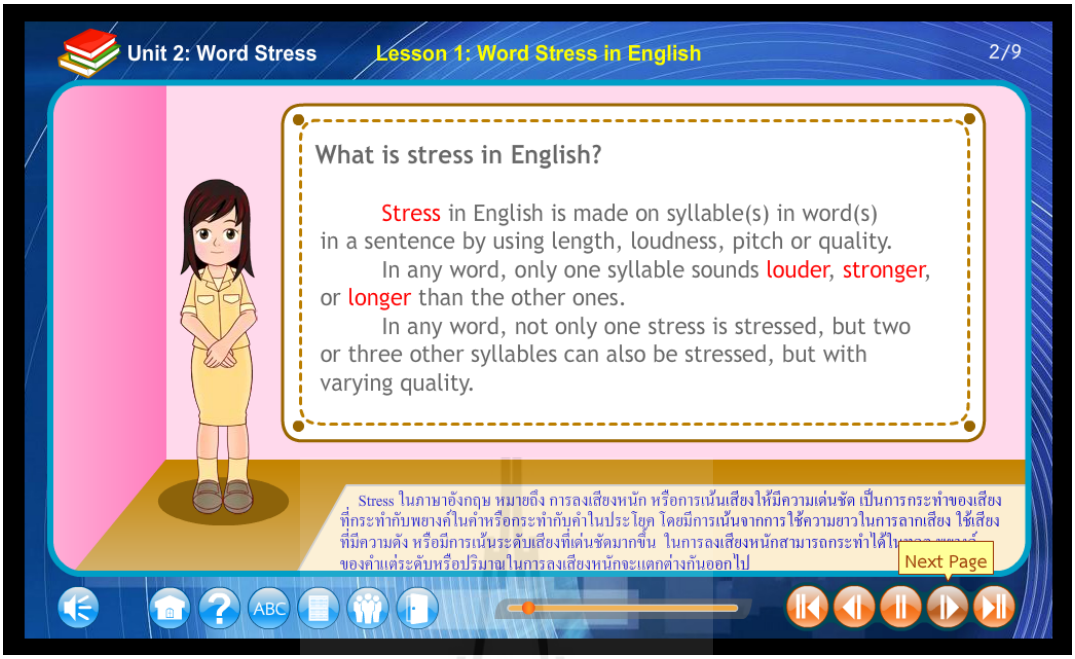

Figure 5.22: Screenshot of the Unit 2: Lesson 1 (1)

In the tutorial section, students may practice by themselves by listening to sound models and then repeating them. Look at Figure 5.23 as an example.

Figure 5.23: Screenshot of the Unit 2: Lesson 1 (2)

Similar to Unit 1, exercises are provided during the content presentation. It aims to check learners' understanding while learning. Figure 5.24 shows an exercise of Unit 2, lesson 1.

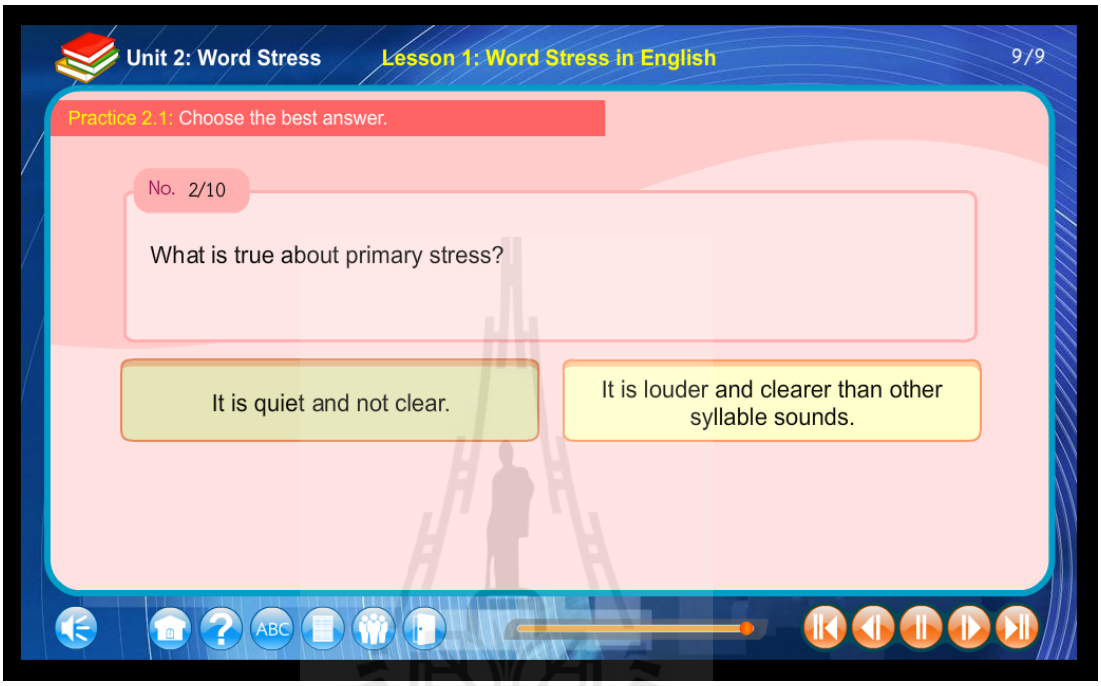

Figure 5.24: Screenshot of the Unit 2: Exercise (1)

After lesson 1 of Unit 2, has been finished by the learners continue to lesson 2. While lesson 1 introduces basic knowledge of word stress in English, lesson 2 provides students with methods for pronouncing and stressing words. Figure 15.25 and 15.26 show the lesson contents of Unit 2, lesson 2.

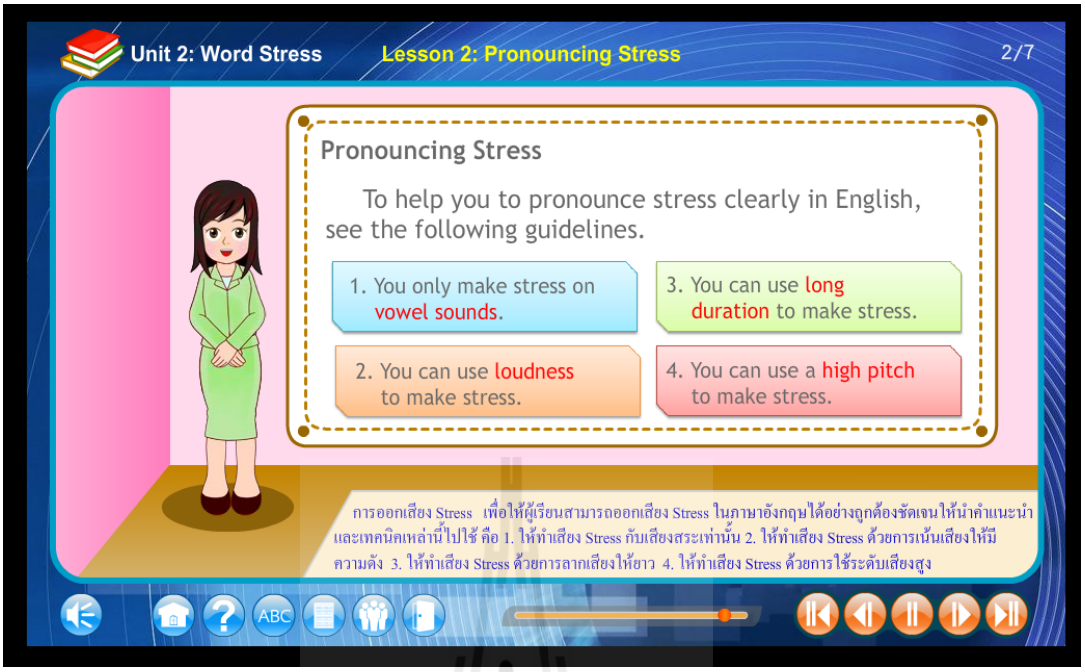

Figure 5.25: Screenshot of the Unit 2: Lesson 2 (1)

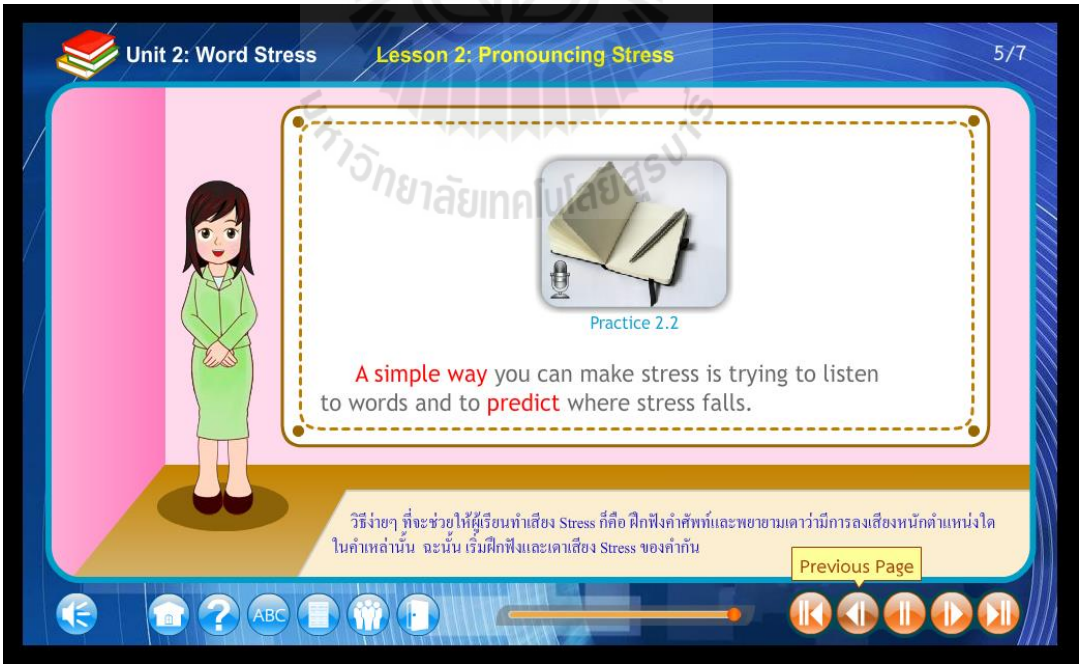

Figure 5.26: Screenshot of the Unit 2: Lesson 2 (2)

Then, students enter the practice test mode to do exercises. Unit 2, lesson 2 provides two exercises to test students in the prediction of primary stress. Figure 5.27 is an exercise of Unit 2, lesson 2. After that, if the students are able to do the exercises with satisfactory scores, they are then assigned to do the unit quiz. Figure 5.28 shows the quiz of Unit 2.

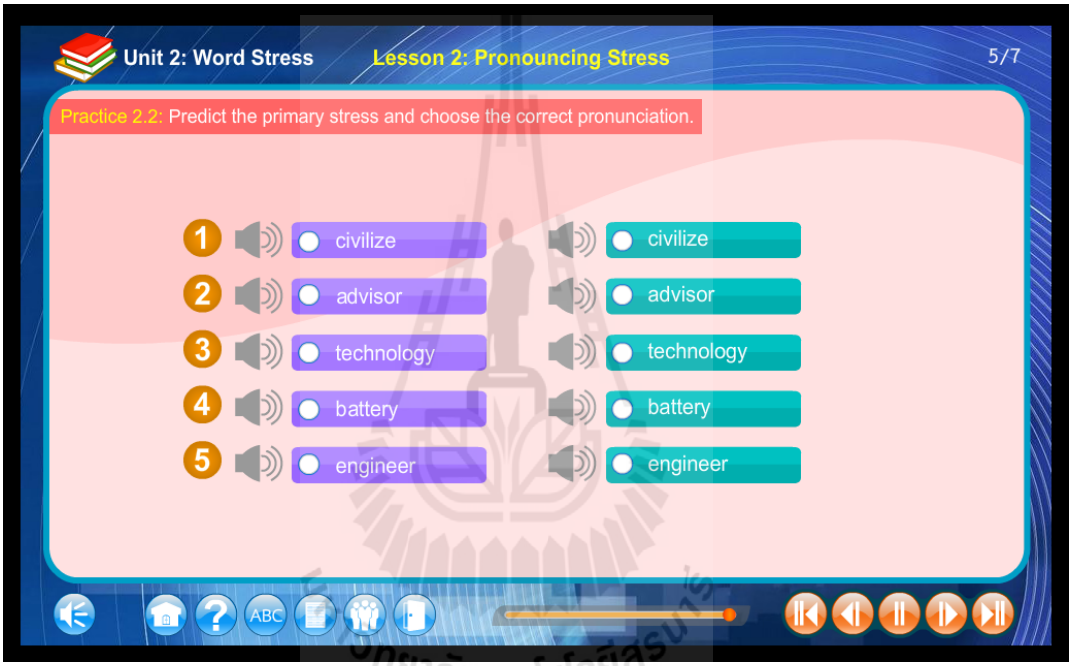

Figure 5.27: Screenshot of the Unit 2: Exercise (2)

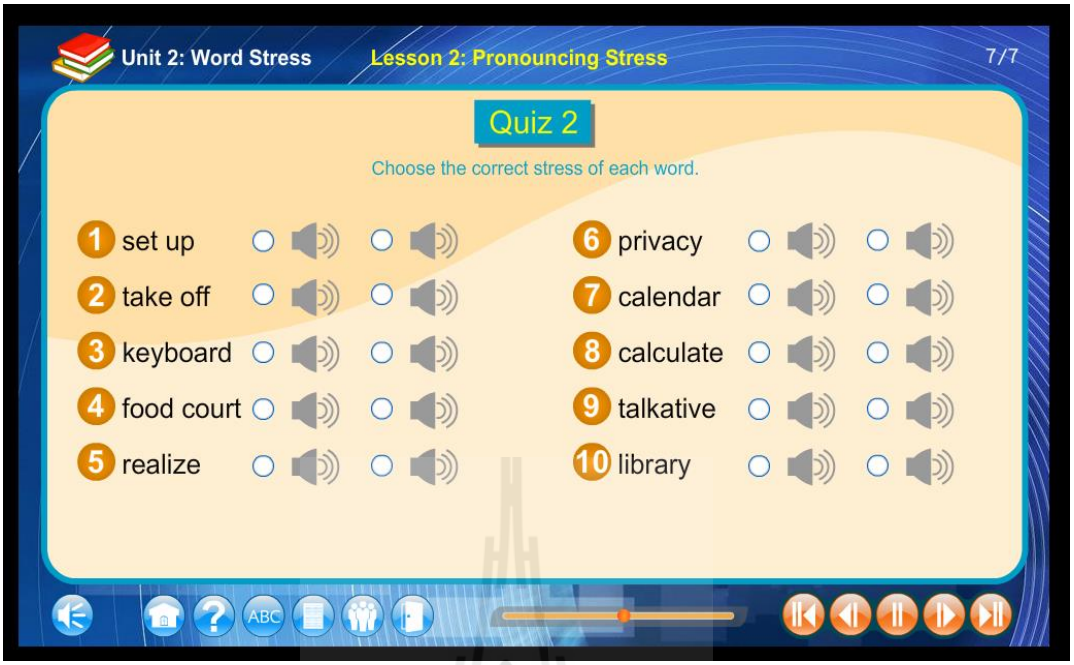

Figure 5.28: Screenshot of the Unit 2: Quiz 2

Unit 3 presented the contents of English word stress patterns focusing on one- and two-syllable words and word stress, and the stress on words with prefixes and suffixes. There were 9 pages in lesson 1, 23 pages in lesson 2, and 12 pages in lesson 3 with the knowledge objectives; learning objectives and behavioral objectives are located at the beginning page of each lesson, and each lesson ends with a unit quiz. Figure 5.29 – 5.31 shows the contents of Unit 3, lessons 1-3, and the following topics contained in Unit 3.

Unit 3: Word Stress Patterns

Lesson 1: One-syllable word

- *Stress of one-syllable words*
- *Vowel sound preview*

Lesson 2: Two-syllable words

- *Stress of two-syllable nouns*
- *Stress of two-syllable adjectives*
- *Stress of two-syllable verbs*

Lesson 3: Words with prefixes and suffixes

- *Stress of words with prefixes*
- *Stress of words with suffixes*

Quiz 3: On which syllable of the red words do you hear the stress?

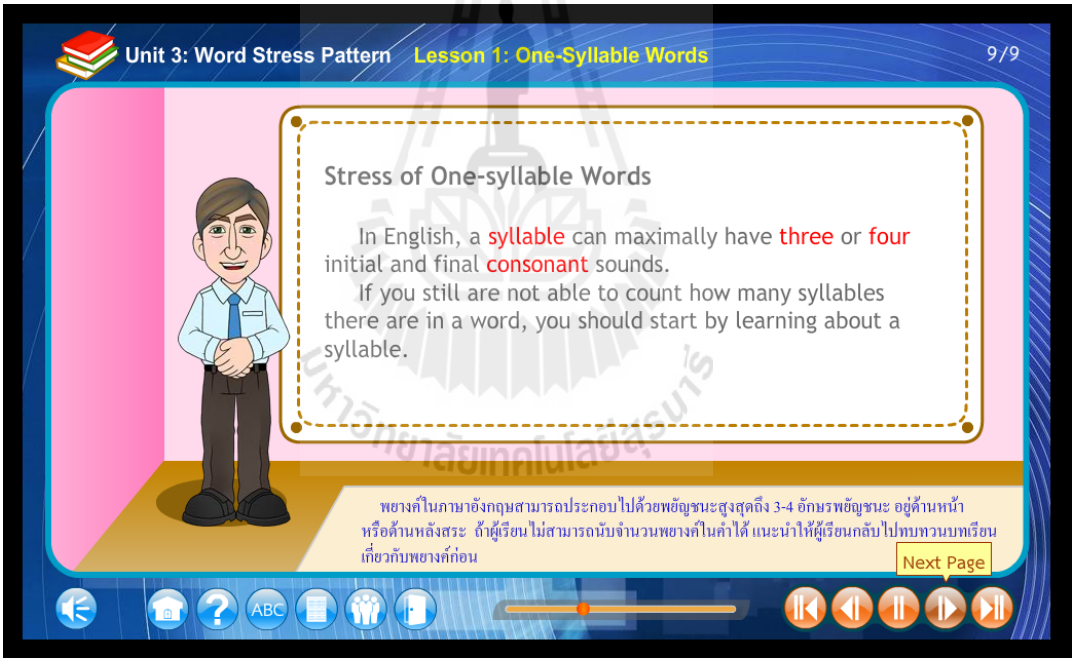

Figure 5.29: Screenshot of the Unit 3: Lesson 1

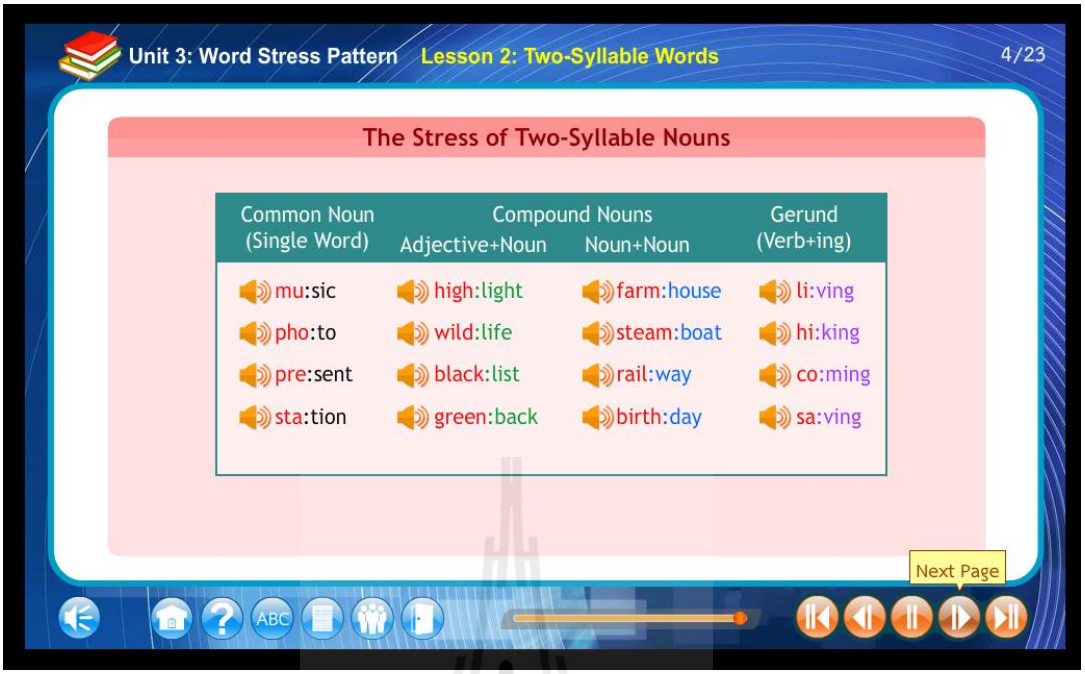

Figure 5.30: Screenshot of the Unit 3: Lesson 2

Figure 5.31: Screenshot of the Unit 3: Lesson 3

Also, exercises were provided in the tutorial pages, but learners could link to them from the practice test mode and from the Home/Main menu page. In Unit 3, there are three exercises. Figure 5.32 – 5.34 present Unit 3 exercises' captured screenshots.

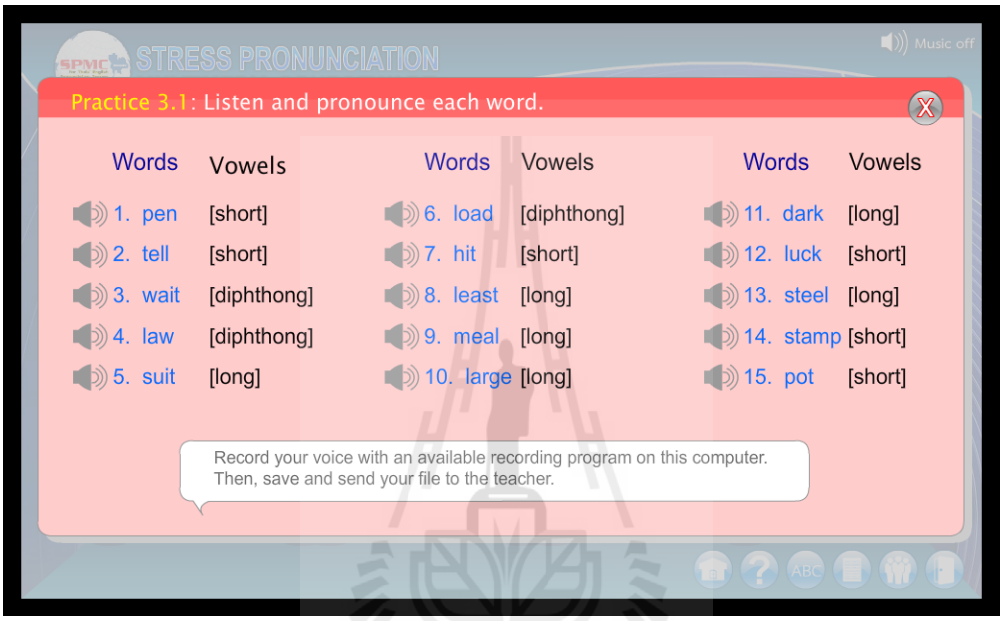

Figure 5.32: Screenshot of the Unit 3: Exercise (1)

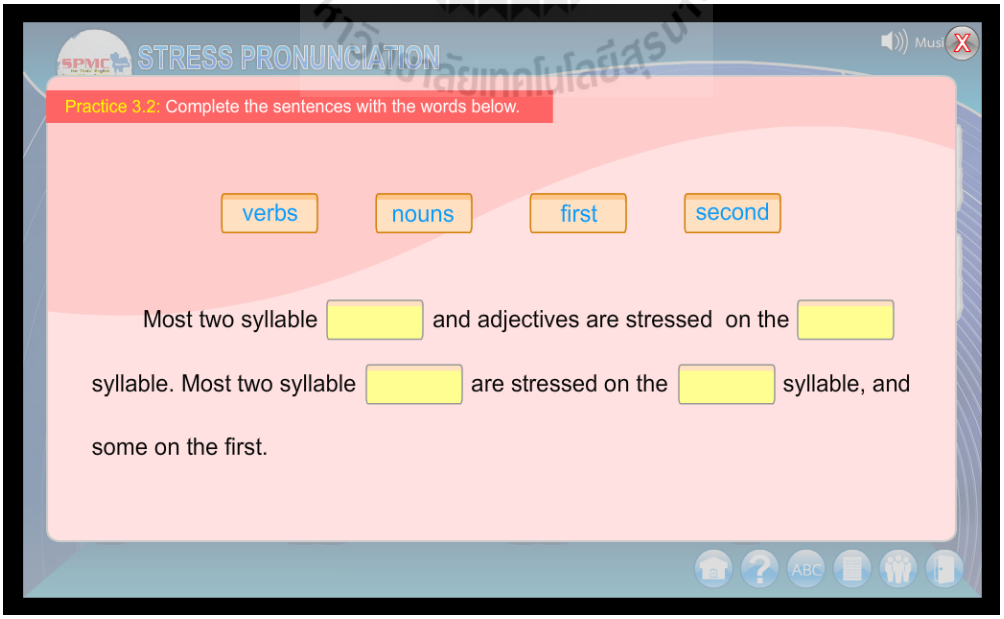

Figure 5.33: Screenshot of the Unit 3: Exercise (2)

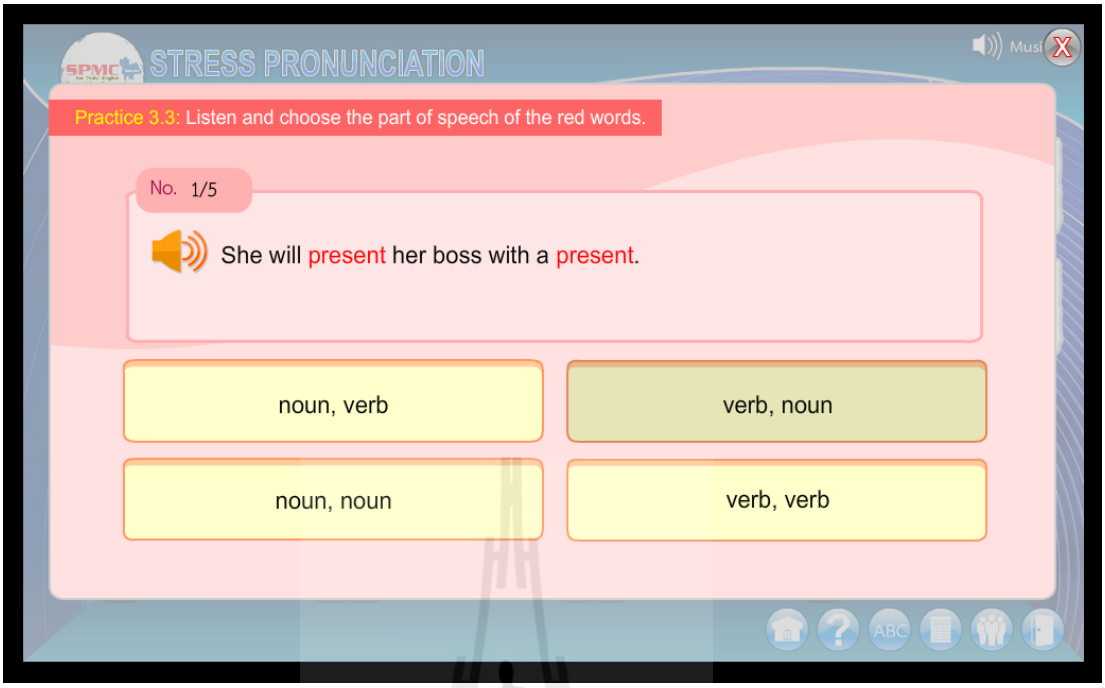

Figure 5.34: Screenshot of the Unit 3: Exercise (3)

At the end of the unit, a unit quiz is provided to test students' knowledge improvement of the whole unit. Figure 5.35 shows unit 3 quiz.

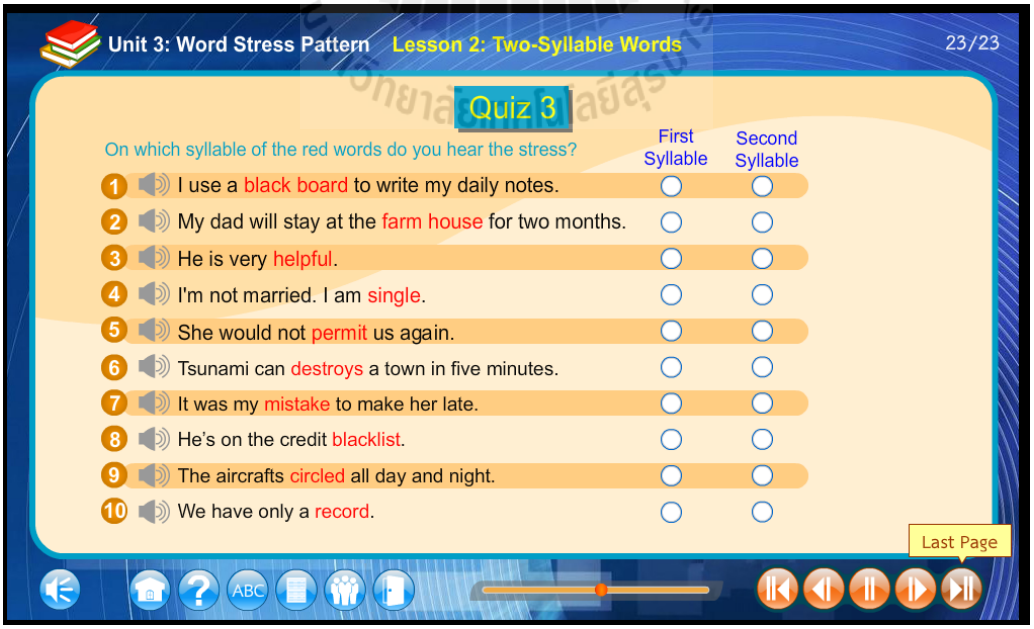

Figure 5.35: Screenshot of the Unit 3: Quiz 3

As mentioned in previous chapter, SPMC was developed to approach to pronunciation pedagogy using multimedia and computer to promote interactive instruction with authentic setting. Therefore, SPMC contains a number of audio and sound models including listening activities. Besides, there were videos enhancing learning process from active media that could motivate learners' attention on SPMC, since the use of technology like a small computer, tablet, smart-phone as well as staying on the Internet are their favorite daily activity. The following paragraphs present the videos provided on SPMC.

5.2.3 Practice and videos

Practice and video modes and shortcuts are available on the Home/Main menu page, meanwhile, they were involved in the tutorial phase of each unit. However, they are provided on the first pages so that learners can find it easily at the same setting. The whole exercises provided in the Practice phase are the following topics (Look at the screenshot capture of Practice phase in Figure 5.36).

Unit 1: Practice

- *Practice 1.1: What are these sound patterns?*
- *Practice 1.2: How many syllables are there in each word?*
- *Practice 1.3: Listen and pronounce vowel sounds*

Unit 2: Practice

- *Practice 2.1: Choose the best answer*
- *Practice 2.2: Predict the primary stress and choose the correct pronunciation (1)*
- *Practice 2.3: Predict the primary stress and choose the correct pronunciation (2)*

Unit 3: Practice

- *Practice 3.1: Listen and pronounce each word*
- *Practice 3.2: Complete the sentence with the words below*
- *Practice 3.3: Listen and choose the part of speech*

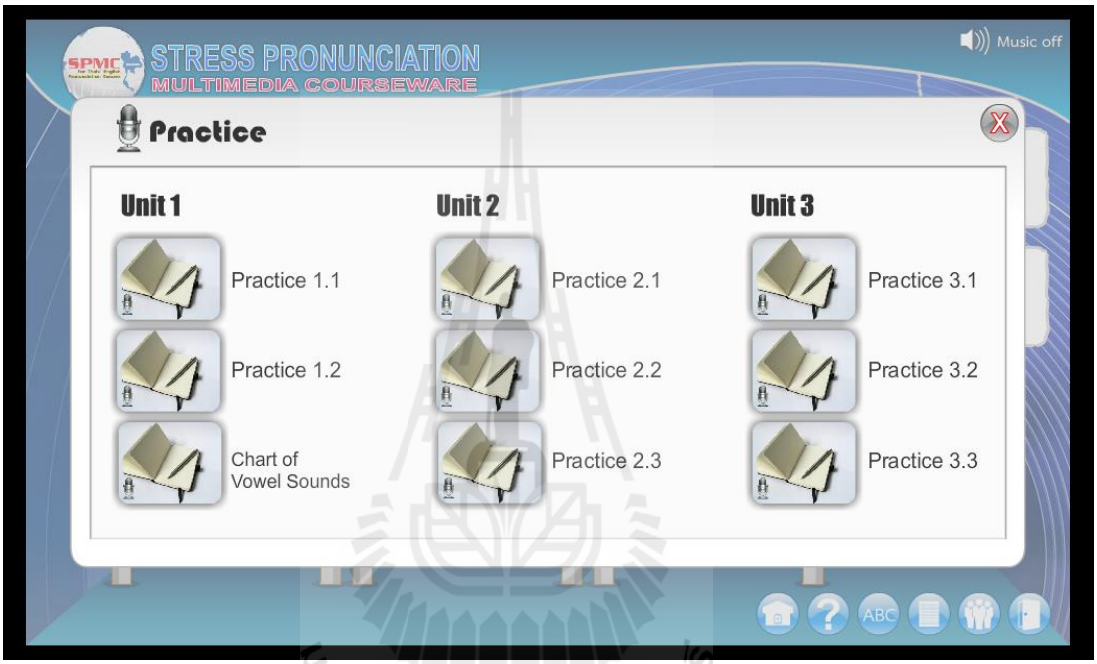

Figure 5.36: Screenshot of the Practice Tests Page

In this courseware, there were three videos downloaded from YouTube Websites, and were allowed to use for education in this courseware. The video mode screenshot capture is shown in Figure 5.37, and the topics are as follows:

Video 1: Sam Niang Khan Thep (Awesome Accent!)

Video 2: What color do you like?

Video 3: Teaching syllables.

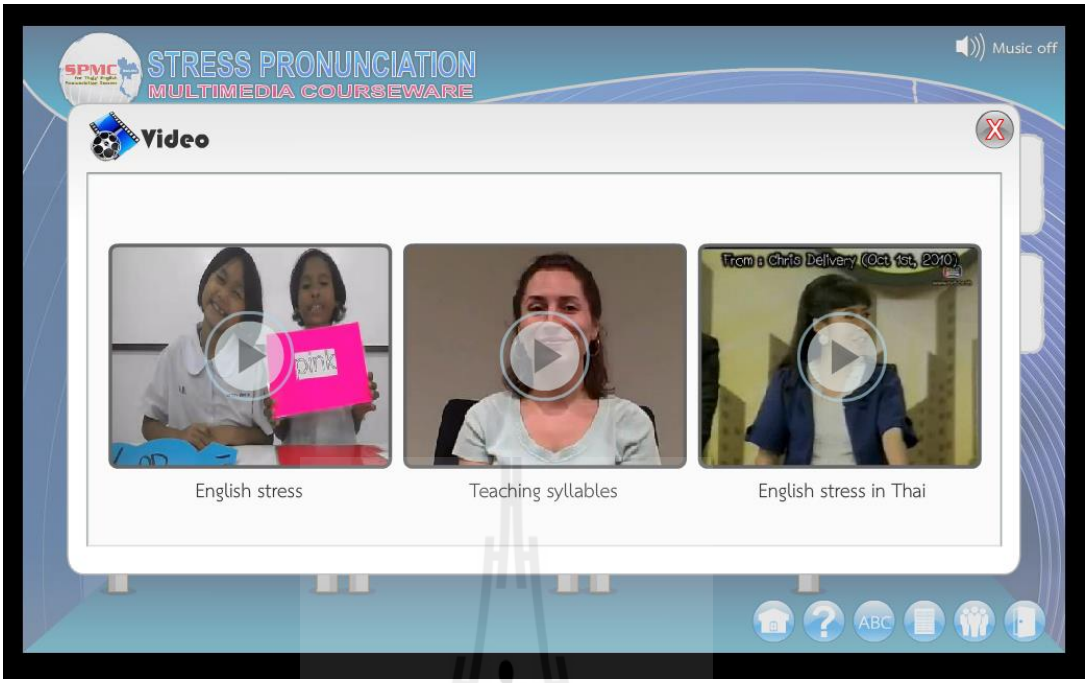

Figure 5.37: Screenshot of the Video Page

SPMC lessons were quite new for the students since they had not taken any courses on English pronunciation except the students who were majoring in English. Thus, this courseware did not provide a lot of specific lessons about stress, but basic knowledge like syllable count and vowel sounds as well as phonetic symbols were prepared for the lessons. However, according to the revisable model of SPMC, the courseware can be altered with additional content if it was found that the SPMC instructional process and the learners' outcomes had efficiency and met the criteria of the 80/80 Standard.

5.3 Summary

This chapter presents the development of the SPMC production model steps explained in detail as well as the information found in the SPMC lessons. Also presented were the courseware components including the instructional modes and strategies. Exercises and quizzes were discussed and presented with text and the screenshots captured from SPMC.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

This chapter provides an overview of the research framework including conclusions from the research procedures, finding and outcomes. Limitations of the current study are also presented and discussed such as factors that were encountered and impacted the administration of the research. Finally, the recommendations for future study and conclusions are presented.

6.1 Introduction

This thesis presents a new instructional model of development using a multimedia courseware pedagogy approach to English pronunciation and stress instruction. The study was developed using models derived from instructional system design theory and other essential models. Then, the courseware production followed the model steps. Initially, the population was identified and analyzed to prepare for the contents and instructional strategies. Multimedia and courseware were selected and produced according to learners' needs and preferences. The multimedia courseware was evaluated for its efficiency with a tryout study and a trial run based on Brahmawong evaluation and criteria of instructional media systems. The following section describes the population and why the current research should be studied and concentrated on this audience.

The undergraduate student requirements were found to have two elements; (1) training courses to help with English pronunciation focused on word stress where students had the most pronunciation errors and problems, and (2) instructional methods that promoted interactive and autonomous learning acquisition and pronunciation of English as a foreign language. These two requirements were combined to develop a suitable pedagogy that responded to the audience, Thai undergraduate students. The study started with the development of an instructional design model to use as a conceptual framework to assist with the planning. The identification of the learning approach and content was found after completing a learner analysis which found that the population had been encountering difficulty with English pronunciation. Errors were particularly common when pronouncing words without stress and/or with the stress misplaced. Therefore, the study concentrated on a pedagogical approach to pronunciation and stress instruction. Meanwhile, the population revealed their requirements and had a positive attitude toward using technology for education and everyday life. Accordingly, the employment of computers and multimedia was selected as the instructional strategy and tool.

There were two main reasons why multimedia and computer were used for pronunciation learning and teaching. First, the computer system can store phonological knowledge and sound models including interactive and graphic media like animation and video that demonstrate mouth movement and pronunciation. Second, Thai undergraduate students have excellent skills in using technology, and they indicated their preference in using technology on a daily basis, such as logging in to the Internet or a 3G connection through a desktop computer, laptop computer, Net-book computer, tablet, and/or a smart-phone.

For these reasons, ISD and model development were basic knowledge required of the researcher to understand the instructional design and how they can be used to produce, step-by-step, suitable multimedia courseware that was revisable and modifiable. Therefore, the current study was carried out following the following research purposes presented in Chapter 1:

1) To develop a multimedia courseware production model for enhancing the English pronunciation and stress abilities of Thai undergraduate students at Kamphaeng Phet Rajabhat University
2) To determine the efficiency of the English pronunciation and stress lessons provided through the multimedia courseware based on the 80/80 Standard
3) To compare the evaluation of students' English pronunciation and stress abilities before and after receiving English pronunciation and stress treatment via the multimedia courseware
4) To explore students' views toward the use of the multimedia courseware for enhancing their English pronunciation and stress abilities

6.2 Conclusions

6.2.1 Overview of Research Procedure

The methodology used to carry out the research was a quasi-experiment with one group, comparing abilities pre-test and post-test. Mixed-method research administered quantitative and qualitative data collection and analyses. Prior to the experiment, the subjects' pronunciation ability was measured by using a pre-test, and then the subjects were asked to use the English pronunciation and stress (SPMC) multimedia courseware for 10 hours. After that, the post-test was used to assess the

subjects' improvement in their pronunciation and stress abilities. Pre-test and post-test results were calculated to compare the mean scores, and to see if the students had made any progress after receiving the treatment.

People who participated and gave assistance with this current study consisted of:

1) Three experts in educational technology, instructional design, and in English language teaching who examined and evaluated the SPMC production model.
2) Two experts in Linguistics and English language teaching examined and checked the validity and reliability of the English stress and pronunciation lessons used in the courseware.
3) Three specialists in software production, graphic design, and audio and video production.
4) Three sample students who were determined to be able, moderately able and less able in English proficiency who were studying in their third year at Kamphaeng Phet Rajabhat University during the first semester of the 2012 academic year. These students were asked to participate in the individual testing for the courseware tryout first step.
5) Six sample students who were determined to be able, moderately able and less able in English proficiency who were studying in their third and fourth years at Kamphaeng Phet Rajabhat University during the first semester of the 2012 academic year. These students were asked to attend the small group testing for the courseware tryout second step.
6) Forty volunteer samples studying in their first year at Kamphaeng Phet Rajabhat University during the first semester of the 2012 academic year

were asked to participate in field study testing for the courseware tryout third step.

7) Forty volunteer samples studying in their first and the second years at Kamphaeng Phet Rajabhat University during the first semester of the 2012 academic year were asked to participate in the trial run phase.

The procedure of the present study started on conducting model development. The model was designed by following to the principals of an instructional system design (ISD) with systematic step(s).

Previous effective models such as the Brahmawong's 7-Step Model, the Dick and Carey Model, the ADDIE Model, the SREO Model, and the AIOU Model were studied because they covered the necessary steps to produce effective tools, curriculum, instruction for schools, etc.

Then, the Model was created and presented to three experts for content check and evaluation. The experts evaluated the model development and the appropriateness of each step including the entire picture.

6.2.2 Research Outcomes

According to the research purposes and questions, the research outcomes were found to be the following.

6.2.2.1 SPMC production model: the evaluation of the multimedia courseware production by the three experts found; the production model titled Stress Pronunciation Multimedia Courseware (SPMC) was developed well and appropriately (Mean = 4.77) for the production of English pronunciation and stress multimedia courseware for Thai undergraduate students at Kamphaeng Phet Rajabhat Univeristy.

6.2.2.2 SPMC lessons: the English pronunciation and stress multimedia courseware, or SPMC, was developed following the SPMC model steps and plans. SPMC lessons contained three units; Unit 1 (Syllables in English), Unit 2 (Word Stress), and Unit 3 (Word Stress Patterns). Each unit was involved with the interactive instruction and activities including exercises and quizzes in each unit. The instruction efficiency was evaluated based on the Brahmawong E_1/E_2 formula in the criteria of 80/80 Standard. According to the courseware trial run, the scores of E_1/E_2 met the Standard in every unit. Unit 1 was **81.25/82.50**, while Unit 2 was **81.13/81.75**, and **82.20/82.50** for Unit 3.The scores showed the efficiency of the SPMC instructional process and product. The courseware could be used and was suitable for KPRU undergraduate students to improve their English pronunciation and stress abilities.

Students pronunciation improvement: the score results of the pre-test and post-test taken by the participants from the trial run phase were **61.58%** and **68.63%**, with a significant difference at the .05 level (sig.=0.000) according to the statistical calculation. The pre-test and post-test results showed that the participants' pronunciation and stress abilities had improved after the SPMC treatment.

Students' opinion ratings of SPMC: a checklist questionnaire was used to ask students' views and opinions toward the use of SPMC. The results presented in Chapter 4 showed that the participants had an optimistic attitude towards SPMC to enhance their English pronunciation and stress abilities. Students' perspective view toward SPMC shows that they most strongly agreed with the SPMC instruction and design (Mean = 4.30). They most frequently strongly agreed that SPMC instruction enhances English listening skills (Mean = 4.48), while they least agreed that the tutor's voice was clear and understandable (Mean = 3.70).

Students' views and opinions: the students gave positive views in an open-ended questionnaire and the semi-structured interview. Most participants identified their preference in using the courseware rather than the textbook to study English pronunciation. Most of the participants really liked the media in SPMC particular, for example, the videos, exercises and the score feedback. The students' claims about the sound recording shows that sound model and audio recording were very important and affected the students' learning process and outcomes.

Although there are recent studies on second language acquisition including the study of pronunciation problems of second language learners; pronunciation pedagogy in Thai EFL classes have been inadequately promoted and provided. Many English lecturers use traditional methods of lecturing using some materials like textbooks, tape cassettes, or audio CDs to assist with instruction, exercises and speaking drills. The attempt of this current study was to develop pronunciation pedagogy that promotes interactive instruction; developed with suitable knowledge disciplines, carefully planned, and with instruction evaluation. Multimedia instruction development would be effective with the assistance of subject matter experts like instructional peers, software programmers, and native speakers, etc.

6.3 Limitations

Development technology instruction was time consuming for a non-expert in instructional design. In this current study, the development of SPMC and other media and graphics needed a design team including the instructor, or instructional designer, a software programmer, video and audio producers, and graphic designers to create and integrate the many media elements ((Ivers & Barron, 2006). In the present study,

the researcher needed to study a variety of areas even though she has been teaching EFL classes for more than ten years. The researcher brainstormed and reviewed information in the areas of pronunciation pedagogy for EFL learners, computer assisted language learning (CALL) and existing pronunciation technology instruction as well as the available package software for developing courseware.

Since the researcher was not keen on technology development and design, the researcher asked for help from computer programmers, or IT technicians, and also used a variety of existing media, software, graphics, videos, etc. available from other resources like Websites. But, there were some components/learning environments such as the native-speaker sound models, the tutor (lecturer) voice, and other graphics that were produced in order to match with the SPMC lessons and the target (population). The researcher not only studied hard to produce the courseware but also received help from experts and specialists to examine several research instruments and other learning materials such as the English pronunciation and stress lesson content, pre-test and post-test, questionnaire, software production and others media elements. The courseware development should be well organized and planned well in advance. The best way to construct multimedia courseware involves the following three topics:

- The lesson content and relevant topics
- The instructional system design and the design model
- The production of media elements and other graphics on the computer

In the current study, the SPMC lesson content concentrated on English pronunciation and word stress. The researcher reviewed and brainstormed concepts to provide the instructional pedagogy that would fit best and serve as an appropriate

pronunciation and stress program. This step took time since there was a lot of material preparation, for instance, providing lessons, text and speech descriptions and asking experts to check and examine their content, developing interactive drills and activities and asking experts to check and examine their content, producing audio recordings and graphics and asking for help from technical specialists. It was recommended that the multimedia courseware project needed time, good plans organized step-by-step, a review of the instructional system design and multimedia instruction, to assist in producing an excellent multimedia production. The researcher therefore decided on the model steps carefully and sequentially. The study of the instructional design model and previous models assisted in developing the model faster. Since learning goals and outcomes should respond to the target audience, the model was designed as after determining the subjects' learning backgrounds, needs and problems. Also, a new instructional model was required in order to design appropriate instruction and to fit to the target audience.

Furthermore, the evaluation of the courseware efficiency was important to the study. To identify the courseware efficiency, the researcher administered the evaluation by using the Brahmawong E_1/E_2 formula. In the current study, E_1/E_2 score results were different based on the learners' background in pronunciation proficiency, their learning motivation as well as the instructional design. From the courseware tryout and trial run process, the E_1/E_2 scores increased each time the courseware was improved. The results recommended that an evaluation process should not be conducted only once or twice, but many times with learners of different proficiencies so that the courseware could be revised, edited, and modified repeatedly to fit most learners.

The most important thing that impacted the researcher in carrying out the current research was the courseware production. Computer and technology production skills were the key to project success. The current project required a production team that included the content designer, a graphic designer, an audio and video producer, and a software programmer in order to develop effective courseware (Lee & Owens, 2000). In contrast, the researcher had to complete the project alone with some help from a few people including the current thesis supervisor, peer reviewers who reviewed the English stress and pronunciation lessons provided in the courseware, an expert in information technology, and a Flash software programmer.

There is one more important point to recognize in the multimedia courseware project of the present study. The audio recordings and the selection of native speakers were essential to project success. Since the multimedia courseware promoted pronunciation learning and listening, the sound model and speech voices directed the learners' knowledge perception. According to the findings from the questionnaire and the interview sections, most participants had some problems in hearing the sounds composed with the courseware. This technical sound problem affected the students' learning and ability to practice pronunciation, for example in the exercise activities, the students needed to listen to sound models to select the correct answer, so the sound needed to be clear. In the current project, native speakers were asked to be record the tutor voice and voice model composed for the lessons, exercises and quizzes. Some participants revealed the following:

1) There was unclear sound in the tutorial section that interfered with their learning perception and affected their ability to learn the correct stress and pronunciation of words.

2) Someone encountered the American and the British accent.
3) Many participants suggested using voices from younger females and males. They claimed that the old man voice made them less active.
4) Some of the pronunciation in the courseware was different from that of the teacher they studied with.
5) The participants claimed that in some of the exercises they could not perceive a difference between paired sounds.

The comments from the participants listed above, suggest that the voice model, such as the instructor voice, affected the learners' motivation because with the courseware the voice of a 50-year old man's was used. (Students mentioned that they felt less active and alert and that the voice made them sleepy.). Another problem came from the sound production/editing. This occurred because the researcher didn't have sound operation skills and had made the recordings unvoiced after editing them in separate MP3 files.

6.4 Recommendations for Future Study

Technology devices like computers, tablets, smart-phones are favored by people, especially among the younger generations as well as by Thai undergraduate students. As mentioned in Chapter 1, Thai students do not like to study English and are not able to use it effectively because they lack learning motivation. Consequently, it seems like an auspicious opportunity to use technology integrated into English language and pronunciation pedagogy to encourage learners' motivation in Thai EFL classes. According to the findings from the questionnaire and the interviews in the present study, the participants articulated optimistic views and attitudes towards using

technology to enhance language learning and teaching. Findings showed that the students liked and enjoyed using the courseware to study English pronunciation and stress. Even though they might not master the material instantly, they showed improvement.

Again, findings from the open-ended questionnaire and interviews showed that students' desired more lessons in English pronunciation and stress as well as a variety of other active media instruction and activities. These suggestions demonstrate their positive views and preference towards employing technology including multimedia as a learning tool. Accordingly, educators or English instructor might study the use of multimedia and technology and take advantage of this study to design technology instruction to assist language learning and teaching. It could also save the lecturers' time and energy in the long run.

Nevertheless, the results showed that some of the students who volunteered in the treatment and used the courseware did not demonstrate much improvement in pronunciation and making stress after the use of SPMC. In this study SPMC provided only three units focused on syllable and word stress, the students may need more content and drills. This point may be useful for further study in providing more lessons.

The overview in the above paragraphs, the current study recommends useful implication and important guiding for the future study as presented in the following points.

Since the SPMC model was designed to develop the pronunciation and word stress instruction using the multimedia courseware with a computer as a base, but Thai undergraduate students at KPRU do not like to carry or frequently use their own

computers in the campus. So, the requirements of updating technology and instruction, suggests that future studies are needed to explore new technology devices that can facilitate and motivate learners to use them for learning English and or other specific areas. Consequently, the model of this current research may be applied and modified to produce a course or a new pedagogy in conjunction with available technology and devices in the future.

Therefore, the researcher of a future study should review and select additional updated package software and programs that can be produced and integrated into a small computer like a Netbook, Tablet, or a Smartphone in which data can be stored in different ways. Therefore, future studies may use these types of modern technology to construct lessons and evaluate the efficiency of the lessons, for instance, in a type of application (App.) program. The future study may choose the software program that served for a new instructional designer to produce a course syllabus and curriculum easily. Those mentioned may include available Websites with enhanced instructional development. However, to produce technology instruction effectively in order to save time and energy, a project team consisting of a variety of subject matter experts may be essential and have many advantages for technology production.

Exploration of the target population needs, problems and requirements should not be neglected. In future study, the instructional pedagogy may be provided in two versions, one that learners use in class and another one for use alone outside class to see what may take as factors affecting their learning perception and feedback from the two situations.

The present study was operated carefully with steps and disciplines of research methodologies but took long time. The limitation of this study was also time

constrain, and the product of this present research and results may not be generalized to other populations and sustainable for use in the long-term. Nevertheless, results of this current research are useful and can be applied to future study, particularly in English pronunciation pedagogy and technology enhanced language learning for EFL classes.

6.5 Summary

This chapter summarizes the conclusions of the research and includes the research procedure and outcomes, focusing on the research findings as well as the limitations and recommendations for future study.

REFERENCES

REFERENCES

Abuseileek, A. F. & Rabab'ah, G. A. (2007). The effect of computer-based grammar instruction on the acquisition of verb tenses in an EFL context. **The JALT CALL Journal**, 3(1-2) : 59-80.

Accent Master. (2011). **English Pronunciation Made Easy for Thai Speakers**. Retrieved 26 July, 2011 from http://www.accentmaster.com

Adobe Systems Incorporated. (2013). **Adobe Privacy Policy: What does this privacy policy cover?**. Retrieved March 9, 2013, from http://www.adobe.com/privacy.html

Allen, M. (2007). **Designing Successful E-learning**. NY: Wiley.

Allesi, S. & Trollip, S. (2001). **Multimedia for learning: Methods and development**. Massachusetts, USA.

Barrett, H. (2000). **ADDIE Model.** Retrieved February 14, 2013, from http://edweb.sdsu.edu/Courses/EDTEC700/ETP/addie.htm

Barron, A. E., Orwig G. W., Ivers, K. S. & Lilavois, N. (2002). **Technologies for education: A Practical guide (4th ed.)**. Colorado: Libraries Unlimited.

Brahmawong, C. (1977). **Instructional Media System**, Bangkok: Chulalongkorn University.

Britton, C. & Doake, J. (1996). **Software System Development: A gentle Introduction**. McGraw-Hill.

Cambridge English Online. (2011). **Phonetic Focus**. Retrieved November 8, 2011,

from Clarity Language Consultants. (2012). **Programs: Clear Pronunciation 1-2**. Retrieved January 12, 2012, from http://www.clarityenglish.com

Carey, M. (2002). **An L1- Specific CALL Pedagogy for the Instruction of Pronunciation with Korean Learners of English**. Thesis, Ph.D. (LING), Macquarie University.

Chapelle, A. C. (2001). **Computer Applications in Second Language Acquistion; Foundations for teaching, testing and research.** Cambridge University Press, UK.

Chomphuboot, S. (2005). **Computer-Assisted Language Learning /CALL/ pronunciatioin/ word stress/ intonation**. M.A. Thesis. Silpakorn University.

Collins, B. & Mees, I. M. (2003). **Practical Phonetics and Phonology: A Resource Book for Students**. USA, Canada: Routledge.

Cronbach, L. J. (1947). Test "reliability': Its Meaning and Determination. **Psychometrika**, 12 : 1-16.

Cronbach, L. J. (1951). Coefficient alpha and the Internal structure of tests. **Psychometrika**, 16 : 297-334.

Dale, P. & Poms, L. (2005). **English Pronunciation: Made Simple**. New York: Pearson Education, Inc.

David, M. & Sutton, C. D. (2004). **Social Research: The Basics**. London, California, New Delhi: SAGE Publications Ltd.

Davies, G. (2007). **ICT4LT Module 1.4: Introduction to Computer Assisted Language Learning (CALL)**. [Online], Retrieved on 1 November 2007, available at http://www.ict4lt.org/en/en_mod1-4.htm

Dick, W., Carey, L. & Carey, J. O. (2005). **The Systematic Design of Instruction (6th ed.)**. USA: Walter Dick and Lou Carey.

Duffy, L. J., McDonald, J. B. & Mizell, A. P. (2005). **Teaching and Learning with Technology (2nd ed.)**. USA: Pearson Education. Inc.

Ellis, R. (2005). **Instructed Second Language Acquisition: A Literature Review**. The University of Auckland.

Ertmer, P. A. & Newby T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. **Performance Improvement Quarterly**, 6(4), 50-70.

Foley, J. & Thompson, L. (2003). **Language Learning: A Life Long Process**. London: Hodder Arnold Publication.

Fouz, G. J. (2012). Can Apple's iPhone Help to Improve English Pronunciation Autonomously? State of the App. **Proceedings of the 2012 EUROCALL International Conference.** Gothenburg, Sweden, 81-87.

Hardison, D. M. & Sonchaeng, C. (2005). Theatre voice training and technology in teaching oral skills: Integrating the components of a speech event. **System**, 33(4) : 593-608.

Harless, W. C., Zier, M. A. & Duncan, R. C. (1999). Virtual dialogues with native speakers: The evaluation of an interactive multimedia method. **CALICO Journal**, 16(3): 313-338.

Hegelheimer, V & Tower, D. (2004). Using CALL in the classroom: Analyzing student interactions within an authentic CALL program. **System**, 32(2), 185-205.

Heinich. R., Molenda, M., Russell, J. & Smaldino, E. S. (2002). **Instructional Media and Technologies for Learning (7th ed.)**. New Jersey: Prentice Hall.

Hewer, S. (1997). **Text Manipulation: Computer-Based Activities to Improve Knowledge and Use of the Target Language**. London: CILT.

Hişmanoğlu, M. (2006). Curent Perspectives on Pronunciation Learning and Teaching. **Journal of Language and Linguistic Studies**, 2(1) : 101-110.

Hymes, D. (1971). **On communicative competence**. Philadelphia, PA: University of Pennsylvania Press.

Iqbal, M. J. (2003). **Development of a model for instructional design in distance education at Allama Iqbal Open University**. Ph.D. Thesis. Allama Iqbal Open University, Islamabad.

Iver, S. & Barron, E. (2006). **Multimedia Projects in Education: Designing, Producing, and Assessing (3rd ed.)**. Libraries Unlimited. USA.

Jenkins, J. (2000). **The phonology of English as an international language**. UK: Oxford University Press.

Jukpim, C. (2009). An investigation of KU CSC students' pronunciation performance reflects pronouncing needs improving. **Proceedings of the 13th International Conference on English in Southeast Asia**. Nanyang, Singapore, 391-398.

Kamphaeng Phet Rajabhat Univeristy. (2011). **Course Description: General Coreses**. Kamphaeng Phet Rajabhat University.

Kamphaeng Phet Rajabhat University. (2009). **School Record: Listening-Speaking I-II**. Kamphaeng Phet Rajabhat University.

Kelly, G. (2003). **How to Teach Pronunciation**. England: Pearson Education.

Klassen, J. & Milton, P. (1999). Enhancing English language Skills using multimedia: Tried and tested. **Computer Assisted Language Learning**, 12(4): 284-294.

Lee, W. W. & Owens, D. L. (2000). **Multimedia-based Instructional Design: Computer-based Training, Web-based Training, Distance Broadcast Training**. USA: Jossey-Bass Pfeiffer.

Levis, J. & Pickering, L. (2004). Teaching intonation in discourse using speech visualization technology. **System**, 32: 505-524.

Liu, G. Z. (2008). Innovating research topics in learning technology: Where are the new blue oceans?. **British Journal of Educational Technology**, 39(4): 738-747.

McKay, S.L. (2002). **Teaching English as an International Language: Rethinking Goals and Approaches**. Oxford University Press.

Molanda, M. (2003). In search of the elusive Addie Model. **Performance Improvement**, 42(5) : 34.

Morley, J. (1999). New developments in speech/pronunciation instruction. **As We Speak**, 2 : 1 – 4.

Munro, M. J. & Derwing, T. M. (2006). The functional load principle in ESL pronunciation instruction: An exploratory study. **System**, 34(4), 520-531.

NCS Pearson. (2013). **Adobe Creative Suite®6 Software**. Retrieved 16 April, 2013 from http://www.adobemarketplace.com/default.asp

Oxford University Press. (1989). **Strategy Inventory for Language Learning (SILL): Version 7.0 (ESL/EFL)**. Retrieved April 22, 2012, from http://richarddpetty.files.wordpress.com

Oxford University Press. (2012). **New English File**. Retrieved January 15, 2012, from http://elt.oup.com

Oxford University Press ELT. (2012). **English File Pronunciation: Version 1.1**. Retrieved January 15, 2012, from http://itunes.apple.com

Phon-Ngam, P. (2008). Developing innovation instruction for improvement Thai and Laotian' pronunciation problems in English consonants. **Proceedings of Thailand Research Expo 2008**. Bangkok, Thailand.

Por, F. P., & Fong, S. F. (2011). The Design and Development of Multimedia. and Pronunciation Learning Management System. **World Academy of Science, Engineering and Technology**, 60 : 2004-2008.

Potisompapwong, S. (2002). **Computer Assisted Language Learning /CALL/ problem sounds in English/ pronunciation**. M.A. Thesis. Silpakorn University.

Roach, P. (2002). **English Phonetics and Phonology: A Practical Course**. UK: Cambridge University Press.

Rusell, W. R. (1981). Instructional system development (A paper presented to the International Congress for Individualized Instruction). **EDRS publication ED**, 209-239.

Tamburini, F. (1999). A Multimedia Framework for Second Language Teaching in Self-access Environments. **Computer & Education**, 32 : 137-149.

Tsubota, Y., Dantsuji, M. & Kawahara, T. (2004). **Practical use of autonomous English pronunciation learning system for Japanese students.** Retrieved January 29, 2010, from http://www.ar.media.kyoto-u.ac.jp/EN/bib/ intl/TSU-InSTIL04.pdf

Saitakham, K. (2010). **The Development of a Web-based Instructional Model to Enhance Vocabulary Learning Ability by guessing Meanings from the Context Clues for Thai EFL University Students**. Thesis, Ph.D. (ELS). Suranaree University of Technology.

Seferoğlu, G. (2005). Improving students' pronunciation through accent reduction software. **Backwell**, 36(2) : 303-316.

Shen, L. (2010). **Constructive Role Plays via E-Learning for EFL Learners**. Thesis, Ph.D. (ELS). Suranaree University of Technology.

Smith. P. L. & Ragan, T. J. (1993). **Instructional Design**. USA: Macmillan.

Softonic International. (2012). **WordBanker**. Retrieved 3 March, 2012 from http://wordbanker.en.softonic.com/

Sucharitrak, S. & Seepho, S. (2011). The Development of CALL English Lessons for Nursing Science Students. **Silpakorn Education Research Journal**, 2(2) : 287 – 302.

Suppasetseree, S. (2005). **The Dvelopment of an Internet-based Instructional System for Teaching Remedial English to First-year University Students**. Ph.D. Thesis. Suranaree University of Technology.

U.S. Army Field Artillery School. (1984). **A System Approach to Training (Course Student textbook). ST-5k061FD92.**

Varasarin, P. (2007). **An action research study of pronunciation training, language learning strategies and speaking confidence**. Ph.D. Thesis. Victoria University.

Wang, X. & Munro M. J. (2004). Computer-based training for learning English vowel contrasts. **System**, 32(4) : 539-552.

Warschauer, M. (1996). Computer Assisted Language Learning: an Introduction. **Multimedia Language Teaching**. Tokyo: Logos International, 3-20.

Wei, Y. and Zhou, Y. (2002). **Insights into English pronunciation problems of Thai students**. Retrieved October 31, 2008 from http://www.eric.ed.gov/PDFS/ED476746.pdf.

Winaitham, W. & Suppasetseree, S. (2012). The investigation of English pronunciation errors and factors affecting English pronunciation of Thai undergraduate students. **Silpakorn Education Research Journal**, 4(2) : 303-319.

APPENDICES

APPENDIX A

An Evaluation Form of SPMC Model

Evaluation form of the Stress Pronunciation Multimedia Courseware (SPMC) production model

Evaluator:

Name _____

Read each item in the form then, make a check mark (/) in a rating box which best describes your opinion.

5 = Strongly Agree 4 = Agree

3 = Uncertain 2 = Disagree

1 = Strongly Disagree

Statement	Rating Scale				
	5	**4**	**3**	**2**	**1**
1. SPMC production model steps are appropriate for multimedia courseware production.					
2. SPMC production model are developed according to instructional system design					
3. Each step of SPMC production model is well organized.					
4. Each step of SPMC production model is not complicated and is suitable for a new instructional designer.					
5. SPMC production model steps have suitable titles.					
6. SPMC production model is designed for language learning and pronunciation pedagogy.					

Other significant information, suggestion and recommendation you would like to include in this regard.

_____

_____

_____

_____

_____

_____

APPENDIX B

An IOC Evaluation Form to the Pronunciation and Stress Tests

The Evaluation form of Pronunciation and Word stress Tests in English for Kamphaeng Phet Rajabhat University Undergraduate Students

Evaluator:

Name _____

Introduction:

Please kindly decide if **the test is truly test learner's behavioral objectives** determined in each part of the test, which the sample will be Kamphaeng Phet Rajabhat University (KPRU) undergraduate students who already enrolled at least one KPRU foundation course of English.

Instruction:

Evaluate each item of the test by making a check mark (/) in a box which best describes your opinion. (85 items)

+1 = Agree

0 = Uncertain

-1 = Disagree

Part/item	+1	0	-1	Remark
Part 1 Listening				
A1.				
A2.				
A3.				
A4.				
A5.				
A6.				
A7.				
A8.				

Part/item	+1	0	-1	Remark
Part 1 Listening				
B1				
B2.				
B3.				
B4.				
B5.				
B6.				
B7.				
B8.				
B9.				
B10.				

Part/item	+1	0	-1	Remark
Part 1 Listening				
C1.				
C2.				
C3.				
C4.				
C5.				
C6.				
C7				
C8.				
C9.				
C10.				
C11.				
C12.				

Part/item	+1	0	-1	Remark
Part 2 Stress and types of word				
D1.				
D2.				
D3.				
D4.				
D5.				
D6.				
D7.				
D8.				
D9.				
D10.				
D11.				
D12.				

Part/item	+1	0	-1	Remark
Part 2 Stress and types of word				
E13.				
E14.				
E15				
E16.				
E17.				
E18.				
E19.				
E20.				
E21.				
Part 2 Stress and types of word				
F1.				
F2.				
F3.				
F4.				
F5.				

Part/item	+1	0	-1	Remark
Part 3 Pronunciation checking				
G1.				
G2.				
G3.				
G4.				
G5.				
G6.				
G7.				
G8.				
G9.				
G10.				
G11.				
G12.				
G13.				

Part/item	+1	0	-1	Remark
Part 4 Pronouncing syllable stress				
J1.				
J2.				
J3.				
J4.				
J5.				
J6.				
J7.				
J8.				
J9.				
J10.				
J11				
J12.				
J13.				
J14.				
J15.				
J16.				

APPENDIX C

The Content Validity of the Pronunciation and Stress Tests

(IOC Item Analysis)

Question Items	Expert1	Expert2	Expert3	IOC	Item Deleted
1	1	1	1	1.00	
2	1	1	1	1.00	
3	1	1	1	1.00	
4	1	1	1	1.00	
5	1	1	1	1.00	
6	1	1	1	1.00	
7	1	1	1	1.00	
8	-1	1	-1	-0.33	×
9	1	1	1	1.00	
10	1	1	1	1.00	
11	1	1	1	1.00	
12	1	1	1	1.00	
13	1	1	1	1.00	
14	1	1	1	1.00	
15	1	1	1	1.00	
16	1	1	1	1.00	
17	1	1	1	1.00	
18	1	1	1	1.00	
19	1	1	1	1.00	
20	1	1	1	1.00	
21	1	1	1	1.00	
22	1	1	1	1.00	
23	0	-1	1	0.00	×
24	-1	-1	-1	-1.00	×
25	1	1	1	1.00	
26	1	1	1	1.00	
27	1	1	1	1.00	
28	1	1	1	1.00	
29	1	1	1	1.00	

Question Items	Expert1	Expert2	Expert3	IOC	Item Deleted
30	1	1	1	1.00	
31	1	1	1	1.00	
32	1	1	1	1.00	
33	1	1	1	1.00	
34	1	1	1	1.00	
35	1	1	1	1.00	
36	1	1	1	1.00	
37	1	1	1	1.00	
38	1	1	1	1.00	
39	1	1	1	1.00	
40	1	1	1	1.00	
41	1	1	1	1.00	
42	1	1	1	1.00	
43	1	1	1	1.00	
44	1	1	1	1.00	
45	1	1	1	1.00	
46	1	1	1	1.00	
47	1	1	1	1.00	
48	1	1	1	1.00	
49	1	1	1	1.00	
50	1	1	1	1.00	
51	1	1	1	1.00	
52	1	1	1	1.00	
53	1	1	1	1.00	
54	1	1	1	1.00	
55	1	1	1	1.00	
56	1	1	1	1.00	
57	1	1	1	1.00	
58	1	1	1	1.00	
59	1	1	1	1.00	
60	1	0	1	0.67	
61	1	1	1	1.00	
62	1	1	1	1.00	
63	1	1	1	1.00	
64	1	0	-1	0.00	×
65	0	0	1	0.33	×
66	1	1	1	1.00	

Question Items	Expert1	Expert2	Expert3	IOC	Item Deleted
67	1	1	1	1.00	
68	1	1	1	1.00	
69	1	1	1	1.00	
70	1	1	1	1.00	
71	1	1	1	1.00	
72	1	1	1	1.00	
73	1	1	1	1.00	
74	1	1	1	1.00	
75	0	1	1	0.67	
76	1	1	1	1.00	
77	1	1	1	1.00	
78	1	1	1	1.00	
79	1	1	1	1.00	
80	1	1	1	1.00	
81	1	1	1	1.00	
82	1	1	1	1.00	
83	1	1	1	1.00	
84	1	1	-1	0.33	×
85	1	1	1	1.00	

Note that: IOC value of ≥ 0.5 is satisfied, but ≤ 0.5 is unsatisfied.

APPENDIX D

Item Analysis of the Pronunciation and Stress Tests

The results of reliability and the value level of the difficulty (p) and the discrimination index (r) of the pronunciation and stress tests. (80 items)

Items	H	L	p	r	Deleted
1	11	5	0.73	0.27	
2	9	3	0.55	0.27	
3	7	7	0.64	0.00	×
4	11	2	0.59	0.41	
5	9	4	0.59	0.23	
6	11	2	0.59	0.41	
7	10	11	0.95	-0.05	×
8	10	2	0.55	0.36	
9	10	3	0.59	0.32	
10	10	11	0.95	-0.05	×
11	9	3	0.55	0.27	
12	11	5	0.73	0.27	
13	11	9	0.91	0.09	×
14	11	10	0.95	0.05	×
15	10	1	0.50	0.41	
16	9	8	0.77	0.05	×
17	8	8	0.73	0.00	×
18	11	11	1.00	0.00	×
19	10	3	0.59	0.32	
20	11	10	0.95	0.05	×
21	9	3	0.55	0.27	
22	11	3	0.64	0.36	
23	10	3	0.59	0.32	
24	8	2	0.45	0.27	
25	10	4	0.64	0.27	
26	11	4	0.68	0.32	
27	11	2	0.59	0.41	
28	10	3	0.59	0.32	
29	11	10	0.95	0.05	×
30	7	1	0.36	0.27	

The results of reliability and the value level of the difficulty (p) and the discrimination index (r) of the pronunciation and stress tests. (80 items) (Cont.)

Items	H	L	p	r	Deleted
31	8	1	0.41	0.32	
32	10	4	0.64	0.27	
33	8	3	0.50	0.23	
34	8	3	0.50	0.23	
35	11	2	0.59	0.41	
36	10	4	0.64	0.27	
37	11	5	0.73	0.27	
38	10	2	0.55	0.36	
39	8	2	0.45	0.27	
40	10	4	0.64	0.27	
41	11	4	0.68	0.32	
42	11	2	0.59	0.41	
43	10	3	0.59	0.32	
44	10	4	0.64	0.27	
45	8	2	0.45	0.27	
46	2	3	0.23	-0.05	×
47	9	3	0.55	0.27	
48	7	7	0.64	0.00	×
49	11	2	0.59	0.41	
50	9	8	0.77	0.05	×
51	10	3	0.59	0.32	
52	11	4	0.68	0.32	
53	11	2	0.59	0.41	
54	10	4	0.64	0.27	
55	3	2	0.23	0.05	×
56	11	2	0.59	0.41	
57	10	9	0.86	0.05	×
58	11	4	0.68	0.32	
59	11	2	0.59	0.41	
60	10	2	0.55	0.36	
61	8	3	0.50	0.23	
62	9	3	0.55	0.27	
63	8	6	0.64	0.09	×
64	8	2	0.45	0.27	
65	5	5	0.45	0.00	×
66	9	1	0.45	0.36	

The results of reliability and the value level of the difficulty (p) and the discrimination index (r) of the pronunciation and stress tests. (80 items) (Cont.)

Items	H	L	p	r	Deleted
67	1	4	0.23	-0.14	×
68	9	2	0.50	0.32	
69	10	3	0.59	0.32	
70	11	4	0.68	0.32	
71	10	4	0.64	0.27	
72	8	1	0.41	0.32	
73	9	1	0.45	0.36	
74	9	3	0.55	0.27	
75	8	2	0.45	0.27	
76	8	9	0.77	-0.05	×
77	7	7	0.64	0.00	×
78	9	3	0.55	0.27	
79	8	2	0.45	0.27	
80	7	2	0.41	0.23	
Reliability (Alpha)					**0.81**

Note That: **H** is the proportion of students who correctly answered in a high group, while **L** presents the proportion of students who correctly answered in a low group.

APPENDIX E

The Pronunciation and Stress Tests

(Pre-test and Post-test)

Part 1

Listening

A. Listen to the words and decide how many syllables you hear.

A. Two syllables
B. Three syllables
C. Four Syllables
D. Five syllables

1. invention
2. examination
3. ability
4. opportunity
5. electronic
6. romantic
7. practical

B. Listen to the words. Do you hear stress sounding? (8-17)

If you hear the speaker making a stress, select A, and choose B if the speaker does not make a stress,

A. Yes
B. No

8. banana
9. December
10. original
11. temperature
12. Carbon
13. student
14. Computer
15. Bangkok
16. Apartment
17. Another

C. Listen to the words and decide in which position the main stress falls. (CD3of5, Track11) (18-29)

Note: ● = a symbol of (main) stress o = a symbol of weak stress, or unstressed

18. completely

a. ● o o — **com**pletely
b. o ● o — com**plete**ly
c. o o ● — complete**ly**

19. jealous

● o
a. **jea**lous

o ●
b. jea**lous**

20. apartment

● o o
a. **a**partment

o ● o
b. a**part**ment

o o ●
c. apart**ment**

21. biology

●o o o
a. **bi**ology

o● o o
c. bi**o**logy

o o ●o
b. bio**lo**gy

oo o ●
d. biolo**gy**

22. excellent

● o o
a. **ex**cellent

o ● o
b. ex**cel**lent

o o●
c. excel**lent**

23. machine

● o
a. **ma**chine

o ●
b. ma**chine**

24. woman

● o
a. **wo**man

o ●
b. wo**man**

25. women

● o
a. **wo**men

o ●
b. wo**men**

26. success

● o
a. **suc**cess

o ●
b. suc**cess**

27. distance

● o
a. **dis**tance

o ●
b. dis**tance**

28. vanilla

● o o
a. **va**nilla

o ● o
b. va**nil**la

o o ●
c. vanil**la**

29. question

● o
a. **ques**tion

o ●
b. ques**tion**

Part 2

Pronunciation

D. Look at the correct position of stress. (30-42)

Note: The capital letter(s) in a bold syllable shows the main stress. (Capital letter = ตัวพิมพ์ใหญ่)

30.	a. **ICE CREAM**	b. **ICE** cream	c. ice **CREAM**	d. b and c
31.	a. **AIRPLANE**	b. **AIR**plane	c. air**PLANE**	d. a and c
32.	a. **WHITE HOUSE**	b. **WHITE** house	c. **WHITE** house	d. a and b
33.	a. **WHITEHOUSE**	b. **WHITE**house	c. white**HOUSE**	d. b and c
34.	a. **RECORD**	b. **RE**cord	c. re**CORD**	d. b and c
35.	a. **DRINKING**	b. **DRINK**ing	c. drink**ING**	d. a and c
36.	a. **BACK** off	b. back **OFF**	c. **BACK OFF**	d. a and b
37.	a. **SUG**gest	b. sug**GEST**	c. **SUGGEST**	d. b and
38.	a. **PRE**sent	b. pre**SENT**	c. **PRESENT**	d. a and b
39.	a. **FOR**get	b. for**GET**	c. **FORGET**	d. a and c
40.	a. hun**GRY**	b. **HUNGRY**	c. **HUNG**ry	d. b and c
41.	a. hand**MADE**	b. **HANDMADE**	c. **HAND**made	d. a and b
42.	a. bor**ING**	b. **BORING**	c. **BOR**ing	d. a and c

Part 3

Pronouncing Syllable Stress

E. Does student create stress these words correctly? (43-60)

	a. Yes		**b. No**
43	accident	52	captain
44	company	53	casino
45	original	54	guitar
46	dictionary	55	chlorine
47	vocabulary	56	cocktail
48	engineer	57	computer
49	get up	58	nylon
50	first-class	59	bacteria
51	System	60	battery

APPENDIX F

Item Analysis of the Questionnaire of Students' Views and Opinions towards SPMC

Reliability and item analysis of the questionnaire of students' views and opinions towards the use of SPMC. (35 items)

Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Item Deleted
1	0.601	0.847	
2	0.557	0.849	
3	0.391	0.852	
4	0.528	0.851	
5	0.646	0.847	
6	0.565	0.849	
7	-0.044	0.865	□
8	0.324	0.854	
9	0.488	0.85	
10	0.465	0.851	
11	0.552	0.848	
12	0.574	0.848	
13	0.472	0.851	
14	0.299	0.855	
15	0.374	0.853	
16	0.463	0.851	
17	0.456	0.851	
18	0.058	0.865	□
19	0.380	0.853	
20	0.142	0.858	□
21	-0.054	0.863	□
22	0.081	0.859	□
23	0.363	0.853	
24	0.414	0.852	
25	0.434	0.852	
26	0.373	0.853	
27	0.646	0.847	
28	-0.111	0.869	□
29	-0.006	0.861	□

Reliability and item analysis of the questionnaire of students' views and opinions towards the use of SPMC. (35 items) (Cont.)

Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Item Deleted
30	0.121	0.863	×
31	0.601	0.847	
32	0.557	0.849	
33	0.391	0.852	
34	0.528	0.851	
35	0.646	0.847	
Reliability (Alpha)			**0.857**

APPENDIX G (1)

Questionnaire of Students' Views and Opinions towards SPMC

(Thai Version)

แบบสอบถามการใช้บทเรียนคอมพิวเตอร์และสื่อประสมเพื่อพัฒนาการออกเสียงและการเน้นเสียงภาษาอังกฤษ

ตอนที่ 1

โปรดระบุข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

เพศ ❑ ชาย ❑ หญิง

อายุ ❑ 18 ปี ❑ 19 ปี ❑ 20 ปี
❑ 21 ปี ❑ 22 ปี ❑ อื่นๆ ระบุ .....

โปรแกรมวิชา .....

ชั้นปีที่ศึกษา ❑ ปีหนึ่ง ❑ ปีสอง ❑ ปีสาม
❑ ปีสี่ ❑ สูงกว่าปีสี่

ที่อยู่อีเมล์ ..... เบอร์โทรติดต่อ .....

ตอนที่ 2

โปรดใส่เครื่องหมาย (✓) ในช่องหมายเลข 5, 4, 3, 2, หรือ 1 เพื่อตอบคำถามแต่ละข้อว่าท่านมีความคิดอยู่ในระดับใด ดังต่อไปนี้

5	=	เห็นด้วยอย่างมาก	2	=	ไม่เห็นด้วย
4	=	เห็นด้วย	1	=	ไม่เห็นด้วยอย่างมาก
3	=	ไม่แน่ใจ			

ประเด็นที่ 1: สื่อประสมต่างๆและรูปแบบการเรียนสอนของบทเรียน

ข้อคำถาม	5	4	3	2	1
1. ฉาก หน้าจอและสัญลักษณ์ลูกเล่นต่างๆสร้างความเร้าใจและดึงดูดความสนใจผู้เรียน					
2. รูปแบบข้อความ ตัวอักษร และพื้นหลังมีความสวยงามเหมาะสม สามารถมองเห็นและอ่านได้อย่างชัดเจน					
3. มีการแสดงหัวข้อในแต่ละหน้าเพื่อแจ้งผู้เรียนเสมอว่ากำลังอยู่ส่วนใดของบทเรียน					

ข้อคำถาม	5	4	3	2	1
4. มีการออกแบบด้านเทคนิคอย่างเหมาะสมและมีคุณภาพ เช่น ข้อความตัวอักษร รูปภาพประกอบ วิดิโอ เสียง สัญลักษณ์ลูกเล่นต่างๆ					
5. วิดิโอประกอบบทเรียนส่งเสริมการเรียนรู้และพัฒนาทักษะแก่ผู้เรียน					
6. วิดิโอประกอบบทเรียนส่งเสริมการเรียนการสอนและการฝึกทักษะของผู้เรียน					
7. น้ำเสียงของผู้บรรยายมีความชัดเจนและเข้าใจง่าย					
8. เสียงแทรกคำศัพท์และประโยคทั้งในบทเรียนและแบบฝึกหัดมีความชัดเจนและเข้าใจง่าย					
9. รูปแบบการเรียนการสอนส่งเสริมให้ผู้เรียนมีการเรียนรู้แบบมีปฏิสัมพันธ์กับคอมพิวเตอร์ จากสื่อต่างๆภายในบทเรียน					
10. รูปแบบการเรียนการสอนกระตุ้นให้ผู้เรียนกล้าฝึกฝนและแสดงออกด้วยตนเอง					
11. รูปแบบการเรียนการสอนส่งเสริมกิจกรรมการเรียนรู้ที่หลากหลาย					
12. รูปแบบการเรียนการสอนส่งเสริมและพัฒนาทักษะภาษาอังกฤษด้านการฟัง					
13. รูปแบบการเรียนการสอนส่งเสริมและพัฒนาทักษะภาษาอังกฤษด้านการพูดและการออกเสียง					

<u>ประเด็นที่ 2:</u> แบบฝึกหัดประกอบบทเรียน

ข้อคำถาม	5	4	3	2	1
14. คำชี้แจงในแบบฝึกหัดมีการอธิบายอย่างชัดเจนและเข้าใจง่าย					
15. ประกอบด้วยกิจกรรมมีความหลากหลายและน่าสนใจ					
16. สอดคล้องกับเนื้อหาและไม่ยากจนเกินไป					
17. ใช้คำศัพท์และประโยคที่เหมาะสมกับระดับความรู้ของผู้เรียน					
18. ส่งเสริมให้ผู้เรียนเรียนรู้จักแก้ปัญหาด้วยตนเอง					

ข้อคำถาม	5	4	3	2	1
19. มีการประเมินผู้เรียนทันทีหลังเสร็จสิ้นการทำแบบฝึกหัด					
20. ผู้เรียนสามารถย้อนกลับไปทบทวนเนื้อหาระหว่างทำแบบฝึกหัดและเปิดโอกาสให้ผู้เรียนแก้ไขคำตอบได้มากกว่าหนึ่งครั้ง					
21. ผู้เรียนสามารถใช้เมาส์ ชี้ คลิก หรือลาก หรือใช้คีย์บอร์ดในการทำแบบฝึกหัด					
22. ผู้เรียนสามารถสั่งพิมพ์ผลคะแนนของตนเองได้จากอุปกรณ์ต่อพ่วงคอมพิวเตอร์					

<u>ประเด็นที่ 3:</u> มุมมองและความคิดเห็นของผู้เรียนที่มีต่อการเรียนรู้การออกเสียงเน้นในภาษาอังกฤษโดยใช้

Question items	5	4	3	2	1
23. ข้าพเจ้าชอบที่การเรียนรู้การด้านออกเสียงและการเน้นเสียงภาษาอังกฤษผ่านบทเรียนคอมพิวเตอร์และสื่อประสมมากกว่าเรียนรู้จากหนังสือและตำรา					
24. ข้าพเจ้าสามารถจัดตารางเวลาเพื่อเข้าใช้บทเรียนคอมพิวเตอร์และสื่อประสมเพื่อการเรียนรู้การออกเสียงและการเน้นเสียงในภาษาอังกฤษได้ทุกเวลาตามต้องการ					
25. บทเรียนคอมพิวเตอร์สื่อประสมเพื่อการเรียนรู้การออกเสียงและการเน้นเสียงภาษาอังกฤษส่งเสริมให้ข้าพเจ้าฝึกการเรียนรู้ด้วยตนเอง					
26. ข้าพเจ้าจะกลับมาใช้บทเรียนคอมพิวเตอร์และสื่อประสมเพื่อเรียนรู้การออกเสียงและการเน้นเสียงภาษาอังกฤษอีกเมื่อต้องการทบทวนความรู้และฝึกฝนการออกเสียงภาษาอังกฤษ					
27. ข้าพเจ้าสนใจที่จะเรียนวิชาอื่นๆผ่านบทเรียนคอมพิวเตอร์สื่อประสมด้วยเช่นกัน					

<u>ส่วนที่ 3</u>

จงแสดงความคิดเห็นต่อข้อคำถามต่อไปนี้

1. นักศึกษาชอบหรือไม่ชอบอย่างไรต่อการเรียนรู้การออกเสียงเน้นในภาษาอังกฤษผ่านบทเรียนคอมพิวเตอร์และสื่อประสม จงอธิบาย

   .....

   .....

2. จงอธิบายว่าบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้ช่วยพัฒนาและปรับปรุงการออกเสียงเน้นและการออกเสียงภาษาอังกฤษของนักศึกษาอย่างไร

   .....

   .....

3. จงอธิบายข้อดีของบทเรียนคอมพิวเตอร์สื่อประสมที่มีต่อการเรียนรู้การออกเสียงเน้นในภาษาอังกฤษ

   .....

   .....

4. จงอธิบายว่านักศึกษาประสบปัญหาอะไรบ้างระหว่างการใช้บทเรียนคอมพิวเตอร์สื่อประสมเพื่อการเรียนรู้การออกเสียงเน้นในภาษาอังกฤษ

   .....

   .....

5. ในความคิดเห็นของนักศึกษา ต้องการให้มีอะไรเพิ่มเติมในบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้

   .....

   .....

6. ในความคิดเห็นของนักศึกษา ต้องการให้มีการแก้ไขอะไรบ้างในบทเรียนคอมพิวเตอร์สื่อประสมชุดนี้

   .....

   .....

7. แสดงความคิดเห็นอื่นๆตามต้องการ

   .....

   .....

ขอขอบคุณที่ให้ความร่วมมือ

APPENDIX G (2)

Questionnaire of Students' Views and Opinions towards SPMC

(English Version)

The evaluation of SPMC and views toward the use of Stress Pronunciation Multimedia Courseware (SPMC) to enhance Thai undergraduate students' pronunciation and stress in English

Part 1

Describe your personal information

Sex ❑ Male ❑ Female

Age ❑ 18 years ❑ 19 years ❑ 20 years

❑ 21 years ❑ 22 years ❑ Other ……

Program of study ……

Year of study ❑ 1st year ❑ 2nd year ❑ 3rd year ❑ 4th year

❑ Other ……

Email Address …… Telephone No. ……

Part 2

Check (✓) each item (5, 4, 3, 2, 1) according to the following rating criteria that describe your opinions toward the use of SPMC.

5	=	Strongly agree	2	=	Disagree
4	=	Agree	1	=	Strongly disagree
3	=	Uncertain			

Section 1: Multimedia and SPMC Design

Question items	5	4	3	2	1
1. Displayed screen and graphic stimulate and captivate learners					
2. Displayed screen has clear, readable text and suitable font styles, background and colors					
3. The designed pages always show title to recall learners' attention					

Question items	5	4	3	2	1
4. The courseware design uses proper technical quality for text, images, sounds, and video.					
5. The videos encourage learners' learning and skills					
6. The videos enhance tutoring and practice					
7. The tutor's voice is clear and understandable.					
8. The recorded sounds of words and sentences are clear and understandable.					
9. The instruction encourages learners' interactive learning with simulated environment.					
10. The instruction encourages learners' self-performance.					
11. The instruction accommodates multiple learning activities.					
12. The instruction enhances English listening skills.					
13. The instruction enhances English speaking and pronunciation skills.					

Section 2: The Lesson Exercise and Activity in SPMC

Question items	5	4	3	2	1
14. The directions for the exercises are clear and understandable.					
15. Exercises in SPMC include interesting activities and multiple styles.					
16. Exercises in SPMC match the contents and are not too difficult.					
17. Exercises in SPMC use the appropriate vocabulary and text for the learners' ability.					
18. Exercises in SPMC develop learners' problem solving ability.					
19. Instant feedback is available after responses.					
20. Learners are allowed to return to the lesson and correct their wrong response.					
21. The availability of multiple techniques for responding are provided (mouse to click, point, and drag)					
22. Printing out feedback (score) is available.					

Section 3: Preference View toward Using the Courseware for Learning

Question items	5	4	3	2	1
23. I prefer learning stress and pronunciation through SPMC rather than with a textbook.					
24. I can manage my schedule to use and learn via SPMC anytime anywhere.					
25. SPMC encourages me towards autonomous learning.					
26. I will return to SPMC whenever I want to review and practice pronunciation.					
27. I would like to learn other subjects using multimedia courseware.					

Part 3

Write your opinions in the following points.

1. Please discuss if you like or don't like using a multimedia courseware to learn English pronunciation and stress.
   ……
   ……
2. Please discuss how this multimedia courseware could improve your pronunciation and stress in English.
   ……
   ……
3. Please identify advantages of this multimedia courseware in enhancing your learning pronunciation and stress in English.
   ……
   ……
4. What are the problems you encounter when you use the multimedia courseware to learn English pronunciation and stress?
   ……
   ……
5. In your opinions, what should be added in this multimedia courseware?
   ……
   ……
6. In your opinion, what should be edited in this multimedia courseware?
   ……
   ……
7. Anything else you want to tell us?
   ……
   ……

Thank you very much for your cooperation.

APPENDIX H

Pre-test and Post-test Scored Results

N	Pre-test Result		Post-test Result	
	60 Points	**%**	**60 Points**	**%**
1	40	66.67	40	66.67
2	34	56.67	39	65.00
3	36	60.00	37	61.67
4	38	63.33	43	71.67
5	36	60.00	38	63.33
6	32	53.33	42	70.00
7	36	60.00	37	61.67
8	41	68.33	42	70.00
9	43	71.67	44	73.33
10	31	51.67	39	65.00
11	37	61.67	41	68.33
12	35	58.33	40	66.67
13	36	60.00	39	65.00
14	24	40.00	38	63.33
15	43	71.67	44	73.33
16	38	63.33	50	83.33
17	33	55.00	34	56.67
18	30	50.00	40	66.67
19	36	60.00	43	71.67
20	39	65.00	38	63.33
21	42	70.00	41	68.33
22	27	45.00	31	51.67
23	45	75.00	47	78.33
24	40	66.67	38	63.33
25	39	65.00	43	71.67
26	38	63.33	44	73.33
27	42	70.00	43	71.67
28	41	68.33	45	75.00
29	45	75.00	47	78.33
30	37	61.67	42	70.00
31	39	65.00	40	66.67
32	36	60.00	37	61.67
33	40	66.67	47	78.33
34	28	46.67	36	60.00
35	34	56.67	42	70.00
36	40	66.67	41	68.33
37	40	66.67	48	80.00
38	41	68.33	43	71.67
39	39	65.00	44	73.33
40	27	45.00	40	66.67
Overall Average	**36.95**	**61.58%**	**41.18**	**68.63%**
Pre-test			**Post-test**	

APPENDIX I

E_1 / E_2 Scores of Participants from Individual Testing

(3 Participants)

Unit 1	**S1**	**S2**	**S3**	**Average**	
Practice 1.1 What are these sound pattern?	5	7	5	5.67	
Practice 1.2 How many syllable are there in each word?	8	7	6	7.00	
Unit 1 exercise score (17 points)	**13**	**14**	**11**	**12.67**	E1= 74.51
Unit 1 Quiz (15 points)	**12**	**12**	**10**	**11.33**	E2= 75.56
Unit 2	**S1**	**S2**	**S3**	**Average**	
Practice 2.1: Choose the best answer	6	8	7	7.00	
Practice 2.2: Predict the primary stress and choose the correct pronunciation (1)	4	5	3	4.00	
Practice 2.3: Predict the primary stress and choose the correct pronunciation (2)	2	4	4	3.33	
Unit 2 exercise score (20 points)	**12**	**17**	**14**	**14.33**	E1= 71.67
Unit 2 Quiz (10 points)	**7**	**8**	**7**	**7.33**	E2= 73.33
Unit 3	**S1**	**S2**	**S3**	**Average**	
Practice 3.1: Complete the sentence with the providing Words	3	4	2	3.00	
Practice 3.2: Listen and choose the part of speech	3	5	3	3.67	
Unit 3 exercise score (9 points)	**6**	**9**	**5**	**6.67**	E1= 74.07
Unit 3 Quiz (10 points)	**8**	**9**	**6**	**7.67**	E2= 76.67

Note that: Student 1 (S1), Student 2 (S2). Student 3 (S3)

APPENDIX J

E_1 / E_2 Scores of Participants from Small Group Testing

(6 Participants)

Unit 1	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**Average**	
Practice 1.1 What are these sound pattern?	7	6	6	5	4	4	5.33	
Practice 1.2 How many syllable are there in each word?	9	7	10	6	10	8	8.33	
Unit 1 exercise score (17 points)	**16**	**13**	**16**	**11**	**14**	**12**	**13.67**	**E1=80.39**
Unit 1 Quiz (15 points)	**14**	**13**	**11**	**10**	**11**	**14**	**12.17**	**E2=81.11**
Unit 2	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**Average**	
Practice 2.1: Choose the best answer	8	8	7	6	6	7	7.00	
Practice 2.2: Predict the primary stress and choose the correct pronunciation (1)	4	3	5	3	4	3	4.00	
Practice 2.3: Predict the primary stress and choose the correct pronunciation (2)	5	4	5	3	4	3	4	
Unit 2 exercise score (20 points)	**17**	**15**	**17**	**13**	**13**	**15**	**15**	**E1=75.00**
Unit 2 Quiz (10 points)	**8**	**7**	**9**	**8**	**7**	**8**	**7.83**	**E2=78.33**
Unit 3	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**Average**	
Practice 3.1: Complete the sentence	4	4	3	4	2	4	3.50	
Practice 3.2: Listen and choose the part of speech	4	5	5	3	3	3	3.83	
Unit 3 exercise score (9 points)	**8**	**9**	**8**	**7**	**5**	**7**	**7.33**	**E1=81.48**
Unit 3 Quiz (10 points)	**8**	**8**	**8**	**7**	**10**	**8**	**8.17**	**E2=81.67**

Note that: Student 1 (S1), Student 2 (S2). Student 3 (S3), Student 4 (S4), Student 5 (S5). Student 6 (S6)

APPENDIX K (1)

E_1 / E_2 Scores of Participants from Field Study Testing (40 Participants)

Student	Unit 1 exercise score			Quiz (15 points)
	Practice1.1	Practice1.2	Total (17 points)	
1	5	7	12	14
2	7	9	16	13
3	7	8	15	12
4	5	9	14	12
5	5	8	13	13
6	5	7	12	13
7	5	8	13	13
8	7	9	16	14
9	5	7	12	12
10	7	8	15	12
11	4	8	12	12
12	7	8	15	13
13	5	9	14	13
14	7	8	15	13
15	7	7	14	12
16	7	7	14	13
17	7	9	16	12
18	7	9	16	13
19	7	9	16	14
20	7	8	15	14
21	7	7	14	12
22	5	7	12	12
23	5	9	14	11
24	7	7	14	11
25	4	8	12	11
26	7	8	15	13
27	7	9	16	12
28	5	8	13	13
29	4	8	12	12
30	4	9	13	12
31	5	8	13	11
32	4	7	11	9
33	5	8	13	10
34	6	8	14	13
35	7	8	15	13
36	7	7	14	12
37	5	6	11	12
38	5	7	12	13
39	5	7	12	10
40	7	8	15	14
		Average	**13.75**	**12.33**
		%	**E_1 = 80.88**	**E_2 = 82.17**

APPENDIX K (2)

E_1 / E_2 Scores of Participants from Field Study Testing

(40 Participants)

Student	Unit 2 exercise score				Quiz (10 points)
	Practice2.1	Practice2.2	Practice2.3	Total (20 points)	
1	7	4	3	**14**	**9**
2	8	3	4	**15**	**7**
3	8	5	4	**17**	**8**
4	7	3	4	**14**	**9**
5	8	5	4	**17**	**8**
6	8	4	4	**16**	**6**
7	9	5	5	**19**	**10**
8	8	5	5	**18**	**8**
9	9	2	5	**16**	**7**
10	9	5	4	**18**	**9**
11	9	4	5	**18**	**8**
12	9	5	5	**19**	**6**
13	8	4	5	**17**	**9**
14	9	4	4	**17**	**9**
15	8	5	5	**18**	**9**
16	5	3	5	**13**	**8**
17	7	4	5	**16**	**7**
18	8	5	4	**17**	**7**
19	8	4	4	**16**	**8**
20	7	5	3	**15**	**7**
21	8	2	3	**13**	**6**
22	7	4	4	**15**	**9**
23	8	5	3	**16**	**10**
24	7	3	4	**14**	**8**
25	7	5	3	**15**	**9**
26	10	4	3	**17**	**9**
27	7	4	4	**15**	**8**
28	8	5	4	**17**	**7**
29	9	4	5	**18**	**9**
30	9	3	5	**17**	**8**
31	8	4	4	**16**	**8**
32	6	3	5	**14**	**7**
33	7	4	4	**15**	**8**
34	5	5	4	**14**	**8**
35	7	4	4	**15**	**8**
36	8	4	4	**16**	**9**
37	7	3	4	**14**	**9**
38	8	3	5	**16**	**7**
39	9	5	4	**18**	**8**
40	7	4	5	**16**	**7**
			Average	**16.03**	**8.03**
			%	**E_1 = 80.13**	**E_2 = 80.25**

APPENDIX K (3)

E_1 / E_2 Scores of Participants from Field Study Testing (40 Participants)

Student	Unit 3 exercise score			Quiz (10 points)
	Practice3.1	Practice3.2	Total (20 points)	
1	4	4	8	8
2	4	5	9	9
3	4	5	9	10
4	3	3	6	9
5	4	4	8	8
6	4	3	7	8
7	4	4	8	10
8	4	5	9	9
9	4	4	8	7
10	4	5	9	10
11	4	4	8	7
12	4	5	9	7
13	4	4	8	8
14	4	3	7	7
15	2	3	5	7
16	4	3	7	8
17	4	3	7	9
18	4	4	8	6
19	4	3	7	8
20	4	3	7	8
21	4	3	7	7
22	4	3	7	7
23	4	3	7	7
24	4	3	7	9
25	3	3	6	8
26	3	3	6	8
27	4	3	7	8
28	4	3	7	8
29	3	3	6	9
30	3	3	6	9
31	3	4	7	9
32	2	4	6	10
33	4	3	7	9
34	3	3	6	9
35	5	4	9	10
36	4	3	7	8
37	4	3	7	9
38	4	4	8	5
39	4	5	9	9
40	4	4	8	9
		Average	**7.35**	**8.25**
		%	**E_1 = 81.67**	**E_2 = 82.50**

APPENDIX L (1)

E_1 / E_2 Scores of Participants from Trial Run

(40 Participants)

Student	Unit 1 exercise score			Quiz (15 points)
	Practice1.1	Practice1.2	Total (18 points)	
1	5	8	**13**	**15**
2	8	9	**17**	**14**
3	5	9	**14**	**12**
4	8	8	**16**	**14**
5	6	8	**14**	**10**
6	5	9	**14**	**10**
7	5	7	**12**	**11**
8	5	7	**12**	**11**
9	5	9	**14**	**11**
10	5	9	**14**	**10**
11	6	8	**14**	**9**
12	5	9	**14**	**11**
13	5	9	**14**	**11**
14	7	9	**16**	**11**
15	5	8	**13**	**13**
16	5	9	**14**	**11**
17	8	7	**15**	**11**
18	5	7	**12**	**12**
19	5	10	**15**	**11**
20	5	7	**12**	**11**
21	7	8	**15**	**14**
22	5	8	**13**	**13**
23	5	10	**15**	**12**
24	7	8	**15**	**11**
25	5	8	**13**	**13**
26	7	9	**16**	**12**
27	5	8	**13**	**13**
28	5	10	**15**	**13**
29	8	8	**16**	**14**
30	8	9	**17**	**13**
31	7	10	**17**	**12**
32	7	8	**15**	**13**
33	8	9	**17**	**15**
34	5	10	**15**	**14**
35	5	8	**13**	**14**
36	5	9	**14**	**13**
37	8	10	**18**	**15**
38	8	10	**18**	**14**
39	6	9	**15**	**15**
40	8	8	**16**	**13**
		Average	**14.63**	**12.38**
		%	**E_1 = 81.25**	**E_2 = 82.50**

APPENDIX L (2)

E_1 / E_2 Scores of Participants from Trial Run

(40 Participants)

Student	Unit 2 exercise score				Quiz (10 points)
	Practice2.1	Practice2.2	Practice2.3	Total (20 points)	
1	7	4	4	**15**	**8**
2	7	5	4	**16**	**8**
3	7	4	4	**15**	**8**
4	7	4	4	**15**	**8**
5	7	4	4	**15**	**8**
6	8	4	4	**16**	**7**
7	8	4	4	**16**	**7**
8	7	5	4	**16**	**10**
9	7	5	5	**17**	**9**
10	8	5	4	**17**	**10**
11	8	5	4	**17**	**8**
12	7	5	4	**16**	**7**
13	8	4	4	**16**	**8**
14	9	4	4	**17**	**10**
15	7	4	4	**15**	**9**
16	7	4	4	**15**	**9**
17	7	4	5	**16**	**9**
18	8	4	4	**16**	**8**
19	8	5	5	**18**	**10**
20	7	4	4	**15**	**8**
21	6	4	5	**15**	**8**
22	8	4	4	**16**	**7**
23	9	5	4	**18**	**8**
24	7	5	5	**17**	**8**
25	8	4	4	**16**	**7**
26	8	4	4	**16**	**8**
27	7	5	5	**17**	**9**
28	8	5	5	**18**	**9**
29	7	5	4	**16**	**7**
30	7	4	4	**15**	**7**
31	8	4	4	**16**	**7**
32	8	4	5	**17**	**8**
33	8	3	4	**15**	**7**
34	8	5	4	**17**	**9**
35	7	4	5	**16**	**7**
36	9	4	4	**17**	**8**
37	8	5	5	**18**	**9**
38	9	4	4	**17**	**8**
39	8	4	5	**17**	**8**
40	8	4	4	**16**	**9**
			Average	**16.23**	**8.18**
			%	**E_1 = 81.13**	**E_2 = 81.75**

APPENDIX L (3)

E_1 / E_2 Scores of Participants from Trial Run

(40 Participants)

Student	Unit 3 exercise score				Quiz (10 points)
	Practice3.1	Practice3.2	Practice3.3	Total (25 points)	
1	12	4	3	**19**	**9**
2	13	5	4	**22**	**8**
3	13	5	5	**23**	**8**
4	14	5	3	**22**	**7**
5	12	5	4	**21**	**9**
6	10	5	3	**18**	**8**
7	13	4	3	**20**	**7**
8	12	5	5	**22**	**7**
9	13	5	3	**21**	**7**
10	13	5	3	**21**	**8**
11	12	5	3	**20**	**6**
12	14	5	3	**22**	**9**
13	12	4	3	**19**	**7**
14	13	5	3	**21**	**9**
15	12	4	4	**20**	**8**
16	13	5	3	**21**	**9**
17	13	4	3	**20**	**8**
18	14	4	3	**21**	**8**
19	12	5	3	**20**	**10**
20	12	5	3	**20**	**7**
21	13	4	4	**21**	**10**
22	14	5	3	**22**	**10**
23	15	5	3	**23**	**10**
24	13	4	4	**21**	**8**
25	13	5	4	**22**	**10**
26	13	4	4	**21**	**10**
27	13	4	3	**20**	**8**
28	11	4	5	**20**	**9**
29	14	4	3	**21**	**9**
30	11	4	4	**19**	**8**
31	12	4	3	**19**	**8**
32	11	4	3	**18**	**7**
33	11	4	4	**19**	**8**
34	14	4	4	**22**	**10**
35	12	4	4	**20**	**8**
36	11	4	3	**18**	**7**
37	12	4	5	**21**	**8**
38	15	5	4	**24**	**8**
39	10	5	3	**18**	**7**
40	11	5	4	**20**	**8**
			Average %	**20.55** E_1 **= 82.20**	**8.25** E_2 **= 82.50**

APPENDIX M

Semi-structured Interview: Questions and Transcript (1)

Question	Interviewee 1	Interviewee 2	Interviewee 3
1. Could you introduce yourself?	My name's Miss Saychon Phetphueng. I study in Humanities and Social Sciences, English program, the first year.	I'm Pasiri Karakate. I study in Faculty of Humanities and Social Sciences in English Program of the first year.	My name is Waraporn Pinchaiyot. Faculty of Humanities and Social Sciences, English Program. The first year.
2. Have you studied about English pronunciation, and also stress in English?	Yes, I took course Phonetics last semester, but did not study about stress.	Yes, I have. I had learnt English stress in my secondary school.	Yes, I have. But I had not studied about stress before.
3. Were those from classroom, textbook, online, or…?	-	-	From classroom and the study-book.
4. Could that help you and easier to learn stress on this courseware?	Yes. The lessons on this courseware improved me to understand more on how to pronounce and make stress in English.	Yes, it could. My background of stress and pronunciation knowledge could help me to do exercises and quizzes easily.	Yes, I felt it was easier for me. I could easily guess how to pronounce words in the lesson.
5. Beside the classroom, do you study yourself about English pronunciation?	Yes, I go on Internet and Websites.	Yes. I have learnt it from English movie series and song. I watch and look at the sub-title to guess meaning and sound. Then, I check the pronunciation from dictionary.	No.
6. What about learning English songs?	-	I use a lyric to repeat the song to learn pronunciation.	-

APPENDIX M

Semi-structured Interview: Questions and Transcript (2)

Question	Interviewee 1	Interviewee 2	Interviewee 3
7. What about textbooks and paper sheet?	Yes, I use study sheet and paper of the Phonetics class.	-	-
8. What about going on Websites to learn pronunciation?	-	Yes, but not often.	-
9. What about using technology tools to study other subjects, like software program, Web-based online lessons, courseware, Websites, smart-phone and tablet application?	Never.	Umm, no. I only use some application on smart-phone to learn English phonetics and to practice out-loud reading.	Yes. Always, I go to Google site whenever I want to know anything and gain more knowledge.
10. What do you like most in SPMC, and why?	I like video clips and the story on them. It could make me more understand clearly pronunciation.	I like the tutorial description because I can both listen and read at the same time. That's very more interesting than reading only.	I like the contents, design which is colorful. Also, I like that has sound description.
11. What do you think your pronunciation has got improved after the use of SPMC?	I think I have got it little better.	Yes, I have. Particularly, I know well more about the position of word stress.	Yes, I have. I know more about stress.

APPENDIX M

Semi-structured Interview: Questions and Transcript (3)

Question	Interviewee 1	Interviewee 2	Interviewee 3
12. What do you think exercises and quizzes are too much easy or difficult for you?	They were acceptable for me. Not too easy and difficult. All of them were right from tutorial section.	I think they are not too easy and too difficult for everyone. The exercises did not make me feel uncomfortable. I love it and enjoy.	No. They were not too much easy and difficult.
13. Was the content presentation arouse and capture you to study?	Yes, the courseware was attractive me to study.	Yes, the courseware is more interesting and attractive to study than textbook.	Yes, it kept me to continue and to click next page.
14. Did you ask to know some answers in exercises and quizzes from your friend?	-	-	Yes, I sometimes did it.
15. Do you have other opinions, comments and suggestion?	Yes. It was about sound and voice. It was very light and unclear.	Sound composed should be made louder.	I want to know the answer key and explanation.

APPENDIX M

Semi-structured Interview: Questions and Transcript (4)

Question	Interviewee 4	Interviewee 5	Interviewee 6
1. Could you introduce yourself?	My name is MissSangphet Thipduanchai. I study English Program in Humanities and Social Sciences, the first year.	Hello, I'm Anuwat Sisawang, the second year of Hotel management and Tourism Industry Program, the Faculty of Management.	I'm Witchaya Saewa. I study Hotel Management and Tourism Industry.
2. Have you studied about English pronunciation, and also stress in English?	Yes. I studied in semester 1 of my first year. I didn't study at all before that time. About stress, I remember that I had learnt it also in the pronunciation class, but not much.	I have never. This is the first time of my pronunciation study.	Never
3. As you have not had background of pronunciation study, it is difficult for you to use this courseware, isn't it?	-	I don't think so. Although I didn't study about pronunciation, I learnt from my experiences. I like to listen to English sound and speak with foreigners. I learnt how to pronounce from them.	No, it was not. There were several media on the courseware that could enhance my study and to assist me to understand easily. When I saw some points I didn't understand, I asked helps from my friends and the teacher.
4. Do you think if intelligible pronunciation is important and could help you in listening comprehension when facing with foreigners?	-	Sure. It's really important I think. From my experiences, I spoke with error pronunciation or even a bit mispronunciation; they didn't understand my point at all. Sometimes I found it was difficult for me to catch the words in English of foreign people from different countries. I also asked them to speak slowly when I felt I didn't understand them.	

APPENDIX M

Semi-structured Interview: Questions and Transcript (5)

Question	Interviewee 4	Interviewee 5	Interviewee 6
5. Were those from classroom, textbook, online, or…?	-	I learnt outside classroom, for example, in museum where it provides both text and sound description.	
6. Could that help you and easier to learn stress on this courseware?	Yes, it could help me very much, particularly, knowing about phonetics. I think if I don't know Phonetics, I might not understand the phonetics symbols shown in the courseware.	-	
7. Beside the classroom, do you study yourself about English pronunciation?	Umm. No.		Yes, from TV program and English movies. I practice by focusing on listening and guessing meaning from context and the story. These really help me to improve my listening skills, but I do not often practice speaking and repeat the pronunciation.
8. What about going on Websites to learn pronunciation?	I like to go on Google when I want to search a vocabulary and the pronunciation, including anything to increase my knowledge. For example, I want to know the pronunciation of a word, I type the word spelling + pronunciation.	-	8. What about going on Websites to learn pronunciation?

APPENDIX M

Semi-structured Interview: Questions and Transcript (6)

Question	Interviewee 4	Interviewee 5	Interviewee 6
9. What about using technology tools to study other subjects, like software program, Web-based online lessons, courseware, Websites, smart-phone and tablet application?	No. Never.	I always use Google to assist my homework and when I want to translate English to Thai. I also use an application on my phone to search about vocabulary. I use it every day in school.	No.
10. What do you like most in SPMC, and why?	I like that they provide the voice model, videos, and colorful screen design.	I like the video clip that the two young students speak with English intonation. I have learnt that we shouldn't be shy to speak and use English intonation and accent.	Nearly everything, for example, feedback from exercise and quiz evaluation, being able to go back to pages before while doing exercise and quiz. I like the tutor voice and description that could encourage me to repeat them at the same time.
11. What do you think your pronunciation has got improved after the use of SPMC?	Umm. For me I think I might not have much better pronunciation. I think this courseware helps me like to review my knowledge about pronunciation and it could help me improve my pronunciation in English, especially word stress.	I know more about how to make stress.	May be, but I'm not sure myself.
12. You might see clearer after pre-test and the treatment. Do you think you could have better pronunciation in the post-test?	Yes, I could. In the post-test, I know better where on word should have stress on the syllable. I have stress pronunciation better I think.		

APPENDIX M

Semi-structured Interview: Questions and Transcript (7)

Question	Interviewee 4	Interviewee 5	Interviewee 6
13. What do you think exercises and quizzes are too much easy or difficult for you?	Umm. I think exercises and quizzes are suitable with the contents. Even I found them difficult, they should be like that.	I don't think it's difficult. It's quite easy for me.	No.
14. Was the content presentation arouse and capture you to study?	Yes. The contents and videos are understandable and arouse me to keep study.	Yes, it was really interesting and more attractive than textbook and class lecture. The design pages excited me and made me curious to click next and next.	This courseware encourages me to learn and to know more about English pronunciation.
15. Did you ask to know some answers in exercises and quizzes from your friend?	-	-	No. I tried to do exercise and quiz by myself without asking for an answer from others.
16. Do you have other opinions, comments and suggestion?	I would like this courseware to have more units and activities.	In the training, I agree that there should have a teacher to observe and direct while learners are using the courseware. Also, this courseware should have many units and contents. The sound composed need to be edited.	There was too big class and very noisy. Sometimes I couldn't hear voice in the lesson. I brought back the courseware CD and opened it to share with my roommates. They very like and are interested in lessons on the courseware. They also want to know how to produce this courseware.

CURRICULUM VITAE

Ms. Wichura Winaitham was born on June 30, 1978 in Phitsanulok. She graduated with Bachelor's Degree (B.A.) and Master's Degree (M.A.) in English from the Faculty of Humanities and Social Sciences, Naresuan University in 1999 (B.A) and in 2002 (M.A.). She has been worked as an English lecturer at Phitsanulok Vocational College in 2001, Phitsanulok Technical College in 2001 to 2003, and Kamphaeng Phet Rajabhat University from 2003 until the present day. In 2007, she continued to study further in the School of Foreign Language, Institute of Social Technology, Suranaree University of Technology for a Ph.D. degree in English Language Studies (ELS). Her research interests include instructional design, technology for education and English pronunciation.