THE EFFECT OF COMPUTER ASSISTED PRONUNCIATION LEARNING PROGRAM ON THAI COLLEGE STUDENTS' PRONUNCIATION PERFORMANCE AND AUTONOMOUS LEARNING CAPACITY

Narathip Thumawongsa

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Narathip Thumawongsa

Graduate School of Language and Communication

Associate Professor.....Advisor

(Kanyarat Getkham, Ph.D.)

The Examining Committee Approved This Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy (Language and Communication).

Assistant Professor.....Committee Chairperson

(Saksit Saengboon, Ph.D.)

Associate Professor.....Committee

(Kanyarat Getkham, Ph.D.)

Assistant Professor.....Committee

(Nongnuch Sriussadaporn, Ph.D.)

Assistant Professor.....Dean

(Saksit Saengboon, Ph.D.)

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ABSTRACT

Title of Dissertation	The Effect of Computer Assisted Pronunciation Learning Program on Thai College Students' Pronunciation Performance and Autonomous Learning Capacity
Author	Mr. Narathip Thumawongsa
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The purpose of this study is to investigate the effect of the computer assisted pronunciation learning (CAPL) program on Thai college students' English pronunciation performance and autonomous learning capacity. Some quantitative and qualitative techniques were applied. Forty nine Srinakharinwirot university students who enrolled in English Phonetics were randomly divided into experimental and control groups. Students in the experimental group studied pronunciation by the integration of the traditional teaching style and the CAPL program, while students in the control group learned pronunciation by the traditional teaching style only.

An independent sample *t*-test was utilized to tabulate the significant differences in pronunciation performance between the two groups. Pair samples *t*-test was used to find significant difference in students' attitudes toward the CAPL program and autonomous learning capacity. Multiple regressions were used to find the factors affecting students' attitudes toward the CAPL program. Some content analysis techniques were utilized to analyze the data of the semi-structured interview and students' journal entries.

The results show that at the end of the semester, students in the experimental group attained higher scores on the pronunciation proficiency test than students in the control group, and students in the experimental group held more positive attitudes toward the CAPL program and gained higher autonomous learning capacity. Gender is the only factor affecting students' attitudes towards the CAPL program.

The key finding of this study is that learning pronunciation by integration of the traditional teaching style and CAPL program can highly enhance pronunciation performance and autonomous learning capacity of Thai university students.

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ABBREVIATIONS

Abbreviations	Equivalence
AEC	ASEAN Economic Community
AG	Advanced Grammar
ALM	Audio-Lingual Method
ASR	Automatic Speech Recognition
ATALL	Autonomous Technology-Assisted Language Learning
CAI	Computer Assisted Instruction
CAL	Computer Assisted Learning
CAMP	Computer-Assisted Musical Pronunciation
CAPL	Computer Assisted Pronunciation Learning
CAPT	Computer Assisted Pronunciation Training
CALL	Computer Assisted Language Learning
CLT	Communicative Language Teaching
CMC	Computer-Mediated Communication
COPI	Computerized Oral Proficiency Instrument
CPR	Cued Pronunciation Readings
EFL	English as a Foreign Language
ESL	English as a Second Language
FLL	Foreign Language Learning
ICT	Information and Communication Technology
IHL	Institutions of Higher Learning
IPA	International Phonetic Alphabet
MATE	Multimedia Assisted Test of English Speaking
NA	Natural Approach
PBL	Project-Based Learning
PFA	Phonetic Flash Animation

Abbreviations	Equivalence
SCT	Sociocultural Theory
SLA	Second Language Acquisition
SOPI	Simulated Oral Proficiency Interview
TEFL	Teaching English as Foreign Language
ZPD	Zone of Proximal Development

CHAPTER 1

INTRODUCTION

In this study the researcher aims to investigate the effects of a Computer Assisted Pronunciation Learning (CAPL) program on the English pronunciation performance and autonomous learning capacity of Thai college students. The ASEAN Economic Community (AEC), which will come into being on the 1st of January 2015, will use English as the international language in order to facilitate communication and thus strengthen economic development among its members. Thailand is one of various countries that realize the importance of learning English. According to the Thai educational curriculum, all four skills (i.e., listening, speaking, reading, and writing) of English proficiency should be developed. Unfortunately, it has been discovered that English pronunciation has been viewed as the least important skill which learners need to acquire after writing and reading skills (Biyaem, 1997). In addition, the realization of the importance of English communication in the soon-to-be-founded AEC has resulted in a change of focus in the English learning strategy from reading and writing to listening and speaking. This is perhaps related to the fact that the basic means of human communication is oral; therefore the importance of pronunciation should be equally emphasized, similar to other language skills in Teaching English as Foreign Language (TEFL). As Wong (1987) stated, even when a non-native speaker's vocabulary and grammar are excellent, if their pronunciation falls below a certain threshold, they will be unable to communicate effectively. Hence, English pronunciation teaching has begun to be considered a vital skill for effective communication in English. Moreover, Morley (1991) highlighted the importance of teaching English pronunciation in an English foreign language classroom; and Scarcella and Oxford (1994) also stated that English pronunciation teaching should be instructed in all foreign language classes through a variety of activities. As a result of this need in the classroom, instructional technology has been developed to fill the demand for a variety of activities for pronunciation teaching such as multimedia and CAPL programs. There are generally three pronunciation teaching

methods that integrate technology into pronunciation instruction: the intuitive-imitative approach, the analytic-linguistic approach, and the integrative approach (Celce-Murcia, 1996). These methods combine conventional instruction and advanced technology. In the intuitive-imitative approach, students listen and imitate the target language's sounds and intonation but do not receive any explicit guidance, and the technology used in this method could be either a computer-based program or web-based learning. In the analytic-linguistic approach, the phonological knowledge of the target language is explicitly instructed to students through the International Phonetic Alphabet (IPA), place and manner of articulation, and vocal charts are used. The technology used in this method could be an interactive speech program or web-based (Lee, 2008). The current most practiced method of pronunciation teaching is the integrative approach in which communication is an ultimate goal of language learning. Thus, pronunciation is a key element and not treated as an isolated part or sub-skill. In this method, students are taught and practice the target language with meaningful task-based exercises. Listening activities are a main element of pronunciation learning since they focus mainly on prosody level (e.g., stress, rhythm, and intonation) which extends beyond segmental level. In the integrative approach method, pronunciation learning is based on the particular needs of each student (Lee, 2008). Moreover, Morley (1994) proposed a dual-focused oral communication program to teach pronunciation which emphasizes both the micro and macro level. In the micro level, students are taught phonological knowledge by practicing both segmental and suprasegmental elements. In the macro level, pronunciation learning focuses on communicative competence in which students are taught to be able to use language to communicate appropriately in a range of situations. The dual-focused oral communication method focuses on developing student's intelligibility and assists them in communicating the target language effectively and appropriately.

1.1 Background of the Study

In Thailand, CAPL can be viewed as an ultimate solution for Thai English teachers for a number of reasons. Firstly, pronunciation teaching is viewed as a significant area of difficultly (as discussed below). Due to the fact that Thai English teachers are not English native speakers, they might not be able to pronounce all

English sounds adequately. Moreover, the nature of the typical Thai classroom is that it includes a large number of students within the one classroom. It is difficult for English teachers to deliver pronunciation corrections to all students during a sound production lesson. The learners' difficulties in learning English pronunciation in Thailand are listed by Biyaem (1997) as: (1) the interference from mother tongue (Thai) in pronunciation, syntax and idiomatic usage; (2) unchallenging English lessons; (3) being treated as passive learners; (4) lack of opportunity to utilize English in learners' daily lives; and (5) lack of confidence to speak English with classmates.

In addition, Foley (2005) reported that the factors limiting the success of learning and teaching English in Thailand are lack of proper curricula, dry teaching style that overemphasized grammatical details, students, learning media, inappropriate text, and testing and evaluation. Thus, it could be postulated that a CAPL program could play a major role in assisting the pronunciation learning of EFL students. The CAPL instruction is mainly used for two purposes: (1) analyzing the deviation of L2 students' pronunciation, and (2) assisting them to minimize and eliminate their deviation (Najmi & Bernstein, 1996; Kawai & Hirose, 1997; Machovikov, Stolyarov, Chernov, Sinclair, & Machovikova, 2002, as cited in Abu Seileek, 2007). Furthermore, it has been mentioned by many researchers such as Hua (2006, as cited in Hismanoglu, 2011) that the technology available currently allows automatic speech processing to be integrated into pronunciation teaching. Moreover, there are many studies that report the benefits of CAPL software (e.g., Molholt, 1988; 1990; Harless, Zier, & Duncan, 1999; Holland, Kaplan, & Sabol, 1999; Kaplan, Sabol, Wisher, & Seidel, 1998; LaRocca, Morgan, & Bellinger, 1999; Eskenazi, 1999a, 1999b; Neri, Strik, & Boves, 2002; Butler-Pascoe, & Wiburg, 2003; Kim, 2006, as cited in Hismanoglu, 2011). Furthermore, Hismanoglu (2011) also reported the advantages of CAPL as being tireless and non-judgmental. Tireless means CAPL programs can assist language learners on unlimited occasions, learners can practice any part of the teaching materials at any time, and the system can offer other assistance as language learners require it. It is also believed that CAPL programs can enhance learner-centeredness as they allow language learners to study based on their own judgment, such as when selecting which function to learn first, and providing unlimited opportunities regarding how often they utilize it. Not only language learners are able

to obtain benefits from a CAPL program, but also teachers can gain benefits from employing a CAPL program in their pronunciation classes, as it can provide automatic and unlimited drill and practice for language learners. Drill and pronunciation practice in conventional classes are viewed by teachers as tiresome and time consuming. Pennington (1999, as cited in Hismanoglu, 2011) also added that CAPL enhances the collaborative learning environment by allowing language learners to learn in a whole class, small group, and pair group. Furthermore, it was reported that computer assisted pronunciation instruction could provide benefits that the conventional teaching class could not offer. Neri, Cucchiarini and Strik (2002) mentioned that each student who learns pronunciation from computer assisted pronunciation instruction is allowed to receive unlimited and realistic L2 input from various channels, and CAPL could deliver individual feedback immediately after students produce L2 speech production, whereas the opportunities for being exposed to L2 input under the conventional teaching style are limited to classroom only. LaRocca (1994) also reported that in the conventional class, students could not repeatedly utilize prerecorded L2 speech models in the CAPL program, which could provide high quality target visual and audio clips. Hence, students with access to a CAPL program could visualize the movement of correctly articulated speech production, whereas students in the conventional class could not have this type of opportunity.

Furthermore, utilizing a CAPL program in the EFL classroom could also enhance the autonomous learning capacity of EFL students. Pu (2009) reported that student autonomy is significantly increased under the instruction of a web-based Computer Assisted Language Learning (CALL) environment. Because CALL instruction is designed based on student-centeredness and independence, it could provide a rich environment where students are allowed to control their language study in an effective way. Furthermore, Deci and Ryan (1985, as cited in Pu, 2009) also reported that learning language by utilizing CALL could supply beneficial language input, and a CALL program could allow students to control their own language learning pace, goal, speed, behavior, and strategy instead of being required to study the same material at the same time and speed as in conventional instruction. As a result, the autonomous learning capacity of students is activated and increased.

Furthermore, once autonomous learning capacity is activated, it is expected that students could improve their language skills, especially pronunciation skill more effectively (Pu, 2009). Tuncok (2010) also reported the benefits of CALL in developing autonomous learning capacity. CALL allows students to engage in their language learning process by managing their learning based on their deficiencies and desires. It also allows them to learn language independently. Students are able to define their own language learning goals, decide to utilize learning materials at their own pace, and receive feedback to readjust their learning process according to correction and feedback provided from CALL. Thus, it assists students in learning the target language autonomously.

Furthermore, it is important for teachers to understand the attitudes of their students (Mager, 1984, as cited in Chiu, 2003). Human behaviors are influenced by attitudes, therefore comprehending the theory of attitude and its progression is vital (Craig & Norris, 1991), and learning results are influenced by learners' attitudes (Chiu, 2003). Min (1998, as cited in Chiu, 2003) believed that a positive and strong attitude could restore and preserve the target language in the long-term memory, whereas negative and weak attitudes could lead to deterioration and decease in recall of the target language. Thus, examining students' attitudes toward the new technology used in pronunciation instruction is vital. Moreover, Tuncok (2010) reported that students' demographic information such as age, gender, education, and CALL experiences affect their attitudes toward the CALL program. In addition to investigating students' attitudes toward CAPL programs, factors affecting students' attitudes toward CAPL programs will also be investigated.

1.2 Statement of the Problem

Numerous researchers have investigated the advantages of CAPL, including being tireless, and non-judgmental. However, little is known about its effectiveness in terms of its enhancement to improve language learners' pronunciation performance, especially in a Thai college context. Moreover, Thai pronunciation scholars such as Janyasupab (1981), Chunsuvimol and Ronnakiat (2000), and Yangklang (2006) tried to improve only single English sound elements by utilizing CAPL programs they

themselves had designed. Thus, the problem of English pronunciation learning for Thai students probably has not been solved, as correcting only one sound could not help Thai students to acquire intelligibility and native-speaker-like pronunciation. Moreover, current research has provided insufficient empirical evidence about the influence of CAPL towards autonomous learning capacity of Thai students in pronunciation learning, as language scholars tend to focus on overall language proficiency instead of concentrating on pronunciation skills where autonomous learning capacity is required. Furthermore, it is believed that attitudes can affect a student's performance, cognition, emotion and proficiency when they learn with a computer or using CALL (Chiu, 2003). Attitudes toward CAPL could be either positive or negative, and they could produce a great impact toward further usage of CAPL programs. Negative attitudes to CAPL programs may detract from computer effectiveness (Wu, 1997). Furthermore, there are some student's factors that affect their attitudes toward CAPL program as reported by Tuncok (2010).

Hence, examining students' pronunciation performance, autonomous learning capacity, attitudes toward the utilization of CAPL programs, and factors affecting attitudes toward the utilization of CAPL programs could be vital in order to acknowledge the relationship between a CAPL program and learning English pronunciation of Thai students.

1.3 Purposes of the Study

The study aims to investigate

1) whether or not difference exist between experimental and control groups in pronunciation performance.

2) the attitudes of Thai college students toward the utilization of a CAPL programs.

3) whether or not a CAPL programs could enhance autonomous learning capacity of Thai college students in learning English pronunciation.

4) whether or not age, gender, major of study, years of studying English, and CALL experiences could affect Thai college students' attitudes toward CAPL programs in the experimental group.

1.4 Significance of the Study

It is hoped that the utilization of a CAPL program could assist Thai college students in overcoming their English pronunciation problems, and assist them to acquire intelligibility and attain a near native-speaker-like accent. Moreover, it is also expected that the use of a CAPL program could activate autonomous learning capacity of Thai college students and encourage them to manage their English pronunciation learning according to their needs and level. Lastly, it is believed that a positive attitude toward CAPL program could produce positive outcomes in pronunciation learning. Thus, investigating its enhancement in terms of pronunciation performance, autonomous learning capacity, students' attitudes toward the use of a CAPL program, and investigating factors affecting students attitudes toward the use of a CAPL program will shed light on how the program should be used by language teachers and software developers. The findings could assist these professionals in developing suitable pedagogy and tools to enhance learners' language outcomes, and might help software developers plan and design suitable programs to assist pronunciation learning. Moreover, the findings from this study might promote the idea of utilizing CAPL in pronunciation classes in the Thai college context and assist Thai English teachers in being successful in teaching English pronunciation.

1.5 Hypotheses

Based on the four aforementioned purposes, the hypotheses are proposed as follows:

H_1 1: Students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will gain higher pronunciation scores than those learning using only a conventional teaching style.

H_1 2: Students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will have higher positive attitudes toward CAPL programs after utilizing computer-assisted pronunciation learning programs.

H_1 3: Students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will gain higher autonomous learning capacity after utilizing CAPL programs.

H_1 4: Age, gender, major of study, years of studying English, and CALL experiences will affect students' attitudes toward CAPL programs in the experimental group.

1.6 Research Questions

RQ1: Is there any significant difference in performance between students who learn pronunciation by the integration of the conventional teaching style and CAPL programs and students who learn pronunciation by the conventional teaching style alone?

RQ2: Is there any significant difference in attitudes of students who learn pronunciation by the integration of the conventional teaching style and CAPL programs while, before and after utilizing CAPL programs?

RQ3: Is there any significant difference in the autonomous learning capacity of students who learn pronunciation by the integration of the conventional teaching style and CAPL programs while, before and after utilizing CAPL programs?

RQ4: Can age, gender, major of study, years of studying English, and CALL experiences affect students' attitudes in the experimental group toward CAPL programs?

1.7 Definition of Terms

1) Attitude — The attitude of the students studying in English Phonetics (EN291) in the experimental group at Srinakharinwirot University
2) Computer Assisted Pronunciation Learning (CAPL) programs — "Speexx" and Phonetics Flash Animation Project from the University of Iowa (http://www.uiowa.edu/~acadtech/phonetics/)
3) Oral test — Oral proficiency test of a "Speexx" program
4) Performance — Students' pronunciation scores of English consonant sounds in the course of English Phonetics (EN291) at Srinakharinwirot University

5) Autonomous learning capacity
The capacity to control and manage pronunciation learning process of students enrolled in English Phonetics (EN291) in the experimental group at Srinakharinwirot University

6) Feedback Pronunciation score from ‘Speexx’ program.

1.8 Assumptions

The assumptions of this study are as follows:

1) It is assumed that participants of this study will respond honestly and accurately to the questionnaire.

2) It is assumed that participants of this study will take the oral test and respond to it honestly and accurately.

CHAPTER 2

REVIEW OF THE LITERATURE

The CAPL's effectiveness in terms of its enhancement of students' pronunciation performance, autonomous learning capacity, and attitudes toward the use of CAPL among Thai university students are investigated in this study. The related theories and research of language learning such as constructivism, and autonomous learning are firstly reviewed. Furthermore, English pronunciation learning, CAPL, and attitudes toward language learning, computers, and CAPL are also reviewed to provide a theoretical framework for this study.

2.1 Theoretical Framework of Language Learning

2.1.1 Modes of Instructional Design

The learning theories and instructional systems are connected in order to establish the instructional design process (Moallem, 2001). The major paradigms of instructional design are constructivism and autonomous learning. The constructivist or interpretive instructional design model is the model that is commonly used as instructional design models and principles (Moallem, 2001). The constructivist instructional design model is derived from cognitive science and constructivism. In spite of some differences among the instructional design models, the constructivist instructional design models demand that the teacher specify the prior knowledge of learners, both general and specific learning output, strategies of instruction and assessment, and procedures of evaluation (Lee, 2008).

2.1.1.1 Constructivism

The Constructivist learning theory states that "the child, at first directly assimilating the external environment to his own activity, later, in order to extend this assimilation, forms an increasing number of schemata which are both more mobile and better able to intercoordinate" (Piaget, 1955, p. 25). The learning theory of

constructivism is based on the study of cognitive development, such as how thinking and knowledge are developed with age, by psychologists Jean Piaget and Lev Vygotsky. The study of cognitive development by both Piaget and Vygotsky can be considered as the foundation for the psychological theory of constructivism. It is the belief of constructivists that children develop knowledge by actively participating in their learning. Piaget believed that cognitive development was a product of the human mind "achieved through observation and experimentation, whereas Vygotsky viewed it as a social process, achieved through interaction with more knowledgeable members of the culture" (Rummel, 2008, p. 80). Piaget's work is considered as "cognitive" constructivism (Chambliss, 1996). Piaget's theory consists of two major elements which are ages and stages. According to Piaget, "these elements help to predict what children can and cannot understand at different ages" (Rummel, 2008, p. 80). Piaget's theory of development is the major foundation for cognitive constructivist approaches to teaching and learning (Weegar & Pacis, 2012). Piaget's theory of cognitive development claims that humans are not able to automatically understand and utilize information that they are just given, because they need to construct their own knowledge from previous personal experiences. This construction of knowledge will enable humans to create mental images. Thus, the main duty of the teacher is to motivate his/her students to create their own knowledge from their personal experiences (Rummel, 2008).

On the other hand, Vygotsky preferred to call his work "social" constructivism. Vygotsky's theory makes the same assumptions of Piaget on how children learn, but Vygotsky focused on the social context of learning. In Piaget's theory, the teacher's role was limited, while Vygotsky emphasized the role of the teacher in learning. In a constructivist setting, the learning activities are based on active engagement, inquiry, problem solving, and collaboration with others. The teacher acts as a guide, facilitator, and co-explorer who stimulates learners to ask questions, challenge, and create their own ideas, opinions, and conclusions rather than being a dispenser of knowledge.

One of Vygotsky's theories that has greatly influenced language education nowadays is the Sociocultural Theory (SCT), which focuses on human mental functioning. The human mind consists of a lower-level neurobiological base

and higher-order mental functions, and humans can manage their biology by utilizing their higher-order mental functioning through the interaction with cultural tools such as "language, literacy, numeracy, categorization, rationality, and logic" (Lantolf & Thorne, 2006, p. 198). The SCT theorists believe that human mental functioning is basically developed in the mediated process (Ratner, 2002). This mentioned mediated process is managed by cultural artifacts, activities, and concepts. Humans learn to utilize cultural artifacts, and their developmental processes are constructed by taking part in a cultural, linguistic and historical setting. The examples of these settings are family, friends, school, workplace, etc. The basic mediums of mediation are language use, organization, and structure. The concept of mediation is that humans do not directly interact to the world, but "their cognitive and material activities are mediated by symbolic artifacts (such as languages, literacy, numeracy, concepts, and forms of logic and rationality) as well as by material artifacts and technologies" (Lantolf & Thorne, 2006, p. 216).

Regulation is one type of mediation. The concept of regulation is about how children construct knowledge. There are three stages that children develop their self-regulation. The first stage is object-regulation, where children are controlled by object(s). The second stage is other-regulation, which includes explicit and implicit mediation by parents, brother or sister, friends, teachers, etc. Self-regulation is the final stage. At this stage, children are able to perform activity and successfully by themselves with no or minimal assistance by others. Children can reach this stage, when they could develop the internalization, which is the process of changing what used to be external assistance into an internal resource for individuals, for instance, in order to be a skillful speaker of a language, speakers are required to be self-regulated (Lantolf & Thorne, 2006). Nonetheless, the condition of self-regulation is not durable. Even native speakers are required to revisit the stages of object or other-regulation, while they are faced with stressful situations. They might produce a language of ungrammatical and irrelevant conversations (Frawley, 1997).

To conclude what Vygotsky proposed regarding integrated psychology, there are some biological components in humans' minds which shape the foundation of the human thought system. Notwithstanding, these mentioned components could not cause the establishment of capability to "voluntarily and intentionally regulate our

mental activity" (Lantolf & Thorne, 2006, p. 202). But humans could succeed in acquiring this mentioned capability from the process of internalization, which is culturally constructed by the mediation of artifacts, especially language.

Another concept from Vygotsky that has influenced EFL and ESL learning is the zone of proximal development (ZPD) which was utilized in numerous areas of study such as psychology, teaching and learning, and applied linguistics. The zone of proximal development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). There are many reasons the ZPD has gained interest from many education scholars. First, the ZDP leads to the notion of assisted performance which is the main interest of Vygotsky's study. Second, it could predict the potential level of student's development after receiving the assistance from adults or the collaboration from friends. It is more valuable than ordinary measurement, which can report only the level of obtained attainment. In other words, the ZPD can deliver both potential and actual levels of student development (Lantolf & Thorne, 2006). The ZPD is developed from the notion of Vygotsky's genetic law of cultural development from Vygotsky (1978, p. 57) who mentioned that

> Any function in the child's cultural development appears twice, or on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts, and the development of volition. . . It goes without saying that internalization transforms the process itself and changes its structure and functions. Social relations or relations among people genetically underlie all higher functions and their relationships.

In sum, Vygotsky truly believed that "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (1978, p. 88). He found the complex effects of school education on students' cognitive development. School education produces sociocultural and institutional learning activities that cause participation among students and teachers. The vital finding found by Vygotsky is that collaborative learning in school context with peers and teachers could lead to educational development. The correlation between studying and development is not basically direct. It requires a well-designed learning setting that can enhance students' development. In this sense, the ZPD is a teaching or ideational tool that the teacher could utilize in order to enhance their students' performances that are in the beginning levels of maturation (Lantolf & Thorne, 2006).

Zheng (n.d.) mentioned the three different teaching styles that are taught by utilizing the mediation of artifacts such as teachers and peers in order to enhance the zone of proximal development of students.

1) Reciprocal teaching – both teachers and students learn and practice together in four skills, which are summarizing, questioning, clarifying, and predicting. The role of the teacher will be reduced accordingly.

2) Scaffolding - more advanced friends or teachers arrange some structured assignments; therefore students can carve out structured assignments successfully.

3) Collaborative learning – students should have different levels of ability in one class; hence students with more advanced ability could assist lower ability students to improve their ZPD.

Moreover, constructivism "is the philosophy, or belief, that learners create their own knowledge based on interactions with their environment including their interactions with other people" (Draper, 2002, p. 522). Constructivists view learning as the process of interpretation, recursion, and creation in which active learners interrelate themselves with the physical and social world (Fosnot, 1996). It is reported that constructivism has been proven successful in helping teachers confront the challenge of enhancing student accomplishment. "Assuming the role as 'guide on the side' requires teachers to step off the stage, relinquish some of their power, and

release textbooks to allow their students to be actively engaged and take some responsibility in their own learning" (White-Clark, DiCarlo, & Gilchriest, 2008, p. 44). When learning by applying a constructivist approach, teachers instruct students by utilizing cooperative learning, experimentation, and open-ended problems in which students are able to actively participate in the learning process with concepts and principles (Kearsley, 1994). Teachers who believe in the constructivist theory focus on demonstrating to students with relevance and meaningful lessons. For example, teachers present realistically complex and meaningful problems for students to search for solutions in the constructivist classroom. Students would learn in cooperative groups to find possible answers, establish a product, and demonstrate findings to a selected audience (Carbonell, 2004). "Cooperative learning, hands on activities, discovery learning, differentiated instruction, technology, distributed practice, critical thinking, and manipulation are elements that embrace the constructivist educational philosophy" (White-Clark, et al., 2008, p. 41). In sum, the constructivists believe that learning is a search for meaning, knowledge is constructed by the learner, and that the learner develops her/his own understanding through experience (Weegar & Pacis, 2012).

Several studies were conducted from the perspective of constructivism. Can (2009) undertook a study to teach English language through online tools such as Microworlds and Hypermedia. He concluded that a constructivist approach employing constructivist learning principles and utilizing online learning might have positive results in terms of developing learners' language skills, communicative skills, and fostering language learners' autonomy. Mojica-Dıaz and Sanchez-Lopez (2010) proposed that advanced grammar (AG) teaching at the university level should be done from the perspective of constructivism. They believed that normally AG teaching still focused on form rather than function and meaning. But they proposed that the study of AG should be based on completely authentic texts and follow the constructivist approach to grammar learning which allows language learners to unite in a process of discovery. This process allows language learners to actively participate by developing and testing hypotheses concerning the function and meaning of grammatical structures in a given context. Mvududu and Thiel-Burgess (2012) explored how the theory of constructivism may benefit English language learning students in an

inclusive classroom. The findings show that integrating the theory of constructivism into an inclusive language classroom could assist language teachers in developing material relevant for students who are culturally and linguistically different. They also concluded that building on previous knowledge, developing relevant material, and involving active thinking are essential to both constructivism and instruction for English language learners. These elements could potentially be a device to assist language learners to be successful in an inclusive classroom environment.

2.1.1.2 Learner Autonomy

In 1979, the concept of learner autonomy emerged and came to prominence. This concept came from Henri Holec who authored the text, Autonomy and Foreign Language Learning (Little, 1991). Holec (1981, p. 3) defined the term learner autonomy as the "ability to take charge of one's own learning, and this ability is not inborn, but must be acquired either by natural means or (as most often happens) by formal learning, i.e. in a systematic, deliberate way. To take charge of one's learning is to have […] the responsibility for all the decisions concerning all aspects of this learning […]". Holec's work in 1981 influenced the work of the Council of Europe in adult education as it searched to promote learner freedom by establishing ways to assist language learners to learn more responsibly how to handle the affairs of the society in which he/she lives (Little, 1991).

Moreover, Littlewood (1996, p. 428, 431) proposed the framework of fostering autonomy into EFL. This framework is viewed as a coordinated strategy for EFL methodology to enhance the autonomy of a foreign language learner. He mentioned that "since the over-arching goal of all teaching is to help learners act more independently within a chosen range of domains, an appropriate methodology in language teaching is also, by definition, a methodology for furthering (or fostering) autonomy". And he continues that "one of our tasks as language educators is to develop strategies for helping learners to make choices at ever higher levels, and these strategies will constitute our methodology for developing autonomy in and through foreign language learning".

A framework for developing autonomy in foreign language learning

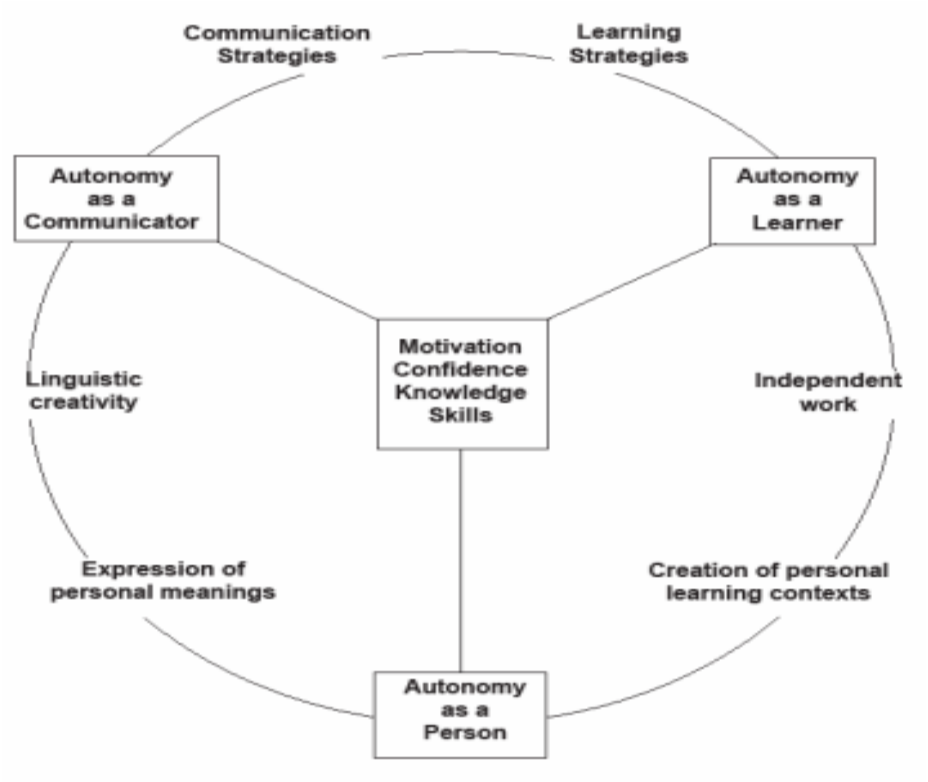


Figure 2.1 A Framework for Developing Autonomy in Foreign Language Learning
Source: Littlewood, 1996, p. 432.

Littlewood (1996, p. 431) mentioned that his framework can be utilized as a basis for a coordinated strategy. He suggested that his framework can assist language learners "for providing students with opportunities to develop the knowledge, skill, motivation, and confidence for autonomy in relevant domains, and to become increasingly independent communicators, learners and individuals". According to Littlewood (1996), the capacity of autonomous learners to make his/her own choices depends on two important elements, which are ability and willingness. First, ability is to use the knowledge to select alternative choices that are available, and it is also the skill to handle these choices. Second, willingness is the motivation and confidence of the learner to take charge of the required choices. He also believed that learners could be successful in learning by performing autonomously when the knowledge, skill, motivation, and confidence of the learners are presented together. Thus, the center of this framework consists of knowledge, skill, motivation, and confidence. The three domains of autonomy consist of the communicator, learner, and

person who are connected via the circle. The major factors in fostering learners to make choices are the ability to communicate and to learn independently. These factors are also conducive to each learner's autonomy as an individual. Each of three domains incorporates abilities which are placed on the left and right hand side of each domain. For instance, autonomy as a learner incorporates both the ability to participate in independent learning and the ability to utilize suitable learning strategies. A teacher has to make his/her own judgment to select the most suitable methodology to assist the learners to practice their capacity in order to be autonomous. It is also believed that knowledgeable groups could be involved in the process of choosing the appropriate methodologies, but these groups would be considered as advanced.

In formal educational contexts, learner autonomy involves planning, implementing, monitoring and evaluating language learning. Since learning language relies on language use, the boundary of learner autonomy depends on what language learners can perform in the target language (Little, 1991). There are three principles of learner autonomy pedagogy:

1) Learner involvement – encouraging language learners to take responsibility for the learning process in order to establish affective and metacognitive dimensions

2) Learner reflection – assisting language learners to think critically when they participate in planning, monitoring and evaluating their language learning in order to establish metacognitive dimensions

3) Appropriate target language use – utilizing the target language as a means of language learning in order to establish communicative and metacognitive dimensions

Paracha, Mohamad, Jehanzeb, and Yoshie (2009) noted that learner autonomy has been an area of interest to researchers for almost two decades. Learner autonomy is also considered a pre-requisite of creating productive learning. Learner autonomy could promote sustained learning in order to achieve long-term success (Little, 1995). Holec (1981) said that learner autonomy will enable language learners to take greater control over the content and methods of language learning. This kind of ability will gradually be developed by language learners when they realize their responsibility toward foreign language learning. Language learners will develop their

own ability to be able to make decisions on what tools and resources to use in their language learning.

Benson (2001, p. 136) mentioned that "there has always been a perceived relationship between educational technology and learner autonomy. This is taking educational technology in its broadest sense and taking learner autonomy as the superordinate term". He also said that CALL is often suggested as a universal solution for fostering autonomy through language learning, and CALL is also praised for equipping access to huge quantities of learning materials and interactive opportunities for language learners. The key aspect of success might be pedagogical input such as how it is used (Benson, 1991). Thus, it is worthwhile to incorporate CALL into the language learning classroom, as CALL is perceived as a tool to promote autonomy and improve language learning. The potential of CALL as a tool in language learning is due to its capacity to be integrated in the process of fostering autonomy and learning language, and because CALL could provide endless chances for choices and the act of control (Rousseau, 2008). Beginning in the 1980's, integrative CALL has come to play a large role in language teaching. Bax (2003) stated that the use of multimedia and the Internet could offer authentic learning material. The main focus is the learners as the "agency". This idea implies that constructivism has played a major role in developing learning theory. Moreover, Benson (2001) mentioned that utilizing integrative CALL into the language classroom could promote autonomous learners. He also said that integrative application could stimulate exploratory learning and learner control. These kinds of applications, such as the Internet, could create unlimited opportunities for self-directed access to a wide range of authentic learning material. The Internet also promotes collaborative learning, learner control over communication, process writing, and a real-world audience. He claimed that these applications could support the development of autonomy when it is integrated into the language classroom, as the Internet or integrative CALL enables and provides rich input by presenting new language lessons through various kinds of media activities, and by providing branching options. From the above information, it could be implied that integrative CALL can enhance autonomy development further and enhancing language-learning effectiveness. There are many studies that explore and investigate the integrative CALL effectiveness in terms of fostering autonomy in language

learning. For instance, Autonomous Technology-Assisted Language Learning (ATALL) was invented to assist foreign language learning with the concept of leaner autonomy to enhance the effectiveness of second and foreign language learning. Paracha, Mohamad, Jehanzeb, and Yoshie (2009) defined ATALL as: (1) the development and utilization of technological devices to assist foreign language (FL) or second language (L2) learning, and (2) research on the development, use, and effects of technological devices for language teaching and learning. Hence, ATALL could be utilized by second and foreign language learners in formal language learning contexts or by those who are not taking English lessons. Moreover, ATALL could be considered as an integrated device for the language learning classroom or supplemental activities outside the language classroom. The term "autonomous" could also be viewed as the tools that are widely available (such as via the World Wide Web) at no or low cost (Dias, 2000). ATALL consists of all forms of electronic and information technology (IT) that can be facilitated in second and foreign language learning. This ATALL idea includes the computer and Internet technology as well as other forms of information and communication technology (ICT) such as wired and wireless telephone, television and radio (broadcast, satellite and cable). In addition, Kessler and Bikowski (2010) also reported the nature of individual and group behavior when attending to meaning in a long-term wiki-based collaborative activity, and the students' collaborative autonomous language learning abilities. The results show that integrative CALL could benefit students in terms of providing the opportunities to practice autonomy in flexible learning environments. Kaur (2010) utilized the integration of ICTs in a course offered at institutions of higher learning (IHLs) in order to empower learners to become autonomous lifelong learners. Initial findings indicated that ICT could enhance students in becoming autonomous learners, but it should be done under the assistance of a language teacher to empower them in terms of the necessary skills and tools.

Furthermore, there is a report on using integrative CALL in a pronunciation class with the concept of autonomous language learning. Hismanoglu (2006) mentioned that due to the influence of autonomous language learning, many pronunciation teachers have tried to move towards autonomous pronunciation learning. Pronunciation teachers try to stimulate their language learners to become

autonomous learners. As pronunciation learners could not always rely on the assistance of pronunciation teachers in their real-life context, they should be encouraged to be enabled to make decisions on their own pronunciation learning such as learning how to transcribe words by using phonetic symbols (IPA). In addition, students could become autonomous to some extent in that they could consult with their monolingual dictionaries when they do not know how to pronounce a word in the target language. Moreover, with the concept of CALL, encouraging language learners to utilize computer-assisted pronunciation teaching programs might help language learners to acquire autonomous pronunciation learning and improve their pronunciation performance in the target language. However, pronunciation learners could not be fully viewed as autonomous pronunciation learners or they are semi-autonomous pronunciation learners because it is still the pronunciation teachers' responsibility to choose the appropriate CAPL program that could be matched with the needs and expectations of each learner.

2.1.2 The Interface of Constructivist and Autonomous Learning Approaches

There are two different viewpoints to teaching and learning. One is directed instruction, which is originally grounded in behaviorist learning theory. The other is the constructivist learning theory, which was developed from other branches of thinking in cognitive theory (Roblyer, 2000). Roblyer also stated that "some technology applications such as drill and practice and tutorials are associated only with directed instruction; most others (problem solving, multimedia production, and web-based learning) can enhance either directed instruction or constructivist learning, depending on how they are used."

Murray, Morgenstern and Furstenberg (1991, as cited in Beatty, 2003) reported that only a few software programs are deliberately produced from a behaviorist or constructivist viewpoint. However, software programs are probably produced to benefit from a combination of the two learning theories in order to assist all learners who are at different stages of cognitive development. In a typical pronunciation classroom, it is expected that each learner might have a different level of pronunciation proficiency; therefore utilizing software programs that come from behaviorist (drill and practice) and constructivist (multimedia) methods could fulfill all learners who have different levels of pronunciation proficiency to enhance their

performance. From these aforementioned points of view, it could be predicted that the behaviorist and constructivist approaches can be combined to assist the language teacher in integrating these two approaches.

Table 2.1 illustrates key features of two dominant educational models which affect current educational conduct and influence the procedural, functional and material organization of instruction (Valcke, 1999). In relation to behaviorism and constructivism, the role of the teacher and the learner, the characteristics of the teacher and the learner, the view of the learning process, the view of the instructional approach, and the role of the context are presented below.

Table 2.1 Key Features of Two Instructional Models

	Behaviorist Model	**Constructivist Model**
Teacher	Controls of the complete learning/teaching setting	1. Is a coach, a facilitator 2. Designs authentic contexts
Learner	Individual learning is an outcome of the instructional activities of the teacher/lecturer	1. Controls the learning process 2. Is part of a social context 3. Takes responsibility for the learning process
Characteristics of learner	No special attention paid to characteristics of individual learners	1. Own experiences, interpretation and problems are a point of departure for learning 2. Individual cultural background can play a role.
Characteristics of teacher	Educational professional	Can be a professional, an expert in a certain field and not a teacher/lecturer
Learning activities	Learning is always a consequence of the instructional activities	Knowledge is a process that is acquired in a personal way by each individual and in social contexts

Table 2.1 (Continued)

	Behaviorist Model	**Constructivist Model**
Instructional activities	1. Teacher defines instructional Objectives 2. Pre-structured activities that build upon a systematic breakdown of the knowledge domain pursued 3. Major attention for structure in especially elaborated learning materials 4. Assessment by teacher at each level	1. Higher-order objectives are pursued such as problem solving 2. Builds on student experience 3. Respects student learning style 4. Design of learning environment is essential 5. Use of real-life learning materials that reflect full complexity and multiple perspectives 6. Learning is put in a social context 7. Involvement with the real world 8. Activities: discussion, role play, collaboration, and construction activities. 9. Self- and peer assessment 10. Consideration for knowledge acquired in non-formal settings (intake, portfolio, and certification)
Context	No attention paid to the context outside the learning situation	The real and complex world is the educational context. Teacher/instructors pre-structure this context as "learning environments"

Source: Valcke, 1999, p. 91.

Moreover, Hung (2001) presented two models of learning which are behaviorism and constructivism. He also provided the key concepts of these two dominant learning theories as shown in Table 2.2.

Table 2.2 Key Concepts of Dominant Learning Theories

	Behaviorist	**Constructivist**
Learning	stimulus and response	personal discovery and experimental
Type of learning	memorizing and responding	problem solving in realistic and investigative situations
Instructional strategies	present for practice and feedback	provide for active and self-regulated learner
Key concepts	reinforcement	personal discovery

Source: Hung, 2001, p. 284.

Beatty (2003, p. 27) stated that the main difference between the behaviorist and constructivist instruction model is "in a behaviorist model of instruction, engagement is more likely to stem from extrinsic rewards such as points. In a constructivist interface, intrinsic rewards are likely to participate based on the interactivity of the program's responses to their interests". From Beatty's quotation, it could be implied that points or a scoring system are sometimes considered as a feedback feature of CALL software. However, considering the purpose of this study, it is beneficial to utilize the two aforementioned models in this way. It is assumed that the proficiency of the participants in this study is generally different. Thus, a combination of behaviorist and constructivist approaches is reasonably suitable at this stage.

Further, to enhance English pronunciation performance, the constructivist learning approaches can allow pronunciation learners to develop autonomy through self-directed learning. Littlewood (1996), who proposed a framework for developing

autonomy, stated that to develop autonomy a learner should depend on (1) the ability to be involved in independent work (e.g., self-directed learning), and (2) the ability to utilize suitable learning strategies both inside and outside the classroom. Since the CALL program is typically developed from the combination of behaviorist and constructivist approaches, it could allow each learner to explore a suitable pronunciation lesson according to their capacity. This activity could be considered as independent work that allows learners to develop their own suitable learning strategy or learning at their own pace both inside and outside the classroom.

Moreover, there are some researchers that attempted to foster learner autonomy by utilizing the CALL program. Oberga and Daniels (2013) utilized an iPod Touch under a self-paced instructional method in order to stimulate learners' involvement in independent work and to create their own learning strategy. The result showed that students could learn with an iPod Touch effectively and an iPod Touch could be considered as a tool that could enhance learner autonomy. Hobrom (2004) attempted to promote learner autonomy by incorporating online resources for college-level students of Arabic. The Arabic language students in this study were requested to give their perception on autonomy, online resources, and how they have been empowered by utilizing online resources in language learning. The findings showed that Arabic language students expressed themselves as autonomous learners in two ways. First, they were allowed to take more responsibility and were more motivated through learning from online resources. Second, online resources forced them to improve their skills and assist them to be able to evaluate themselves.

Furthermore, a number of studies have been conducted on how Computer Assisted Pronunciation programs enhance learner autonomy. Tsubota, Dantsuji and Kawahara (2004) investigated the effectiveness of CALL programs to enhance the Autonomous English Pronunciation Learning System for Japanese Students. They developed an original CALL system to ascertain the errors in English pronunciation produced by Japanese learners. The findings showed that CALL could enhance Japanese learners to learn to be autonomous learners in pronunciation learning. Kruk (2012) also developed a quasi-experimental study in order to examine the effectiveness of online resources on developing learner autonomy and to investigate whether or not increased autonomy could lead to improved pronunciation. She also

tried to discover whether or not the acquired English pronunciation knowledge from online resources can be maintained over a long time period. The results showed that the majority of students in the treatment group where students who learnt pronunciation by online resources, and they expressed more autonomy. She concluded that online resources could be utilized as a tool for developing both autonomy and pronunciation teaching.

However, some educators may question the reliability of learning pronunciation outside the classroom or how a teacher could trace back whether learners truly practice CALL exercises outside the classroom. Some scholars utilize log books in order to measure learners' participation in exercises outside the classroom, but many scholars still question that learners might not provide true information. Lee (2008) claimed that students' journals could be viewed as a solution to ensure students' participation outside the classroom as students are required to provide detailed information such as what topics they covered, what they learned in the session, the particular features and functions of the programs they used, what sentences they recorded, what they thought about their pronunciation compared with the models in the programs, and what progress they were making. Thus, real participation can be ensured by directing students to provide a CALL learning journal for every lesson they have participated in.

In sum, it is expected that the constructivist learning approach could enhance the effectiveness of pronunciation learning both inside and outside the classroom. Moreover, autonomy of language learners and life-long learning are expected to be developed by utilizing this mentioned approach.

2.1.3 Implications of Learning Theory for Technology Integration Learning Approaches

Koc (2005) mentioned that technology assists the teacher to be able to serve the various learning styles of students and teach students with a wider range of capabilities. Students might have different learning styles for acquiring meaningful learning, but teachers cannot provide all the learning styles by teaching under the conventional classroom environment. On the other hand, technology can assist teachers to create learning environments where students can construct their own

knowledge. Moreover, Scheffler and Logan (1999) stated that to integrate technology into learning is to utilize technology as a device to educate students and build students' problem-solving and higher-order thinking skills. It does not involve computer literacy and computer awareness. This integration uses the computer, which is perceived as the best medium to achieve the learning goal.

2.1.3.1 Implications of Constructivist Learning Theory for the Technology Integration Learning Approach

Constructivism is derived from a combination of two perspectives. First, cognitive constructivism is influenced by the work of Jean Piaget. Piaget's theory consists of two major components (MacKinnon, 2002). One component can foresee what children are capable of and not capable of comprehending at different ages, and the other component is the theory of development that explains how children establish cognitive abilities. The two key Piagetian implications for teaching and learning are: (1) learning is an active process where firsthand experience, making errors, and finding solutions are vital for the absorption and accommodation of information; how information is displayed is vital; and when information is firstly presented as an aid to problem solving, it functions as a device rather than an isolated arbitrary fact; and (2) learning should be authentic, and real. In a classroom following Piagetian's theory, teachers should place less emphasis on directly teaching specific skills and more emphasis on learning in a meaningful and authentic context (MacKinnon, 2002). Providing more learning within a meaningful context, technology has come to play a role in supporting learning, particularly multimedia. Multimedia offers a variety of learning opportunities (Chen, 2000). Examples of multimedia are videodisks and CD-ROMs. Teachers can create a learning environment that assists in the extension of the conceptual and experiential background of the learners. Much of the new multimedia educational software is influenced by constructivist theories.

Secondly, Vygotsky's constructivist theory, which is also known as social constructivism, allows a more active role for the teacher than cognitive constructivism (MacKinnon, 2002). Vygotsky claimed that the central theme of human psychology is mediation. In mediation, human cognition involves the relationships with the material and social environment. These kinds of relationship are fundamentally different from non-mediated relationships. In the view of social

constructivism, technology is used to connect other students rather than separate them. Thus, teachers can not only facilitate cognitive growth and learning, but also learners' friends or other members of the learners' community can perform it too (MacKinnon, 2002).

In sociocultural theory, there are three main concepts from Vygotsky that have been incorporated into computer assisted language learning for enhancing ESL and EFL acquisition; mediation, social learning, and genetic analysis (Warschauer, 2005).

Mediation is the central concept of the sociocultural theory. The notion of mediation is that "all human activity is mediated by tools or signs" (Vygotsky, 1981, as cited in Warschauer, 2005). From Vygotsky's point of view, the utilization of tools or signs is not analyzed in terms of assisting activity that might have happened without them, but it should be analyzed in the process of behavior as it is believed that the flow and organization of mental functions could be changed by utilizing tools or signs. Later, Leont'ev (1979) proposed the theory of activity which has been developed from the notion of mediation. In order to understand human cognition and behavior, he believed that the unit of analysis is not plainly human(s) or human(s) and tools, but it should be activities that humans' action are assisted by tools (Nardi, 1995, as cited in Warschauer, 2005). From this point of view, it could be applied to CALL in the sense that how technologies such as computers, the Internet, and CALL alter the structure of human activity; for example, there is no traditional form of learning speaking and computers, but they are new forms of learning speaking that are instructed in their own circumstance (Shetzer & Warschauer, 2001, as cited in Warschauer, 2005).

The second concept of the sociocultural theory that is applied to CALL is social learning or social origin of mental functioning. Vygotsky (1978, as cited in Warschauer, 2005, p. 57) proposed that "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; the first, between people (interpsychological), and then inside the child (intrapsychological)". He also believed that this shows that cultural development is developed in the form of 'apprenticeship learning' by interacting with teachers and friends, and it will assist students in improving their capacity through their zone of proximal development. The

idea of social learning could be applied in the study of computer-mediated communication (CMC). The study of CMC assists scholars to understand how students learn linguistic chunks such as phrases and collocations in the utilization of CMC (St. John & Cash, 1995) and to help acknowledge how students improve their English skills by receiving authentic input from native speakers (Warschauer, 2002b; Warschauer & Lepeintre, 1997).

The last concept of the sociocultural theory that has been applied in CALL is genetic, or developmental analysis. It is believed that in order to understand the perspective of mental functioning, one should understand their 'origins, or histories, and developmental process'. According to Vygotsky, these mentioned origins are "microgenesis (the unfolding of particular events), ontogenesis (the development of the individual), sociocultural history, and even phylogenesis (the development of the species)" (Vygotsky, 1962, as cited in Warschauer, 2005, p. 3). From this point of view, technology scholars can understand CALL when they view it in the wider 'historical, social, and cultural contexts'. For instance, in order to understand the attitudes and motivation of students in learning with CALL is to firstly understand the significance of CALL in today's education, business industry and social group (Murray, 1995; Warschauer, 2000).

The studies of CALL that were based on sociocultural theory mainly emphasize the utilization of computer mediated-communication (CMC) in learning a second or foreign language (Kern & Warschauer, 2000). The subjects involved in the CMC studies are way of life, capability of reading and writing, and identity. There are three environments that CALL based CMC studies have examined; individual language classroom learning, outside language classroom learning, and language inter-classroom learning (Warschauer, 2005). The examples of studies that were investigated in three different setting are illustrated below.

In an individual language classroom, Warschauer (1999) investigated the utilization of online and computer-based language learning in different writing classroom settings. The focused classes are an undergraduate ESL writing class in a religion college, a graduate ESL writing class in a public university, an intensive writing class for pre-university students, and an undergraduate EFL writing class in a community college. The research design was ethnography. He utilized observation,

focus-group interviews, and individual interview methods, and he also analyzed electronic and paper documents. The findings reveal that different contexts develop different beliefs in language learning and CALL such as an undergraduate EFL writing class perceived writing class as a communicative and vocational activity, therefore this classroom requires computer-assisted classroom discussion technology. Moreover, the goal of students who were instructed by CMC was different from students who studied by common CALL. They considered themselves to learn not only writing skills, but also computer skills.

In an outside classroom learning setting, Lam (2003) conducted a longitudinal study of four immigrants from China who had migrated to the U.S. The participants learned the English language through self-directed online language learning. Surprisingly, they could successfully gain status as online English users. Lam found that new technology has changed the concept of authorship, where students were able to produce texts by their own rules. This adjustment assisted in creating a new agency. In other words, technology such as online activity helps language learners to perform meaningful action and acknowledge the outcomes by themselves. The implication of this study is to promote this kind of agency in a language classroom learning context too.

In a cross-classroom language learning, Thorne (2003) conducted a study of CMC by utilizing telecollaboration instruction. In this study, telecollaboration instruction means utilizing CMC to cross-class writing learning between American and French students by encouraging participants to exchange emails in the assigned topics. The findings showed that American students perceived e-mail as formal and restrictive equipment, and they preferred using instant messaging for friendly and informal communication. Thorne also found that telecollaboration instruction could also assist students in learning grammatical forms too.

In sum, the sociocultural theory has produced various benefits in assisting researchers to gain a better understanding of CMC and its enhancement in language learning. It could be said that technology is an educational tool that mediates and reconstructs the activity of humans. Hence, educators should seriously consider how this mentioned mediation could be developed in a micro level, and how it could be beneficial to areas such as society, culture, history, and economics (Warschauer,

2005). Furthermore, the utilization of CMC and CALL have been heavily increasing recently in language learning, both inside and outside classroom, therefore there should be various ways that SCT could lead to further study relevant to language acquisition of the four skills. For example, Lam (2003) mentioned that there is one vital research area, that CMC and CALL researchers have neglected, which is the connection between home and school in ESL learning and the use of technology. There are extensive numbers of ESL learners around the world spending enormous amounts of time online by communicating via computer and smart phones in the English language. Koc (2005) also reported that social constructivist learning could be compatible with web-based activities. ESL and EFL students entering a web-based activity bring their prior knowledge with them. They become involved in web-based activities by searching the Internet, obtaining information, managing their thoughts, or chatting with friends via email, which will enhance their cognitive infrastructure. Thus, language and literacy practices of ESL and EFL students outside the classroom should be examined, as well as how school instruction and assignments could be designed in order to contribute to out-of school language learning. Another point of view that should be examined is that CALL can enhance regulation in language learning, which is one kind of mediation. The idea of regulation is about how children construct knowledge. There are three stages where children develop their self-regulation. The first stage is object-regulation, where children are controlled by object(s). The second stage is other-regulation which includes explicit and implicit mediation by parents, brother or sister, friends, teachers, etc. Self-regulation is the final stage. At this stage, children are able to perform activity successfully by themselves with no or minimal assistance by others. Children can reach this stage, when they can develop the internalization, which is the process of changing what used to be external assistance into an internal resource for individuals, for instance, in order to be a skillful speaker of a language, speakers are required to be self-regulated (Lantolf & Thorne, 2006). Thus, it could be postulated that the use of technology could be viewed as the combination of object and other- regulation, because CALL is not only object-regulation, but it could be viewed as other-regulation in the sense that CALL could cause interaction between computer and learners through CALL instruction. Learners could also receive correction and feedback from the CALL

program. This kind of interaction could be considered as other-regulation, which relates to the zone of proximal development, where the assistance from ‘other’ could enhance language development. In sum, CALL could be considered as ‘other’ in the sense that it could provide language instruction and at the same time it could provide correction and feedback while learners are practicing exercises. It could be concluded that CALL could perform the same role as language teacher in the classroom. This kind of opportunity assists learners in gaining unlimited chances to receive advice and assistance from ‘other’ in order to enhance their zone of proximal development. Thus, CALL scholars should examine whether or not CALL could be viewed as the combination of object and other-regulation. In addition, it is important to examine whether or not CALL could enhance the zone of proximal development of learners as well as a teacher or friend could.

Moreover, the role of technology in a constructivist-learning environment is an acknowledged and purposeful role in the day-to-day operation of the classroom, but it is not the object of instruction (McClintock, 1992). When a constructivist approach is utilized in the learning environment, learners use technologies to (1) operate data, (2) search for relationships, (3) deliberately and vigorously process information, (4) construct individual and socially shared meaning, and (5) mirror the learning process (Jonassen, Peck, & Wilson, 1999). “The technological applications which support learning in such ways are often described as cognitive tools” (Lajoie & Derry, 1993, p. 32).

Numerous studies illustrate the advantages that arise from utilizing technological applications. Cognitive tools from applications are (1) calculators, (2) spreadsheets, (3) databases, (4) knowledge construction tools, (5) semantic network tools, and (6) communications software. The critical quality of cognitive tools is not in the data and knowledge that they store, but their critical attribute is in the forms of learner activity and engagement that cognitive tools support and inspire. In the utilization of cognitive tools, teachers still need to design and control learning activities, but they also amplify and dispense the cognitive tasks of their own design and for their own application. Besides cognitive tools, the idea of ‘mindtools’ has also been developed by Jonassen. Mindtools are computer-based tools and learning environments that have been “adapted or developed to function as intellectual partners

with the learner in order to engage and facilitate critical thinking and higher-order learning" (Jonassen, 2000, p. 11). From Jonassen's point of view, the mindtools' role is to expand the learner's cognitive functioning while the learning process is taking place, and to involve the learners in procedures while constructing knowledge that they have not been able to complete. "Mindtools enable learners to become critical thinkers. When using cognitive tools, learners engage in knowledge construction rather than knowledge reproduction" (Jonassen, 2000, p.18). Utilizing widely available software in the market, learners can employ technology to both construct and represent knowledge. The students can develop problem solving abilities when they are able to practice project-based learning (PBL) activities on the computer, as computers are primarily employed in an environment where people are stimulated to collaborate naturally following cultural expectations. There are many studies that explore PBL activities such as Tretten and Zachariou (1995), who assessed PBL activities in four elementary schools, collecting data by questionnaire and interview of administering teachers, and a survey of parents. The obtained data revealed that PBL could create positive benefits for students. For instance it could enhance positive attitudes towards learning, work habits, problem-solving capabilities, and self-esteem. Boaler (1999) studied mathematical instruction and PBL for a period of three years. Boaler reported that schools with learning based on PBL gained higher national examination results than traditional schools and the students from PBL based schools developed a more flexible form of mathematical knowledge that they can apply in various settings. In sum, learning within the PBL context encourages problem-solving skills which are more likely to be maintained and applied than the inert knowledge acquisition from traditional teaching methods.

In sum, the use of technology as a learning tool under the constructivist learning theory can result in a significant differences in student performance, attitudes, and interaction between teachers and students. By utilizing technology, interactive, self-directed learning, and higher order thinking ability can be enhanced. Furthermore, technology can have the greatest advantage when the environment contributes to such experiences. Some studies show that technology integration under the behaviorist perspective might not be the best way to improve learning; however, it can assist learners to improve performance at the lower level of sub-skills. On the

other hand, constructivist learning environments with technology could stimulate learners to actively participate and construct information by establishing the connection of internal cognition. In the situation of classrooms that consist of students who have a range of learning proficiency levels, the use of both technologies grounded in behaviorist and constructivist perspectives could provide an effective theoretical framework for successful technology integration (MacKinnon, 2002). The important point is a shift of focus from teacher to student. The key to fostering this change is the teacher, as the computer itself cannot decide the appropriate pedagogical approach. Whether to utilize one approach or the other or a combination depends on the teacher who is responsible for the lesson objectives, the expected results, and the students. These two approaches presented above could be used concomitantly or alternatively as long as the teachers realize the reason why this kind of technology is selected.

2.1.4 Utilizing Computer Assisted Language Learning (CALL) in Learning Approaches

Incorporating technological tools into the learning classroom requires teachers to search for a suitable instructional design that could work well with their students. Roblyer (2000) suggested that teachers who are skillful with educational technology must learn to incorporate directed instruction and constructivist approaches. According to Roblyer's postulation, teachers are required to select educational technologies and methods of integration which can be best used to meet educational goals. Furthermore, the classroom that consists of learners with different language knowledge levels could be well instructed through a web-based instructional design. Learners, who have their own pace of learning, can match their learning with their knowledge level (Moallem, 2001). For learners at the beginning level, a behaviorist instructional design focusing on directed instruction might be appropriate. After learners have gained sufficient knowledge, they could learn to interact collaboratively and socially in an authentic context in order to construct and gain more advanced knowledge. In EFL learning, prior knowledge is important for learners. Prior knowledge is basic required knowledge that has been acquired from learning the target language at the beginning stage, and then this knowledge can be applied in

constructivist learning (Moallem, 2001). However, Hung (2001) mentioned that this foundation knowledge or prior knowledge, such as knowledge of the alphabet and grammatical rules, could be directly imparted to students before they engage in constructivist activities.

In Thailand, there is one major obstacle to teaching English pronunciation, which is that students have a wide range of English proficiency levels. Thus, it is difficult for Thai teachers to teach low and intermediate students in the same class, as students who have different English proficiency levels might require different instructional pedagogies. Moallem (2001, p. 16) also mentioned that "students with no or limited knowledge of a topic (introductory level) do not engage in conversations and discussions when provided with an ill-structured problem. In such cases, perhaps it is more appropriate to use traditional design models and provide interested learners with 'conceptual over-simplification'". In order to allow them to learn in their own pace, a combination of educational technologies have been utilized from both the behaviorist approach (drill and practice) and the constructivist approach (multimedia program).

Students at the beginning level might need to learn from a Computer Assisted Pronunciation Training (CAPT) program that could provide an opportunity for beginner students to practice individually through drill and practice, and a tutorial program. Neri, Mich, Gerosa, and Giuliani (2008) examined the effectiveness of CAPT programs in order to discover whether or not CAPT could assist young learners to pronounce at the word level in English as a foreign language. They separated students into two groups; one group learnt by CAPT, and the other group learnt by the conventional teacher-led teaching style. They compared the CAPT class results with the class that had used the convntional teacher-led training. Findings showed that teaching by utilizing CAPT software with a speech recognition feature can have short-term improvements in learning English pronunciation. The achievement level of students learning via CAPT was comparable to that of those learning with conventional teaching instruction. Moreover, Pearson, Pickering, and Da Silva (2011) examined the impact of CAPT on the improvement of Vietnamese learner production of English syllable margins. Participants were test by pre- and post-test in order to discover whether or not after CAPT integration the students could improve their

pronunciation of English syllables. The results from the post-test showed that there was a significant movement toward more target-like production of English syllables from the students in the treatment group. Thus, it could be concluded that teaching English pronunciation for low level English proficiency needs to include the CAPT software in order to establish the knowledge required prior to further advanced knowledge learning. Drill and practice activities from CAPT software (which are derived from the behaviorist perspective) could work well with students who have low English proficiency level. Therefore, a "Speexx" program has been selected as one of the CAPL devices in this study, as it could provide an opportunity for students to remember and respond, practice, receive feedback, and reinforce English pronunciation learning.

On the other hand, Dooley, Stuessy, and Magill (1998, p. 37), as cited in Boyd and Murphy, (2002) state that students who are at the intermediate level can study well with a multimedia program, as it could offer a collaborative environment.

> Computer-based multimedia provides instructional designers the tools of animation, video, and sound to provide learners with working models that convey complex concepts. Specifically, multimedia simulations provide stimuli to auditory, visual, and kinesthetic learners. It is known that animation can increase learner interest and motivation, provide metacognitive scaffolding and mental models, and promote visual stimuli to establish connections between the abstract and the concrete.

Moreover, multimedia used for teaching pronunciation introduces to invisible sound a visible component in the form of graphics, aiding EFL learners. The learners can learn to pronounce the target sound by listening, copying, repeating, and receiving feedback. Moreover, learners could receive feedback without embarrassment from other students within their class (Boyd & Murphy, 2002). Boyd (2002, p. 35) added that "one of the most powerful uses of multimedia is to immerse the user in a learning environment". Moreover, Liou (2000, p. 75) indicated that under the CALL environment, the "technology [nowadays] has new potentials in multimedia or hypermedia-type

courseware where students have considerable freedom to navigate in the environment". From Liou's statement, it could be implied that students can have more opportunities to contact with English pronunciation by utilizing multimedia.

Lai, Tsai and Yu (2009) investigated the utilization of multimedia in pronunciation learning. They proposed multimedia English learning based on the Hidden Markov Models (HMMs) and mastery theory strategy. The purpose of this study was to determine students' awareness of English phonetics and pronunciation and to compare the performance of students between students who learnt by multimedia English learning and students who learnt by conventional style. The results indicated that students who had a low awareness of English phonetics and pronunciation in the multimedia environment could improve their performance on an English achievement test more than those students in the conventional group who studied by teacher instruction. Lee (2008) also noted that software which provided multimedia models of phonological systems could enhance productive and receptive skills of both adolescent and adult language learners in pronunciation of the target language. Thus, it could be postulated that the UIOWA multimedia English phonetics website, which will be utilized in this study, could be another tool in assisting students learning English phonetics, as it provides a phonological multimedia facility to help students construct knowledge with sounds and graphics.

Since two educational technology programs, Speexx and Phonetics Flash Animation (PFA) Project from UIOWA, have been selected as the mediums of instruction in this study, an instructional methodology that allows the integration of educational technology programs into the pronunciation learning classroom should also be selected. Roblyer (2000) stated that the design of most computer software programs for learning are based from Gagne's nine events of instruction. According to Roblyer, the Gagne's nine events are arranged in sequences. It begins with gaining attention, and then the objective is informed to learners, prerequisite knowledge is recalled, the stimulus material is presented, learning guidance is provided, performance is elicited, feedback is provided, performance is evaluated, and retention and transfer are attempted to be maintained. Table 2.3 below illustrates the nine events of Gagne's instruction.

Table 2.3 Gagne's Nine Events of Instruction

Events	Instruction
1. Gain attention	Present a good problem, a new situation or a novel idea to gain students' attention.
2. Informing learner of the objective	Objectives are to be communicated effectively to the learner (use words, even pictures, if appropriate).
3. Stimulate recall of prerequisites	Have learners recall previously acquired capabilities just before the new learning takes place.
4. Presenting the stimulus material	Stimuli that are to be displayed are those involved in the performance that reflects the learning. For example, if learning a concrete concept is the objective of the lesson, the concept's physical characteristics are to be emphasized.
5. Providing learning guidance	The amount of hinting or promoting will vary with the kind of learner and the difficulty of the task/ lesson objective.
6. Eliciting performance	Have learners show that they can carry out the task. This is usually done informally.
7. Providing feedback	Once the correct performance has been exhibited by the learner, there should be feedback concerning the degree of correctness/appropriateness of the learner's performance.
8. Assessing performance	At this level the teacher gathers formal and convincing evidence (valid and reliable) regarding the learner's performance.
9. Enhancing retention and transfer	Varieties of new tasks are to be assigned to enhance the learner's understanding and to assure the transfer of learning.

Source: Moallem, 2001, p. 4.

Gagne, Wager, and Rojas (1981) illustrated how Gagne's Events of Instruction could be utilized to design lessons by using various kinds of instructional software such as drill, tutorial, and simulation. They discovered that a tutorial is only a program that could stand by itself and achieve all of the necessary events of instruction.

From reviewing Gagne's Events of Instruction, it could be postulated that they might be considered as the most appropriate instruction method for language teachers who desire to integrate CALL as a medium of instruction, as Roblyer (2000) claimed that Gagne's principles could provide the methodology to integrate CALL into English language instruction.

2.2 English Pronunciation Learning

2.2.1 Problems of Acquiring English Pronunciation Skills

A number of scholars such as Bell (1996), Lambacher (1996), and Fanshi (1998) have agreed that the differences between first language and target language cause problems in learning pronunciation (Warisara Yangklang, 2006). Thai learners could overcome the problem of their inability to achieve acceptable English pronunciation by realizing the differences in the sound systems of their native language (Thai) and target language (English). The contrastive analysis hypothesis takes into account the differences between the two languages, and this approach may be taken by teachers. Lado (1957), a well-known scholar in the field of contrastive analysis, believed that first language or native language can significantly affect the second or foreign language learning outcome. He also postulated that language teachers could foresee the problem of learning the target language facing learners by comparing the native language system with the target language system. The process of L1 transfer could be viewed as a cause of many second or foreign language learning problems. The hypothesis of contrastive analysis focuses on its inability to account for various exceptions. For instance, what are the L2 patterns that could produce difficulty for L2 learners? It could be implied that the major obstacles to learning second or foreign language is the interference of the native language. Lado (1957, p. 11) stated that in the process of L1 transfer:

> …We have ample evidence that when learning a foreign language, we tend to transfer our entire native language system in the process. We tend to transfer to that language our phonemes and their variants, our stress and rhythm pattern, our transitions, our intonation patterns and their interaction with others phonemes…

Based on Lado's postulation, it could be said that EFL learners tend to pronounce the target language by utilizing the characteristics of their native language. This means that learning L2 pronunciation is normally interfered with by the L1 pronunciation system. In sum, the differences of the phonological systems could produce a problem for language learners. Realizing these differences could assist teachers in predicting the problem of acquiring English pronunciation that learners have to confront and to enhance pronunciation learning outcome. Moreover, English phonology alone cannot assist teachers; native phonology should also be introduced to learners. It is believed that teachers need to provide a list of English phonemes and assist their students in realising the differences between L1 and L2. Subsequently, students need to be given many opportunities to practice their pronunciation in order to improve their performance.

There are many studies that report the problems encountered by Thai learners acquiring English pronunciation. Wei and Zhou (2002), who were English pronunciation teachers in Thailand for six years, reported on the problems Thai learners face in learning pronunciation. They classified the problems of Thai learners into three levels which are: (1) pronunciation problems with consonants and vowels, (2) intonation problems, and (3) stress problems. The majority of problems are consonants and vowels such as /r/ is pronounced as /l/, /v/ is pronounced as /f/, /z/ is pronounced as /s/, /θ/ and /ð/ is pronounced as /t/, and /k/ is pronounced as /c/. The cause of these problems might come from mother tongue interference in pronunciation of the English language. The way to counter this problem is to present learners with articulatory descriptions of the mother tongue and the English language in order to assist language learners in realizing what they are doing and what they should do to correct it. Chunsuvimol and Ronnakiat (2002) investigated Thai learners' stylistic variation of /v/. There were three styles chosen in this study which were: (1) conversation (informal), (2) reading text (formal), and (3) minimal pairs (very formal). Findings

indicated that there was a significant pronunciation difference between initial and final position of /v/. Most initial positions of /v/ is pronounced as /v/ in each style but the final position of /v/ is most frequently pronounced as /f/. It could be implied from this study that Thai learners still have a problem with pronouncing English words which have /v/ in the final position. This finding from Chunsuvimol and Ronnakiat (2002) is relevant to Chunsuvimol and Ronnakiat (2000), which suggested that Thai speakers indeed have a problem with /v/. Moreover, Janvasupab (1981) also reported the problem of /v/ of English major students. She reported that Thai learners tend to pronounce /w/ in the initial position instead of /v/ such as in “vast” and “very”, and pronounce /v/ as /p/, /f/, or /θ/ in the final position as in “save”, “halve”, and “live”. Yangklang (2006) found the problems of Thai learners in pronouncing /l/ with syllables in the final position. The findings show that participants tended to correctly pronounce the /l/ consonant sound when it appeared in the initial position while they had difficulty in pronouncing /l/ when it appeared in the final position such as kill /kɪl/ as /kɪn/ and bill /bɪl/ as /bɪn/. Sumdangdej (2007) reported the problem of Thai learners encountered acquiring English pronunciation from elementary, secondary and higher education resources, noting that Thai learners tend to have similar problems including: (1) mispronouncing the English consonant clusters in initial or final position, (2) unconsciously ignoring pronunciation of the final sound of English words, and (3) wrongly stressing disyllabic and multi-syllabic English words. Phaiboonnugulkij and Prapphal (2012) reported that Thai EFL learners always had problems in pronouncing the /ʃ/ sound at the end of word. Similarly, Swan and Smith (2012) also mentioned in this book that Thai EFL learners face a problem in articulation when /ʃ/ sound occurs in the final position of the word. In sum, the majority of problems Thai learners face in learning English pronunciation are found to be pronouncing English consonants such as /r/, /l/, /v/, /z/, /θ, /ð/, and /k/ that are either in the initial or final positions. Encountering this problem, Thai pronunciation teachers should present students with the differences between the Thai and English phonological system together with the descriptions of English articulation on both consonants and vowels in order to enlighten Thai learners on how to pronounce them correctly.

2.2.2 Thai Consonant System and English Consonant System

This part of the study shows the differences between the Thai and English consonantal systems in order to shed light on some of the obstacles that Thai pronunciation students face when learning to pronounce English consonants.

1) Consonant Sounds

There are 21 Thai consonant sounds. On the other hand, the English language has 24 consonantal phonemes (Pintip Tuaycharoen, 1990) as follows:

	Bilabial	Labio-dental	Alveolar	Lamio-prepalatal	Palatal	Velar	Glottal
Plosive	p b pʰ		t d tʰ			k kʰ	ʔ
Nasal	m		n			ŋ	
Fricative		f	s				h
Affricate				tç tçʰ			
Tap			ɾ				
Lateral			l				
Semivowel	(w)				j	w	

Figure 2.2 Thai Consonantal Phonemes

Source: Monthon Kanokpermpoon, 2007, p. 58.

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Glottal
Plosive	p b			t d			k g	
Nasal	m			n			ŋ	
Fricative		f v	θ ð	s z	ʃ ʒ			h
Affricate					tʃ dʒ			
Lateral				l				
Approximant	(w)			ɹ		j	w	

Figure 2.3 English Consonantal Phonemes

Source: Monthon Kanokpermpoon, 2007, p. 58.

After considering the two tables above, the similarities and differences between Thai and English consonantal sounds are presented by manner of articulation respectively.

2) The Similarities and Differences of Thai and English Plosives

In Thai, aspirated and non-aspirated sounds of /p/, /t/, /k/ are different phonemes. The aspirated counterparts of /p/, /t/, /k/ and /p^h/, /t^h/, /k^h/ show that they are different phonemes (Monthon Kanokpermpoon, 2007).

Examples:

/p/ → /pɑː/ /p^h/ → /p^hɑː/

/t/ → /tɑː/ /t^h/ → /t^hɑː/

/k/ → /kɑː/ /k^h/ → /k^hɑː/

On the other hand, in English, an aspiration indicates allophonic distribution of a phoneme. It is not a feature to indicate phonemic realization of the sound. Normally, Thai students don't have a problem in pronouncing voiceless aspirated phonemes of /p^h/, /t^h/, /k^h/ , in the initial position, because the phonemes /p/, /t/, and /k/ are pronounced with aspiration /p^h/, /t^h/, /k^h/ in English also. Moreover, Thai students also do not have a problem in pronouncing plosive consonant clusters as Thai and English have the identical rule such as when voiceless plosive phonemes in English and Thai are followed by the phoneme /s/, which is consonant cluster, they are pronounced with no aspiration (Monthon Kanokpermpoon, 2007).

Examples:

spy → /spɑɪ/not [sp^{h}ɑɪ] sky → /skɑɪ/ not [sk^{h}ɑɪ]

stay → /steɪ/not [st^{h}eɪ]

Thus, Thai students do not have any problem in pronouncing /p/, /t/, and /k/ in both initial position and initial consonant cluster (Monthon Kanokpermpoon, 2007). However, he also added that Thai students may have a problem when pronouncing /p/, /t/ and /k/ in English in the final position because these three plosive sounds are supposed to be pronounced without release of breath and no audible release: [p^-], [t^-], [k^-].

Examples:

sop → [sɒp^h]not[sɒp$^-$] lot → [lɒt^h]not[lɒt$^-$]

sack → [sæk^h]not[sæk$^-$]

In English, the final sounds /p/, /t/, and /k/ could be pronounced in three different ways:

1) Aspiration: [p^h], [t^h], [k^h],
2) Non-aspiration: [p], [t], [k], and
3) No audible release: [p^-], [t^-], [k^-]

Examples:

Pronunciation variation of English voiceless plosives in the final position

	Aspirated	Non-aspirated	Inaudible
sop	[sɒp^h]	[sɒp]	[sɒp^-]
lot	[lɒt^h]	[lɒt]	[lɒt^-]
sack	[sæk^h]	[sæk]	[sæk^-]

Normally, Thai EFL learners tend to pronounce voiceless plosives in final position without releasing breath. Thus, Thai EFL learners should practice pronouncing English voiceless plosives in the final position with more aspiration (Monthon Kanokpermpoon, 2007).

Moreover, Thai EFL learners do not have any difficulties pronouncing /b/ and /d/ sounds, because these two sounds also exist in the Thai consonantal system. However, there is one English plosive sound that might confuse Thai EFL learners, /g/, as this sound does not exist in the Thai consonantal system (Monthon Kanokpermpoon, 2007). According to Bowman (2000), Thai EFL learners tend to pronounce /k/ instead of pronounce /g/ such as

good [gʊd] Thai tends to pronounce as [ku:t^-]

league [li:g] Thai tends to pronounce as [li:k^-]

In addition, the final position of English voiced plosives which are /b/, /d/, and /g/ might cause a problem for Thai EFL learners, since /b/, /d/, and /g/ do not normally occur in the final position of the Thai phonological system. Thus, it is advised that pronunciation teachers need to instruct their students to vibrate their vocal cords in order to have a voiced feature in the final position when pronouncing words which have voiced plosives in the final syllable (Monthon Kanokpermpoon, 2007).

3) The Similarities and Differences of Thai and English Nasals

Ronakiat (2002) stated that Thai EFL learners do not have any difficulty pronouncing English nasals, because /m/, /n/, and /ŋ/ sounds can occur in both initial and final position in the Thai sound system, and in English, /m/ and /n/ can occur in initial position and /ŋ/ can occur in final position. However, Thai EFL learners might face a problem uttering /m/ and /n/ sounds when these two sounds function as a syllabic. "Syllabic consonants occur when a syllable ends in /p/, /b/, /t/, /d/, /m/, and /n/ and the following syllable is unstressed and contains an /l/ or /n/" (Praromrat Jotikasthira, 1998, p. 4). A syllabic means /m/ and /n/ are uttered without any vowel in pronunciation. This syllabic function does not occur in the Thai sound system, therefore it might cause a problem for Thai learner pronunciation.

Example:

Syllabic m	Syllabic n
rhythm [rɪðm]	sudden [sʌdn]

Thus, it is suggested that Thai EFL learners should place their articulators of the syllabic when they are pronouncing the consonant preceding it. Therefore, the vowel is not pronounced and the syllabic occurs in English syllables. Moreover, /ŋ/ sound is spelled /ng/ in English or is written as /nk/ (Nantana Ronakiat, 2002).

Example:

Spellings /ng/	Spellings /nk/
sing /sɪŋ/	link /lɪŋk/

Furthermore, adding the suffix –er to English words such as sing or strong can cause a confusion to Thai EFL learners as they tend to pronounce by adding /g/ sound before the suffix –er (Monthon Kanokpermpoon, 2007).

Examples:

sing /sɪŋ/	singer /sɪŋə/
strong /strɒŋ/	stronger /strɒŋə/

Therefore, Nantana Ronakiat (2002) suggested that Thai teachers should advise their students to acknowledge that when the root word is a verb and has an /ng/ ending, after adding a suffix, /ng/ should be pronounced as /n/ instead of /g/ sound.

Example:

sing /sɪŋ/ singer /sɪŋə/ not/sɪŋgə/

4) The Similarities and Differences of Thai and English Fricatives

Fricatives such as /f/, /s/, and /h/ sounds occurred often in English both in the initial and final positions. However, these three sounds occur only in the initial position in the Thai sound system, and they do not occur in the final position at all, which is why Thai EFL learners have faced significant problems in pronouncing fricatives in the final position (Monthon Kanokpermpoon, 2004). Moreover, /θ/ sound which is spelled as /th/, and /ʃ/sound which is spelled as /sh/often cause problems for Thai EFL learners as these two sounds do not occur in the initial position of Thai phonology (Nantana Ronakiat, 2002).

Examples:

English word with initial /th/		Mostly replaced with
thin	/θɪn/	/t^{h}ɪn/
thanks	/θæŋks/	/t^{h}ɛŋk/
English word with initial /sh/		Mostly replaced with
shoe	/ʃuː/	/tɕ^{h}uː/ (tɕ^{h}= /ɕ/and/ʁ/in initial position)
shop	/ʃɒp/	/tɕ^{h}ɔp/ (tɕ^{h}= /ɕ/and/ʁ/in initial position)

Thai EFL learners oftentimes have a problem in pronouncing words that have the voiceless fricatives which are /f/, /θ/, /s/, and /ʃ/ on the last syllable of a word, as there are only four plosives, which are /p/, /t/, /k/, and /ʔ =ɵ/, and three nasals, which are /m/, /n/, and /ŋ/ that occur in the final position of Thai phonology (Abramson, 1972; Pintip Tuaycharoen, 1990). Thus, Thai students tend to replace voiceless fricatives which do not occur in Thai phonology with their Thai final plosives and nasals or sometimes ignore them (Monthon Kanokpermpoon, 2007).

Examples:

English words with final voiceless fricatives		Replaced with
puff	/pʌf/	/p^{h}ɑp/
breath	/breθ/	/bɾet/
kiss	/kɪs/	/k^{h}it/
cash	/kæʃ/	/k^{h}ɛt/

Moreover, /v/, /θ/, /z/, and /ʒ/ sounds which are voiced fricatives also cause a large problem for Thai EFL learners, since these four sounds do not occur in Thai phonology in either the initial or final positions. Thus, Thai learners tend to replace English voiced fricatives with Thai consonants across three positions of words (initial, medial, and final positions) (Monthon Kanokpermpoon, 2007).

Examples:

Initial Voiced Fricatives		Replaced with
van	/væn/	/wɛːn/
then	/ðen/	/den/
zoo	/zuː/	/suː/
genre	/ʒɒnɪə/	/tɕɔŋɾə/ (tɕ = ʧ)
Medial Voiced Fricatives		**Replaced with**
living	/lɪvɪŋ/	/liːpwiŋ/
breathing	/briːðɪŋ/	/bɾɪːdɪŋ/
easy	/iːzi/	/ʔɪːsɪː/
pleasure	/pleʒə/	/p^{h}retɕ^{h}ɤː/
Final Voiced Fricatives		**Replaced with**
leave	/liːv/	/liːp/
soothe	/suːð/	/suːt/
please	/pliːz/	/pliːt/
beige	/beɪʒ/	/beːt/

From the tendency of replacing Thai consonants in English voiced fricatives, Thai students are advised to concentrate primarily on practicing voiced fricatives in every syllable position. Monthon Kanokpermpoon (2004) proposed some advice to assist Thai learners in pronouncing voiced fricatives. It is suggested that Thai learners should start to pronounce voiced fricatives with the voiceless feature first and then move towards the voiced counterpart. Below are some examples of practice:

1) /f/ - /v/

Students should practice the /f/ sound, which is voiceless, by moving the lower lip to the upper teeth by creating a narrow gap between them. The /f/ and

/v/ sounds have the same movement of articulation, but the difference is the vocal cords are forced to vibrate while pronouncing the /v/ sound.

2) /θ/ - /ð/

Students should practice the /θ/sound, which is voiceless, by moving the tongue tip to the upper teeth, leaving a narrow gap between them. The /θ/ and /ð / sounds have the same movement of articulation, but the difference is the vocal cords are forced to vibrate while pronouncing the / ð / sound.

3) /s/ - /z/

Students should practice the /s/ sound which is voiceless by moving the tongue blade to the alveolar ridge by leaving a narrow gap between them. The / s / and /z / sounds have the same movement of articulation, but the difference is the vocal cords are forced to vibrate while pronouncing the / z / sound.

4) /ʃ/ and /ʒ/

Students should practice the /ʃ/ sound, which is voiceless, by moving the front blade of the tongue to the area behind the alveolar ridge, then raising the upper lip and pronouncing the sound without vibrating the vocal cords. The /ʃ/ and /ʒ/ sounds have the same movement of articulation, but the difference is the vocal cords are forced to vibrate while pronouncing the /ʒ / sound. Finally, Thai EFL learners do not have a problem in uttering the /h/ sound in English because there is the /h/ sound in Thai in all positions; however the /h/ sound in English occurs initially and medially.

Examples:

	Initial Position	Medial Position
/h/	/hæf/ (half)	/bɪhaɪnd/ (behind)

5) The similarities and differences of Thai and English affricates

In the Thai consonantal sound system, there are two affricates, which are /tɕ$^{h/}$ (ฉ, ช, and ฌ) and $^{/}$tɕ$^{/}$ (จ). /tɕ$^{h/}$ is a voiceless aspirated alveolar-palatal affricate, and $^{/}$tɕ$^{/}$ is a voiceless unaspirated alveolar-palatal affricate (Harris, 1972). However, there are two different sounds in the English affricates manner of articulation which are /ʧ/ and /dʒ/.

Examples:

	Initial Position	Medial Position	Final Position
/ʧ/	/ʧiːp/ (cheap)	/kætʃ.ɪŋ/ (catching)	/wɑːtʃ/ (watch)
/ʤ/	/ʤɔɪn/ (join)	/deɪn.ʤə/ (danger)	/eɪʤ/ (age)

The Thai /tɕ/ sound might not cause a problem for Thai EFL learners to pronounce "since the voice onset time of the vowel succeeding the articulation of Thai /tɕ/ is considerably shorter for English /ʧ/ causing it to sound almost indistinguishable from English /ʤ/" (Bowman, 2000: 45). The Thai/$tɕ^{h/}$ is sounded similarly to the English /ʧ/ in the initial position. Thus, there is no problem for Thai EFL learners to pronounce both /ʧ/ and /ʤ/. Moreover, Nantana Ronakiat (2002) gave some suggestions on how to utter English affricates correctly.

(1) The places of articulation between the Thai aspirated affricate /$tɕ^{h}$ / and the English affricate /ʧ/ are very close. Thus, Thai EFL learners are advised to raise their tongue tips to the area behind the alveolar ridge, press the articulators tightly before gradually leaving the articulators in order to utter the English affricate /ʧ/ correctly.

(2) It was found that Thai EFL learners tend to utter /tɕ/ instead of pronouncing /ʤ/. The /tɕ/ sound is voiceless, while /ʤ/ is voiced. Thus, Thai learners are recommended to pronounce the /ʤ/ sound by imitating the same articulation of pronouncing the /ʧ/ sound, but they need to force their vocal cords to vibrate.

Example:

General /ʤen.ər.əl/ not /tɕen.ər.əl/

On the other hand, Thai EFL learners have a significant problem in pronouncing /ʧ/ and /ʤ/ in the final position as/ʧ/ and /ʤ/ sounds do not occur in the Thai final syllable. There is a tendency to substitute these two sounds with Thai final plosives (/p/, /t/, and /k/) and Thai final nasals (/m/, /n/, and /ŋ/). Thus, Thai teachers should assist their students to carefully practice pronouncing /ʧ/ and /ʤ/ sounds in the final position (Monthon Kanokpermpoon, 2007).

Examples:

stage /steɪʤ/ not /steɪt/

manage /mæn.ɪʤ/ not /mæn.ɪn/

6) The Similarities and Differences of Thai and English Laterals

There are two English lateral sounds which are clear, /l/ and dark /l/. In the Thai consonantal system, when the /l/ sound occurs in initial position of word, the Thai /l/ sound is quite similar to the English clear /l/ when it occurs in the initial position. Thus, Thai EFL students do not have a problem in uttering /l/ in the initial syllable. However, when the dark /l/ occurs in the medial and final position of an English word, it might cause a problem to English learners, as English dark /l/ "will never occur before vowels" (Roach, 2002, p. 61). The dark /l/ is normally found in the final position of English words.

Examples of Clear and Dark /l/

Clear /l/ occurs in	Initial Position	Consonant Cluster
	/leɪt/ (late)	/slɪm/ (slim)
Dark /l/ occurs in	Final Position	
	/kuːl/ (cool)	

The difference between clear and dark /l/ is that when uttering clear /l/, the front of the tongue is raised while the back of the tongue is raised in pronouncing dark /l/ (Roach, 2002). According to Nantana Ronakiat (2002), pronouncing dark /l/ when it occurs in the final position of an English word causes a major problem for Thai EFL learners as Thai students tend to substitute dark /l/ with Thai nasal /n/ or ignore to utter dark /l/.

Examples:

English words with final lateral		Replaced with
ball	/bɔːl/	/bɒn/
call	/kɔːl/	/k^hɔː/

7) The Similarities and Differences of Thai and English Approximants

There are three English approximants which are /w/, /j/, and /ɹ/. According to Nantana Ronakiat (2002), there is no problem for Thai learners in pronouncing /w/ and /j/, as these two sounds also occur in the Thai consonantal system. However, the English /ɹ/ sound may cause a problem with Thai learners, because in the Thai system there is a tap /ɾ/ (ร) sound which is quite different to the English /ɹ/ sound. In uttering the English /ɹ/ sound, there are two different ways to

pronounce it, because in British English /r/ is only pronounced when it comes in the initial position while /r/ is pronounced in all positions by Americans (Deterding & Poedjosoedarma, 1998; Roach, 2002).

Examples:

British English		American English
red	/ɹed/	/ɹed/
bird	/bɜːd/	/bɝːd/
car	/kɑː /	/kɑːɹ /

There are two problems when Thai EFL learners attempt to utter the English /ɹ/ sound (Nantana Ronakiat, 2002).

(1) Thai EFL learners tend to substitute English /ɹ/ sound with Thai /l/

Example:

	English	Thai
read	/ɹiːd/	/lĩːt̚/

(2) Thai EFL learners tend to substitute Thai tap /ɾ/ to English/ɹ/ sound when pronouncing an English word in which the English /ɹ/sound occurs.

Examples:

	English	Thai
read	/ɹiːd/ /	/riːd/
red	/ɹed/	/red/

Thus, Thai EFL learners are advised to raise their tongue tips approximately to the area behind the alveolar ridge, but leave some gap under the roof of the mouth. During articulation, they have to vibrate their vocal cords and round and protrude their mouth (Monthon Kanokpermpoon, 2007).

In conclusion, the English consonantal system has more sounds than the Thai consonantal system. Thai EFL learners almost always have a problem in uttering English sounds that do not occur in the Thai sound system. The most common problem of Thai EFL learners is the tendency to substitute English sounds that do not occur in the Thai sound system with Thai consonantal sounds which may cause a misunderstanding for English native speakers. According to the information presented

above, the English consonantal sounds that cause problems for Thai students are /b/, /d/, and /g/ in the final position, /ŋ/ in the final position, /θ/ and /ʃ/ in the initial position, /ʧ/ and /dʒ/in the final position, dark /l/ in the final position, and /ɹ/ in the initial position.

2.2.3 Teaching English Pronunciation

Looking back 50 years ago when the audio-lingual approach influenced the pronunciation pedagogy of second language acquisition, L2 pronunciation teaching focused on the deviation of nonnative pronunciation, which was immediately corrected by teachers (Busa, 2008). Especially during the 50's and 60's, the audio-lingual approach became the most popular approach; therefore, the ultimate goal of instruction was to obtain and imitate a native accent guided by pronunciation teachers. During this period, instruction was grounded on the discrimination and production of sounds by improving the recognition and articulation of L2 specific English phonemes (Lambacher, 1996). From the 1960's to 1980's, Preston (1981) mentioned that focusing on L2 pronunciation instruction was questioned and the ultimate goal of instruction shifted. Many scholars speculated that imitating native accent was unattainable in second language learning. The role of pronunciation instruction was reduced and eliminated from many language programs. In the late 1980's, pronunciation instruction was reconsidered, but the shift of interest was from segmental aspects such as minimal pairs, tongue twisters, songs, sound animations, step-by step phonetic descriptions, and video animations specific to consonant and vowel phonemes of English to suprasegmental aspects for instance pitch, loudness, tempo, and rhythm sound co-articulation, and voice quality of learning a new language (Esling & Wong, 1983). The goal of instruction also shifted from utilizing grammatical rules to obtaining communicative competence. Obtaining communicative competence means language learners could produce pragmatically appropriate utterances and suitably utilize obtained competence in an appropriate context. Nevertheless, meaningful interaction is promoted in pronunciation instruction, the correction of L2 articulation of vowels, and consonants were ignored (Morley, 1991; Pennington & Richards, 1986). Beginning in the 1980's, the English language became the prominent language for people around the world, who use it as a second language and a foreign language (Anderson-Hsieh, 1989). Moreover, immigrants, refugees,

students, and academic professionals from all over the world were required to develop their English pronunciation, as they needed to reside in or visit English speaking countries to acquire cultural, economic, and financial opportunities (Celce-Murcia, 1991). In fact, many L2 learners who are immigrants and international students in the U.S. and Canada faced many problems in finding jobs due to having a foreign accent (Ferrier, et al., 1999, as cited in Hismanoglu, 2011). Because of this situation, there is a great demand in learning proper English language pronunciation. In the age of globalization, many researchers, linguists, and pronunciation teachers realize the importance of L2 learners' pronunciation needs. Therefore, new perspectives on pronunciation teaching and learning have emerged (Haslam, 2010). In the 90's, because of the growing needs of people who use English as a second and a foreign language, pronunciation was viewed as an important part of communication. Morley (1991) reported that the focus of pronunciation teaching was on suprasegmental aspects and how language learners could utilize obtained knowledge to communicate meaning, meaningful practice, and the uniqueness of each individual ESL learner. Learner-centered speech awareness and self-monitoring were the focus of pronunciation learning in those years. The focus of pronunciation instruction changed from the teacher playing the key role in the learning process to child-centeredness where students performed a key role in the learning process (Brown, 2003). Moreover, Celce-Murcai, Brinton, and Goodwin (1996) stated that the traditional classroom for pronunciation teaching at that time was primarily based on the communicative approach. The phonetics alphabet was used to instruct English pronunciation learners together with transcription practice, details of the articulatory systems, developmental approximation drills, focused production tasks, tongue twisters, and games. The other methods were listening and imitating, using visual aids, and the practice of vowel shifts and stress shifts related by affixation.

Morley (1994), Celce-Murcia, et al. (1996), and Pennington (1996) proposed that the pronunciation practice process develops communicative competence. The process involves three stages. Firstly, listening, reading, repeating of minimal pairs, short dialogues, and passages are presented to learners. These types of activities are called control practice. Secondly, simulation of communicative language activities such as information gap activities and a role-play of a situation similar to real life context are presented to learners. These types of activities are called guided practice.

Lastly, learners are allowed to engage in independent or communicative practice where they are involved in less controlled activities, but are engaged in a discussion in a real life situation, or presenting speech related to his/her own areas of interest without preparation.

Moreover, Laroy (1995) proposed the idea of providing a relaxed atmosphere when learning pronunciation. Pronunciation lessons should be presented indirectly by providing a relaxing atmosphere. A relaxing atmosphere can be defined as one which utilizes games and music. He believed that learners can perform well in pronunciation activities when they are in a relaxing atmosphere.

From reviewing the aforementioned teaching methods, pronunciation teachers seem to play a major role in controlling activities in the pronunciation class, and they also need to stimulate and support each learner to interact in pronunciation activities. Pennington added that teachers could also act as a motivator, a facilitator, and an expert consultant. Teachers can also act as a person who analyzes the learners' problems in learning pronunciation and creates activities that can help learners cope with their pronunciation problems. They could assist each learner in creating individual pronunciation learning goals and then help each learner to achieve their own goals (Morley 1994; Celce-Murcia, et al., 1996; Pennington 1996). From the above suggestions, it could be concluded that pronunciation teachers have the role of controlling learning activities in class. On the other hand, Pennington (1996) noted that the learners' role is to commit and try to achieve their own pronunciation learning goals. Thus, learners need to follow and give full cooperation in pronunciation activities.

Acquiring a native English accent is not a goal of English pronunciation learning in teaching English pronunciation currently as mentioned earlier by Preston (1981). Thus, Kenworthy (1987) introduced the new goal of pronunciation learning, which is "intelligibility". Morley (1994) mentioned that the goal of pronunciation learning should be acquiring intelligibility or communicability. Thus, the goal of pronunciation shifted from acquiring near-native pronunciation to intelligibility. Kenworthy (1987, p.13) defined intelligibility as "being understood by a listener at a given time in a given situation". Thus, it is the same as understandability. Pennington (1996) added that intelligibility should be first acquired in pronunciation learning, and

then each pronunciation learner could acquire further fluency and accuracy of pronunciation.

In Thailand, the English pronunciation teaching classroom also employs the communicative approach. Normally, the classroom focuses on each English sound, and then combines them into words and sentences. Some students may gain benefit from this method, however, some may not. Therefore, new methods were developed to fulfill some gaps in the traditional pronunciation teaching classroom. The new direction of pronunciation teaching involves many fields such as drama, psychology and pathology (Celce-Murcai, Brinton, & Goodwin, 1996). In addition, Jenkins (2004) stated that during several decades of the twentieth century, the main interest of research was in applying contrastive analysis techniques to the sound segments of L1 and L2. Moreover, Wiriyachitra (2001) stated that the role of English in Thailand is vital as it is in many other developing countries. New technology and the adoption of the Internet have impacted many areas such as business, education and science, all of which require high English proficiency. Wiriyachitra (2001) also pointed out that the English curriculum used in Thai universities could not meet the demand of English used in workplace. Moreover, there are difficulties in teaching English pronunciation in Thailand as listed by Biyaem (1997) as follows:

1) Heavy teaching hours per week (over 20hours per week).
2) High number of students within one class (over 45 to 60).
3) Inadequately equipped classrooms and educational technology.

Moreover, the difficulties in terms of English learners are:

1) The interference from mother tongue (Thai) in pronunciation, syntax and idiomatic usage.
2) Unchallenging English lessons.
3) Being treated as passive learners.
4) Lack of opportunity to utilize English in learners' daily life.
5) Lack of confidence to speak English with classmates.

In addition, Foley (2005) also reported the factors limited success of learning and teaching English in Thailand; for instance, lack of proper curricula, dry teaching style that overemphasizes grammatical details, students, learning media, inappropriate text, testing and evaluation.

These obstacles are recognized by the Thai government, therefore Thailand's new constitution, enacted in 1999, established the National Education Act which forced the most radical education reform in Thai history. The communicative approach is still utilized, yet with more emphasis on listening and speaking. Integrated, cooperative, holistic, content, task-based and problem-based learning are also applied. This education reform implemented between 1999 and 2007 focuses on four main areas: school, curriculum, teacher, and administrative reform. Its main concern is that learners have the ability to learn and develop. Learners are the most important component and life-long learning must be developed (Arunee Wiriyachitra, 2001).

In 2002, the Ministry of Universities Affairs ordered the reform of English learning and teaching in Thai higher institutions to correspond to the National Education Act 1999. The most vital improvement of the reform is related to Self-Access Learning and Information Technology. According to Beyaem (1997), Self-Access Learning Centers (SALCs) have been established in many Thai schools and universities in order to: (1) provide multimedia and learning facilities for the students to further practice language skills according to individual interests on their own in addition to what has been taught in the classroom; (2) be a source of a variety of general knowledge which the students can integrate into the study of subject matter in the English language, especially in listening and reading skills; and (3) be used as a tool for learner training in strategies of learning (how to learn), which is hoped will lead to the formation of skills to know how to utilize all these processes for life-long education, thus students will be empowered to continue the development of their work.

Since the enactment of the National Education Act 1999, it could be said that teaching English pronunciation in Thailand has unintentionally been ignored. There has been a lack of focus on English pronunciation skills which needs to be included in the new Self-Access Learning Center (SALC) by the installation of software programs that can enhance pronunciation learning in order to facilitate equal emphasis on the four basic English skills and assist Thai EFL learners to acquire intelligibility of pronunciation which is the ultimate goal in learning pronunciation according to communicative competence (Arunee Wiriyachitra, 2001). Therefore, it is theoretically important to examine teaching English pronunciation using CAPL in the Thai college context.

2.2.4 Acquiring English Pronunciation Skills

In the past, it was believed that the behavior of humans and animals could be studied from the idea of habit formation, which is from the behaviorism standpoint (Isono, 2005). As Ellis (1985) stated, behaviorists believed that a behavior could be formed when a stimulus was habitually connected with a response, and that connection was reinforced when subjects received the response that they desired. This belief was utilized in First Language Acquisition (FLA), and it was believed that children could acquire their first language (L1) pronunciation by mimicking and repeating spoken utterances that were produced by adults (Isono, 2005).

Later, language scholars found that human beings have the innate ability to learn language. Therefore, acquiring first language is more than just receiving input from adult's speech. As Cook (1985, as cited in Isono, 2005) stated, language knowledge could not be learnt by only receiving positive signs that children have listened, such as when seven year old English native speakers are able to differentiate between the two following sentences that look mostly alike in structure, but actually are different in meaning: "1. John is eager to please (John is pleasing other people).; 2. John is easy to please (Other people are pleasing John)" (Cook, 1985, as cited in Isono, 2005, p. 58). He observed that all of his subjects, who were seven year-old English native speakers, could point out the differences between these two sentences. Thus, he postulated that there exists an innate, universal knowledge that all human beings are born with. The idea of innate ability is relevant to the cognitive approach, which comes from Chomsky, who proposed the theory of Universal Grammar and Language Acquisition Device (Isono, 2005). Thus, it is believed that the innate ability of human beings could be activated after receiving input and then it could enable all human beings to understand more complicated rules and structures in a fixed order in FLA.

Thus, the development of the pronunciation of L1 sounds depends on experience of learners in exchanging L1 sounds with adults, and innate abilities could play a supporting role that assists L1 learners to acquire sounds successfully. However, it should be noted that that only imitating spoken utterances by adults is not enough to complete the process of L1 sound acquisition, as it is believed that there is a physical limitation that obstructs young children in their acquisition of some intrinsically difficult sounds at the particular stage of the acquisition, therefore it

could be viewed as a fixed acquisition order. Once young L1 learners are confronted with some intrinsically difficult sounds, they create their own rules to cope with them (Isono, 2005).

2.2.4.1 Process of Acquiring Pronunciation Skills in L1

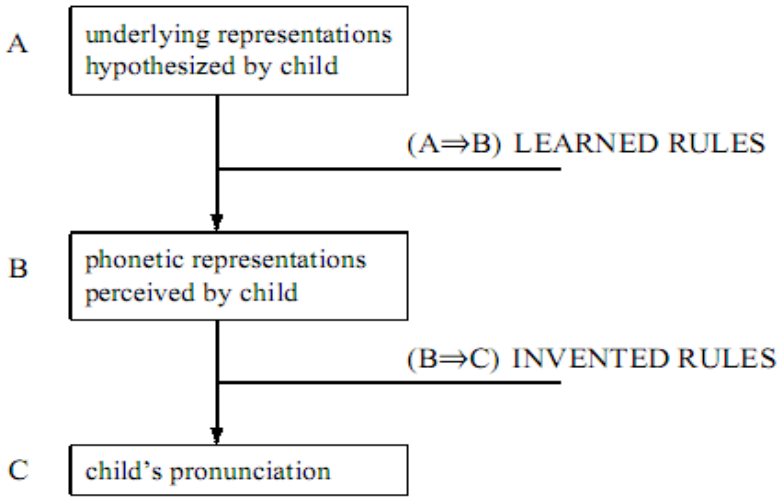


Figure 2.4 First Language Acquisition in Pronunciation

Source: Kiparsky and Menn, 1987, p. 36.

Kiparsky and Menn's framework for first language acquisition in pronunciation is presented to clarify the process of how native speakers learn their own pronunciation skills. This framework proposes the acquisition process of phonetic repertoire by native children (Isono, 2005). This framework was based on the cognitive approach of Chomsky (1957, as cited in Isono, 2005) who claims that learning first language is not only mimicking sounds that children have heard, but children are also capable of creating their own assumptions against what they have heard and test their assumptions. Chomsky's theory was in the domain of syntax, which consists of grammatical and morpheme studies. Nevertheless it was widely accepted in the pronunciation acquisition field also. Kiparsky and Menn (1987) viewed the process of acquiring pronunciation as a problem solving activity which consists of three stages. In Stage A, children create assumptions of underlying representations against what they have heard from adults. They try to understand the

relationship between different forms of sounds. In Stage B, they could perceive the phonetics representations from adult speech. Then, they successfully pronounce sounds at stage C. The problem solving activities occur during Stages B to C when children create and test their own assumptions. Nevertheless, the physical limitations of each child is also a major factor that influences the development of children's speech production as it impedes children's pronunciation of some difficult sounds. Kiparsky and Menn also believed that Stages A and B co-occur, but this is different to stages B to C. They claimed that when children have gained enough of a phonetic repertoire from adult speech, then they could establish language rules. They could pronounce sounds similar to adult speech and the acquiring process of pronunciation will be completed once if they could pronounce sounds like adult speech.

After reviewing the acquisition process of pronunciation learning in L1, there are some differences that EFL teachers must take into account when comparing it with the acquiring process of pronunciation learning in L2. First, L2 learners already have acquired their L1 phonetic repertoires. Second, the opportunities for EFL learners to be exposed to L2 input and feedback are restricted. Finally, it is believed that not all L2 learners could succeed in learning L2 pronunciation skills (Isono, 2005).

2.2.4.2 Process of Pronunciation Learning in L2 Learners

Selinker (1972) stated that the process of L2 pronunciation learning could be considered as a creative process in which L2 learners incorporate representation of the regularities they have discovered in the linguistic data, while they have been exposed through the interaction between L2 learners and the environment. Thus, it is expected that L2 learners could construct their systemic phonological systems like native children. Selinker concluded that the phonological systems that lie in the middle between a learner's first language (L1) and the second language (L2) are called interlanguage phonology, and the creative process is named the continuum of interlanguage phonology.

There are two points concerning the nature of the continuum of interlanguage phonology (Flege, 1980; Major, 1987). First, L2 phonological errors are caused by the L1 interference at the beginning stage. Secondly, after the certain period of learning the features of L1, sounds are replaced by L2 sounds step by step.

From these two points, it could be postulated that the nature of the continuum of interlanguage phonology is the process where the features of the L1 sound system are gradually replaced with those of the L2 sound system. Moreover, Selinker added that the acquisition process of L2 pronunciation could be viewed as the selection process where some L1 sounds are transferred and some are not, and some L2 sounds are acquired into the interlanguage phonology. However, it is still not clear why there are some L1 sounds that could not be transferred, and why some L2 sounds could not be acquired into interlanguage phonology.

Process of Acquiring Pronunciation Learning in L2 by Conventional Approach

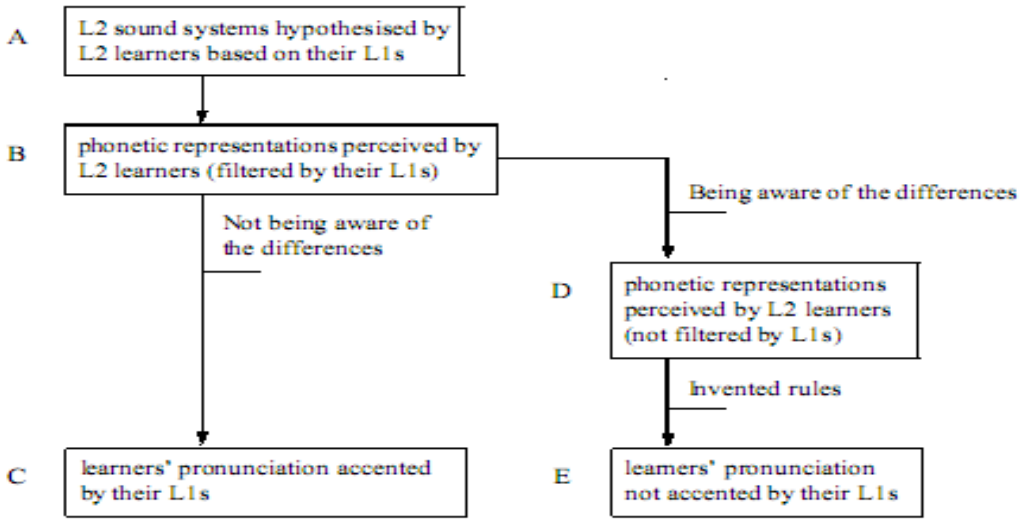


Figure 2.5 Process of Acquiring Pronunciation Learning in L2

Source: Isono, 2005, p. 12.

From the diagram above presented by Isono, the pronunciation learning process of L2 learners consists of five stages. During Stage A, L2 learners rely only on the knowledge from L1 that they already acquired. In other words, they compare their L1 sounds with L2 sounds. In Stage B, L2 learners receive input and feedback from formal instruction of L2 learning or from exposure to the target language. However, they still cannot escape from the influence of L1 sound systems, because they perceive the L2 sounds based on the L1 sound systems knowledge.

Normally, L2 learners do not recognize the differences between L1 and L2 sound systems at Stage C. Later, when L2 learners have gained sufficient input and feedback, some learners may be able to recognize "some" of the differences between the L1 and L2 sounds, and they finally escape from the influence of the L1 sound system. This is called Stage D, where only some L2 learners could realize the difference between the L1 and L2 sound systems. Bohn and Flege (1992) and Isono (2003) reported that realizing the differences between L1 and L2 sounds system of L2 learners depends on how much difference exists between the phonetics categories of the L1 and L2 sound systems. If they are quite different in terms of their phonetic sounds, it is much easier for L2 learners to distinguish the differences. After Stage D, L2 learners will attempt to establish their L2 pronunciations to become more native-like, and this attempt assists them in creating their own rules and enforcing them so they can reach the final stage which is called Stage E. Isono (2003) reported the example of transforming from Stage D to Stage E in her study of the acquisition process of the English vowels [æ]. Her participants in the experimental group were 51 overseas Japanese language students, and the control group consisted of eight native speakers who had been teaching English in Essex, East Anglia, England. It was recognized that the English [æ] sound, which was produced by the Asian group during Stages D and E, was pronounced differently, especially at the early stage of acquisition, because of the tongue's muscular limitation or wrong rules acquired by L2 learners. After the acquisition stage progresses, Stage D is assumed to reach to Stage E where the English [æ] that was produced by the Asian group was identical to native English speakers. Once the pronunciation process reaches Stage E, the process is completed. On the other hand, some L2 learners who could not identify the differences between the L1 and L2 sound systems during Stage B will continue to substitute L1 sounds for L2 sounds, and as a result, could not reach the above route of stages D and E. Their L2 pronunciation remained in Stage C, and is fossilized until the awareness of the differences occurs.

From reviewing the first and second language acquisition process, it has been found that the FLA process in pronunciation learning is shorter than SLA in the pronunciation process. Native children could acquire their first sound system successfully with the assistance of innate ability. However, it is clear that the

L1 sound system of L2 learners could interfere with the process of acquiring L2 sounds even though they have been exposed to input and feedback from pronunciation instruction. Thus, some L2 learners remain at Stage C. Once they have gained a sufficient level of input and feedback, they should recognize the differences between L1 and L2 sound systems. Then, they could reach Stage D and pronounce L2 sounds without an L1 accent. This means that they reach Stage E, where the listener could understand L2 pronunciation clearly. Thus, acquiring Stage E means L2 learners gain intelligibility, which is the goal of pronunciation learning, as recognized by Kenworthy (1987) in the previous section.

In conclusion, L2 learners could attain intelligibility once they have been exposed to sufficient authentic input and feedback in order to recognize the differences between L1 and L2 sounds. However, when acquiring English pronunciation in EFL conventional instruction, the opportunity to receive input and feedback is limited to the classroom only. CAPL programs could play a major role in helping pronunciation learners to attain intelligibility as they could offer learners unlimited authentic input and feedback outside the classroom. This is realized on the condition that L2 learners themselves must continuously seek authentic input and attend to it consciously.

2.3 Computer Assisted Pronunciation Learning (CAPL)

As Molholt (1988) mentioned above, CAPT has been highly regarded and of wide interest to both pronunciation teachers and researchers for several decades. The main interests of CAPL research are how computer technology can be incorporated into pronunciation learning and examining the effectiveness of CAPL in terms of enhancing performance (Liu, 2008).

In the next section, the definition of CAPL, benefits of CAPL, features of CAPL, correction of English pronunciation learning, and feedback from CAPL system are presented.

2.3.1 What is Computer Assisted Pronunciation Learning (CAPL)?

Many scholars such as Hiller, Rooney, Laver, and Jack (1993), and Kawai and Hirose (2000) defined CAPL in general terms as a system that is developed for pronunciation training. This system can capture a deviation of L2 student's pronunciation and give correction feedback to cope with their deviations.

Pennington (1999) defined CAPL in technical terms as a system that could perform and illustrate speech for acoustic analysis in both segmental and suprasegmental levels. These kinds of systems utilize input from a microphone to display pronunciation learner's acoustic speech, and it can also be utilized for enhancing L2 or foreign language pronunciation learning.

There are two reasons why CAPL systems have come to play a major role in pronunciation teaching and learning nowadays. First, the conventional pronunciation teaching approach relies on verbal indication only. This conventional approach lacks visual elements such as representations of articulators, as visual elements could assist learners to encode and retrieve acquired input through more than one channel of cognition such as aural/oral and visual (Paivio, 1971; 1991). Secondly, in the conventional classroom the opportunities to receive feedback from teachers are limited. Feedback in the conventional pronunciation class comes in the form of paper and instructional materials in electronic form that cannot include effective feedback. According to Neri, Cucchiarini, and Strik (2002, p. 1210), an effective feedback is "comprehensible, [does] not rely solely on the learner's own perception, [allows] verification of response correctness, [pinpoints] specific errors and possibly [suggests] a remedy."

2.3.2 Benefits of Computer Assisted Pronunciation Learning

There are many scholars who reported the advantages of a commercial CAPL system such as Anderson-Hsieh (1992), Chun (1989), Pennington (1989a, 1996a), and Pennington and Esling (1996). First, it could execute an analysis and deliver feedback to learners faster than humans can. Learners' speeches are analyzed by CAPL without limitation, and this analysis is accurate, reliable and repeatable. From all these benefits, it could be said that CAPL could provide better pronunciation instruction than a human pronunciation coach or phonetician in terms of giving feedback.

Learners also do not need to suffer from the limitations of hearing, judgment or bias. CAPL could be considered as being more authoritative or trustworthy than human-aided pronunciation instruction (Pennington, 1999).

Further to providing trustworthy feedback, CAPL feedback is also highly salient. CAPL is highly salient in the sense that it could incorporate the capacities of the computer to present feedback in a visual, auditory and multimedia modality presentation. The computer could provide individual instruction by presenting a mechanical analysis of each pronunciation learner's problem, past trials, and performance. Furthermore, the computer could provide various ways of presentation such as on demand and on the spot. Therefore, it means that the computer could provide both individual and variable training (Pennington, 1999).

Lambacher (1997, 1998) mentioned that the CAPL system was designed to be utilized only in a stand-alone individual computer. Recently, the CAPL system could be incorporated into a language lab where learners could independently practice their pronunciation at their terminals. Teachers could access and retrieve his or her students' results from a main control station. This kind of feature could allow the teacher to assign specific practice for each student, group, and class. The CAPL system in the language lab also provides the opportunity for teachers to review their students' performance and to move analysis of students' speech from one terminal to another terminal in order to compare performance across students. Moreover, an individualized CAPL system can also offer an opportunity for teachers to compare the performance of each student. The CAPL system can be utilized in various modes such as combining the whole class, small group or pair, teacher-to-student, and individual work.

According to Pennington (1999), the CAPL system could develop positive potential for pronunciation instruction. First, CAPL has the potential to enhance learners' motivation and willingness to learn their pronunciation. CAPL can enhance the awareness of learners and increase the understanding of key concepts of the phonology of target languages as it could provide various kinds of pronunciation input such as sounds and motion pictures. More importantly, it could improve the learnability of phonology, which is for learners who have moved past the critical period. Practicing the automaticity of pronunciation mechanics, the suprasegmental

speech and overall fluency of sentences through the CAPL system could increase learner's correctness in articulating a target language. Lastly, CAPL can assist learners in establishing their confidence during developing abilities in pronunciation, differentiation of sounds, recognition of sound patterns of the target language by practicing in a private and individual work-space and various tools.

Table 2.4 Benefits of Computer Assisted Pronunciation

CAPL is	**Benefits of CAPL**
quick	motivating
repeatable	stimulates effort
precise	raises awareness
reliable	increases understanding
authoritative	enhances learnability
highly salient	increases automaticity
multi-modal	fosters precision
individual	builds confidence
variable	develops skills

Source: Pennington, 1999, p. 430.

Furthermore, it is believed that L2 learners might confront a point of fossilization or diminishing returns at an early intermediate level of L2 learning. Thus, without explicit instruction, some L2 learners, who are fossilized, will have difficulty in developing their productive and receptive competence of a new sound system (Pennington, 1998). CAPL could provide opportunities to L2 learners for accessing a review of their own performance and basic phonological systems in order to emphasize phonology and to learn new pronunciation patterns. Therefore, the CAPL system is considered as a tool to enhance L2 learners' productive and receptive abilities in learning pronunciation of a target language (Pennington, 1999). Moreover, Neri, Cucchiarini, Strik, and Boves (2002) summarized the benefits of CAPL on learning, stating that it could offer a personal, anxiety-free environment where

learners could (1) receive and access unlimited input, (2) learn pronunciation at their own pace, and (3) receive individual and instantaneous feedback from Automatic Speech Recognition (ASR) which is one feature of the CAPL system.

Moreover, with advanced technology related to CALL, an increasing interest in learner autonomy has emerged. Web-based CAPL has adopted the idea of learner autonomy in order to apply the student-centered approach and establish independent language learners (Pu, 2009). A web-based CAPL program demands language learners to develop autonomous learning capacity in the following aspects (Xu, Peng &Wu, 2004):

1) The Capacity to Establish Learning Objectives

Language learners are required to be able to establish short- and long-term objectives from the requirements of the language course. These objectives should come from the evaluation of language learners' current English proficiency and be appropriate to their own learning circumstance.

2) The Capacity to Choose Learning Materials

Because web-based learning could present various kinds of multimedia learning materials for language learners, they are required to be able to assess all multimedia learning materials and be capable to choose material that is appropriate to their needs.

3) The Capacity to Use Appropriate Learning Strategies

Language learners are required to make decisions on what learning strategies are suitable for them. They should also be able to select the most appropriate learning environment, certify their study time, and control their learning speed. However, it should be noted that the learning strategy of each learner will vary according to personal learning style, cultural background, and cognitive development.

4) The Capacity to Self-assess

Self-assessment is vital for the learning process. Computers are capable of accurately presenting language information and feedback. They also provide an explanation of why an input is correct and incorrect. Thus, language learners are empowered to monitor their learning progress by utilizing the computer's feedback information.

From reviewing Xu, Peng and Wu (2004), it could be expected that web-based learning programs allow language learners to have more options and flexibility in

learning with instructional material. It also offers more opportunities for language learners to take control and initiate pronunciation learning. The activities provided by computer-aided pronunciation are based on the student-centered approach, therefore learners could develop more independent and self-directed behavior in learning L2 pronunciation. Learners are less dependent on the teacher. Thus, it could be postulated that student autonomy could be highly developed by utilizing computer-aided pronunciation (Pu, 2009).

On the other hand, CAPL also has some limitations. Pennington (1999, p. 431) stated that "CAPL remains more a set of exciting potentials for instruction than an exciting reality" when compared with software that was developed in the last 20 years for teaching science and mathematics. He concluded that CAPL has not achieved state-of-the-art status in language instruction. First, some analysis of speech acoustics does not illustrate well in a visual presentation such as simplified or modified waveforms. Thus, it is difficult to be trained by the aforementioned visual presentations. Software developers should take the issue of the limitation of visual presentation of speech analysis into account. Secondly, CAPL programs are designed for individual use; therefore, CAPL utility is limited and not quite practical for whole class instruction. Moreover, some CAPL software needs to be set up again once a new user begins practicing pronunciation, and it can be used by only one user at a time (Pennington, 1999).

Another limitation of CAPL is pedagogical concerns. First, most software does not come from any particular theory or model of pronunciation which could distinguish variation from (true) error. There are only voices from software developers that are recorded as a standard for pronunciation analysis and imitating, but there is no baseline for analyzing pronunciation targets and deviation. Thus, pronunciation learners must observe by visualizing from a simplified waveform whether they could achieve pronunciation by comparison with the pre-recorded voice waveform generated by the software. However, some good advanced software could illustrate the degree of pronunciation achievement in a motivating graphic such as a giraffe with a neck that grows as the achievement of the speech input increases. Some CAPL that lacks a baseline to distinguish between acceptable variations to unacceptable deviations could produce the problem of "false negatives" and "false

positives". False negatives mean misinterpreting analysis of learners' pronunciation where learners actually produce an acceptable variation. This is because the acceptable variation is only based on one variety. False positives mean software indicating wrong feedback where learners actually do not achieve an acceptable deviation. This is because the criterion for acceptable performance is set too broad or the software is not capable of distinguishing right and wrong, native and non-native, or unmarked and marked performance (Pennington, 1999). The last limitation is the decontextualized mechanics of articulation, as most CAPL overemphasize the computer-based work on pronunciation. CAPL software in the market does not consist of curriculum or has only limited curriculum. There is a lack of mechanical connection and meaningful dimensions of phonology in most CAPL programs (Pennington, 1989).

Furthermore, it has been found that many CAPL programs are incorporated into EFL pronunciation learning in order to examine the effectiveness of CAPL on EFL pronunciation performance at both the segmental and suprasegmental level. First, Pearson, Pickering, and Da Silva (2011) utilized a Kay Pentax Computerized Speech Laboratory which could illustrate visual spectrograms of students in producing English syllable margins sounds. In utilizing a CAPL program, Vietnamese students in the experimental group were able to compare their syllable margins spectrogram with the prerecorded target spectrogram. After eight 30-minute tutoring sessions, the students measured their production of English syllable margins and the results showed that they tended to produce more target-like production of syllable margins. Both teachers and students in this study also tended to have positive reaction towards the use of the CAPL program in their learning. Secondly, Neri, Mich, Gerosa and Giuliani (2008) investigated whether a CAPL program which has an ASR feature could improve English pronunciation skills at the word level of EFL children in comparison to the results of a control group that studied pronunciation by conventional teacher-centered instruction. The results showed that children from both the experimental group and the control group had significant improvement on pronunciation performance at the word level, with some difficult English words that the children could not pronounce before the experiment being able to be pronounced correctly by both groups after instruction. The CAPL program could enhance

pronunciation learning at the word level for children in short term memory and could produce the same rate of improvement in EFL pronunciation performance as in conventional teacher-led pronunciation training.

Not only does the CAPL program enhance pronunciation learning in segmental or word level, but the CAPL program could also improve pronunciation learning in the suprasegmental or sentence level too. Tanner and Landon (2009) investigated the effectiveness of CAPL in assisting learners producing correct English pausing, stress, intonation, and overall comprehensibility. The participants in the experimental group studied prosody pronunciation by utilizing self-directed computer-assisted practice using Cued Pronunciation Readings (CPRs). After the treatment process, they examined their perception and production of key suprasegmental features which are pausing, word stress, sentence-final intonation, and the learners' level of perceived comprehensibility. The results revealed that the CAPL program, which has the Cued Pronunciation Readings (CPRs) feature in a self-directed environment, could enhance pronunciation learners' perception of pausing, word stress, and controlled production of stress. Moreover, the CAPL program could not only be utilized as a tool for enhancing English pronunciation for EFL learners, but it could also be applied to teach pronunciation to English native speakers in learning a foreign language. Hirata (2010) created an experimental study by using a CAPL program that could provide visual feedback. This program is expected to enhance English native speaker's acquisition in pitch and durational contrasts in the Japanese language. The participants were trained from words, phrases, and sentences that contained Japanese pitch and durational contrasts from the CAPL program. Then, they measured their performance in terms of ability to produce and perceive novel Japanese words in isolation and words in sentences. The finding illustrated that the participants' performances had been improved significantly for both words in isolation and in sentences. Hirata concluded that CAPL programs that could present visual feedback could assist English native speakers in acquiring Japanese pitch and duration contrasts.

As discussed by Pennington (1999), pronunciation learner's speech could be analyzed by CAPL without limitation, and this analysis is more accurate, reliable and repeatable when compared with the teacher giving feedback, therefore CAPL

programs are also incorporated in EFL pronunciation classroom as an assessment tool. Lee (2007) investigated the effectiveness of the Multimedia Assisted Test of English Speaking (MATE) that was designed to assess global speaking competence of Korean speakers of English at Sookmyung Women's University. MATE's test structure was designed grounded on the structure of the Simulated Oral Proficiency Interview (SOPI). The results from participants at Sookmyung Women's University revealed that MATE has showed positive evidence for authenticity, interactiveness, and practicality.

In Thailand, there is evidence that the CAPL program was also utilized to enhance English pronunciation learning at high school level. Yangklang (2006) tried to develop a CAI program for improving the students' English final /l/ pronunciation, to examine its effectiveness on improving pronunciation performance in producing English final /l/ sound, and to explore students' reaction towards the use of CAI. Her participants were 40 Thai students in Matthayom Suksa four at Assumption Convent Lamnarai School. She divided her participants into two groups which consisted of good and poor pronunciation learners. After the treatment, the results showed that both groups of participants could significantly increase their performance in pronouncing the English final /l/ sound after they used the CAI program and they tended to have positive reactions towards the use of the CAI program in improving their pronunciation learning. Moreover, the CAPL program is also utilized to assist Thai learners in achieving learning pronunciation at the suprasegmental level. Supateera, Jungsatitkul, and Griffith (2012) developed the Computer-Assisted Musical Pronunciation (CAMP) Courseware in order to enhance Thai college students' pronunciation performances in English suprasegmental. They also investigated the students' attitudes toward the use of the CAMP. After one semester, the post-test scores of Thai college students' suprasegmental performance were significantly different from the pre-test score. They also tended to have positive attitudes toward the use of the CAMP courseware.

2.3.3 Features of Computer Assisted Pronunciation Learning

2.3.3.1 Introduction

The scope of English pronunciation learning should consist of consonants, vowels, intonation, stress at both word and sentence level, and rhythm.

Most advanced CAPL programs offer features that could cope with all these vital elements (Hashim, n.d.). The examples of a CAPL program that consists of features that could cope with these important elements of learning pronunciation are "Pronunciation Power", "American Sounds", "Phonics Tutor", and "Eyespeak". These all have the following components (Finley, n.d., p. 4):

1) "Speech analyzing windows or frames"
2) "Internet-based features like email answering, online help and chat sessions with human tutors"
3) "Animated views of the articulatory mechanics, video clips showing jaw, lip and tongue movement and waveform patterns of sound samples"

Moreover, Celce-Murcia, Brinton, and Goodwin (1996, as cited in Lee, 2008, p. 32) listed the general features of computer assisted pronunciation programs in Table 2.5

Table 2.5 General Features of Computer Assisted Pronunciation Programs

General Features of Computer Assisted Pronunciation Programs
1. Using multimedia in teaching pronunciation
2. Audio Feedback
3. Video
4. Computer-assisted Instruction
5. Speech Spectrographic Devices
6. System incorporating Automatic Speech Recognition modules
7. Stress free environment
8. Learner centered: focus on individual problems, allows self-pace and self-directed learning
9. Provides immediate corrective feedback
10. Provides multiple samples of native speakers
11. Interaction with the speakers in the software and classmates (incorporating Automatic Speech Recognition modules)
12. Focus on those segmental and suprasegmental aspects

The most valuable feature of the CAPL program is a speech spectrograph, which is also known by other names, such as ASR. This type of feature includes voice recognition technology that could analyze sounds that are pronounced by L2 learners with native sounds, and it can illustrate their evaluation through a graphic wave back to learners. The equipment required for a CAPL program to have this capability is sound cards, speaker phones, and microphones (Anderson-Hsieh, 1992; 1998; Chun, 1989, as cited in Lee, 2008). Shilling (1997) stated that "speech-synthesized feedback may be most supportive when children exhibit metalinguistic awareness or cognitive clarity" (as cited in Beatty, 2003, p.188). Moreover, it is believed that incorporating ASR into the conventional pronunciation classroom may enhance learning for students who are fossilized; as ASR could offer these students unlimited special instruction in order to assist them in changing their sound production behavior and assist them in pronouncing sounds that are more native-like (Celce-Murcia, et al., 1996, as cited in Lee, 2008).

After CAPL introduces new sound lessons to learners, it could provide exercises such as drill and practice, and also show them feedback of their speech production instantaneously (Chen & Liang, 2003). Hess (2004, p. 44) also highlighted that, "Most schools reported using software of the drill and practice methodology, with some variation of mastery learning. For schools with more modern equipment, the most popular programs are based on the learning environment model, allowing for greater student control of instruction." Moreover, Neri, Cucchiarini, Strik, and Boves (2002) also compared key features of the CAPL program such as input, output, and feedback function. Most current CAPL programs try to compress all pronunciation components into one single CD-Rom. These can also illustrate pictures with verbal information such as "ILT 1997" and "Auralog 2000" that can show text in balloons. Some CAPL programs could teach learners how to pronounce the L2 sounds by explaining and illustrating the position and movement of articulators while producing each of the target sounds. These illustrations are presented through a 3D presentation which shows a simulation of the mouth while pronouncing the target sound and a written description of how to articulate each sound. Examples of CAPL programs that could provide 3D presentation are "Auralog 2000", "Glearner 2001", and "Pronunciation 2002". CAPL programs can also show a motion picture which consists of

native speakers who are pronouncing the target sounds such as “Glearner 2001”, “Nieuwe Buren 2002”, “the Advanced series”, and “Eurotalk 2002”. Motion pictures such as animations and video clips are preferable and valuable, and the 3D mouth presentations provide visible clues to learners precisely and realistically. Some 3D presentations are capable of illustrating facial expressions and movement of organs in order to assist L2 speech production, and also give details on pragmatic information. Furthermore, there were some studies such as Wachowicz and Scott (1999), and Liontas (2002) indicating that incorporating 3D presentation or multimedia elements into teaching can enhance the effectiveness of pronunciation learning, as multimedia could provide authentic learning material and develop the learners’ engagement during the process of learning.

However, teaching pronunciation by presenting 3D presentation or multimedia could enhance only receptive skills, and speaking is vital for pronunciation learning; therefore output is another feature that CAPL provides to the pronunciation classroom. Thus, most CAPL programs are designed to encourage learners to pronounce the target sounds, it can also archive sounds produced by learners and play recorded sounds of the learner. Learners could listen and review their speech production and improve their speech production by comparison with the target sound model. The examples of CAPL programs that have this feature are Tutsui’s CAPL program (1999) and “My Pronunciation Coach” from Van deVoort (1995). The limitation of output features is that learners are required to judge how their speech production varies from the target sound model. Learners might not have enough knowledge to evaluate their speech production with the target model. Moreover, it is believed that some L2 learners could not perceive the differences between L1 and L2 sound system as mentioned by Isono (2005) in the previous section, thus feedback could assist learners in improving their speech production in the target language. Some CAPL programs such as “Nieuwe Buren 2002” require teachers to hear the recorded sounds of their students and give them feedback. This type of activity is not preferred by learners, as they might be humiliated through being given face to face feedback by their teachers. Lastly, some CAPL programs for L2 pronunciation were designed for distance learning scholars, such as that of Ferrier and Reid (2000), and Ross (2001). Their programs offer learners external feedback. Learners are required to archive their speech production and upload their files to a

web page or send their files by email. Professional pronunciation evaluators open and listen to learner's speech production files, then give feedback such as evaluation, explanation, and score. The limitation of this feature is that CAPL cannot provide immediate feedback and learning depends on a third person who will give the feedback via email (Neri, Cucchiarini, Strik, & Boves, 2002).

2.3.3.2 Recommended Features of Computer Assisted Pronunciation Learning

Some teachers might design their own CAPL program for their students, as they believe that the CAPL programs in the marketplace do not have suitable features for their pronunciation teaching. However, commercial CAPL programs are designed by professional and skillful people such as editors, who can check the accuracy and consistency of the language used, as well as graphic designers, programmers, and marketing staff who have analyzed the needs of L2 pronunciation teachers and learners towards teaching L2 pronunciation. Thus, CAPL programs that are designed by pronunciation teachers might not be sufficient for the needs of learners in general in terms of accuracy, consistency, variety, and generalization (Beatty, 2003).

There are various kinds of commercial CAPL programs on the marketplace that have a range of features to offer. Thus, pronunciation teachers should have some criteria for selecting a suitable CAPL program that could serve the needs of learners in their own context. As Lee (2001, p. 2) stated: "With a wide range of commercial software programs available to language teachers, selecting those that best suit the needs of the students has become a challenging task". Lee (2001, p.2) also specified six criteria for choosing CALL in the EFL environment. Before selecting a CALL program, teachers should consider: (1) purpose of purchasing a CALL software program, (2) teacher readiness, (3) financial concerns, (4) content and methodology, (5) design, and (6) after sales service.

Lee (2001, p. 2) uses the term "design" to mean "the user friendliness and flexibility, layout, feedback and record-keeping features of the software program." Moreover, Ryan (2004) mentioned that teachers should consider CALL programs in terms of text, audio, images, and interface (navigation) when selecting suitable software for their students.

Many scholars (Alessi & Trollip, 1991; Bangert-Drowns & Kozma, 1989; Reeve, 1994; Olson &Wilson, 1985; Lippert, 1993; Caffarella, 1987, as cited in Lee, 2008) have divided how to select a CALL program into four domains; suggestions summarized in table 2.6 as follows:

Table 2.6 How to Select CALL Program

Topic	Details consideration
Instructional:	Motivation, Interaction and Feedback, Goal orientation, Instructor's role, Treatment of errors, Learner control
Curriculum:	Sequencing, Experiencing, Cognitive Load, Knowledge Space, Understandability
Cosmetic:	Color, Text Layout, Use of Hypertext, Screen Layout, Graphics, Animation/Video, Sound, Instructions, Menus and Icons, Interface design
Technical:	Individualization, Record Keeping, Security

Source: Lee, 2008, p. 36.

The Process of evaluating software and its effect on learning

Moreover, Jamieson, Chapelle, and Preiss (2005, p. 94) proposed six general concerns that should be taken into account when searching for an appropriate program that could enhance L2 acquisition as follows:

1) Language learning potential: The degree of opportunity present for beneficial focus on form;

2) Learner fit: The amount of opportunity for engagement with language under appropriate conditions given learner characteristics;

3) Meaning focus: The extent to which learners' attention is directed toward the meaning of the language;

4) Authenticity: The degree of correspondence between the learning activity and target language activities of interest to learners out of the classroom;

5) Positive Impact: The positive effects of the CALL activity on those who participate in it; and

6) Practicality: The adequacy of resources to support the use of the CALL activity.

Hubbard (1988, p. 63) suggested ways to select a suitable CALL program based on "explicit learning" approaches which could provide clear and straightforward instruction and feedback:

1) Program gives meaningful rather than mechanical practice, contextualized in a coherent discourse larger than a single sentence;

2) Program provides hints of various types to lead students to correct answers;

3) Program accepts alternative correct answers within a given context;

4) Program offers the option of explanations for why correct answers are correct; and

5) Program anticipates incorrect answers and offers explanations for why they are incorrect.

Having reviewed the CALL recommended features of different scholars in general, we should look more specifically in terms of features that could contribute to learning L2 pronunciation and enhance pronunciation performance of EFL learners. However, it has been reported by Pennington (1999, p. 427) that

> It is maintained that considerable promise of the computer as an instructional tool for developing language learners' pronunciation has yet to be realized in practice, primarily because of lack of attention to pedagogical design rather than because of inherent limitations of the technology.

Thus, he proposed ten criteria (see table 2.7), based on suitable pedagogical design, which software developers and pronunciation teachers should consider when designing or selecting a CAPL program. Thus, a good CAPL program should have these kinds of characteristics.

Table 2.7 Ten Suggestions for Computer Assisted Pronunciation Program

	Ten Suggestions for Computer Assisted Pronunciation Program
1	The CAP should start from a well-articulated theoretical position. "Linking the mechanics of articulation to communicative contexts or goals".
2	Establish a baseline for pronunciation in terms of one or more reference accents.
3	Set an overall goal for performance. This goal should be determined by the learner's characteristics, such as language proficiency and needs.
4	Build in specific targets for performance: the developer will also need to consider what items, structures, skills or tasks will be good indicators of the learner's progress or achievement.
5	Build skills in stages: move from easier to more challenging tasks and link pre-production with in-production and post-production training.
6	Link pronunciation to other learning and communicative goals such as vocabulary, grammar, discourse and pragmatics.
7	Design on a principled curriculum: the design of CAP pedagogy should be based on a curriculum linked to creative use of the properties of the computer medium in concert with, rather than in place of, the other considerations of this list.
8	Design based on creative use of properties of computer medium: CAP should be based on a principle language learning curriculum such as a communicative or task-based syllabus.
9	Raise awareness of contrast with L1 and range of targets for L2: CAP should raise learners' awareness of the contrast of the L2 or target variety with the native language or variety and also of the range of acceptable or related targets and their social significance
10	Provide for exploration of database: As one of the most significant potentials of computer access for individualizing instruction and promoting learner control and independence, exploratory CALL should be a feature of CAP.

Source: Pennington, 1999, pp. 432-438.

Moreover, Neri, Cucchiarini, and Strik (2002) recommended that learning through a CAPL program should occur in a "stress-free environment" and instruction of CAPL programs should provide noteworthy and understandable input sounds. Learning pronunciation through a CAPL program, learners should be encouraged to engage in practicing pronunciation ability. They should also receive relevant feedback immediately after they have produced their output from both segmental and suprasegmental levels. Neri, et al. (2002, p. 3) also summarized the recommended features for CAPL programs, summarized in table 2.8 below:

Table 2.8 Recommended Features of a CAPL Program

No.	Recommended features
1	Present authentic speech samples and natural discourse
2	Focus learners' attention on both segmental and suprasegmental features
3	Support social interaction and communication
4	Focus on intelligibility
5	Support the development of metacognition and critical listening
6	Provide opportunities for practice
7	Provide scaffolding and individualized feedback

Source: Neri, et al., 2002, p. 3.

Some of these researchers' suggestions and recommendations regarding features of CAPL programs were utilized as a guideline when considering an appropriate CAPL program for this study. In sum, there are two criterions for selecting an appropriate CAPL program: first, general features which CAPL should have as proposed by Celce-Murcia, Brinton, and Goodwin (1996, as cited in Lee, 2008) will be used as the first baseline; secondly, ten characteristics that effective CAPL programs should have from Pennington (1999) is the second baseline.

2.3.4 Correction of English Pronunciation Learning

The role of correction in SLA has shifted over the decades following movements in pedagogical paradigms. Initially, error correction in drill and practice was strongly emphasized, which follows the idea of the Audio-Lingual Method (ALM). Later, teachers were forced to ignore errors in learners' L2 production, a method influenced by the idea of the Natural Approach. Subsequently, Communicative Language Teaching (CLT) played a major role in teaching L2, with correction only utilized when those errors might cause a problem in communication. Recently, Form-focused Approach, where communication-orientation is the major concern, has been supported by Long (1991) and Long and Robinson (1998). Corrective feedback is promoted in order to stimulate learner's self-correction in terms of correctness, accuracy of linguistic forms, and comprehensibility (Lyster & Ranta, 1997). Correction in CAPL programs have also been influenced by all of these approaches.

The roles of correction and correction in pronunciation learning both in conventional contexts and CAPL contexts are described and discussed below.

2.3.4.1 The Roles of Correction in English Pronunciation Learning

Under influence of behaviorism, errors made by L2 learners were recognized as the interference of the L1 system which caused the incorrect language production in L2. ALM was utilized as pronunciation teaching pedagogy; therefore all errors should be eliminated explicitly (An, 2006). Under ALM, learners were instructed to repeat correct answers in chorus when teachers found any incorrect pronunciation. Subsequently, learners who made errors were instructed to practice correct pronunciation individually (Omaggio, 1988). However, though this approach could correct errors in L2 production; it was separated from the context. Thus, it could not assist learners in improving communicative competence and learners could not bring their learned knowledge to use in real contexts, therefore foreign language teachers tried to search for other approaches (Ming, 1993).

Due to the impracticality of ALM, the cognitive method emerged as the dominant pedagogical paradigm, proposing that errors byL2 learners were not caused by inadequate knowledge of L2 learners, rather, learners did not acknowledge how to utilize language knowledge in a real context (An, 2006). In the cognitive method, teachers were required to explain the grammatical rules and provide a learning environment where learners could utilize learned knowledge in authentic communicative

activities (Johnson, 1988). There were different kinds of corrective feedback given under the cognitive method such as repeated practices and sequences. These kinds of activities were initiated by controlled processing, and it was hoped that controlled processing would lead to automatic processing and the reformation of correct L2 production (Mitchell & Myles, 1998).

In the 1960s, the attitude towards error correction was changed by Chomsky's theory of Universal Grammar. He believed that learning language was controlled by an innate ability possessed by all humans, thus learners should be exposed to enough L2 input. Following Chomsky, the Natural Approach (NA) and Communicative Language Teaching (CLT) emerged in an attempt to assist learners in practicing language production in an authentic and natural environment (An, 2006). None of these approaches concentrated on correctness, but rather learners stressed the importance of encouraging learners to communicate intended meanings to others successfully. Thus, error correction was perceived as negative input that would damage the pronunciation learning process (Ming, 1993).

Recently, there has been a shift in belief in L2 learning: that form and meaning should be given equal treatment in the L2 classroom. The resistance against the NA and CLT approach has led to the emergence of the form-focused approach, which emphasizes L2 error correction. Thus, both implicit and explicit correction has been utilized while meaning-focused or communicative activities are taking place (An, 2006). In the form-focused approach, it is believed that corrective feedback, which comes from the negotiation of form and language rules elaboration, could assist learners in paying attention to form while they are practicing meaning activities (Long, Inagaki, & Ortega, 1998). It is also believed that corrective feedback enhances the integration of form, meaning, and function of learners' L2 production (Doughty & Williams, 1998).

2.3.4.2 Correction in English Pronunciation Learning and Computer Assisted Pronunciation Learning Program

It is believed that adult L2 learners commonly speak L2 with a foreign accent (Felps, Bortfeld, & Gutierrez-Osunaa, 2009). A foreign accent could have two side effects towards L2 learners (Flege, 1988). On the plus side, it could inform the native speaker that the speaker is non-native and might need more clarification while

communicating (Gass & Varonis, 1984). On the negative side, a foreign accent might reduce the intelligibility in the target language conversations from native to non-native and non-native to non-native, and it might lead to a negative evaluation and discrimination (Munro, 2003). Derwing and Munro (2005, p. 385) summarized the key areas of pronunciation evaluation in L2 conversation (see table 2.9 below).

Table 2.9 Intelligibility, Comprehensibility, and Accentedness

Term	Definition	Measurement
1. Intelligibility	The extent to which a listener actually understands an utterance	Transcription task % words correct
2. Comprehensibility	A listener's perception of how difficult it is to understand an utterance	Scalar judgment task 1 extremely easy to understand 9 extremely difficult to understand
3. Accentedness	A listener's perception of how different a speaker's accent is from that of the L1 community	Scalar judgment task 1 no accent 9 extremely strong accent

Notions concerning the foreign accent of L2 adult learners is derived from the critical period hypothesis, which is originally based on the observation of animal behavior. It was found that animals cannot learn new behaviors such as nest creating and courtship after they have passed a certain age (Felps, Bortfeld, & Gutierrez-Osunaa, 2009). Thus, language scholars such as Penfield and Roberts (1959) and Lenneberg (1967) adopted this idea and proposed the notion of a critical period for language acquisition. At first, they initially compared animals' learning behavior with human first language learning, and they believed that the certain age that humans could acquire language is between the age of two to adolescence. This notion was also utilized in second language acquisition (Major, 2001). Apart from

other language proficiency such as L2 grammatical knowledge, vocabulary knowledge, and semantics knowledge, it was found that learning to attain native-like pronunciation is heavily dependent on the critical period for language acquisition, as L2 learners' speech organs have already developed and utilized with their first language, and it is difficult to adjust to be perfectly compatible to produce L2 speech production. Scovel (1988) used the phrase "neuromusculatory basis of speech production" to describe this phenomenon. Thus, L2 learners, who have passed the critical period, might not be able to pronounce L2 sounds without a foreign accent and might be unable to attain native-like pronunciation. Recently, many pronunciation scholars such as Neri, et al. (2002) and Pennington (1999) denied the importance of native-like pronunciation for L2 learning, and proposed the goal of pronunciation as intelligibility which is concerned with understanding of listeners while L2 learners are speaking. If listeners do not have any difficulties in listening to an L2 learner's pronunciation, this means that the L2 learner has achieved intelligibility of pronunciation. However, the foreign accentedness might affect the attitude of listeners and lead to a negative stereotype (Anisfeld, et al., 1962; Arthur, et al., 1974; Lippi-Green, 1997; Ryan & Carranza, 1975; Schairer, 1992, as cited in Felps, Bortfeld, & Gutierrez-Osunaa, 2009). Thus, attaining native-like pronunciation might produce positive benefits towards L2 learners; and learning L2 pronunciation is more than merely acquiring intelligibility. In addition, Lara (2009) stated that, in general, the attainment of native-like pronunciation should not be viewed as an ultimate goal, as it seems impractical for all L2 learners to achieve. However, there are some groups that need to attain native-like accent, such as pre-service EFL teachers and EFL teachers who are non-native English speakers.

Nevertheless, it was reported that some adult learners who had passed the certain ages proposed by critical period hypothesis were capable of acquiring native-like pronunciation in L2 learning (Bongaerts, 1999). However, the number of L2 learners who can successfully attain a native-like accent ranges in estimation from 0.1% to 3% (Markham, 1997). With such a small proportion who achieve a native-like accent, it is not feasible to adopt the achievement of a native-like accent as a reasonable learning goal, however, L2 learners should spend time to practice and reduce their foreign accent as much as possible and attain at least near-native pronunciation. Bongaerts (1999) proposed three factors that could assist L2 learners in

attaining near-native pronunciation: (1) high motivation of L2 learners to eliminate their foreign accent, (2) unlimited opportunities to be exposed to L2 speech, and (3) large amount of opportunities to be trained in L2 speech production and perception. Thus, CAPL programs can be considered as an ultimate solution for assisting L2 learners acquiring near-native or native-like pronunciation, as it could provide all three factors proposed by Bongaerts (Felps, Bortfeld, & Gutierrez-Osunaa, 2009). Moreover, several scholars such as Neri et al. (2002) and Pennington (1999) also reported the positive effects of utilizing CAPL in the classroom environment. First, most CAPL allows learners to practice at their own level, and could provide individual lessons that are compatible with each learner's proficiency, and provide opportunities without limitation. Murray (1999) also reported the benefit of CAPL as it could provide a stress-free learning environment that could protect learners from anxiety and humiliation. It is also convenient for learners to practice whenever and wherever they desire. McAllister (1998) added that the most effective CAPL program is the program that utilizes ASR technology, because this kind of technology could provide reliable and consistent feedback. Lastly, learners could also practice listening skills while also learning pronunciation.

Apart from the critical period hypothesis, it is also believed that transfer from L1 to L2 could cause negative outcomes in L2 speech production, such as inaccuracy and errors. Thus, phoneticians, applied linguists, pronunciation scholars, and technologists are interested in studying the process of interlanguage of L2 learners who could not acquire native-like pronunciation. One possible solution to eliminate this problem is to integrate the CAPL program as it could compliment the conventional pronunciation learning classroom in the sense that it enhances accessibility, can decrease nervousness, and provides an individualized learning environment (Meng, 2009).

2.3.5 Feedback

2.3.5.1 What is Feedback?

In SLA, the term "feedback" is normally used as a general term to refer to various kinds of explicit responses from the teacher, friend, or native speaker about a students' L2 production (Pujolà, 2001). The examples of feedback in SLA are

corrective and verifying information on students' incorrect answer in order to reinforce corrective responses (Alessi & Trollip, 2001). According to Alessi and Trollip, desired feedback should be positive and corrective. For instance, teachers should not use negative statements when giving feedback, as these will discourage students. Teachers should also provide corrective information that will assist students in responding correctly in the future.

2.3.5.2 Feedback in Conventional EFL Pronunciation Learning

In the EFL context, there are three areas of disagreements on feedback among scholars: (1) disagreement on defining different types of feedback such as corrective, implicit, explicit, and metalinguistic feedback; (2) disagreement on considering which types of feedback could produce positive or negative evidence; and (3) disagreement on what factors enhance the effectiveness of feedback (Neri, et al., 2002).

Lightbown and Spada (1999, p. 171) proposed the definition of corrective feedback as ''any indication to the learners that their use of the target language is incorrect''. Thus, feedback that is aimed to inform learners' wrong pronunciation production could be utilized in many different ways. Lyster and Ranta (1997, as cited in Engwall & Bälter, 2007, p. 239) classified the feedback types used by L2 teachers as follows in table 2.10 below.

Table 2.10 Feedback Types Used by L2 Teachers

Feedback Types	Method
1. Explicit Correction	The teacher gives the correct form and clearly indicates that what the student said was incorrect.
2. Implicit Correction	
-Recasts	The teacher reformulates the student's utterance, removing the error.
-Repetition	The teacher repeats the student's utterance with the error, using intonation to indicate where the error occurred. Repetitions may also be used as positive feedback on a correct utterance.
-Clarification requests	The teacher urges the student to reformulate the utterance, because the meaning was unclear.

Table 2.10 (Continued)

Feedback Types	Method
-Elicitation	The teacher encourages the student to provide the correct pronunciation by open-ended questions or fill-in-the-gap utterances
3. Metalinguistic feedback	The teacher comments or asks questions to make the students find the error themselves with the information given by the teacher.

Moreover, Long (1996) reported that corrective feedback could help adult learners to become aware of the differences between their L2 production and the correct L2 form, when they have been exposed to enough feedback. According to the "noticing hypothesis" from Schmidt (1990), this type of awareness could assist L2 learners in acquiring language skills. In L2 pronunciation learning, feedback has played a major role, as L2 learners unconsciously produce deviations in accent, which is caused by the interference of their L1 sound system (Flege, 1995). L2 learners might not be aware of their deviant accent, which is the result of interference of their L1. Thus, giving feedback will assist them in recognizing their incorrect speech production. Ehsani and Knodt (1998, p. 9) added that feedback which could help learners to recognize their deviations is "a type of feedback that does not rely on the student's own perceptions". In providing feedback, teachers should indirectly point out specific problems of each learner and encourage learners to cope with their problems on their own. Thus, once learner's awareness is established by receiving feedback, then they can move to the remedial stage (Neri, et al., 2002).

Even though feedback is quite important in pronunciation learning, there are few studies on the impact of various types of feedback. However, Chaudron (1977, p. 39) mentioned that recent studies in feedback found that recast or "repetition with change" is the feedback that teachers primarily utilize. Recasts seem to be preferred in pronunciation teaching as it does not intervene in the learning process. Recasts also allow learners to compare and learn new sounds, as feedback occurs immediately (Nicholas, et al. 2001). Lyster (1998), who investigated the feedback strategies used by teachers from the interaction between teachers and their students in

French immersion classrooms, found that recasts were rated as the most frequency strategies used in pronunciation teaching, while it was rated as the least frequency strategies used in teaching grammar and vocabulary. Lyster reported that reforming incorrect pronunciation habits should be established immediately in order to be successful in correcting a deviating accent. Moreover, recast feedback was also found to be the most appropriate type of feedback for beginner learners who have not acquired enough prior language knowledge to realize their own mistakes (Lightbown, 2001). However, Nicholas, Lightbown, and Spada (2001) argued that recasts could assist learners in correcting their deviating accent temporarily, as it could only enhance pronunciation improvement in terms of short term retention.

Furthermore, Chun (1998), Warschauer and Healey (1998) and Crompton and Rodrigues (2001, as cited in Neri, et al., 2002) agreed that feedback should not only be based on what is correct or incorrect, but it should specify specific mistakes and encourage a remedy. Thus, apart from receiving scores, learners should acknowledge why they gain or do not gain a satisfactory score. This does not mean that teachers have to specify all mistakes from each learner, but the selection of mistakes for presentation to learners should be based on the objectives of pronunciation learning such as "accent-free" or "intelligibility".

There is one major problem with giving feedback in pronunciation learning which is the limitations of pronunciation teaching methodology, as there is no exact definition on how to differentiate between accentedness and intelligibility (Derwing & Munro, 1997). However, it is believed that teaching L2 pronunciation should be based on both segmental and suprasegmental levels. Derwing and Munro (1997) and Rogers and Dalby (1996) believed that mistakes from segmental speech production could obstruct learners in acquiring intelligibility of speech. On the other hand, learning suprasegmental speech production will compliment learners in learning segmental speech production in the sense that it will assist learners in perceiving the segmental content by combining each sound into a structure (Celce-Murcia, Brinton, & Goodwin 1996).

2.3.5.3 Feedback in Computer Assisted Pronunciation Learning Program

Alessi and Trollip (2001) defined feedback in CALL as the response from a program to a learner's action. The forms of feedback in CALL may consist of text notes and graphic items. The general role of feedback in CALL is to report the

result of a learner's action as feedback will reinforce learners' performance of the correct response. They also classified feedback in CALL in four types:

1) Text feedback

The most common practice in text feedback is to deliver the correct answer when the learner's response is incorrect. Text feedback should also provide a hint to assist the learner in giving the correct response.

2) Graphic feedback

Apart from giving text feedback, graphics such as a graph or chart can help lead the learner to perform the correct response.

3) Audio and video feedback

The study of Lalley (1998, as cited in Alessi & Trollip, 2001) shows that multimedia could promote a positive advantage for language learning as multimedia, which consists of audio and motion pictures, could attract the interest of learners and also enhance the effectiveness of text feedback.

4) Markup

This is another form of graphic feedback in the form of a response from the program when a learner's response is partially correct. Thus, learners could come to realize which part of their answer is still incorrect.

Heift (2004, p. 418) has compared the feedback types used in pronunciation learning between the conventional classroom and CAPL classroom (see table 2.11).

Table 2.11 Comparison of Feedback Used in Conventional and CAPL Classroom

Feedback Types	Conventional Classroom	CAPL Environment
1. Explicit correction	You mean ……	Correct answer (Text Feedback)
2. Implicit correction		
-Recasts	Teacher reformulation	Listen to model sounds (Audio and visual feedback)

Table 2.11 (Continued)

Feedback Types	Conventional Classroom	CAPL Environment
-Repetition	Repeat with intonation on wrong part	Try again! (Mark up)
-Clarification requests	What do you mean?	Highlighting (Graphic Feedback)
-Elicitation	Ellipsis	Highlighting (Graphic Feedback)
3. Metalinguistic feedback	Explanation of error type	Explanation of error type (Text Feedback)

Moreover, Neri, et al. (2002), who classified feedback in CAPL into two types, which are visual displays and automatic assessment, mentioned that current CAPL program feedback employed various ways to teach pronunciation. There are many different kinds of feedback in CAPL such as visual, audio, graphic, waveform, and motion picture. Each CAPL program has different objectives in pronunciation learning, and some feedback could provide more informative and explicit information than others. According to Neri, et al., the first type of CAPL feedback is "visual display". CAPL programs could immediately provide a visual display or graphic feedback in the forms of waveform or spectrograph of learner's speech production. Learners could compare their waveforms with the model waveform which is prerecorded by the teacher or native speakers. This kind of feedback could provide acoustic analysis of learner's speech production in the forms of "amplitude, pitch, duration, and spectrum of learner's speech" (Neri, et al., 2002, p. 6). Actually, waveform and spectrogram graphics were not originally intended to support pronunciation learning in the classroom, but were developed to assist phoneticians and speech scientists to undertake speech research. However, it is reported from De Bot (1983); Anderson-Hsieh (1992); Akahane-Yamada and McDermott (1998, as cited in Neri, et al., 2002) that these kinds of visual displays could be used to compliment audio feedback for improving pronunciation skills in the classroom. There are some disagreements among scholars regarding the effectiveness of visual

displays. First, it is questioned whether the improvement of pronunciation skills directly comes from utilizing visual displays or if this improvement is merely the result of learners' dedication and extra practice with the program (De Bot, 1983, as cited in Neri, et al., 2002). Second, it could not be guaranteed that learner's speech really matches the intended utterance as the program simply analyzes learner's speech "without first recognizing the utterances" (Neri, et al., 2002, p. 6). Third, using only one waveform or spectrogram model is too narrow as the same structure of utterance could be pronounced and produced with different waveforms. Fourth, waveforms and spectrograms are difficult to interpret for learners and might require a teacher's assistance in order to interpret (Neri, et al., 2002). Thus, learners might need to be trained to read waveforms and spectrograms; however it is reported that even trained learners still have some difficulties in deciphering these kinds of graphic displays. Furthermore, many scholars such as Ehsani and Knodt (1998); Eskenazi (1999), Menzel, et al. (2000) and Kommissarchik and Kommissarchik (2000) reported that learning pronunciation actually requires information on how to perform correct articulatory behavior, however, receiving only visual displays and spectrograms does not assist learners in learning the correct movement of speech organs in order to pronounce correctly. The lack of articulatory information might lead to a decrease in performance and fossilization (Eskenazi 1999). Another type of visual display feedback is pitch contours. This produces positive benefits for the teaching of intonational patterns, as pitch contours are more easily deciphered than waveforms and spectrograms (Chun, 1998). The example of a CAPL program that provides pitch contours for suprasegmental level is the "Better Accent Tutor" program developed by Kommissarchik and Kommissarchik (2000) with the aim of creating a program that teaches English prosody to non-native speakers of English. In the Better Accent Tutor program, there are three kinds of pitch contour displays, which are intonation, stress, and rhythm. Learners listen to the model utterance and view model pitch contours, and they start uttering learned utterances. Subsequently, they receive immediate audio-visual feedback; therefore they could compare their pitch contour graphics with the model (Neri, et al., 2002).

The second type of CAPL feedback is "automatic assessment". This can allow learners to learn individually and learners do not need the teacher's assistance

as the program can evaluate student's speech production with the speech model and automatically illustrate feedback by using pronunciation scores such as number, graph, and symbols. "Automatic scoring" could benefit learners in several ways such as by providing immediate, understandable feedback (Neri, et al., 2002). However, Neri, et al. noted two points that need to be addressed when developing a CAPL system that has an automatic assessment feature. Firstly, the speech measurement of automatic assessment should be based on real human evaluation of pronunciation quality as learners practice in order to talk to L2 speakers and not talk to computers. Therefore, the quality of learners' speech production should be evaluated based on what L2 speakers seem to view as acceptable. Second, the automatic measurement also needs to be appropriate for utilization as feedback. This could be explained by referring to the case of the temporal measures of speech quality. This kind of measure highly correlates with human evaluation of pronunciation quality; however it is not appropriate to utilize as feedback as it is illogical to teach learners to speak faster in order to improve their pronunciation skills. Precoda, Halverson and Franco (2000), who developed SRI's "Freshtalk", which utilizes temporal measures of speech quality to provide feedback, found that providing information on the rate of speech did not assist learners in improving their pronunciation skills. Thus, CAPL programs should not rely only on automatic scoring. Automatic scoring can be integrated with more detailed suggestions on learner speech production. The examples of CAPL programs that could provide more applicable and appropriate feedback are "Tell me More" and the "Talk to Me" series by Auralog (2000) and TTM (2002). These programs allow learners to learn under communicative circumstances. The ARS tool in "Tell me More" and the "Talk to Me" series were specifically designed to be able to train non-native learners. These types of programs could provide various kinds of feedback such as scoring, waveform, and informing learners which parts of pronunciation they are unable to pronounce correctly (Neri, et al., 2002).

In conclusion, effective feedback should be understandable and not based on the learner's own perception. Moreover, feedback should provide detailed information to clarify correct and incorrect responses, inform the learner as to which parts are pronounced incorrectly, and stimulate remedy practice. The ASR feature in CAPL programs seem to be useful for giving feedback as it could provide

understandable and comprehensible detailed information on pronunciation correctness and deliver immediate feedback.

2.4 Attitudes Towards Language Learning and Computer

The concept of attitudes is complicated according to Gardner (1985, as cited in Chiu, 2003, p. 9). He defined attitudes in terms of their operation as: “an evaluative reaction to some referent or attitude object, inferred on the basis of the individual’s beliefs or opinion about the referent”. Mantle-Bromley (1995, as cited in Chiu, 2003, p. 373) also proposed the definition of attitudes as: “What is termed attitude refers to affect and is evaluative, emotional reaction (i.e., the degree of like or dislike associated with an attitudinal object)”. Moreover, Min (1998, as cited in Chiu, 2003, p. 23) proposed in his dissertation that “attitudes are an evaluative response to the environment, ideas, objects, and other people”.

In language acquisition, Wenden (1998) describes attitudes as “learned motivations, valued beliefs, evaluations, what one believes is acceptable, or responses oriented towards approaching or avoiding.” Wenden (1998, p. 52) also believed that attitudes are a form of “metacognitive knowledge”. However, Candy (1991, p. 295) mentioned that “the overall approach a learner adopts will significantly influence the shape of his or her learning outcomes”. Moreover, Fishbein and Ajzen (1975) believed that attitudes are not innate, but are learned. In addition, Fishbein (1967, p. 21) also commented that attitudes are established and are “organized through experience”. Thus, it could be implied that students’ attitudes can be customized or adjusted. The belief that attitude can be adjusted caused the existence of the functional Theory of attitudes which was proposed by Katz (1938, as cited in Lindzey & Aronson, 1985, p. 142), who believed that “attitudes are determined by the functions they serve for us. People hold given attitudes because these attitudes help them achieve their basic goals”. According to Katz, there are four types of psychological functions of attitude; utilitarian, knowledge, value-expressive, and ego-defensive. Katz also mentioned that “attitude change is achieved not so much by changing a person's information or perception about an object, but rather by changing the person's underlying motivational and personality needs”.

According to Fishbein and Ajzen (1975); Gardner (1985b); Kiesler, Collins and Miller (1969); Mantle- Bromley (1995); Mantle-Bromley and Miller (1991); and Wudthayagorn, (2000, as cited in Chiu, 2003) attitudes could be classified into three components: cognition, affect, and behavior. Firstly, the cognitive component is the knowledge of an individual toward an attitudinal object. Secondly, the affective component is an attitude toward an object or attitudinal object. Lastly, the behavioral component is an appreciation or experience of an individual to an attitudinal object.

Tuncok (2010) stated that each scholar focuses on the significance of each type of attitudes differently. Graham (1997, p. 92) viewed affective components as "the emotionally relevant characteristics of the individual that influence how she or he will respond to any situation". However, Schumann (1978, as cited in Tarone & Yule, 1989, p. 139).

> attaches less importance to learners' emotions and more importance to social and psychological factors. Among social and affective variables, self-esteem and desire to learn appear to be the crucial ones in learners' ability to overcome occasional setbacks or minor mistakes in the process of learning a second and foreign language and in shaping their attitudes towards learning

According to Hammerly (1982) and Mian (1998, as cited in Chiu, 2003), there are numerous factors that could influence language learning and positive attitude is the most significant factor. Bartley (1970 as cited in Chiu, 2003) also mentioned that attitudes toward language learning are probably viewed as the most important factor in academic achievement. Many researchers (Gardner & Lambert, 1972; Raymond & Roberts, 1983; Titone, 1990, as cited in Chiu, 2003) also supported the idea that attitude is the most important factor for accomplishment in academic learning and found that attitude is more important than aptitude. The best well-known study conducted on attitude is probably that of Gardner and Lambert, who recognized the relationship between attitude and the degree of student achievement in second language learning. According to Gardner and Lambert, the attitudes of learners toward the target language could influence learner's achievement in the language-learning process.

The notion of attitude has long been perceived as a vital element in language learning (McGuire, 1997). Hakuta (1985, p. 158) stated in regards to the importance of attitudes in second language acquisition that "the importance of a positive attitude toward the target language has been shown in a variety of foreign-language-learning contexts in Canada and the United States". Likewise, Benremouga (1995) also believed that the role of attitude is significant in language learning, and Brown (1997) also mentioned that negative attitudes can also create negative effects towards the accomplishment in language learning. Gardner (1985), who examined learners' attitudes towards experiences of second language learning, found that learners' attitudes could influence the process of second or foreign language learning. Krashen (1982, as cited in Ellis, 1997) also stated in relation to the significance of learners' attitudes that they could produce a significant impact on second language acquisition as the range of language is one element of the cognitive structure, thus attaining the second language must not be perceived as only a normal action. Attaining a second language should be viewed as a process that affects the learner's social identity. Hence, the attitudes of second language learners might significantly impact the accomplishment of acquiring a second or foreign language (Ellis, 1997).

Previous findings of well-known scholars such as Gardner and Krashen indicated that learners' attitudes highly affect language learning, therefore, it is crucial for ESL and EFL teachers to search for a way to promote positive attitudes of ESL or EFL learners toward the target language (McGuire, 1997).

Almahboub (2000, as cited in Chiu, 2003, p. 22) mentioned that, "Students' attitudes toward computers are considered to be very important indicators of students' inclination to adopt this new technology in their lifelong learning". From Almahboub's quotation, it could be implied that computer technology currently is considered as a vital tool in the language learning process.

Moreover, Lockard, Abrams, and Many (1997, as cited in Chiu, 2003, p. 4) also specified that "the computer is an inescapable component of changes now facing education in the United States, indeed throughout the world". In addition, the use of computers in education has increased dramatically in both Eastern and Western countries (Collis & Sakamoto, 1996 as cited in Chiu, 2003). Thus, examining students' attitudes toward the use of computers in language classrooms is extremely significant. Benremouga (1995) reported that computers have been utilized in the

English language classroom since the 1960s, but "early applications were limited and difficult to use, and access to the technology was restricted to the few educators who were computer literate and adventurous" (Egbert, Jessup, & Valacich, 1991, p. 23, as cited in Chiu, 2003). From reviewing attitudes toward computers, it could be implied that students tend to have positive attitudes to computers in language learning. However, there is one principle question regarding computer education, which is its capability to create positive attitudes of learners in terms of the utilization of computers in language learning.

There are few empirical studies on CAPL which examine the attitudes of users such as learners, language teachers, and general users in learning language skills by utilizing technology such as computer assisted instruction or CAPL programs. However, the results of previous studies have shown that attitudes of the users have played a vital role in influencing learners' willingness to use computer technology. Below are some studies discussing the effectiveness of CAPL towards EFL learning and pronunciation learning.

In 2003, Chiu investigated attitudes toward CALL among 300 Taiwanese college students in Pingtung, Taiwan. Findings revealed that the students possessed a positive attitude toward learning English, using computers, and using computers when learning English. Moreover, male Taiwanese college students have more favorable attitudes than females toward the use of computers when learning English.

Tuncok (2010) investigated students' attitudes towards CALL by combining their attitude towards computer assisted learning (CAL) and foreign language learning (FLL) into a single consideration. Factors affecting students' attitudes and the relationships among CAL, CALL, and FLL were studied. The findings demonstrated that most of the students hold positive attitudes towards CAL, CALL and FLL. Factors affecting students' attitudes (age, grade, gender, years of studying English, and CALL experiences) affect students' attitudes. Moreover, student attitudes towards CAL, CALL, and FLL are significantly interrelated. Likewise, Rampino and Taylor (2013), who studied the students' factors affecting their attitudes, found that gender difference could play a significant role in attitude change, and this finding could be explained by the theory of gender role socialization where children were raised according to the gender roles by the interaction with others and observation. Second,

the social control theory expanded the idea that girls tended to be closely controlled by their parents more than boys, therefore, they tend to develop self-control internalization. Thus, they tend to behave properly according to the expectation of the society, especially showing favorable attitudes towards education.

Abu Seileek (2007) examined the effectiveness of utilizing computer-based pronunciation teaching on EFL learners' stress production performance of words, phrases, and sentences, in advanced English classes; and investigated EFL learners' attitudes towards computer-based pronunciation teaching and activities. The pedagogical basis of this study was the communicative approach and learners studied English stress patterns in meaningful and authentic lessons. The participants in this study consisted of 50 male Saudi Arabian EFL learners. The results show that learners' post-test scores in producing and perceiving English stress patterns are higher than pre-test scores. Learners also have positive attitudes toward CAPL programs.

Chu (2012) examined the effects of utilizing an online pronunciation training program on university ESL learners' word stress performance. Twenty participants were selected to participate in this study from learners who had previously studied in English foundation classes. They were separated into two groups, a control and an experimental group. Apart from normal pronunciation learning in the classroom, the participants in the experimental group were trained for 30 additional hours with online pronunciation training and were also instructed to practice pronunciation online at their home. The study's online pronunciation training program was "My ET", which measured the appropriateness of pronunciation by utilizing the six criteria for CALL evaluation developed by Chapelle (2001, as cited in Chu, 2012). A questionnaire was distributed to the participants in the experimental group to examine learners' attitude towards experiences in learning pronunciation and the online training program. The findings show that learners with a strong foreign accent significantly improved their stress production; however the positive effect in learning stress production via online training was less significant to learners who have less foreign accent. Learners in the experimental group tended to have positive attitudes to pronunciation learning experiences and to the online pronunciation training program.

Kenyon and Malabonga (2001) investigated the attitudes of pronunciation examinees towards both the Computerized Oral Proficiency Instrument (COPI) and the tape-mediated Simulated Oral Proficiency Interview (SOPI). Fifty-five examinees took an oral test across three languages, Spanish, Arabic, and Chinese. They participated in both test formats (COPI and SOPI). The questionnaire consisted of six Likert-type scales to examine attitude and perceptions towards different formats of oral assessment proficiency. The findings indicated that the COPI could provide an appropriate level of difficulty in relation to the proficiency level of the examinee. Moreover, examinees having lower proficiency levels perceived the COPI more highly than the SOPI. On the other hand, examinees who had higher proficiency levels rated the COPI and the SOPI equally.

2.5 Summary

An overview of the literature has been provided covering two language learning approaches, which are constructivism and autonomous learning and their influence on technology integration in language learning. This led to the consideration of problems facing Thai students in acquiring English pronunciation by reviewing 1) the differences between the Thai and English sound systems that cause problematic sounds for Thai EFL learners such as /b/, /d/, and /g/ in the final position, /ŋ/ in the final position, /θ/ and /ʃ/ in the initial position, /t͡ʃ/ and /dʒ/in the final position, dark /l/ in the final position, and /ɹ/ in the initial position, 2) the practice of English pronunciation in both EFL and Thai contexts, and 3) the process of pronunciation acquisition in both L1 and L2. Finally, CAPL was reviewed as computer technology has played a vital role in the teaching environment, especially in pronunciation learning. Basically, there are several types of CALL such as drill-practice, tutorial, simulations, utility, the World Wide Web, the Internet, and email. Interestingly, the Internet has become crucially important in all aspects of life in the modern era, and this particularly is the case in pronunciation learning. Web-based language instruction also has been widely used in pronunciation learning, therefore it is expected that CAPL programs that are designed for web-based instruction can be well-utilized for pronunciation learning. The key issue is how computers improve pronunciation

performance and autonomous learning capacity among EFL students in order to assist them in studying pronunciation autonomously. In addition, the literature review in this study has shown that pronunciation performance and autonomous learning capacity have not been studied as dependent variables with regard to computer integration in pronunciation learning. Hence, this void in the literature is addressed in the current study.

Moreover, the important impact of positive attitudes toward the use of computers has been supported through much research. However, there has been little empirical study on learners' attitudes toward CAPL, and based on the existing research, it appears that CALL-related attitudes perform a vital role in language learning. Hence, exploring Thai students' attitudes toward CAPL is also examined as learners' attitudes are an important factor in the pronunciation learning process.

In sum, the literature review has covered the research across the various issues related to pronunciation learning such as the debate on the utilization of CAPL programs as a primary medium of pronunciation instruction and preferable features of CAPL programs. The conceptual framework of the study is presented in figure 2.6.

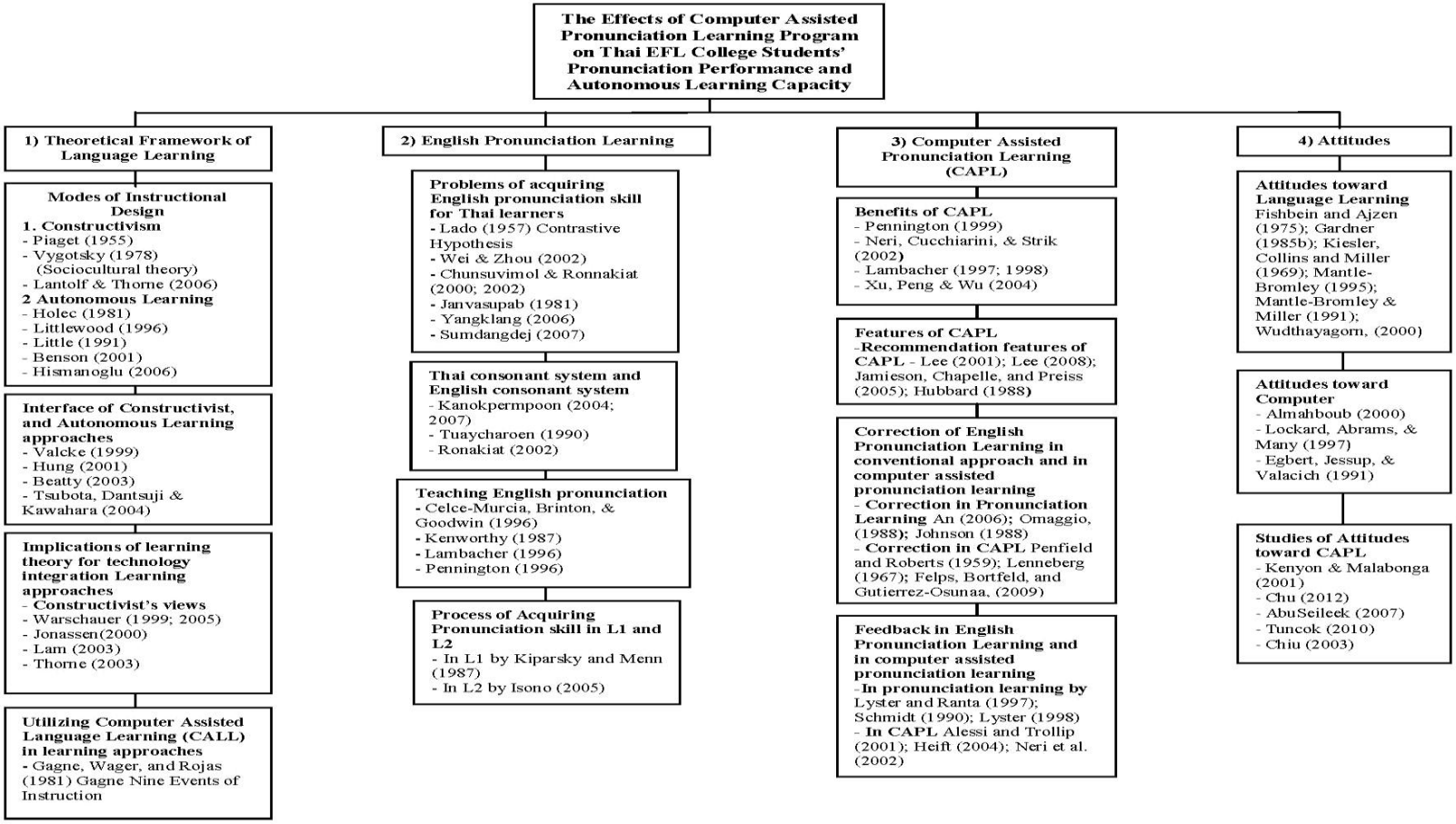


Figure 2.6 The Conceptual Framework of the Study

CHAPTER 3

RESEARCH METHODOLOGY

The effect of CAPL on Thai students' English pronunciation performance, autonomous learning capacity, attitudes toward the use of CAPL, and factors affecting their attitudes toward were investigated in this study. In this chapter, research design, instrumentation, population of the study, data collection, and data analysis were reported on.

3.1 Research Design

This study follows a quasi-experimental research design. The researcher equally divided participants into a control group and an experimental group. The control group learned pronunciation by utilizing the analytic-linguistic approach, which is a conventional teaching style. On the other hand, the experimental group learned pronunciation by a conventional teaching style together with the integration of a CAPL program.

3.2 Instrumentation

In order to obtain data for answering each research question, four research instruments were utilized. The first and second research instruments in this study are two CAPL programs that were integrated in the pronunciation learning of the experimental group. There are many commercial CAPL programs available in the marketplace, and they all possess different characteristics, advantages and disadvantages. Thus, selecting a suitable CAPL program should be based on the reliable suggestions of professional pronunciation scholars. According to Celce-Murcia, Brinton, and Goodwin (1996, as cited in Lee, 2008, p. 32), it is undeniable that the selected CAPL program should consist of at least 12 general features. Thus,

the 12 general features from Celce-Murcia et al. were used as the first criterion to evaluate the "Speexx" program in order to examine its appropriateness for being the research instrument in this study. The features of "Speexx" are summarized in table 3.1 below.

Table 3.1 Summary features of "Speexx"

General features of Computer Assisted Pronunciation Program	Speexx
1. Using multimedia in teaching pronunciation	Yes
2. Audio feedback	Yes
3. Video	Yes
4. Computer-assisted instruction	Yes
5. Speech spectrographic devices	**No**
6. System incorporating Automatic Speech Recognition modules	Yes
7. Stress free environment	Yes
8. Learner centered: focus on individual problems, allows self-paced and self-directed learning	Yes
9. Provides immediate corrective feedback	Yes
10. Provides multiple samples of native speakers	Yes
11. Interaction with the speakers in the software and classmates (incorporating Automatic Speech Recognition modules)	Yes
12. Focus on those segmental and suprasegmental aspects	Yes

According to table 3.1, most "Speexx" features match general features suggested by Celce-Murcia et al. However, there is one feature that "Speexx" does not have which is a speech spectrographic device. The "Speexx" program is utilized as the first research instrument and integrated in the pronunciation learning of the experimental group. Moreover, the test in "Speexx" is used as a pronunciation assessment test as evaluation from human beings might not be 100 percent consistent and reliable. CAPL's judgment on pronunciation performance is also bias-free. The "Speexx" test

is used as an assessment test to measure the performance of students in both the control and experimental groups before the semester begins in order to avoid bias in pronunciation proficiency between the two groups. It is also utilized to evaluate the students' performance between the control and experimental groups at the end of the experiment. The content of the assessment in this study covers English words which consist of selected consonant sounds that Thai students typically have difficulty in pronouncing, which are /b/, /d/, and /g/ in the final position, /ŋ/ in the final position, /θ/ and /ʃ/ in the initial position, /t͡ʃ/ and /dʒ/in the final position, dark /l/ in the final position, and /ɹ/ in the initial position.

In addition, a number of scholars such as Bell (1996), Lambacher (1996), and Fanshi (1998) have noted that the differences between the first and the target language can cause a problem in learning pronunciation. Thus, Thai learners could overcome the problem of being unable to attain native-like pronunciation by realizing the differences between the sound system of their native language (Thai) and the target language (English). English phonetics knowledge should be instructed to Thai learners in order to assist them in realizing these differences. Thus, the PFA project from the University of Iowa will be used as the second research instrument as it can present information on the English language articulatory system and English language sound system in the form of motion pictures and clearly show how each English sound is articulated providing examples of English sounds, including both consonants and vowels.

Furthermore, it was reported by Pennington (1999) that pronunciation teaching pedagogy has been ignored during the designing of CAPL programs; as a result, most CAPL programs could not be used in a practical way when teaching L2 pronunciation. Thus, the selected program should have features that are designed based on the pedagogy of pronunciation learning as well. The ten suggestions of Pennington are also used as the second baseline for examining the appropriateness of both selected programs to ensure that they could be used in a practical way in learning L2 pronunciation. Below, "Speexx" and PFA features are compared with ten characteristics of good CAPL programs from Pennington in order to illustrate their suitability for integration into L2 pronunciation learning in this study.

1) The CAP should start from a well-articulated theoretical position. “Linking the mechanics of articulation to communicative contexts or goals”.

The PFA project could introduce the articulatory system which consists of speech organs. Place and manner of articulation could be explained by utilizing both multimedia and audio sounds of English consonants and vowels.

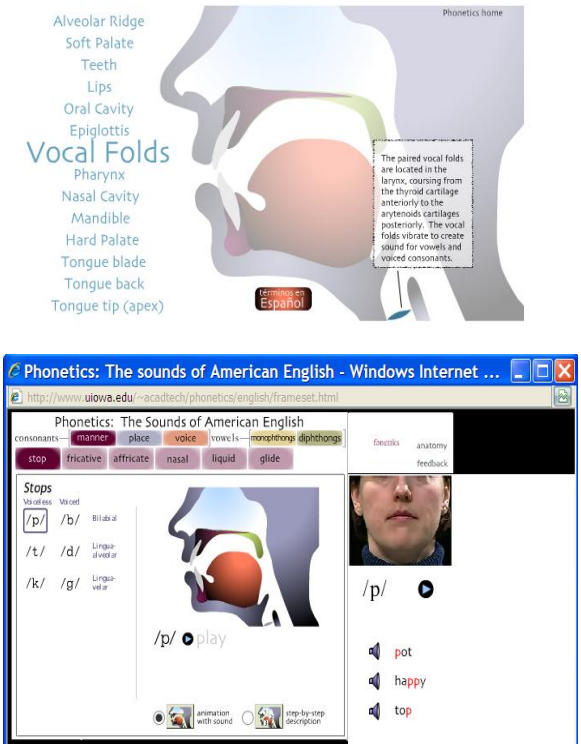


Figure 3.1 Phonetics Flash Animation Project from UIOWA

2) Establish a baseline for pronunciation in terms of one or more reference accents.

“Speexx” could provide both male and female voice models and learners could also choose to listen in American and British accents. “Speexx” provides more than 1,000 hours of practice to reduce the L1 accent with speech recognition tools which could deliver individual, teacher-like feedback. Moreover, the learner’s speech production is recorded and listened to by the learner in order to compare their speech production with the speech models.

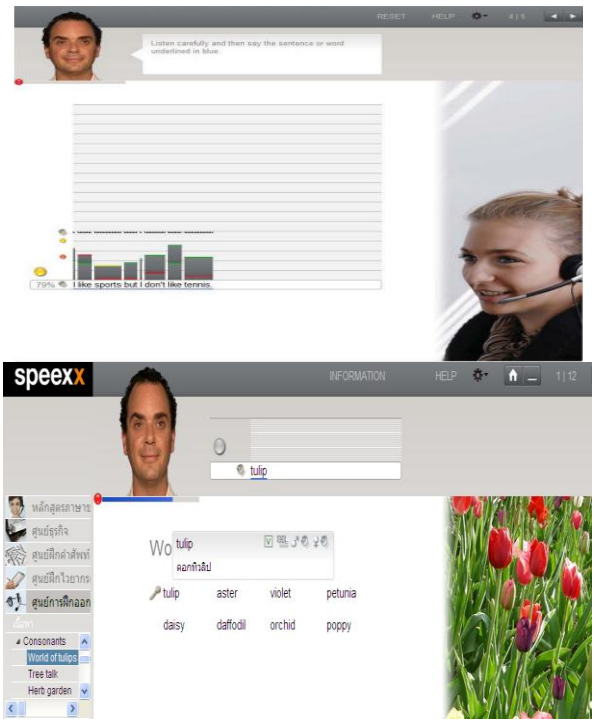


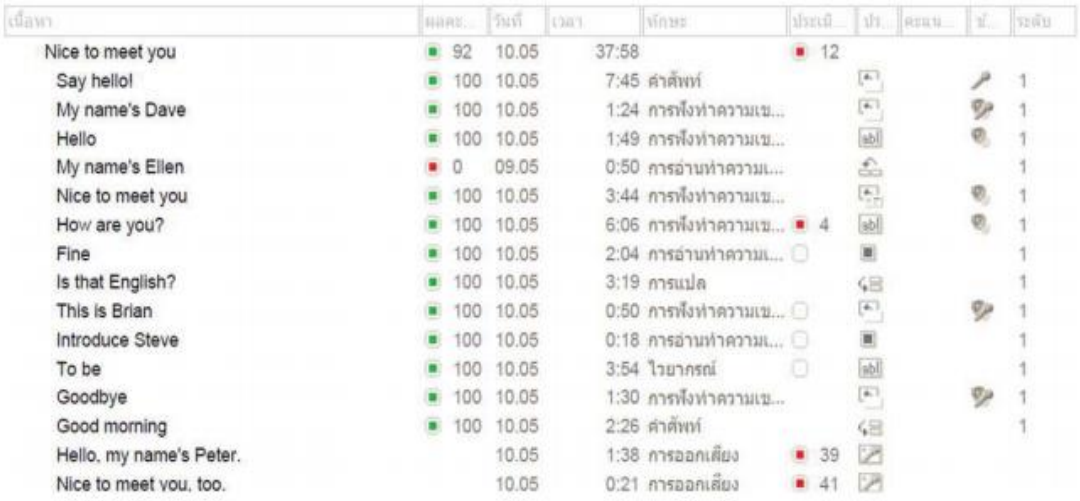
Figure 3.2 Speech Recognition Feature of "Speexx" Program

3) Set an overall goal for performance. This goal should be determined by the learner's characteristics, such as language proficiency and needs.

"Speexx" could provide seven levels of difficulty from basic to advanced level (A1, A2, B1.1, B1.2, B2.1, B2.2, and Business). Each level consists of 24 lessons, but there are 40 lessons at the business level. Learners can select the level that matches their language proficiency and need.

4) Build in specific targets for performance: the developer will also need to consider what items, structures, skills or tasks will be good indicators of the learner's progress or achievement.

Each exercise of "Speexx" has specific criterion for assessing learner's language performance. Each language skill is measured separately by using different objectives and test formats.



เนื้อหา	ผลคะ...	วันที่	เวลา	หัวข้อ	ประเมิ...	ประ...	คะแน...	ห้...	ระดับ
Nice to meet you	92	10.05	37:58		12				
Say hello!	100	10.05	7:45	คำศัพท์					1
My name's Dave	100	10.05	1:24	การฟังทำความเข...					1
Hello	100	10.05	1:49	การฟังทำความเข...					1
My name's Ellen	0	09.05	0:50	การอ่านทำความเ...					1
Nice to meet you	100	10.05	3:44	การฟังทำความเข...					1
How are you?	100	10.05	6:06	การฟังทำความเข...	4				1
Fine	100	10.05	2:04	การอ่านทำความเ...					1
Is that English?	100	10.05	3:19	การแปล					1
This is Brian	100	10.05	0:50	การฟังทำความเข...					1
Introduce Steve	100	10.05	0:18	การอ่านทำความเ...					1
To be	100	10.05	3:54	ไวยากรณ์					1
Goodbye	100	10.05	1:30	การฟังทำความเข...					1
Good morning	100	10.05	2:26	คำศัพท์					1
Hello, my name's Peter.		10.05	1:38	การออกเสียง	39				
Nice to meet you, too.		10.05	0:21	การออกเสียง	41				

Figure 3.3 Score Summary Report of "Speexx" Program

5) Build skills in stages: move from easier to more challenging tasks and link pre-production with in-production and post-production training.

Pronunciation exercises of "Speexx" can start from English basic sounds (A to Z), consonants, and vowels to complex sentences. Each exercise begins with an introduction, instruction and explanation of new sounds; then a prerecorded sound model is presented. Next, the learner is encouraged to practice the particular sounds with the program. Lastly, the program immediately delivers feedback on the learner's performance by using a motivational graph. Learners can listen to the sound model and practice pronunciation without limitation.

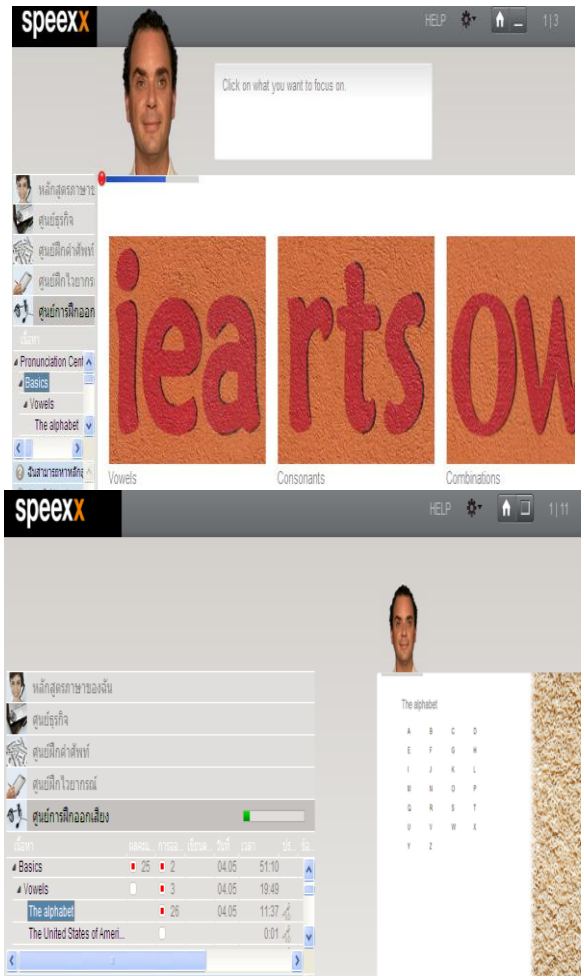


Figure 3.4 Pronunciation Exercise of “Speexx” Program

6) Link pronunciation to other learning and communicative goals such as vocabulary, grammar, discourse, and pragmatics.

“Speexx” pronunciation exercises are connected to other language skills in order to develop not only pronunciation, but also other language skills such as reading and listening, reading and speaking, and listening and speaking.

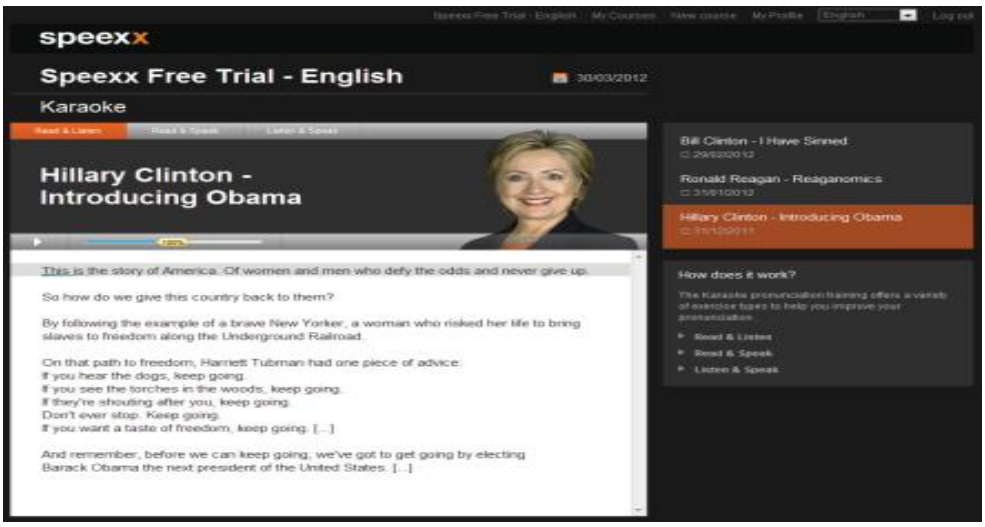


Figure 3.5 Karaoke Exercise of "Speexx" Program

7) Design on a principled curriculum: the design of CAP pedagogy should be based on a curriculum linked to creative use of the properties of the computer medium in concert with, rather than in place of, the other considerations of this list.

"Speexx" can ideally incorporate a computer's capacity. It utilizes pictures, multimedia, sounds, and the Internet in order to allow learners to access and learn pronunciation anywhere that is convenient or in a stress-free environment.

8) Design based on creative use of properties of the computer medium: CAP should be based on a principle language learning curriculum such as a communicative or task-based syllabus.

It is claimed that the "Speexx" program is based on CLT. Its exercises are authentic and present real life situations. Learners learn under a real-life context.

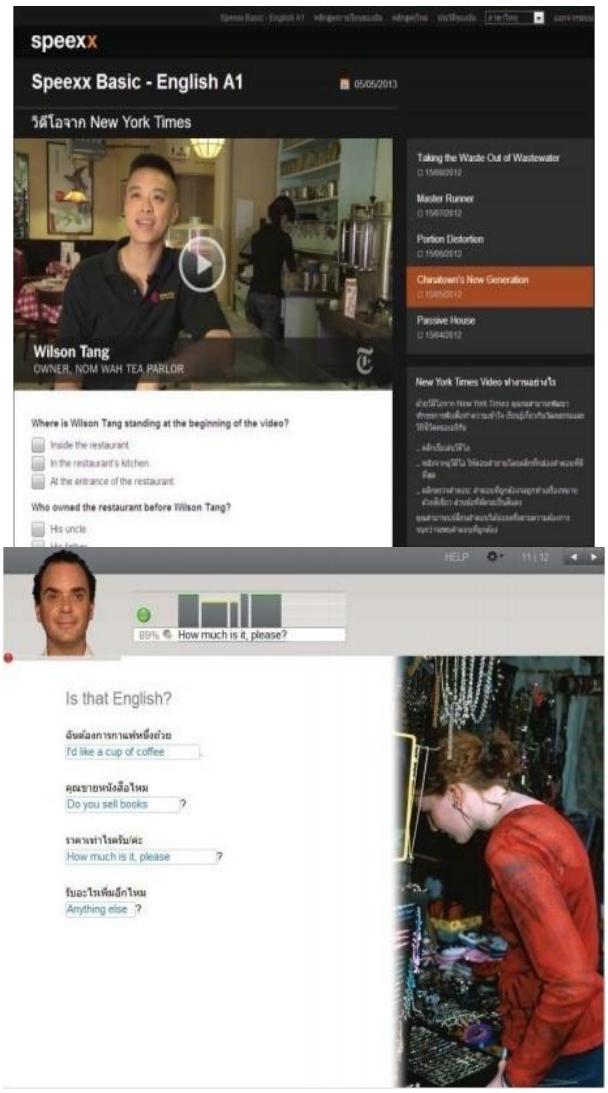


Figure 3.6 Video Exercise of "Speexx" Program

9) Raise awareness of contrast with L1 and range of targets for L2: CAP should raise learners' awareness of the contrast of the L2 or target variety with the native language or variety and also of the range of acceptable or related targets and their social significance.

The "Speexx" program is capable of providing comparative information between L1 (Thai) and L2 (English). While learners are practicing pronunciation and facing a problem in articulating some difficult English sounds, they can search for explanations by clicking on the help icon.

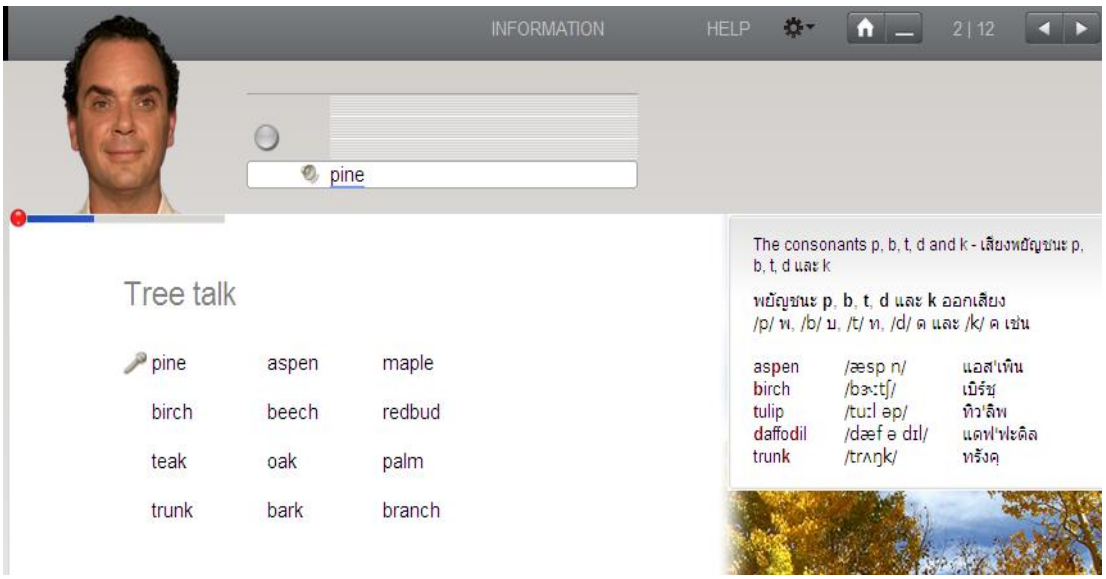


Figure 3.7 Comparison Information Between L1 (Thai) and L2 (English) Sound of "Speexx" Program

10) Provide for exploration of database: As one of the most significant potentials of computer access for individualizing instruction and promoting learner control and independence, exploratory CALL should be a feature of CAP.

Each learner is allowed to learn at his or her own pace. Learners can also choose to learn according to his or her needs and interests. They can receive individual instruction by clicking on icons in which he or she is interested.

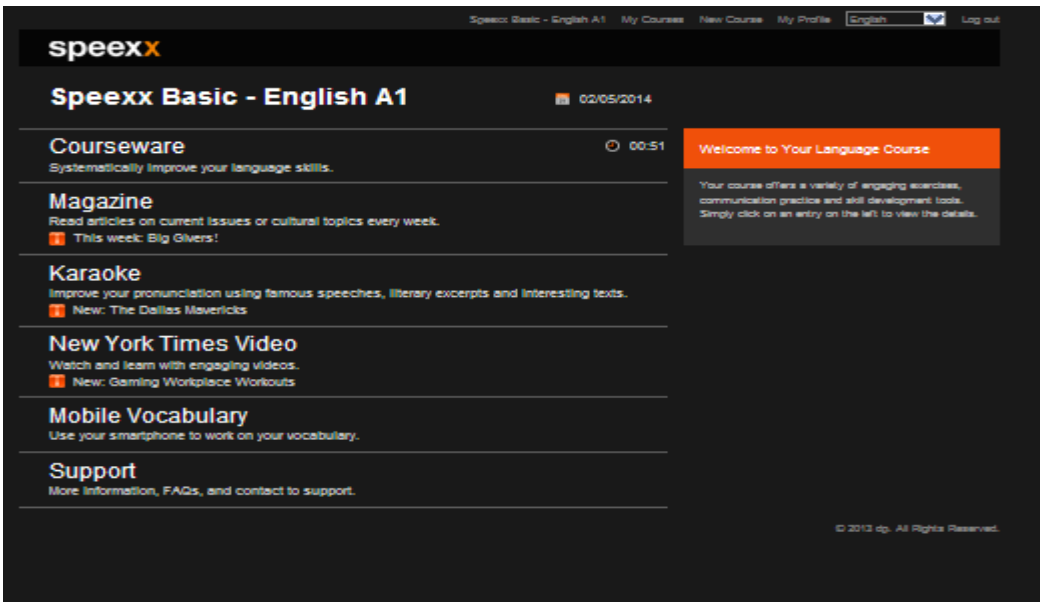


Figure 3.8 Main Menu of "Speexx" Program

A questionnaire is the third instrument used in this study. The questionnaire consists of three parts including students' demographic data, attitudes toward the use of CAPL, and autonomous learning capacity. First, the demographic data is in the first part of the questionnaire in order to obtain students' personal information, and is used for analyzing factors affecting students' attitudes towards CAPL programs. The second and third parts consist of a Likert-type five-point questionnaire containing 28 items. The second part of the questionnaire involving the students' attitudes is adapted from the questionnaire of Abu Seileek (2007) who investigated the attitudes of Saudi Arabian College students towards the use of computer-based pronunciation instruction and activities. The third part of the questionnaire is adopted from Pu (2009), who examined the efficacy of CALL in fostering the autonomous learning capacity of Chinese college students.

In terms of validity, the questionnaire consisting of 28 items was submitted to an expertise board comprised of three lecturers in the English language teaching field in order to examine the Index of Item Objective Congruence (IOC). The expertise board confirmed the relevance of all 28 items and all items obtained an IOC value over .50. The values of the 28 IOC items are illustrated in table 3.2 below:

Table 3.2 The Index of Item Objective Congruence (IOC) of the Questionnaire

No.	Expertise's scores			Total score $\sum R$	IOC = $\frac{\sum R}{N}$	Result
	No.1	No.2	No.3			
1	1	0	1	2	0.66	appropriate
2	1	1	1	3	1.00	appropriate
3	0	1	1	2	0.66	appropriate
4	1	0	1	2	0.66	appropriate
5	1	1	0	2	0.66	appropriate
6	1	1	1	3	1.00	appropriate
7	1	1	1	3	1.00	appropriate
8	1	1	1	3	1.00	appropriate
10	1	1	1	3	1.00	appropriate
11	1	1	0	2	0.66	appropriate
12	0	1	1	2	0.66	appropriate
13	1	0	1	2	0.66	appropriate
14	1	1	1	3	1.00	appropriate
15	1	1	1	3	1.00	appropriate
16	1	0	1	2	0.66	appropriate
17	1	1	1	3	1.00	appropriate
18	1	1	1	3	1.00	appropriate
19	1	1	0	2	0.66	appropriate
20	1	1	1	3	1.00	appropriate
21	1	0	1	2	0.66	appropriate
22	1	1	1	3	1.00	appropriate
23	0	1	1	2	0.66	appropriate
24	1	1	0	2	0.66	appropriate
25	1	1	1	3	1.00	appropriate
26	1	1	1	3	1.00	appropriate
27	1	1	1	3	1.00	appropriate
28	1	0	1	2	0.66	appropriate

The questionnaire was piloted in October 2013 in order to examine the reliability. The questionnaire was randomly distributed to 14 fourth year students majoring in English and Education (English) and had experiences in utilizing CALL. Fourth year of English and Education (English) major students were selected in order

to assure that they could represent the population of the study. The process of piloting the questionnaire was examined and some inquiries from the selected samples were noted. Some terms were clarified in order to clearly understand the questions such as ‘feedback in conventional pronunciation classroom’ and ‘feedback in a CAPL environment’.

After the selected samples answered the questionnaire, the data obtained were analyzed by the SPSS program. Spector (1992) discussed the level of alpha for a scale questionnaire to be accepted as demonstrating reliability: “Nunnally (1978) provides a widely accepted rule of thumb that alpha should be at least .70 for a scale to demonstrate reliability” (p. 32). The reliability value scores of the questionnaire were .79, which indicates good reliability. The first part of the questionnaire examined participants’ attitudes in the experimental group toward CAPL programs (Cronbach alpha = .92). The second part of the questionnaire examined the participants’ autonomous learning capacity in the experimental group (Cronbach alpha = .73).

A weekly journal entry is the fourth instrument used in this study. Students in the experimental group were assigned to write a weekly journal entry in order to examine their pronunciation learning. During the semester, pronunciation teacher used this information to assign extra exercises or to help students cope with problem sound(s) each week and traced students’ participation to CAPL programs.

3.3 Population and Sample

The population in this study is urban Thai college students who major in English and Education (English) from closed public universities. Due to time and budget limitations, the non-probability sampling method is used as a criterion for selecting the sample group from the population. In this study, purposive sampling has been selected as the sampling criterion in order to search for appropriate characteristics of sample members. Based on its accessibility, Srinakharinwirot University will be chosen as the sample site. According to Hatcher (1994, as cited in Garson, 2008), the sample of experimental research should have 5 times of the research’s variable. There are 8 variables in this study which are pronunciation performance, autonomous learning capacity, students’ attitudes toward the utilization

of CAPL program, age, gender, major of study, years of studying English, and CALL experiences. Thus, according to Hatcher (1994, as cited in Garson, 2008) the sample should contain at least 40 students in this study. In sum, the sample of this study was 49 sophomore students from Srinakharinwirot University who major in English and Education (English).

3.4 Data Collection

Data was collected quantitatively and qualitatively in one semester. Quantitatively, sophomore students from Srinakharinwirot University majoring in English were selected as the control group, and Education (English) were selected as the experimental group. Both groups had their oral proficiency measured by the "Speexx" program test at the beginning of the semester in order to ensure that the participants of the study were at the beginning level of oral proficiency.

Generally, there are twenty four English consonant sounds. In Speexx's pronunciation test, each consonant sound has ten marks; therefore the full mark is 240 marks. Thus, the Speexx program evaluated students' sound production performance and illustrated marks which students received. Their pronunciation performances are illustrated on the table below:

Table 3.3 Pretest Pronunciation Score of Education (English) Major Students

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
1	0	0	5	5	5	0	5	0	5	5	5	0	5	5	5	5	5	0	5	5	5	5	0	5	85
2	5	0	5	0	5	0	5	0	5	5	0	5	5	5	0	5	5	0	5	5	0	5	5	5	80
3	5	0	0	0	5	5	5	5	5	5	0	5	5	5	0	5	5	5	5	5	0	0	5	5	85
4	5	5	5	5	5	0	5	5	5	5	5	0	5	5	0	5	5	5	5	5	5	5	5	5	105
5	5	0	0	5	5	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	0	0	5	90
6	5	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	0	0	5	80
7	5	0	0	5	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	0	0	5	85
8	5	0	0	5	5	0	5	5	5	5	5	5	5	5	5	0	5	5	5	5	0	0	5	5	90
9	5	0	0	5	5	0	5	5	5	5	5	0	5	5	0	5	5	5	5	5	5	0	5	5	90
10	0	0	0	5	5	0	5	5	5	5	5	0	5	5	0	5	5	5	5	5	5	0	5	5	85
11	5	5	5	5	5	5	5	0	5	5	5	0	0	5	0	0	5	5	5	5	5	0	5	0	85
12	0	0	5	5	5	0	5	5	5	5	5	0	5	5	5	5	5	0	5	5	5	0	5	5	90
13	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	0	5	5	5	5	5	5	5	5	85
14	5	0	5	5	5	5	5	0	5	5	5	0	0	5	0	0	5	5	5	5	5	5	5	5	90
15	5	0	5	5	5	0	5	5	5	5	0	5	5	5	0	5	5	0	5	5	0	5	5	5	90
16	5	5	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	5	5	5	5	0	5	0	85
17	5	5	0	0	5	0	5	5	5	5	5	5	5	5	0	0	5	5	5	5	0	0	5	5	85
18	5	5	5	5	5	5	5	0	5	5	0	5	5	5	0	0	5	0	0	0	5	0	0	5	75
19	0	0	5	5	0	0	5	5	5	5	5	0	5	5	0	0	5	5	5	5	5	0	0	5	75
20	5	0	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	0	5	5	5	0	5	5	80
Av.	**4.0**	**1.3**	**2.3**	**3.3**	**4.0**	**1.0**	**5.0**	**3.8**	**5.0**	**5.0**	**4.0**	**2.5**	**4.5**	**5.0**	**2.0**	**2.8**	**5.0**	**3.5**	**4.8**	**4.8**	**3.0**	**1.5**	**3.5**	**4.5**	**85.75**

Table 3.4 Pretest Pronunciation Score of English Major Students

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
1	5	5	5	5	5	0	0	5	5	5	5	0	5	5	5	0	5	5	5	5	0	0	5	5	90
2	5	5	5	0	0	0	5	0	5	5	0	5	5	5	5	0	5	5	5	5	5	5	0	5	85
3	5	0	5	0	5	0	5	0	5	5	0	5	5	5	5	0	5	5	5	5	5	5	0	5	85
4	5	5	5	5	0	5	5	5	5	5	0	0	5	5	0	0	5	5	5	5	5	5	5	5	95
5	5	0	0	0	5	0	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	0	0	5	85
6	5	0	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	0	5	5	5	0	5	5	80
7	5	0	5	0	5	0	5	5	5	5	5	0	5	5	0	0	5	5	5	5	5	0	5	5	85
8	5	5	0	5	0	5	5	5	5	5	0	0	5	5	5	5	5	5	0	5	0	0	5	5	85
9	5	0	0	0	5	0	5	5	5	5	5	0	5	5	5	5	5	5	5	5	5	0	0	5	85
10	5	0	5	5	5	0	5	5	5	5	5	0	5	5	0	5	0	5	5	5	5	5	0	5	90
11	5	0	5	0	5	0	5	5	5	5	5	0	5	5	5	0	5	5	5	5	5	0	0	5	85
12	5	0	5	0	5	0	5	5	5	5	5	0	5	5	5	0	5	5	5	5	0	5	5	5	90
13	5	5	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	5	5	5	5	0	5	0	85
14	5	5	0	0	5	0	5	5	5	5	5	5	5	5	0	0	5	5	5	5	0	0	5	5	85
15	5	5	5	5	5	5	5	0	5	5	5	0	0	5	0	0	5	5	5	5	5	0	5	0	85
16	0	0	5	5	5	0	5	5	5	5	5	0	5	5	5	5	5	0	5	5	5	0	5	5	90
17	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	0	5	5	5	5	5	5	5	5	85
18	5	0	5	5	5	5	5	0	5	5	5	0	0	5	0	0	5	5	5	5	5	5	5	5	90
19	5	0	5	5	5	0	5	5	5	5	0	5	5	5	0	5	5	0	5	5	0	5	5	5	90
20	5	5	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	5	5	5	5	0	5	0	85
21	5	5	0	0	5	0	5	5	5	5	5	5	5	5	0	0	5	5	5	5	0	0	5	5	85
22	5	5	5	5	5	5	5	0	5	5	0	5	5	5	0	0	5	0	0	0	5	0	0	5	75

Table 3.4 (Continued)

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
23	0	0	5	5	0	0	5	5	5	5	5	0	5	5	0	0	5	5	5	5	5	0	0	5	75
24	5	0	0	0	5	0	5	5	5	5	5	0	5	5	5	0	5	0	5	5	5	0	5	5	80
25	5	5	5	5	5	0	5	5	5	5	5	0	5	5	5	0	5	5	0	5	5	0	5	5	95
26	5	5	5	5	5	0	0	5	5	5	5	0	5	5	5	0	5	5	5	5	0	0	5	5	90
27	5	5	5	0	0	0	5	0	5	5	0	5	5	5	5	0	5	5	5	5	5	5	0	5	85
28	5	0	0	5	5	0	5	0	5	5	5	0	5	5	5	5	5	5	5	5	5	0	5	5	90
29	5	0	0	0	5	0	5	0	5	5	5	0	5	5	5	5	5	5	5	5	5	0	5	5	85
Av.	**4.7**	**2.2**	**2.9**	**2.2**	**4.0**	**0.9**	**4.7**	**3.6**	**5.0**	**5.0**	**3.8**	**1.6**	**4.7**	**5.0**	**3.1**	**1.4**	**4.8**	**4.1**	**4.3**	**4.8**	**3.8**	**1.6**	**3.4**	**4.5**	**86.03**

Tables 3.3 and 3.4 reveal that students in the Education (English) major received less than 5 out of 10 marks for nineteen sounds, and there were only five sounds that they obtained 5 marks, which are /f/, /θ/, /ð/, /ʒ/, and /dʒ/. There are twenty one sounds which English major students received less than 5 marks, and there are only three sounds that students obtained 5 marks, which are /θ/, /ð/, and /ʒ/. In sum, it is found that students from both Education (English) which was the experimental group and English majors which was the control group obtained approximately the same mean scores at the beginning of the semester. The students of the Education (English) major obtained 85.75 out of 240 marks as their mean score; while students of the English major obtained 86.03 out of 240 marks as their mean score.

The independent sample *t*-test was utilized to examine the difference of students' oral proficiency level between English and Education (English) major students. The results shown on table 3.5 below reveal that there was no difference in the oral proficiency level among the 49 selected students.

Table 3.5 The Independent Sample *t*-test of Pronunciation Pretest Scores

		M	***SD***	***SE***	***F***	***t***	**d*f***	***p***
Pronunciation pre-test score of English consonant	Experimental group	85.75	6.54	1.46	.715	-.197	46	.845
	Control group	86.06	4.78	4.78				

Note: *P > .05.

The independent sample t-test in table 3.5 reveals that p > 0.05. Thus, there is no difference in students' pronunciation performances between the experimental and control groups before utilizing the CAPL programs. It can be concluded that all participants in this study are at the same level in English pronunciation performance.

Next, the selected participants enrolled in English Phonetics (EN291) as their major course requirement, and were free to enroll in any one of the three sections of English Phonetics being offered, depending on their timetable. The researcher is the

teacher in all three sections. Education (English) major students is selected as the experimental group, while English major students are the control group. In the experimental group, students learn pronunciation by the integration of a conventional teaching style, "Speexx" program, and PFA project. They are required to write weekly journal entries to ensure their participation in utilizing CAPL programs during the semester and to report their progress in pronunciation learning to teacher; while students in the control group learn pronunciation by a conventional teaching style only. In conventional teaching style, the content of this course is the same in both the control and experimental groups. The English consonant lessons were divided into 6 subtopics based on the manner of articulation. The 6 subtopics were plosive, fricative, affricate, nasal, lateral, and gliding. According to the English Phonetics syllabus, students in the experiment and control groups studied English consonants for eight weeks. The first week was the pretest, and the 2nd through 7th weeks focused on the 6 subtopics of English consonants. The last week was the posttest. In the 2nd through 7th weeks, students in the experimental group studied English consonants with their teacher and the speech model from the PFA project, which provided 90 minutes of multimedia of how to articulate each consonant sound. For the next 90 minutes, they practiced pronouncing English consonants with the 'Speexx' program, while students in the control group learnt how to articulate English consonants and practiced pronouncing them with the teacher for three hours. At the end of the semester, both groups took the "Speexx" program test to examine their progression in pronunciation performance. In addition, the questionnaire was distributed to students who are in the experimental group before and at the end of the semester to investigate their attitudes toward the use of CAPL and their autonomous learning capacity.

Qualitatively, students in the experimental group were assigned to write a weekly journal entries during the semester in order to report their progress in pronunciation learning to the teacher each week. Therefore, teacher could use this information to assign extra exercises to assist students with their problem sound(s). Teacher could also use weekly journal entries to ensure students' participation in utilizing CAPL programs during the semester. Moreover, six students were randomly selected from the experimental group in order to attend a semi-structured interview to

gather information that is not covered in the questionnaire and allow them to express their attitudes toward CAPL programs freely.

3.5 Data Analysis

H_1 1: Students who learn pronunciation by the integration of the conventional teaching style and the CAPL programs will gain higher pronunciation scores than those learning by a conventional teaching style alone.

To discover the difference in performance between students who learn pronunciation by the integration of the conventional teaching style and CAPL programs and students who are taught English pronunciation by a conventional teaching style alone, an independent sample *t*-test was employed to compare participants' performances in the post-test scores between the control and experimental groups. Independent variables are the experimental and the control groups, and the dependent variable is students' post-test scores.

H_1 2: Students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will have higher positive attitudes toward CAPL programs after utilizing CAPL programs.

To discover the differences in students' attitudes in the experimental group before and after utilizing the programs, the data analysis was divided into two parts. In the quantitative part, a paired sample *t*-test was utilized to find the difference in students' attitudes before and after utilizing CAPL programs in the experimental group. In the qualitative part, the content analysis was applied to analyze students' responses from a semi-structured interview and students' weekly journal entries.

H_1 3: Students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will gain higher autonomous learning capacity after utilizing CAPL programs.

To examine the differences in students' autonomous learning capacity in the experimental group before and after utilizing the program, a paired sample *t*-test was employed to investigate the difference in students' autonomous learning capacity before and after utilizing CAPL programs in the experimental group.

H_1 4: Age, gender, major of study, years of studying English, and CALL experiences affect students' attitudes toward CAPL programs in the experimental group.

To examine whether age, gender, major of study, years of studying English, and CALL experiences can affect students' attitudes toward the CAPL program in the experimental group, a multiple regression was employed to investigate whether the mentioned factors can affect students' attitudes toward the CAPL program in the experimental group. The summary of instruments and data analysis techniques is illustrated in table 3.6 below.

Table 3.6 Summary of Instruments and Data Analysis Techniques

	Research Questions			
Research instruments	1) Is there any significant difference in performance between students who learn pronunciation by the integration of the traditional teaching style and CAPL programs and students who learn pronunciation by the traditional teaching style alone?	2) Is there any significant difference in attitudes of students who learn pronunciation by the integration of the traditional teaching style and CAPL programs while, before and after utilizing CAPL programs?	3) Is there any significant difference in the autonomous learning capacity of students who learn pronunciation by the integration of the traditional teaching style and CAPL programs while, before and after utilizing CAPL programs?	4) Can age, gender, major of study, years of studying English, and CALL experiences affect students' attitudes in the experimental group toward CAPL programs?
1. Oral test	X			
2. Questionnaire		X	X	X
3. Semi-structured interview		X		
4. Students' weekly journal entries		X		
Dependent variables(s)	Participants' pronunciation posttest scores	Participants' attitudes before and after utilizing CAPL programs from an experimental group	Participants' autonomous learning capacity from an experimental group	Participants' attitudes from an experimental group
Independent variable(s)	Control and experimental groups	Experimental group	Experimental group	Experimental participants
Method of Analysis	Quantitative	Quantitative and Qualitative	Quantitative	Quantitative
Data Analyzes	Independent sample *t* test	Paired samples t-test and Content analysis	Paired sample t-test	Multiple Regression

CHAPTER 4

RESULTS

This chapter presents the results of the collected data from the instruments such as a Speexx's pronunciation test score, a questionnaire, a semi-structured interview and a student journal. The results are reported according to the research questions respectively. Firstly, students' pronunciation performances from the experimental and control groups are reported. The experimental group consists of Education major students who learned pronunciation by the integration of the conventional teaching style and CAPL programs, while the control group consists of the English major students who learned pronunciation by the conventional teaching style. Secondly, the findings about participants' attitudes from the experimental group towards the CAPL programs are demonstrated. Then, participants' autonomous capacity from the experimental group is also illustrated. The last part attempts to investigate whether or not age, gender, major study, years of learning English and CALL experiences of participants can affect their attitudes towards the CAPL programs.

Research Question 1: Is there any significant difference in performance between students who learn pronunciation by the integration of the conventional teaching style and CAPL programs and students who learn pronunciation by the conventional teaching style alone? The results are illustrated in section 4.1.

4.1 Students' Pronunciation Performance

Generally, there are twenty-four English consonant sounds. In Speexx's pronunciation test, each consonant sound has ten marks; therefore the full score is 240 marks. Thus, the Speexx program evaluates students' sound production performance and illustrates the marks students receive. Their pronunciation performances are illustrated in the tables below;

Table 4.1 The Post-test Score of Students in the Experimental Group

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
1	8	6	6	9	9	9	9	10	10	4	8	7	1	7	10	6	7	9	10	10	10	7	4	9	185
2	10	4	6	10	7	7	10	10	10	7	9	7	1	6	10	3	9	10	10	9	7	10	7	7	186
3	10	8	9	9	10	9	10	10	10	8	10	7	0	2	9	8	10	9	10	10	9	8	10	9	204
4	8	9	9	8	6	9	10	9	9	7	8	8	7	0	6	8	8	9	10	6	9	6	7	8	184
5	9	5	9	8	9	6	10	10	10	7	9	9	6	6	9	7	9	10	10	10	10	6	7	7	198
6	10	7	8	8	9	9	9	10	10	5	2	8	0	1	8	6	9	9	10	9	8	2	1	9	167
7	9	1	9	9	6	1	9	7	9	7	9	9	5	10	10	7	6	10	10	10	10	9	7	8	187
8	7	4	10	9	7	10	10	10	8	10	10	10	1	8	9	9	9	10	9	10	9	9	10	9	207
9	9	7	9	9	9	5	6	10	8	6	8	7	1	1	8	9	4	9	10	10	10	8	1	1	165
10	9	9	8	8	9	0	10	9	7	4	9	1	2	1	10	9	10	2	8	8	10	3	4	9	159
11	8	7	9	10	6	8	8	10	9	6	10	9	6	5	6	9	9	10	8	10	9	7	7	8	194
12	9	9	7	6	9	10	9	10	10	5	5	7	5	6	8	9	9	9	10	10	10	8	10	7	197
13	9	8	8	9	10	8	9	9	10	7	8	9	6	5	8	6	10	9	10	7	10	10	5	9	199
14	9	7	6	8	8	4	10	10	9	7	9	8	1	9	10	6	9	7	7	10	9	9	10	8	190
15	10	6	9	10	9	5	10	10	10	5	10	9	1	5	9	9	10	2	5	9	10	8	5	1	177
16	9	9	7	9	9	7	10	10	9	5	10	10	5	9	5	10	9	10	9	10	9	10	4	3	197
17	10	9	8	9	7	9	10	9	7	5	9	7	3	5	9	10	5	9	9	10	8	8	7	9	191
18	8	5	9	10	1	8	10	3	9	10	9	8	0	7	9	8	5	10	10	10	9	6	7	8	179
19	10	9	9	9	10	4	10	10	10	10	9	8	5	9	9	10	9	10	8	8	9	10	1	9	205
20	1	0	1	8	6	8	10	8	9	10	0	8	0	6	9	8	10	10	9	9	10	8	10	7	166
Av.	**8.6**	**6.5**	**7.8**	**8.8**	**7.8**	**6.8**	**9.5**	**9.2**	**9.2**	**6.8**	**8.1**	**7.8**	**2.8**	**5.4**	**8.6**	**7.9**	**8.3**	**8.7**	**9.1**	**9.3**	**9.3**	**7.6**	**6.2**	**7.3**	**186.87**

Table 4.2 The Post-test Score of Students in the Control Group

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
1	9	0	9	9	0	7	1	0	9	6	1	0	0	1	10	0	8	9	9	6	6	1	4	2	107.6
2	8	0	6	8	8	7	9	6	9	0	8	8	7	3	1	1	2	7	6	9	2	1	0	4	120
3	8	1	0	0	9	8	0	0	9	0	8	8	1	5	9	1	8	8	9	9	8	9	7	1	125.5
4	9	0	3	8	9	0	9	1	9	0	8	8	8	0	9	0	4	0	8	9	0	0	5	0	107.2
5	8	6	8	9	8	6	4	6	9	0	9	9	0	9	9	5	6	8	9	5	0	9	5	2	149.1
6	8	0	8	0	7	7	9	9	9	0	8	9	8	0	0	2	2	0	9	9	0	6	0	4	114.4
7	9	0	0	1	8	0	9	7	9	0	0	9	0	6	0	2	9	6	0	9	8	7	8	0	107.7
8	8	0	5	9	9	9	9	0	9	3	9	9	0	0	9	5	0	3	9	0	9	8	0	9	131.5
9	8	0	3	9	7	0	9	6	9	4	8	8	0	0	9	7	5	6	0	9	7	0	5	5	124.4
10	9	6	9	0	8	0	9	0	9	0	9	9	0	8	9	9	9	8	7	9	6	8	0	9	150.2
11	8	8	8	0	8	9	9	9	8	7	9	8	3	9	8	8	6	0	9	8	0	9	0	8	159.2
12	6	0	6	9	9	7	4	0	9	0	6	9	0	0	9	0	9	9	3	9	8	0	0	0	112.2
13	9	0	9	8	0	8	9	0	9	3	8	7	0	0	9	7	0	9	2	9	0	8	7	9	130.4
14	5	0	2	9	0	7	9	0	9	7	9	8	3	0	9	4	9	8	9	6	0	7	0	7	127.4
15	9	0	5	8	0	0	4	0	7	3	8	5	0	1	9	3	8	6	0	9	0	8	0	0	93.2
16	8	9	6	8	8	9	0	3	8	2	8	0	0	1	1	9	9	9	0	9	1	8	0	9	124.6
17	4	6	1	7	9	6	9	1	8	0	9	0	0	1	6	7	6	4	0	7	1	7	8	8	115.1
18	9	1	0	8	5	9	1	5	9	5	2	1	2	1	1	8	4	8	1	8	0	0	6	9	102.6
19	9	6	1	5	6	9	3	6	9	3	8	5	1	7	7	7	9	6	0	8	5	3	0	3	126
20	9	6	8	9	8	0	7	0	9	0	9	0	0	7	8	8	9	3	0	8	1	9	6	5	129.3
21	7	9	8	9	9	9	9	6	9	9	8	5	3	9	8	8	8	9	0	9	0	8	0	8	167.2
22	9	9	7	7	6	8	6	0	8	3	8	2	0	7	0	9	8	3	0	9	0	9	7	0	125.1
23	8	6	8	9	9	4	4	4	8	0	7	0	0	8	0	6	9	6	2	9	3	8	7	8	133.2

Table 4.2 (Continued)

No.	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	h	tʃ	dʒ	m	n	ŋ	l	r	j	w	240
24	9	0	5	9	9	2	9	0	9	4	8	5	0	9	8	8	9	7	0	9	0	6	7	9	141.5
25	9	8	5	0	5	7	8	6	6	3	8	8	0	7	0	5	7	5	8	9	0	9	0	9	132.3
26	9	4	0	0	7	1	6	0	9	2	9	6	0	4	0	8	8	7	9	7	1	3	0	9	109.9
27	9	6	0	9	8	6	9	0	9	0	6	3	0	3	0	9	3	9	7	8	6	6	0	8	124.7
28	1	7	1	8	0	8	9	6	9	3	2	0	1	8	3	6	8	0	8	8	0	7	6	9	118.3
29	0	4	9	0	4	9	7	8	9	7	8	6	2	0	4	8	8	2	0	9	0	2	3	9	118.6
Av.	**7.6**	**3.5**	**4.9**	**6.1**	**6.3**	**5.6**	**6.6**	**3.1**	**8.7**	**2.6**	**7.2**	**5.4**	**1.4**	**3.9**	**5.4**	**5.5**	**6.6**	**5.7**	**4.3**	**8.0**	**2.5**	**5.7**	**3.1**	**5.6**	**125.12**

Table 4.1 shows that students in the experimental group received more than 5 out of 10 marks in most English consonants. There is only one sound that students got below five marks, which is /ʃ/. In Table 4.2, there are fifteen sounds that students in the control group obtained more than five marks, and there are nine sounds that they obtained below five marks, which are /b/, /t/, /v/, /ð/, /ʃ/, /ʒ/, /n/, /l/, and /j/. In sum, students in the experimental group obtained 186.87 marks as their mean score, while the mean score of students in the control group is 125.12 out of 240 marks.

To examine the difference of pronunciation performances between students from the experimental and control groups, an independent sample *t* test was utilized. The result of the *t* test is presented in the next table.

Table 4.3 The Independent Sample *t*-test of the Post-test of the Experimental Group and the Control Group

		M	***SD***	***SE***	***F***	***t***	**d*f***	***p***
Pronunciation score of English consonant	Experimental group	186.87	14.22	3.18	0.11	13.23	46	.000*
	Control group	125.12	16.95	3.2				

Note: *P < .001.

The independent sample t-test in table 4.3 reveals that there is a highly significant difference in students' pronunciation performances between the experimental and control groups (t = 13.23, p < .001); the experimental group (M = 186.87) scored higher than the control group (M = 125.12).

Research Question 2: Is there any significant difference in attitudes of students who learn pronunciation by the integration of the conventional teaching style and CAPL programs while, before and after utilizing CAPL programs? The results of Research Question 2 are presented in section 4.2 below.

4.2 Students' Attitudes Toward CAPL Programs

There are two subsections in this part, which are quantitative and qualitative parts. The quantitative part (4.2.1) is the result of information gathered from the questionnaire. The qualitative part consists of a semi-structured interview (4.2.2) and student journal data (4.2.3).

4.2.1 Students' Attitudes Towards CAPL Programs before and after Utilizing the Programs

The participants in the experimental group were requested to rate their attitudes towards CAPL programs before the actual utilization of the CAPL programs. There are eight statements concerning attitude towards CAPL programs in the questionnaire, which were adapted from Abu Seileek (2007). A five-point-Likert scale was interpreted by the class interval calculation suggested by Colwell and Carter (2012, p. 41).

Class interval = (Highest limit – lowest limit) / class width

= (5 – 1) /5

= 0.80

Therefore, the interpretation of the Likert scale is

Strongly Agree	equal to	"4.21 – 5.00"
Agree	equal to	"3.41 – 4.20"
Uncertain	equal to	"2.61 – 3.40"
Disagree	equal to	"1.81 – 2.60"
Strongly Disagree	equal to	"1.00 – 1.80"

Table 4.4 Attitudes of Students Towards CAPL Programs in the Experimental Group before the Utilization of the Programs

Statement	M	SD	
1. I can learn English on my own by using CAPL.	2.45	.88	Disagree
2. CAPL is easy to use.	2.30	.65	Disagree
3. CAPL is interesting and useful.	4.10	1.21	Agree
4. CAPL activities are suitable and useful.	3.25	.91	Uncertain
5. CAPL instruction can improve pronunciation.	2.75	.63	Uncertain
6. CAPL feedback is useful.	3.00	.64	Uncertain
7. I want to use CAPL again.	3.65	1.04	Agree
8. Generally, CAPL is good.	3.30	.80	Uncertain
Total	3.10	.84	Uncertain

The findings from table 4.4 illustrates that before utilizing CAPL programs, the participants in the experimental group generally tended to have uncertain attitude towards CAPL programs (mean = 3.10). It was also discovered that they agree that CAPL is interesting and useful (M = 4.10), and they want to use CAPL again (M = 3.65). Therefore it could be implied that they are interested to learn by utilizing the CAPL programs, and they perceive the programs as a useful tool and want to utilize CAPL again. Moreover, the Standard Deviation (SD) is 0.84 and less than 30% of the average mean. The SD indicates that the attitudes of students in the experimental group tend to be close to zero. It could be implied that they are likely to have a homogenous attitudes towards CAPL programs.

At the end of the semester, students in the experimental group rated their attitudes towards the CAPL program again. The results are shown in Table 4.5.

Table 4.5 Attitudes of Students Towards CAPL Programs in the Experimental Group after the Utilization of the Programs

Statement	M	SD	
1. I can learn English on my own by using CAPL.	4.65	.58	Strongly Agree
2. CAPL is easy to use.	4.45	.51	Strongly Agree
3. CAPL is interesting and useful.	4.65	.48	Strongly Agree
4. CAPL activities are suitable and useful.	4.45	.51	Strongly Agree
5. CAPL instruction can improve pronunciation.	4.65	.48	Strongly Agree
6. CAPL feedback is useful.	4.35	.48	Strongly Agree
7. I want to use CAPL again.	4.70	.47	Strongly Agree
8. Generally, CAPL is good.	4.70	.47	Strongly Agree
Total	4.57	.50	Strongly Agree

The results from Table 4.5 shows that after utilizing the programs students in the experimental group tend to have highly positive attitudes towards CAPL programs (M = 4.57). The Standard Deviation (SD) is at .50 and less than 30% of the average mean. The SD indicates that the attitudes of students in the experimental group tend to be close to zero. It could be implied that they are likely to have homogenous attitudes towards CAPL programs.

To find the difference in students' attitudes in the experimental group towards CAPL programs before and after utilizing the programs, a paired-sample *t* test was utilized. The findings are presented in Table 4.6.

Table 4.6 Paired-Sample *t* test of Students' Attitudes Towards CAPL Programs

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	I can learn English on my own by using CALL before treatment - I can learn English on my own by using CALL after treatment	-2.2	0.834	0.186	-2.59	-1.81	-11.804	19	.000**
Pair 2	CAPL is easy to use before treatment - CAPL is easy to use after treatment	-2.15	0.813	0.182	-2.53	-1.77	-11.831	19	.000**
Pair 3	CAPL is interesting and useful before treatment - CAPL is interesting and useful after treatment	-0.55	0.999	0.223	-1.017	-0.083	-2.463	19	.024*
Pair 4	CAPL activities are suitable and useful before treatment - CAPL activities are suitable and useful after treatment	-1.2	0.894	0.2	-1.619	-0.781	-6	19	.000**
Pair 5	CAPL instruction can improve pronunciation before treatment - CAPL instruction can improve pronunciation after treatment	-1.9	0.641	0.143	-2.2	-1.6	-13.262	19	.000**
Pair 6	CAPL feedback is useful before treatment - CAPL feedback is useful after treatment	-1.35	0.813	0.182	-1.73	-0.97	-7.429	19	.000**

Table 4.6 (Continued)

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 7	I want to use CAPL again before treatment - I want to use CAPL again after treatment	-1.05	0.945	0.211	-1.492	-0.608	-4.972	19	.000**
Pair 8	Generally, CAPL is good before treatment - Generally, CAPL is good after treatment	-1.4	0.754	0.169	-1.753	-1.047	-8.304	19	.000**

Note: *P < .05

**P < .001

Table 4.6 illustrates that differences exist in students' attitudes towards CAPL programs in the experimental group before and after the utilization of CAPL programs. The *t*-test was processed and the results reveal that there is a highly significant difference in students' attitudes towards CAPL programs before and after utilizing the programs ($p < .001$). Moreover, there is only one pair that was significant at $p < .05$, which is pair 3 (CAPL is interesting and useful).

To triangulate the quantitative part, a semi-structured interview and students' written journal were also analyzed.

4.2.2 Semi-Structured Interview Responses

A semi-structured interview and students' written journal were also analyzed. A five to ten minute semi-structured interview was conducted. Interviews were conducted in a private room, and in a conversational one-on-one fashion. It took place in February 2014. The six selected participants were asked to respond to three open-ended questions which were adapted from Abu Seileek (2007). The questions were:

1) What did you like/dislike about computer-assisted pronunciation instruction and activities?

2) What did you like/dislike about the program and activities?

3) What are your suggestions for improving the program and activities?

4.2.2.1 Interview Question 1

The first interview question inquired students' opinions towards the advantage and disadvantage of CAPL programs' instruction and activities. First, the advantages of CAPL's instruction and activities are reported. It was found that most students view the instruction of CAPL programs as an effective tool to improve their pronunciation learning because it could provide needed information for studying pronunciation. Three of the students said "Speexx instruction provides information based on sound system, not writing system, which assisted them in having a better understanding of how to pronounce. It also provides information on both English and Thai sounds [sic]". Three students also mentioned that the program could act as a pronunciation teacher as they said "Speexx provides a virtual teacher whose name is 'Tim'. He acts as a teacher, providing pre-lesson information and giving some instructions on how to use the program [sic]". Moreover, two students mentioned that the program not only teaches pronunciation, but also provides feedback while they are practicing pronunciation. They said "Speexx provides feedback in pronunciation score in percentage and color in order to inform us whether or not we pronounce this particular consonant sound correctly [sic]". In addition, one student said that the UIOWA website "provides information in motion picture on how to articulate our speech organs in order to pronounce each consonant sound correctly [sic]". Thus, it could be implied that the UIOWA website can assist them in gaining a better understanding of how to articulate their speech organs while pronouncing English consonants. Moreover, three students stressed that Speexx has a variety of activities; "Speexx provides various types of instruction and exercises, which does not focus on pronunciation only, for example, grammar and lexicon test" and "Model sounds of the program is flexible, it can provide both male and female sounds, and also both British and American English [sic]". Apart from improving pronunciation skills, most of the students also believe that Speexx could improve their listening skills; "I can learn

sounds and sentences from English native speakers, and I can improve my listening skills and get used to native accents while listening to model speech [sic]".

Furthermore, the disadvantages of CAPL's instruction and activities are discussed below. According to students' opinions, there are two drawbacks of the program's instruction and activities. First, reliability of Speexx's feedback is one of their concerns. Most of them said "I pronounce exactly the same twice; however the program rates my pronunciation score differently [sic]". They have questioned the reliability of the speech recognition program (feedback) feature. Furthermore, one student from the low scoring group mentioned that he prefers to have a teacher beside him while he is practicing pronunciation from the program as he said "Speexx cannot answer the specific question when I have curiosity about the pronunciation lesson. It can give only feedback on what is right or wrong. However, a teacher can guide me on how to pronounce correctly by observing my speech organs while practicing pronunciation, [sic]".

4.2.2.2 Interview Question 2

The second interview question inquired students' opinions towards the advantages and disadvantages of CAPL programs and activities. First, students' positive views towards programs and activities are reported. Most of them believed that programs provide them an opportunity to control their pronunciation study. They said "Speexx assists my pronunciation learning very well, I can learn by myself outside the classroom. There is no need to learn from the classroom only anymore. Thus, there is no time limitation. Anytime anywhere without the presence of a teacher" and "I can learn pronunciation lessons in advance, there is no need to wait for the teacher to teach in the classroom [sic]". In terms of taking control of their study, they clarified that "I can choose to learn lessons that I do not understand yet, and I can skip lessons or sounds that I can pronounce correctly [sic]". Furthermore, most of the students also think that the programs can encourage them to learn as they mentioned that "programs are an innovative technology, which encourages students to learn pronunciation. I have willingness to learn pronunciation by using the program, and I can use the Internet on my education not for fun only [sic]". Lastly, programs assist them to avoid embarrassment from practicing pronunciation in front of the classroom as one of them mentioned that "I do not have to confront with peer pressure while I try to pronounce correctly [sic]".

For students' negative views towards the CAPL program and activities, the major complaint from the students towards the overall view of the CAPL program is the program's design, because the programs follow a web-based learning design. The program relies on the Internet, and the signal of the Internet is uncontrollable and unstable. Hence, they always have a problem with the Internet as most of them stated that "external factors that can interfere with the effectiveness of the program such as environmental noises and the signal of the Internet" and "once there is a lost connection on the Internet, recorded data disappears [sic]".

4.2.2.3 Interview Question 3

The third interview question aims to examine students' suggestions for improving the program and activities. Most of the students suggested that the design of the program should be adjusted from a web-based design to an offline application which can be utilized through their smart phones as they stated that "I prefer to learn through CDs or offline applications; because the problem of the Internet signal could be eliminated", and "Learning from this program requires using a notebook. Sometimes, my notebook could not open the program. I need to access to the programs from the library, which is inconvenient" and "I prefer to learn by using a smart phone instead of a notebook. It is more convenient and everyone has a smart phone, but not everyone has a notebook. I could use it spontaneously when I have curiosity about pronunciation [sic]". Lastly, one of the students suggested that the activity of the program should be based on students' interest as she said "I would prefer to learn pronunciation through songs instead of reading news in a karaoke section [sic]".

In sum, there are many advantages of CAPL's instruction and activities. First, it could act as a teacher to provide required information for studying English pronunciation such as English speech models, feedback, correction, and motion pictures of consonant speech production. Second, the instruction of CAPL programs does not aim to teach pronunciation only; they could also help improve other skills such as listening skills. On the other hand, most of the students in the experimental group complained about the Speexx's reliability in delivering feedback. Moreover, one of the students prefers to have teacher guided instruction while he is practicing pronunciation with the program. In terms of the overall picture of CAPL programs

and activities, students believe that programs could provide unlimited opportunities to learn English consonant pronunciation both inside and outside the classroom. They also realize that they are motivated to learn by the programs, because the programs are interesting and innovative. Most students think that the program could assist them in avoiding the embarrassment of being judged by the teacher in pronunciation classroom practices. However, there is one major complaint of CAPL programs regarding their design, because the web-based design program requires a strong Internet signal. Thus, the effectiveness of the programs will decrease, when the Internet signal is low. In addition, most of them suggest that the programs should be utilized in an offline application and CD instead because they would like to use the application offline with their smartphones. Lastly, one student prefers to learn pronunciation by listening to English songs instead of reading news.

4.2.3 Students' Journal in the Experimental Group

In order to provide an in-depth description of the results and trace students' participation during the treatment period, each student's journal was utilized to examine their attitudes towards the CAPL programs. Students in the experimental group were assigned to write a journal every time they accessed the CAPL programs. CAPL programs were utilized for teaching pronunciation of English consonants during November and December 2013. At the beginning of the semester, students in the experimental group received a journal form and were informed that journal writing is one part of the English Phonetics marks in order to motivate them to participate in writing a journal. The example of the journal is shown below;

Name:	**ID Number:**	**Date:**	**How long have you used the program today?**
Topic:			
1. What content did you practice today?			
2. What kind of functions in this program did you utilize today?			
3. What sounds did you practice today?			
4. How does this software correct your pronunciation? **4.1 what sound(s) did you speak well?** **4.2 what sound(s) did you speak not well?**			
5. What difficulties do you experience when you are practicing?			

Figure 4.1 Journal Form

At the end of the semester, students in the experimental group submitted their journals through the researcher's email. 177 journals were submitted from 20 students in the experimental group. The average amount of journal writing per student, during the two months was 8.85 journals. There is one student who wrote 18 journals, which is the highest amount of journal writing, while there is one student who wrote only 1 journal, which is the lowest amount of journal writing. Moreover, students in the experimental group spent around 20 minutes to 3 hours per session studying consonant pronunciation through CAPL programs, and most of them studied English consonant content. There are three main functions in Speexx that participants practiced while studying English consonants, which were signal consonant sound, combination (single sentence), and karaoke (reading multiple sentences). Furthermore, there were eight English consonant sounds that students could not pronounce well.

They are /ʃ/ (13 students), /h/ (6 students), /ʒ/ (5 students), /ð/ (5 students), /tʃ/ (4 students), /r/ (4 students), /s/ (1 student), and /l/ (1 student). Thus, the most difficult English consonant sound perceived by the majority of students in the experimental group is /ʃ/. This mentioned information is relevant to the post test pronunciation scores of the students in the experimental group found in Table 4.2, which shows that there is only one sound /ʃ/ in which students received only 2.8 out of 10 marks.

In terms of the difficulties while practicing the programs, it was noticed that there are two factors affecting the studying of English consonants, which are internal and external factors. There are three internal factors; the program itself, students' characteristic, and equipment used. First, two students complained that "Speexx's speech model speaks too fast and sentences in the exercise are too long. I had not finished pronouncing the sentence yet, but the program already evaluated my pronunciation". Four students noticed fluctuations in Speexx's evaluation as they said that "I have pronounced exactly the same twice, however I received different scores". Surprisingly, twelve students reported that the difficulty in pronouncing English consonants in the Speexx program was caused by their characteristics such as "I always used a Thai accent while pronouncing English consonants", and "I had not practiced much; therefore I gained a low score", and "I could not pronounce like the speech model sound", and "I was sick; therefore I could not pronounce well". Lastly, seven students believed that the equipment used (such as computer and microphone) while practicing pronunciation affected their pronunciation performance; "My notebook is too old, and I received low scores while using my own notebook. I gained higher scores while using the computer at the library" and "My microphone is not good, there was some noisy sounds. I gained higher scores while using my friend's microphone".

In terms of external factors, there are two elements which effected students' performance, the Internet signal and the surrounding environment. First, most of the students in the experimental group realized that the Internet signal has a great impact on Speexx evaluation and performance as seventeen students reported that "When the Internet signal was low, the program would not respond and evaluate my pronunciation", and "Sometimes, the program closed itself, while the Internet signal was low", and "I found that the Internet signal is very important. I could perform well,

while I used LAN Internet. However, I could not perform well when I used WIFI because the WIFI signal was too low". Lastly, eleven students believed that noises from the surrounding environment produced a negative effect on Speexx's evaluation and performance as students reported that "Noise produced from my roommate always interrupted my pronunciation practices with the Speexx program. I cannot find a place where there is no noise interrupting", and "I don't have a notebook, hence I have to practice Speexx at the library. There were many people and noises in the library, I could not receive a high score because there were many interrupting noises and the program could not detect my pronunciation".

Research Question 3: Is there any significant difference in the autonomous learning capacity of students who learn pronunciation by the integration of the conventional teaching style and CAPL programs while, before and after utilizing CAPL programs? The results of research question 3 are presented in section 4.3.

4.3 Students' Autonomous Learning Capacity

It is believed that CAPL programs could assist students in the experimental group to activate and improve their autonomous learning capacity. Thus, students in the experimental group were assigned to rate their perception to the questionnaire before and after the utilization of CAPL programs in order to examine their improvement in autonomous learning capacity. There are twenty statements concerning students' autonomous learning capacity, which were adapted from Pu (2009). These mentioned statements were developed based on four factors; 1) "Understanding instructors' teaching objectives and requirements," which are statement numbers one to three; 2) "Setting up personal learning objectives and study plans," which are statement numbers four to eight; 3) "Monitoring the use of learning strategies," which are statement numbers nine to twelve; 4) "Monitoring and evaluating the English learning process," which are statement numbers thirteen to twenty (Pu, 2009).

At the beginning of the semester, students in the experimental group were assigned to complete a questionnaire about autonomous leaning capacity. The results of their autonomous learning capacity are shown in table 4.7.

Table 4.7 Students' Autonomous Learning Capacity before the Utilization of CAPL Programs

Statements	M	SD	Autonomous Learning Capacity
Factor 1: Understanding instructors' teaching objectives and requirements			
1. I understand the course requirement.	2.65	.74	Moderate
2. I can turn course objectives into my own objectives.	2.85	.58	Moderate
3. I can keep up with pronunciation learning.	2.55	.82	Moderately Low
Factor 2: Setting up personal learning objectives and study plans			
4. I will make my own study plan.	2.65	.98	Moderate
5. I make my own study objective from my own situation.	2.10	.64	Moderately Low
6. I adjust my study plan if necessary.	2.65	.81	Moderate
7. I make a time plan to study pronunciation.	2.25	.71	Moderately Low
8. I set up my own study objectives based on the syllabus.	2.80	.61	Moderate
Factor 3: Monitoring the use of learning strategies			
9. I adjust my learning strategies if they do not work.	2.40	.50	Moderately Low
10. I evaluate my learning approaches to find mistakes.	2.25	.55	Moderately Low
11. I change my learning approach if it is inappropriate.	2.85	.81	Moderate
12. I know whether my approaches are suitable or not.	2.55	.60	Moderately Low
Factor 4: Monitoring and evaluating the English learning process			
13. I have chances to learn pronunciation outside the class.	2.05	.60	Moderately Low

Table 4.7 (Continued)

Statements	M	SD	Autonomous Learning Capacity
14. I try to gain benefits from the pronunciation learning resources available.	2.90	1.07	Moderate
15. I try to use new knowledge when I practice pronunciation.	2.75	.96	Moderate
16. I try to cooperate and learn together with classmates.	3.75	.78	Moderately High
17. I realize the pronunciation mistakes that I have made during the studying process.	1.95	.68	Moderately Low
18. I know the causes of my mistakes and try to correct them.	2.00	.79	Moderately Low
19. I check whether I have finished my study plan when I try to finish my learning.	1.90	.55	Moderately Low
20. I check whether I understand previous knowledge when I try to finish learning.	2.50	.68	Moderately Low
Average Mean (Factor 1 – 4)	2.52	0.73	Moderately Low

As show in Table 4.7, the average score of the autonomous learning capacity of students in the experimental group before utilizing CAPL programs is moderately low (M = 2.52). The results from factor one show that they moderately understand instructors' objectives and requirements (M = 2.68). However, they might not be capable of keeping up with their pronunciation learning because they scored moderately low in statement three (M = 2.55). Moreover, the results from factor two shows that they scored moderately low in setting up their personal learning objectives and study plans (M = 2.49). However, they showed moderate autonomous learning capacity in making their own study plans (M = 2.65), adjusting their study plans if necessary (M = 2.65), and setting up their own study objectives based on the syllabus (M = 2.80), statements four, six and eight respectively. Furthermore, factor three's

results illustrate that they scored moderately low in monitoring the use of learning strategies (M = 2.51). However, they scored moderate autonomous learning capacity in changing their learning approach if it is inappropriate, statement eleven (M = 2.49). In addition, they scored moderately low in factor four (M= 2.48). However, there are two statements in factor four that they showed moderate autonomous learning capacity in using benefits from pronunciation learning resources available (M = 2.90) and using new knowledge when they practice pronunciation (M = 2.75). Lastly, they scored moderately high in autonomous learning capacity in cooperating with their classmates (M = 3.75). Furthermore, the Standard Deviation (SD) is 0.73 and less than 30% of the average mean. The SD indicates that the autonomous learning capacity of students in the experimental group tend to be homogenous in autonomous learning capacity.

At the end of the semester, students in the experimental group were instructed to complete the questionnaire of autonomous leaning capacity again. The results of their autonomous learning capacity are shown in table 4.8.

Table 4.8 Students' Autonomous Learning Capacity after the Utilization of CAPL Programs

Statements	**M**	**SD**	**Autonomous Learning Capacity**
Factor 1: Understanding instructors' teaching objectives and requirements			
1. I understand the course requirements.	4.55	.51	High
2. I can turn course objectives into my own objectives.	4.25	.44	High
3. I can keep up with pronunciation learning.	4.40	.82	High

Table 4.8 (Continued)

Statements	M	SD	Autonomous Learning Capacity
Factor 2: Setting up personal learning objectives and study plans			
4. I will make my own study plans.	4.10	.44	Moderately High
5. I make my own study objectives from my own situation.	4.30	.47	High
6. I adjust my study plan if necessary.	4.25	.55	High
7. I make a time plan to study pronunciation.	4.35	.67	High
8. I set up my own study objectives based on the syllabus.	4.30	.65	High
Factor 3: Monitoring the use of learning strategies			
9. I adjust my learning strategies if they do not work.	4.40	.59	High
10. I evaluate my learning approaches for finding mistakes.	4.35	.74	High
11. I change my learning approach if it is inappropriate.	4.50	.51	High
12. I know whether my approaches are suitable or not.	4.60	.50	High
Factor 4: Monitoring and evaluating the English learning process			
13. I have chances to learning pronunciation outside the class.	4.80	.41	High
14. I try to gain benefits from the pronunciation learning resources available.	4.80	.41	High
15. I try to use new knowledge when I practice pronunciation.	4.45	.51	High

Table 4.8 (Continued)

Statements	M	SD	Autonomous Learning Capacity
16. I try to cooperate and learn together with classmates.	4.30	.65	High
17. I realize the pronunciation mistakes that I have made during the studying process.	4.75	.44	High
18. I know the causes of my mistakes and try to correct them.	4.30	.57	High
19. I check whether I have finished my study plan when I try to finish my learning.	4.30	.73	High
20. I check whether I understand previous knowledge when I try to finish learning.	4.25	.55	High
Average Mean (Factor 1 – 4)	4.42	0.56	High

Table 4.8 shows that at the end of the semester the average of students' autonomous learning capacity in the experimental group was high (M = 4.42). After the utilization of CAPL programs, they showed a high autonomous learning capacity in understanding instructors' teaching objectives and requirements in factor one (M= 4.40). The results from factor two shows that they also showed a high autonomous learning capacity in setting up their personal learning objectives and study plans (M = 4.26). Moreover, they showed a high autonomous learning capacity in monitoring the use of learning strategies (M = 4.46), which is in factor three. Lastly, they showed a high autonomous learning capacity in monitoring and evaluating the English learning process (M = 4.49), which is in factor four. Moreover, the Standard Deviation is 0.56 and less than 30% of the average mean. The SD indicates that the autonomous learning capacity of students in the experimental group tend to be homogenous in autonomous learning capacity.

To find the difference in students' autonomous learning capacity in the experimental group before and after utilizing the programs, a paired-sample *t* test was utilized. The findings are presented in table 4.9.

Table 4.9 Paired-Samples *t* test of Students' Autonomous Learning Capacity

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	I understand the course requirements before treatment - I understand the course requirement after treatment	-1.900	.852	.191	-2.299	-1.501	-9.970	19	.000**
Pair 2	I can turn the course objectives into my own objectives before treatment - I can turn the course objectives into my own objectives after treatment	-1.400	.754	.169	-1.753	-1.047	-8.304	19	.000**
Pair 3	I can keep up with pronunciation learning before treatment - I can keep up with pronunciation learning after treatment	-1.850	.933	.209	-2.287	-1.413	-8.865	19	.000**
Pair 4	I will make my own study plans before treatment - I will make my own study plans after treatment	-1.450	.999	.223	-1.917	-.983	-6.493	19	.000**

Table 4.9 (Continued)

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 5	I make my own study objectives from my own situation before treatment - I make my own study objectives from my own situation after treatment	-2.200	.834	.186	-2.590	-1.810	-11.804	19	.000**
Pair 6	I adjust my study plans if necessary before treatment - I adjust my study plans if necessary after treatment	-1.600	.940	.210	-2.040	-1.160	-7.610	19	.000**
Pair 7	I make a time plan to study pronunciation before treatment - I make a time plan to study pronunciation after treatment	-2.100	.912	.204	-2.527	-1.673	-10.299	19	.000**
Pair 8	I set up my own study objectives based on the syllabus before treatment - I set up my own study objectives based on the syllabus after treatment	-1.500	.761	.170	-1.856	-1.144	-8.816	19	.000**
Pair 9	I adjust my learning strategies if they do not work before treatment - I adjust my learning strategies if they do not work after treatment	-2.000	.973	.218	-2.456	-1.544	-9.189	19	.000**

Table 4.9 (Continued)

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 10	I evaluate my learning approaches for finding mistakes before treatment - I evaluate my learning approaches for finding mistakes after treatment	-2.100	.788	.176	-2.469	-1.731	-11.917	19	.000**
Pair 11	I change my learning approach if it is inappropriate before treatment - I change my learning approach if it is inappropriate after treatment	-1.650	.933	.209	-2.087	-1.213	-7.906	19	.000**
Pair 12	I know whether my approaches are suitable or not before treatment - I know whether my approaches are suitable or not after treatment	-2.050	.686	.153	-2.371	-1.729	-13.358	19	.000**
Pair 13	I have chances to learn pronunciation outside the class before treatment - I have chances to learn pronunciation outside the class after treatment	-2.750	.550	.123	-3.007	-2.493	-22.356	19	.000**
Pair 14	I try to gain benefits from the pronunciation learning resources available before treatment - I try to gain benefits from the pronunciation learning resources available after treatment	-1.900	1.165	.261	-2.445	-1.355	-7.292	19	.000**

Table 4.9 (Continued)

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 15	I try to use new knowledge when I practice pronunciation before treatment - I try to use new knowledge when I practice pronunciation after treatment	-1.700	1.031	.231	-2.183	-1.217	-7.373	19	.000**
Pair 16	I try to cooperate and learn together with classmates before treatment - I try to cooperate and learn together with classmates after treatment	-.550	.999	.223	-1.017	-.083	-2.463	19	.024*
Pair 17	I realize the pronunciation mistakes I have made during the studying process before treatment - I realize the pronunciation mistakes I have made during the studying process after treatment	-2.800	.768	.172	-3.159	-2.441	-16.310	19	.000**
Pair 18	I know the causes of my mistakes and try to correct them before treatment - I know the causes of my mistakes and try to correct them after treatment	-2.300	.923	.206	-2.732	-1.868	-11.139	19	.000**

Table 4.9 (Continued)

		Paired Differences					t	df	Sig. (2-tailed)
		M	SD	SE	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 19	I check whether I have finished my study plan when I try to finish my learning before treatment - I check whether I have finished my study plan when I try to finish my learning after treatment	-2.400	.821	.184	-2.784	-2.016	-13.077	19	.000**
Pair 20	I check whether I understand previous knowledge when I try to finish learning before treatment - I check whether I understand previous knowledge when I try to finish learning after treatment	-1.750	.910	.204	-2.176	-1.324	-8.596	19	.000**

Note: *P < .05

**P < .001

According to Table 4.9, the difference exists in students' autonomous learning capacity in the experimental group before and after the utilization of CAPL programs. The t-test was utilized, and it shows that there is a highly significant difference at the p < .001 in most pairs. However, there is only one pair in factor four that is significant at the p < .05, which is willingness of students in the experimental group to cooperate and learn together with classmates.

Research Question 4: Can age, gender, major of study, years of studying English, and CALL experiences affect students' attitudes in the experimental group toward CAPL programs? The findings are presented in section 4.4 below.

4.4 Factors Affecting Students' Attitudes Toward CAPL Programs

The last research question aims to examine whether student's factors in the experimental group such as age, gender, major of study, years of studying English, and CALL experiences affect their attitudes towards CAPL programs. Thus, demographic data of students in the experimental group was collected from the questionnaire and used as factors affecting student's attitudes towards CAPL programs. The dependent variable is scores on students' attitudes towards CAPL programs, and the independent variables are students' age, gender, major of study, years of studying English, and CALL experiences. Moreover, there are eight statements concerning students' attitudes towards CAPL programs, and each statement is analyzed by the analysis of multiple regression. The results of each statement are presented respectively in table 4.10.

Table 4.10 Factors Affecting Students' Attitudes Towards CAPL Programs

Statement	Beta	t	Sig.
1. I can learn English on my own by using CAPL programs.			
(Constant)		2.398	.029
Gender	.245	.879	.392
Years of Studying English	-.059	-.249	.806
2. The CAPL programs are easy to use.			
(Constant)		1.335	.201
Gender	.431	1.668	.115
Years of Studying English	.323	1.471	.161

Table 4.10 (Continued)

Statement	Beta	t	Sig.
3. The CAPL program is interesting and useful.			
(Constant)		1.349	.196
Gender	.715	3.336	.004**
Years of Studying English	.331	1.819	.088
4. The CAPL's activities and exercises are suitable and useful.			
(Constant)		1.896	.076
Gender	.497	2.082	.054
Years of Studying English	.263	1.298	.213
5. The methods and techniques used in CAPL program instruction are effective in improving pronunciation learning.			
(Constant)		2.089	.053
Gender	.290	1.098	.288
Years of Studying English	.325	1.449	.167
6. The feedback provided by the program is useful.			
(Constant)		2.604	.019
Gender	.379	1.432	.171
Years of Studying English	.087	.387	.704
7. I would like to use the program again in learning pronunciation.			
(Constant)		3.292	.005
Gender	-.063	-.215	.832
Years of Studying English	.057	.230	.821

Table 4.10 (Continued)

Statement	Beta	t	Sig.
8. In general, the CAPL is good.			
(Constant)		3.135	.006
Gender	.467	1.932	.071
Years of Studying English	-.097	-.472	.643

Note: *P < 0.05

**P < 0.01

Table 4.10 reveals that there are three predictor variables that have missing correlations and have been cut out from the analysis by the SPSS program; these variables are age, major of study and CALL experience. Thus, gender and years of studying English are only analyzed in multiple regression analysis. There is only one statement concerning attitudes towards CAPL programs that have a correlation with the predictor variable. In fact, a correlation is found between students' attitudes towards the interestingness and usefulness of CAPL programs and gender ($p < 0.01$). The beta (β), R^2, and adjusted R^2 of these mentioned two correlations are presented below in Table 4.11.

Table 4.11 Regression Analysis Predicting Students' Attitudes Towards CAPL Programs ($N = 20$).

No.	Predictor variables	β	R^2	$\triangle R^2$
1	Gender	.72	.47	.37

Table 4.11 reveals that gender affects students' attitudes towards the interestingness and usefulness of CAPL programs, accounting for 37% of the variance in students' attitudes towards the interestingness and usefulness of CAPL programs ($F(3, 16) = 4.753$, $p < .01$).

4.5 Summary of Findings

1) At the end of the semester, students who learn pronunciation by the integration of the conventional teaching style and CAPL programs could perform better in the pronunciation test by the Speexx program (M = 186.87) than students who learn pronunciation by the conventional teaching style (M = 125.12).

2) Students in the experimental group held an uncertain attitude towards the CAPL program before the actual utilization of the CAPL program, but they tended to have a high positive attitude towards CAPL programs after utilizing CAPL programs. They strongly agreed that they could learn on their own by using CAPL, and CAPL is easy to use, interesting and useful. CAPL's activities are suitable and useful, and CAPL's instruction can improve their pronunciation. CAPL's feedback is good, and they want to use it again. Generally, they strongly agree that CAPL is good.

3) Students in the experimental group showed a dramatically high autonomous learning capacity after utilizing CAPL programs in all four factors. In fact, students are able to understand instructors' teaching objectives and requirements, set up personal learning objectives and study plans, monitor the use of learning strategies, and monitor and evaluate the English learning process.

4) There is only one predictor available, gender, which has correlation with students' attitudes towards CAPL programs. In fact, gender predicts students' attitudes towards the interestingness and usefulness of CAPL programs.

CHAPTER 5

DISCUSSION, LIMITATIONS, RECOMMENDATIONS, AND CONCLUSION

This chapter consists of four parts. First, the discussion of the research findings is presented. Next, the limitations of the study are also described. The third section contains the recommendations for further study. Finally, the last section is the conclusion of the study.

5.1 Discussion

This study investigated the effects of computer assisted pronunciation learning (CAPL) programs on Thai college students' pronunciation performance and autonomous learning capacity. The following is a discussion of the findings from the results that were illustrated in Chapter IV. The descriptive data, statistical analyses, semi-structured interview, and student's journal were utilized to test the four research questions and four directional hypotheses concerning students' pronunciation performance, students' attitudes towards CAPL programs, students' autonomous learning capacity, and factors affecting students' attitudes towards CAPL programs. Thus, the discussion of this study is arranged according to the research questions of the study respectively.

5.1.1 Students' Pronunciation Performance between the Experimental and Control Groups

Research Question 1 investigated whether or not students' pronunciation performance will be different between students who learn pronunciation by the integration of the conventional teaching style and CAPL programs and students who learn pronunciation by only the conventional teaching style. The corresponding directional hypothesis mentioned that students who learn pronunciation by the

integration of the conventional teaching style and CAPL programs will gain higher pronunciation scores than those learning using only a conventional teaching style. This hypothesis was accepted.

The present study found that students in the experimental group performed better than students in the control group on the pronunciation test at the end of the semester. This finding implied that the utilization of CAPL programs in teaching English consonants could assist students in improving their pronunciation performance. The improvement in learning English pronunciation of students in the experimental group is relevant to the belief of the Socio Cultural Theory (SCT) in that human mental functioning is basically developed in the mediated process (Ratner, 2002). Humans could learn knowledge by developing human mental functioning through a mediated process, and within the mediated process, humans' "cognitive and material activities are mediated by symbolic artifacts (such as languages, literacy, numeracy, concepts, and forms of logic and rationality) as well as by material artifacts and technologies" (Lantolf & Thorne, 2006, p. 216). Thus, it could be postulated that students' cognition in the experimental group are mediated by CAPL programs which are perceived as material artifacts. According to the findings, CAPL programs could assist students in developing their human mental functioning through a mediated process, therefore, there was a significant improvement in students' pronunciation performance.

Moreover, the fact that the pronunciation performance of students in the experimental group was better than students in the control group also relates to the concept of zone of proximal development from Vygotsky (1978). The zone of proximal development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). In this present study, CAPL programs could be perceived as a teacher who guides students to solve problems in order to develop their potential development in English pronunciation learning. CAPL programs are viewed as teachers, because most of the students mentioned in the interview that CAPL programs could act as a pronunciation teacher, as they said "Speexx provides a virtual teacher whose name is 'Tim'. He acts as a teacher, and

provides pre-lesson information, and gives instruction on how to use the program while practicing pronunciation exercises [sic]". Thus, students in the experimental group could develop their potential development in pronunciation learning with the guidance of CAPL programs through problem solving activities both inside and outside the classroom, while students in the control group learnt pronunciation passively from the conventional teaching style in the classroom only.

According to the findings, CAPL programs are considered as 'others'. This idea of considering CAPL programs as 'others' can be explained by the concept of regulation, which is how children construct knowledge. CAPL programs are generally considered as objects, which are in the stage of object-regulation, where learning of children is controlled by object(s). However, it is mentioned by students in this study that CAPL programs could act as pronunciation teacher, therefore CAPL programs should be perceived as others not objects. In the second stage, other-regulation, explicit and implicit mediation by parents, brother or sister, friends and teachers are provided to children (Lantolf & Thorne, 2006). Thus, it could be postulated that CAPL programs could be perceived as teachers who could provide an explicit and implicit mediation process to enhance students capability in reaching the stage of self-regulation where children are able to perform an activity successfully by themselves with no or minimal assistance by others. Based on the finding of students' pronunciation performance, at the end of the semester students in the experimental group were able to attain intelligibility of English language with the assistance of CAPL programs, which is perceived as others, or teachers who assist them in reaching the stage of self-regulation.

The fact that the CAPL program could act as other or 'agent' in the learning process could add new ideas to the notion of social learning or social origin of mental functioning as Vygotsky (1978, as cited in Warschauer, 2005, p. 57) proposed that "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; the first, between people (interpsychological), and then inside the child (intrapsychological)". He also believed that this shows that cultural development is developed in the form of 'apprenticeship learning' by interacting with teachers and friends. In the pronunciation class of the experimental group, students developed their cultural development through the interaction of the

teacher and the CAPL programs both inside and outside classroom. Thus, it could be postulated that several learning methods in SLA including EFL learning occurs twice on two levels. First, it occurs in the combination of social and technological levels, and then on an individual level. In other words, students can develop their cultural development in the first level by apprenticeship learning with the teacher and CAPL programs or technology.

Furthermore, there are studies that have similar results in improving EFL pronunciation skills by utilizing CAPL programs. First, Neri, Mich, Gerosa, and Giuliani (2008) found that teaching by utilizing Computer Assisted Pronunciation Teaching (CAPT) software with a speech recognition feature could develop a short-term improvement in learning English pronunciation. The achievement level of students learning via CAPT was comparable to that of those learning with conventional teaching instruction. Moreover, Pearson, Pickering, and Da Silva (2011), who utilized CAPT software in pronunciation teaching, discovered that there was a significant movement toward more target-like production of English syllables in the post-test from the students in the treatment group. Likewise, Abu Seileek (2007) found that learners' post-test scores in producing and perceiving English pronunciation were higher than pre-test scores after the utilization of the CAPL program. Lastly, Chu (2012) also discovered that learners with a strong foreign accent significantly improved their pronunciation after learners studied pronunciation with the integration of the conventional teaching style and CAPL programs.

Although, it was found that students in the experimental group could mostly attain English consonants or intelligibility, there is only one sound that they could not attain. It is /ʃ/ in the word of vivacious in the final position. This result is relevant to the problem of Thai EFL learners acquiring English pronunciation skills, as mentioned by Monthon Kanokpermpoon (2007). Monthon Kanokpermpoon (2007) stated that Thai EFL learners often have a problem in pronouncing words that have voiceless fricatives, /ʃ/ sounds, placed on the last syllable of a word, as there are only four plosives, /p/, /t/, /k/, and /ʔ =ə/, and three nasals, /m/, /n/, and /ŋ/ that could occur in the final position of Thai phonology. Thus, Thai students tend to replace voiceless fricatives which do not occur in Thai phonology with their Thai final plosives and nasals or sometimes ignore them (Monthon Kanokpermpoon, 2007). Based on the

observation of the researcher, it was found that they tended to pronounce /ʒ/ in the final position of the word vivacious instead of /ʃ/. The reason why students mispronounce /ʃ/ in the final position is unclear, but as mentioned by Selinker (1972), the acquisition process of L2 pronunciation could be viewed as the selection process where some L1 sounds are transferred and some are not, and some L2 sounds are acquired into the interlanguage phonology. In fact, it is still not clear why there are some L1 sounds that could not be transferred, and why some L2 sounds could not be acquired into interlanguage phonology. However, from the researcher's observation, students in the experimental group have realized the difference between the Thai and English sound systems after studying English Phonetics; therefore they didn't try to replace English sounds with Thai sounds. In fact, they tried to pronounce English sounds as native-like, but they misinterpreted voiceless to voiced sounds. Thus, they pronounced vivacious with /ʒ/ in the final position instead of /ʃ/. There are some studies that have similar results regarding mispronunciation of the /ʃ/ sound of Thai EFL learners. Swan and Smith (2002), who studied Thai interference problems in Thai EFL learning, found that the /ʃ/ sound always causes a problem for Thai learners in articulation when it occurs in the final position. Likewise, the study of Malinee Phaiboonnugulkij and Kanchana Prapphal (2012), who examined the speaking ability of 120 Thai university students, indicated that Thai university students mispronounced the /ʃ/ sound when it comes at the end of word.

In sum, the CAPL programs which are perceived as material artifacts played a significant role in improving pronunciation learning of students in the experimental group. The role of CAPL programs in acting as a teacher is a vital key to enhance the zone of proximal development in pronunciation learning, because students in the experimental group could expand their potential to learn pronunciation successfully by the assistance of the programs (Vygotsky, 1978). According to the obtained data from the interview, CAPL programs can be perceived as 'other' or real teacher instead of object that could assist students reach the second stage of constructing knowledge in the regulation process (Lantolf & Thorne, 2006). In addition, the fact that CAPL programs could act as agent could adjust the notion of social learning in the sense that cultural development of EFL learning on the social level can occur by the combination of social and technology. However, there is one sound that students

could not acquire successfully which is /ʃ/. Students had difficulty pronouncing /ʃ/ because there might be some sounds that EFL learners could not acquire during the interlanguage phonology process, and they tend to substitute them with different sound as mentioned by Selinker (1972). However, based on the researcher observation, students in the experimental group misunderstood that the final position of the word vivacious is a voiced, not a voiceless, sound.

5.1.2 Students' Attitudes Towards CAPL Programs

Research Question 2 examined whether students' attitudes towards CAPL programs would be different after the utilization of CAPL programs. The corresponding directional hypothesis mentioned that students who learn pronunciation by the integration of the conventional teaching style and CAPL programs will have higher positive attitudes toward CAPL programs after utilizing CAPL programs. This hypothesis was accepted. The responses to the questionnaire suggest that students in the experimental group held very positive and accepting attitudes towards CAPL programs after they had studied pronunciation by the integration of conventional teaching styles and CAPL programs. Based on the responses from the questionnaire, students held an uncertain attitude towards the CAPL programs before the actual utilization of them, but they tended to have a high positive attitude towards CAPL programs after utilizing them. They strongly agree that they can learn on their own using CAPL, and CAPL is easy to use, interesting and useful. CAPL's activities are suitable and useful, and CAPL's instruction can improve their pronunciation. CAPL's feedback is good, and they want to use it again. Generally, they strongly agree that CAPL is good.

The fact that students' attitudes towards CAPL programs have changed from uncertain at the beginning of the semester, to positive at the end of the semester could be explained by the functional theory of attitude from Katz (1938, as cited in Lindzey & Aronson, 1985, p. 142). He believed that "attitudes are determined by the functions they serve for us. People hold given attitudes because these attitudes help them achieve their basic goals". According to Katz's theory, there are four functions that attitudes serve, and CAPL programs could serve as a utilitarian function in the sense that students develop preferable attitudes toward thing(s) that assist or benefit them. It

is because CAPL programs could assist students in the experimental group to learn pronunciation both inside and outside the classroom; therefore they developed positive attitudes towards CAPL programs at the end of the semester. The evidence that students hold preferable attitudes towards CAPL programs at the end of the semester were found from both the questionnaire and semi-structured interview. For example, students strongly agree in the questionnaire that CAPL instruction can improve pronunciation learning (M = 4.65). Moreover, it was reported from the semi-structured interview that most students view the instruction of CAPL programs as an effective tool in improving their pronunciation learning because they could provide needed information for studying pronunciation. Three students said "Speexx instruction provides information based on the sounds system not the writing system, which assisted them to have a better understanding of how to pronounce. It also provides information on both English and Thai sounds [sic]".

From the students' responses of the semi-structured interview, it was reported that most students think that programs can encourage them to learn as they mentioned that "programs are an innovative technology which encourages students to learn pronunciation. They have willingness to learn pronunciation by using the program, and they can use the Internet on their education not for fun only [sic]". This response relates to the idea of Wenden (1998) who described attitudes in language acquisition as "learned motivations, valued beliefs, evaluations, what one believes is acceptable, or responses oriented towards approaching or avoiding". From Wenden's quotation, students' positive attitudes towards CAPL programs from that semi-structured interview could be viewed as a learned motivation that encourages students in the experimental group to learn pronunciation by the integration of the conventional teaching style and CAPL programs.

Apart from encouraging students to learn pronunciation through CAPL programs, students in the experimental group are inspired to use CAPL programs again in the future. Based on the responses from the questionnaire, they strongly agree that they are willing to use CAPL programs again (M = 4.70). It is relevant to Almahboub (2000, as cited in Chui, 2003, p. 22) who mentioned that "Students' attitudes toward computers are considered to be very important indicators of students' inclination to adopt this new technology in their lifelong learning". From

Almahboub's quotation, it could be implied that computer technology currently is considered as a vital tool in the language learning process. Based on findings from the questionnaire, it could be concluded that students in the experimental group hold a positive attitude towards CAPL programs, and they desire to utilize these programs again for their language study, especially pronunciation learning, in the future.

Moreover, a positive attitude of students in the experimental group from the questionnaire could be linked to their significant progression in pronunciation learning as all of them could usually pronounce English consonants properly as proved by their post-test pronunciation scores at the end of the semester. In fact, they strongly agree that CAPL instruction could improve their pronunciation (M = 4.65). As mentioned by Krashen (1982, as cited in Ellis, 1997), learners' positive attitudes could produce a significant impact on second language acquisition. Ellis (1997) also mentioned that attaining a second language should be viewed as a process that affects the learner's social identity. Hence, the attitudes of second language learners might significantly impact the accomplishment of acquiring a second or foreign language. From Ellis's view, it could be implied that positive attitudes of students towards CAPL programs could be perceived as a vital factor that enhances students' accomplishment in attaining English pronunciation skills.

Furthermore, it was mentioned in the semi-structured interview that the Speexx program not only teaches pronunciation, but it also provides feedback while students are practicing pronunciation. Students said "Speexx provides feedback in the pronunciation score in percentage and color in order to inform us whether we pronounced a particular consonant sound correctly [sic]". It was also found from the questionnaire that they strongly agree that CAPL's feedback is useful (M =4.35). In fact, they valued the feedback feature in the Speexx program, and they believed that the programs assisted them in avoiding embarrassment from practicing pronunciation in front of the classroom as one of them mentioned that "I do not have to confront with peer pressure while I try to pronounce words correctly [sic]". It confirms the benefit of the CAPL program that was mentioned by Pennington (1999). He claimed that CAPL could provide better pronunciation instructions than a human pronunciation coach or phonetician in terms of giving feedback. Learners also do not need to suffer from the limitations of hearing, judgment or bias. CAPL could be considered as being

more authoritative or trustworthy than human-aided pronunciation instruction. It means that students in the experimental group could learn pronunciation in a stress-free environment when studying with CAPL programs. They could avoid being humiliated from receiving negative feedback from a pronunciation teacher in front of classmates.

The students' attitudes finding is supported by some previous research which investigated students' attitudes towards CAPL programs. For example, Abu Seileek (2007) found that learners have positive attitudes toward CAPL programs after they studied with the programs. Similarly, Chu (2012) also discovered that learners in the experimental group tended to have positive attitudes regarding pronunciation learning experiences and to online pronunciation training programs. Lastly, Kenyon and Malabonga (2001) uncovered that students tended to have a positive attitude towards Computerized Oral Proficiency Instrument (CAPI).

However, according to students, there is a disadvantage of CAPL programs. Students reported that they had a problem in understanding feedback from Speexx programs while they are practicing pronunciation. According to students' opinions in the semi-structured interview, one student from the low scoring group mentioned that he prefers to have a teacher beside him while he is practicing pronunciation from the program as he said "Speexx cannot answer specific questions when I have curiosity about pronunciation lessons. It can give only feedback on what is right or wrong. However, a teacher can guide me on how to pronounce correctly by observing my speech organs while practicing pronunciation, [sic]". In fact, students might have a problem in interpreting feedback from the Speexx program. This fact is relevant to one of the disadvantages reported by Pennington (1999), who mentioned that there is no baseline for analyzing pronunciation targets and deviation in CAPL program. Thus, pronunciation learners must observe by visualizing from a simplified waveform whether they could achieve pronunciation by comparison with the pre-recorded voice waveform generated by the software. However, some good advanced software could illustrate the degree of pronunciation achievement in a motivating graphic such as a giraffe with a neck that grows as the achievement of the speech input increases. In the Speexx program, students will receive feedback in the form of a column chart illustrating how the student could attain English native like pronunciation in

percentage and color. They can also compare the speech model sound with the recorded sound of their own. However, one of them still have a problem interpreting this kind of feedback.

In sum, students' attitudes towards CAPL programs has changed from uncertain to favorable which could be explained by the functionalist theory of attitudes from Katz (1938, as cited in Lindzey & Aronson, 1985). This improved attitude occurred because students in the experimental group perceived CAPL programs as tools that could assist and benefit them in learning pronunciation; therefore their attitudes have changed to become favorable. Moreover, positive attitudes of students in the experimental group could be perceived as learned motivation that stimulates them to learn pronunciation (Wenden, 1998). Moreover, holding positive attitudes towards CAPL programs could assist students in the experimental group in accomplishing learning pronunciation as proved by the post-test scores on the pronunciation test (Ellis, 1997). Moreover, positive attitudes towards CAPL programs could develop students' willingness to utilize CAPL programs again for their pronunciation learning in the future (Almahboub, 2000, as cited in Chui, 2003). Lastly, according to the students, there are both advantages and disadvantages of the feedback from the Speexx program that are relevant to the study of Pennington (1999). In terms of the advantages, feedback from the Speexx program could produce a stress-free environment for students in order to avoid bias and embarrassment from the pronunciation teacher and classmates while receiving feedback in front of the class. In terms of disadvantages, one student in the experimental group still has a problem interpreting feedback of the Speexx program.

5.1.3 Students' Autonomous Learning Capacity

Research Question 3 investigated whether or not CAPL programs could enhance autonomous learning capacity of students in learning English pronunciation. The corresponding directional hypothesis mentioned that students who learn pronunciation by the integration of the conventional teaching style and CAPL programs would gain higher autonomous learning capacity after utilizing CAPL programs. This hypothesis was accepted. The findings suggest that students in the experimental group dramatically improved their autonomous learning capacity after

utilizing CAPL programs in all four factors (M = 4.42), while they are moderately low in autonomous learning capacity before the utilization of CAPL programs (M = 2.52). According to the questionnaire, students who learn pronunciation by the integration of the conventional teaching style and CAPL programs are able to understand instructors' teaching objectives and requirements, set up personal learning objectives and study plans, monitor the use of learning strategies, and monitor and evaluate the English learning process after the utilization of CAPL programs.

According to the results from the questionnaire, it could be postulated that students in the experimental group developed learner autonomy through learning pronunciation by the integration of the conventional teaching style and CAPL programs. As Holec (1981) mentioned, learner autonomy is the "ability to take charge of one's own learning; this ability is not inborn and must be acquired either by natural means or (as most often happens) by formal learning, i.e. in a systematic, deliberate way. To take charge of one's learning is to have […] the responsibility for all the decisions concerning all aspects of this learning […]" (p.3). It can be proved that students in the experimental group are able to take responsibility in all decisions concerning all aspects of their learning at the end of the semester based on the findings in the questionnaire; e.g., they reported that they were able to make decisions in setting up their learning objectives and study plans (M = 4.26), monitoring their learning strategy (M = 4.46), and monitoring and evaluating their language learning process (M = 4.49).

Littlewood (1996) proposed a framework for developing autonomy in foreign language learning (EFL). Littlewood (1996) mentioned that in autonomy as a learner, a learner is required to incorporate both the ability to participate in independent learning and the ability to utilize suitable learning strategies. Based on the findings in the autonomous learning capacity section, students in the experimental group are capable of participating in independent learning as they believe that they realize their pronunciation mistakes and know the cause of their mistakes from learning through CAPL programs both inside and outside the classroom, hence they could learn pronunciation independently. Students in the experimental group become autonomous in the sense that they could consult with CAPL program (Speexx) when they practice English pronunciation because CAPL programs could provide valued information

such as English model sounds and feedback when they pronounce English sounds. Moreover, there is also evidence supporting that they can participate in independent learning as most of the students mentioned in the semi-structured interview that programs provide them an opportunity to control their pronunciation study. They said "Speexx assists their pronunciation learning very well; they can learn by themselves outside the classroom. There is no need to learn from the classroom only anymore. Thus, there is no time limitation. Anytime anywhere without the presence of teacher" and "They can learn pronunciation lessons in advance, there is no need to wait for the teacher to teach in the classroom [sic]". In terms of taking control of their study, they clarified that "they can choose to learn lessons that they do not understand yet and skip lessons or sounds that they can pronounce correctly [sic]". Second, they are able to use suitable learning strategies as they mentioned in the questionnaire that they can adjust their learning strategy if it does not work (M = 4.40), evaluate their learning approach (M = 4.35) and know whether their learning approach is suitable (M = 4.60). Thus, they can use a suitable learning strategy for their pronunciation learning.

Based on the findings from the questionnaire, students in the experimental group tried to gain benefits from the pronunciation learning resources available (M = 4.80) such as UIOWA, Speexx, and online dictionaries which provide English phonetics transcription. This finding relates to the idea of Holec (1981) in that learner autonomy will enable language learners to take greater control over the content and ways of language learning. This kind of ability will gradually be developed by language learners when they realize their responsibility toward foreign language learning. Language learners will develop their own ability to be able to make decisions on what tools and resources to use in their language learning. Thus, students in the experimental group can utilize all available resources provided by the researcher, and then gradually develop their ability to take control over the content and methods of their pronunciation learning.

The fact that autonomous learning capacity of the students in the experimental group increased from moderately low (M = 2.52) to high (M = 4.42) can be explained by Benson (2001) in that utilizing the integrative Computer Assisted Language Learning (CALL) into the language classroom could promote learner autonomy. He mentioned that integrative applications could stimulate exploratory learning and

learner control. These kinds of applications, such as the Internet, could create unlimited opportunities for self-directed access to a wide range of authentic learning materials. The Internet also promotes collaborative learning, learner control over communication, process writing, and a real-world audience. He claimed that these applications could support the development of autonomy when it is integrated into the language classroom, as the Internet or integrative CALL enables and provides rich input by presenting new language lessons through various kinds of media activities, and by providing branching options. According to this study, CAPL programs could be perceived as integrative CALL that could promote exploratory learning and learner control to some extent in that a CAPL program, which is a web-based learning design, can provide unlimited opportunities for self-directed access to a wide range of authentic learning material through English model sounds of both American and British accents, karaoke, and various kinds of pronunciation exercises. Thus, students in the experimental group can develop their autonomous learning capacity after utilizing CAPL programs.

Moreover, CAPL programs used in this study can be perceived as Autonomous Technology-Assisted Language Learning (ATALL) which was created to assist EFL learning with the concept of learner autonomy to enhance the effectiveness of EFL learning. The concept of ATALL was invented by Paracha, Mohamad, Jehanzeb, and Yoshie (2009). They defined ATALL as: (1) the development and utilization of technological devices to assist foreign language (FL). ATALL could be considered as an integrated device for the language learning classroom or supplemental activities outside the language classroom. It consists of all forms of electronic and information technology (IT) that can be facilitated in second and foreign language learning. The concept of ATALL includes the computer and Internet technology as well as other forms of information and communication technology (ICT) such as wired and wireless telephones, television and radio (broadcast, satellite and cable). Thus, CAPL programs can be viewed as ATALL in the sense that programs are required to be used with computers and technology and are designed to assist language learning, especially pronunciation. Programs can be utilized as integrated tools for pronunciation learning and provide supplementary exercises for students both inside and outside the classroom.

Hismanoglu's (2006) study supported the finding that utilizing CAPL programs in pronunciation learning can activate and develop autonomous learning capacity. Hismanoglu (2006) who found that encouraging language learners to utilize computer-assisted pronunciation teaching programs helps language learners to acquire autonomous pronunciation learning and improve their pronunciation performance in the target language.

According to the result from the paired sample t-test analysis, there is a high significant difference in students' autonomous learning capacity before and after the utilization of CAPL programs. However, there is one pair in factor four that is significant at $P < .05$, which is willingness of students to cooperate and learn together with classmates. This finding can be explained by the study of Hismanoglu (2011), who reported the advantages of CAPL as being tireless and non-judgmental. Non-judgmental means CAPL programs can deliver feedback individually and privately to learners via earphones. Learners are not required to receive feedback in front of classmates and therefore do not feel humiliated while mispronouncing English sounds in front of the classroom. This non-judgment characteristic of CAPL programs can stimulate the willingness of students to cooperate and learn pronunciation with their classmates from the beginning of the semester. Therefore, there is a small, significant difference in their willingness to cooperate and learn together with their classmates before and after the utilization of CAPL programs.

In sum, encouraging students in the experimental group to take responsibility in all decision making through all aspects of their pronunciation learning by the utilization of the conventional teaching style and CAPL programs can develop autonomous learning capacity (Holec, 1981). Based on the framework of developing autonomy in EFL learning from Littlewood (1996), students in the experimental group can develop autonomy as learners, because they are able to incorporate both the ability to participate in independent learning and the ability to utilize suitable learning strategies. Moreover, providing various pronunciation resources such as Speexx, UIOWA, and online dictionaries allow them to take greater control over the content and ways of language learning (Holec, 1981). Furthermore, the fact that students' autonomous learning capacity has changed from moderately low to high at the end of the semester can be explained by Benson (2001), who mentioned that integrative

applications such as web-based learning could stimulate exploratory learning and learner control and lead to the development of autonomy when it is integrated into the language classroom. In addition, CAPL programs could be viewed as ATALL in the sense that the programs are designed to be used with computers and the Internet for assisting students in learning language, and it can be integrated as a tool to supplement pronunciation exercises both inside and outside the classroom (Paracha, Mohamad, Jehanzeb, & Yoshie, 2009). Lastly, there is one statement in the questionnaire that is significant at $P < .05$, which is willingness of students to cooperate and learn together with classmates. The reason that there is a small difference in students' willingness to cooperate and learn together with classmates before and after the utilization of CAPL is because the CAPL program can produce a stress-free environment in the classroom where students can privately receive non-judgmental feedback from the CAPL program; therefore they are willing to learn pronunciation together with their classmates from the beginning of the semester (Hismanoglu, 2011).

5.1.4 Factors Affecting Students' Attitudes Towards CAPL Programs

Research Question 4 examines whether age, gender, major of study, years of studying English, and CALL experiences of the students in the experimental group could affect their attitudes toward CAPL programs. The corresponding directional hypothesis mentioned that age, gender, major of study, years of studying English, and CALL experiences affect students' attitudes toward CAPL programs in the experimental group. This hypothesis was partially accepted because the findings indicate that there is only one predictor, gender, which has correlation with students' attitudes towards CAPL programs in the experimental group. In fact, gender can predict students' attitudes towards the interest and usefulness of CAPL programs.

The fact that gender predicts the students' attitudes towards the interestingness and usefulness of CAPL programs in this study is also supported by the study of Tuncok (2010), who found that factors affecting students' attitudes such as age, grade, gender, years of studying English, and CALL experiences can affect students' attitudes towards the CALL program. However, there is a small significant difference in male and female students' attitudes toward the interest and usefulness of CAPL

programs. The average mean of male students in their attitudes towards the interestingness and usefulness of CAPL programs is 4.20, while the average mean of female students in their attitudes towards the interest and usefulness of CAPL programs is 4.80. This finding contradicts the study of Lai and Kuo (2007), who examined the gender difference in Taiwanese students' attitudes towards CALL. They found that male Taiwanese students (91.1%) tended to believe that CALL was fun and useful. On the other hand, more than half of the female students (57.2%) believed that learning English language through computer and CALL programs was difficult. Likewise, Chui (2003) discovered that male Taiwanese college students have more favorable attitudes than female Taiwanese students toward the utilization of CALL. According to these two mentioned studies from Lai and Kuo (2007) and Chiu (2003), male students tend to have more experiences in computers, the Internet, and CALL than female students; hence they might feel more comfortable using these mentioned tools and therefore have more positive attitudes towards programs. They might feel comfortable with technology because of their previous experiences in utilizing computers, the Internet and CALL. However, there is no different in CALL experiences between male and female students in this study, therefore male students do not rate higher positive attitudes towards the CAPL program.

In sum, it is reported that gender differences can predict students' attitudes towards CAPL programs. This finding is supported by the study of Tuncok (2010) who found that gender affect students' attitudes towards computer assisted language learning. However, there are some studies that have opposite results of students' gender differences in attitudes towards technology used in the classroom. First, Lai and Kuo (2007) found that 91% of male students tended to hold preferable attitudes towards CALL in pronunciation class, while only 57% of female students hold preferable attitudes towards the CALL program. Second, Chui (2003) also discovered that male students tend to hold more positive attitudes towards the CALL program than female students. The fact that male students tend to hold positive attitudes towards technology used in both studies can be explained by their technological experiences that assist them in feeling comfortable using the programs. However, male and female students in this study have similar CALL experiences, hence the results contradict the mentioned studies.

5.2 Limitations of the Study

This study aims to examine a specific group of 49 Thai college students in Bangkok, and this sample group might not be enough for valid statistics and might be too limited for general assumptions. Moreover, the scope of this study was limited to the college students in Bangkok. Therefore, the participants in this study might not be able to reflect the whole picture of Thai university students' pronunciation performance, autonomous learning capacity and their attitudes towards CAPL programs.

There was no empirical evidence carried out by the researcher to guarantee whether students truly utilized the programs that they reported in their journals and semi-structured interviews. In addition, the researcher cannot gain insightful experience and deeper understanding of how students utilize the CAPL programs because there were no observations carried out by the researcher while students accessed the program outside the classroom.

Moreover, this study focuses on students who are at the beginning level of pronunciation proficiency, therefore students who are at the intermediate and advanced levels of pronunciation proficiency may yield different results towards their pronunciation performance after the utilization of CAPL programs, autonomous learning capacity, and attitudes towards CAPL programs.

In regard to age of the participants, this study aimed to examine young adult learners, aged 18 to 20; therefore learners at different ages might produce unlike responses. Older learners might require different teaching methods and assignments. Finally, there are 11 male students and 38 female students in this study, and the researcher did not focus on the gender difference in designing the pronunciation learning course. It should be noted that males and females might require different designs in the pronunciation learning method.

5.3 Recommendations for Further Research

This current study investigated the effectiveness of CAPL programs towards students' pronunciation performance, autonomous learning capacity and attitudes towards CAPL programs from 49 Thai university students at Srinakharinwirot university, hence it is suggested that similar studies can be conducted with a larger number of Thai university students in other universities in different provinces in Thailand to be able to fully generalize the assumptions. Due to the fact that this current research focuses only on students who are at a beginning level of pronunciation proficiency, it is advised that intermediate and advanced students should be included in further research in order to reflect the whole picture of Thai university students' pronunciation learning by the utilization of the conventional teaching style and CAPL programs. Furthermore, there are more female than male students in this study, and it would be interesting to differentiate and observe the pattern of learning behaviors and requirements between male and female students.

The researcher recommends observations on a regular basis while students are utilizing CAPL programs in future research in order to provide in-depth information such as how the programs are utilized and whether the programs are user friendly. Observation would be useful because observation could illustrate the effect of CAPL programs in assisting pronunciation learning and testing. In addition, the current study examines only students' attitudes towards CAPL programs, hence it is suggested that the attitude of the pronunciation teachers should be included in order to gain insightful information of key people in the pronunciation learning process regarding their attitudes towards utilizing CAPL programs through their pronunciation teaching. Moreover, the focus of this study is students' pronunciation performance, autonomous learning capacity, and attitudes towards CAPL programs, therefore additional issues such as motivational factors should be included in order to gain a better understanding of methods of integrating technology-based pronunciation learning. In addition, it is suggested that other CAPL programs that conform to the good characteristics of CAPL programs be utilized in assisting pronunciation learning for similar level students in order to examine whether there is a significant improvement in pronunciation learning, and to compare the results with previous studies. Finally, it is

suggested that comparative studies of three groups of different treatments be examined, where the first group learns pronunciation by the conventional teaching style only, the second group learns pronunciation by the integration of the conventional teaching style and the CAPL program, and the third group learns pronunciation by the CAPL program only. Comparing these three treatments can reveal the most effective way to improve pronunciation learning.

5.4 Recommendations for Pronunciation Instruction

This research study showed that teaching pronunciation by the integration of the conventional teaching style, CAPL programs, and journal entry could highly enhance the pronunciation learning performance of Thai students as shown by the results of the post-test pronunciation proficiency test, which shows that students in the experimental group could properly pronounce most English consonants at the end of the semester. It is suggested that the pronunciation teacher assign students to write a weekly journal entry in order to assure that they can access the program and to examine sounds that students might have a problem pronouncing. The pronunciation teacher can make use of the mentioned weekly journal entries to give extra exercises or help students improve specific sound(s) that they have problems with. Moreover, it should be acknowledged that Thai students have been trained under a test-oriented system and are acquainted with teacher-centered learning classrooms. Hence, they might not be able to initiate participation with their classmates. It is the pronunciation teacher's responsibility to assist them in activating their confidence to take control of their pronunciation learning and be able to learn independently. The pronunciation teacher should encourage students to learn pronunciation both inside and outside the classroom and provide activities that stimulate student-centered learning habits. According to this present study, utilizing the CAPL program requires more responsibility from the pronunciation teacher. The pronunciation teacher should not stand idly while students are learning pronunciation with the CAPL program. Pronunciation teachers should observe and guide students to perform exercises in the CAPL program. The most important guidance is to assist students in realizing how to make full use of CAPL programs in order to help them take control of their learning

and learn independently outside the pronunciation classroom. In addition, traditional teacher roles in the classroom should not be overlooked. The role of the teacher is not only lecturing, but also guiding and helping students during the student-centered activities of CAPL instruction.

In sum, the integration of the conventional teaching style, CAPL programs, and weekly journal entries can be effective in enhancing pronunciation learning. The key finding is that assigning a weekly journal entry to students during the semester is useful because the journals can assist the pronunciation teacher in verifying whether students have utilized the CAPL program during the semester and enable teachers to check whether students have problems in learning English pronunciation. Assigning students to write journal entries as part of the course requirements can motivate students to make full use of the CAPL program, and at the same time it allows them to evaluate their pronunciation learning every week. Once they can take control of their pronunciation learning, then they can learn pronunciation independently both inside and outside classroom. This is because having a good CAPL program alone might not fully enhance pronunciation learning. Without motivation to use the tool, students might not be interested in fully utilizing the CAPL program for their pronunciation learning. The proposed diagram of technology and written journal integrated pronunciation learning instruction is presented in figure 5.1 below:

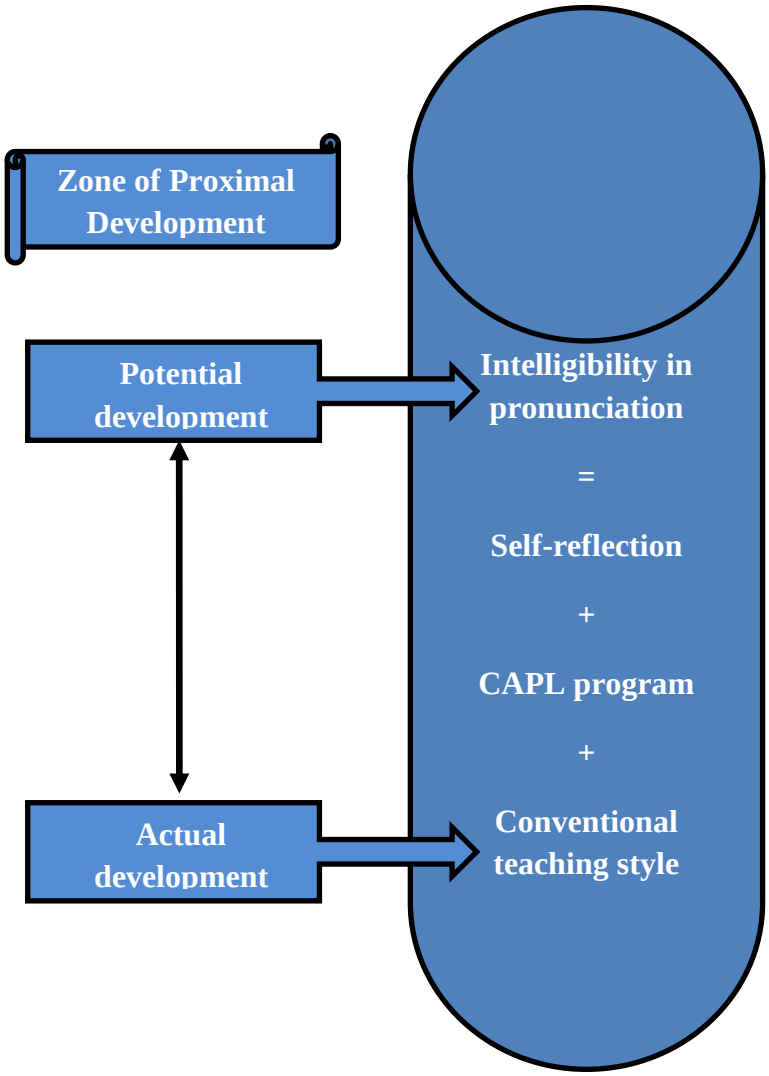


Figure 5.1 Diagram of the Interface of the Conventional Teaching Style, CAPL Program, and Self-reflection

According to the proposed diagram, the pronunciation teacher teaches pronunciation by the integration of the conventional teaching style and the CAPL program inside the classroom and assigns students to utilize the CAPL program outside the classroom and to write a journal entry or self-reflection as one of the pronunciation course requirements. Outside the classroom, the student uses the CAPL program and writes a weekly journal entry to note which sound he/she can or cannot pronounce properly. Then, the pronunciation teacher can use the information from the

weekly journal entry to assign extra exercises or help students cope with problem sound(s). In sum, according to the proposed diagram, students can develop their potential development in the zone of proximal development by the interface of conventional teaching style, CAPL program, and self-reflection. After the cycle of this interface diagram every week, it is hoped that the student can attain intelligibility in pronunciation at the end of the semester.

5.5 Recommendations for Software Developers

The present study showed that students hold positive attitude towards CAPL programs. However, there are some comments that were mentioned on both the semi-structured interview and the student journal entries that should not be neglected. “Speexx” is a web-based application that relies heavily on the Internet signal. It was reported that the effectiveness of the program would decrease when the signal of the Internet is weak. Thus, it is suggested that software developers should develop an application that could perform well with a weak Internet signal. Moreover, an offline application might be suitable to pronunciation classroom environments that have unstable or uncontrollable Internet quality. Furthermore, the speech recognition feature is a useful tool that assists students in realizing their pronunciation mistakes; however the percentage graph feedback and model speech sounds might not be enough to assist them in pronouncing words correctly. It is suggested that more details of feedback such as which sounds within the word that students mispronounce would help them realize their mistakes and improve their pronunciation learning. In addition, the advanced technology in smartphones has become a part of student’s lives; therefore it is advised that software developers develop applications that can be utilized on smartphones instead of or in addition to laptop computers. Mobile applications might be an alternative way to encourage students to learn pronunciation outside the classroom. Finally, it is suggested that singing activities would motivate students to learn pronunciation in a more enjoyable and successful fashion because student comments mentioned that ‘Speexx’ should provide more interesting activities that are compatible with students’ interests. As a result, it is hoped that the program could encourage students to learn pronunciation more successfully.

5.6 Conclusion

In this study, students discussed their views on the CAPL programs in semi-structured interviews with the teacher and in their journals. Thus, this study has provided in-depth information about the effectiveness of CAPL programs for students who are at the beginning level of pronunciation proficiency. It also presents methods of how to integrate CAPL programs and weekly journal entries into the pronunciation learning process. Once students can evaluate their learning strategies and materials and take control of their study, their autonomous learning capacity will be activated for assisting them to establish life-long learning strategies, as Beatty (2003, pp. 153-154) believed that

> In order for learners to learn, they need to reflect upon their learning in discussion with teachers and peers, in diaries and in reports. In this way, learners begin to examine learning materials and their strategies for approaching them, thus benefiting them even when a CALL program does not meet their learning needs

Furthermore, this study not only aims to compare the conventional teaching style and CAPL programs, but it also attempts to illustrate how CAPL programs are integrated into a pronunciation classroom as a supplemental tool, as Beatty (2003) mentioned that a good environment of technology-based learning requires different interfaces to conform to various learning styles that are compatible with different skills. When students in this study are involved in a perfect technology-based learning environment, they can improve their pronunciation learning performance. They can also develop positive attitudes towards CAPL programs as the functional theory of attitude suggests, hence they will be motivated and likely to perform better and accomplish higher levels of pronunciation acquisition.

This study consists of a combination of fields of teaching English as a foreign language (EFL) and Computer Assisted Language Learning (CALL). It is hoped that this study could contribute to EFL pedagogy that can be utilized in designing CAPL applications. It is also expected that the results of this study can provide helpful information for scholars and pronunciation teachers who are in the same circumstance and provide guidance to developers of pronunciation applications.

BIBLIOGRAPHY

Abramson, A. (1972). *Word-final stops in Thai*. Bangkok: Central Institute of English Language.

AbuSeileek, A. (2007). Computer-assisted pronunciation instruction as an effective means for teaching stress. *The JALT CALL Journal, 3*(1), 3-14.

Al-Qudah, F. (2012). Improving English pronunciation through computer-assisted programs in Jordanian Universities. *Journal of College Teaching & Learning, 9*(3), 201-208. Retrieved June 12, 2013 from http://www.cluteinstitute.com/

Alessi, S.M., & Trollip, S.R. (1991). *Computer-based instruction: Methods and development. Englewood Cliffs*, NJ: Prentice Hall.

Alessi, S.M., & Trollip, S.R. (2001). *Multimedia for learning: Methods and development.* Boston: Allyn and Bacon.

An, K. (2006). *An investigation of error correction in the zone of proximal development: Oral interaction with beginning learners of Chinese as a foreign language* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database.

Anderson-Hsieh, J. (1989). Approaches toward teaching pronunciation: A brief history. *Cross Currents, 1*(6), 73-78.

Anderson-Hsieh, J. (1992). Using electronic visual feedback to teach suprasegmentals. *System, 20*(1), 51-62.

Arunee Wiriyachitra. (2001). English language teaching and learning in Thailand in this decade. *Thai TESOL, 14*(1), 4-7.

Arya, T. (2003). Reduced forms and liaisons in the teaching of English to Thai learners. *PASAA, 3*(4), 30-43.

Bax, S. (2003). CALL - past, present and future. *System, 3*(1), 12-28.

Beatty, K. (2003). *Teaching and researching computer-assisted language learning*. Hong Kong: Pearson Education.

Bednar, A.K., Cunningham, D., Duffy, T.M., & Perry, J.D. (1992). *Theory into practice: how do we link.* Hillsdale, NJ: Lawrence Erlbaum.

Bell, M. (1996). Teaching pronunciation and intonation to E.F.L. Learners in Korea. Retrieved January 10, 2014 from http://calico.org/journalarticles/volume3/ vol32/ curtin_shinall.pdf.

Benson, P. (2001). *Teaching and researching: Autonomy in language learning*. Essex: Pearson Education.

Biyaem, S. (1997). Learner Training: Changing Roles for a Changing World, Educational Innovation for Sustainable Development. In *Proceeding in the 3rd UNESCO-ACEID International Conference* (pp. 8-12). Bangkok, Thailand.

Bohn, O., & Flege, J. (1992).The Production of New and Similar Vowels by Adult German Learners of English. *Studies in Second Language Acquisition*, *14*(2), 131-158.

Bongaerts, T. (1999). *Ultimate attainment in L2 pronunciation: the case of very advanced late L2 learners.* Mahway, NJ: Lawrence Erlbaum.

Boonruang Chunsuvimol & Nantana Ronnakiat. (2000). Stylistic variation of (f) and (v) in the English of Thai students. *Thammasat Review*, *2*(1), 84-95.

Bowman, M. (2000). A contrastive analysis of English and Thai and its practical application for teaching English pronunciation. *The English Teacher*, *4*(1), 40-53.

Boyd, B.L., & Murphrey, T.P. (2002). Evaluation of a computer based, asynchronous activity on student learning of leadership concepts. *Journal of Agricultural Education*, *43*(1), 35-37.

Brown, J. D. (1997). Computers in Language Testing: Present research and some future directions. *Language Learning & Technology*, *1*(1), 44-59.

Brown, K. (2003). From teacher-centered to learner-centered curriculum: Improving learning in diverse classrooms. *Education*, *12*(4), 49-54.

Busa, M. G. (2008). New Perspectives in Teaching Pronunciation. Retrieved March 5, 2014 from http://etabeta.univ.trieste.it/dspace/bitstream/10077/2850/1/bus%C3%A0.pdf.

Bush, G. (2006). Learning about learning: from theories to trends. *Teacher Librarian*, *34*(2), 14-19.

Cameron, L. (2001). *Teaching Languages to Young Learners*. Cambridge: Cambridge University Press.

Can, T. (2009). Learning and teaching languages online: a constructivism approach. *Novitas-ROYAL*, *3*(1), 60-74.

Candy, M. (1991). *Self- direction for lifelong learning*. Los Angeles, CA: Jossey Bass.

Carbonell, L. (2004). Instructional Development Timeline. Retrieved October 30, 2013 from http://www.my-ecoach.com/idtimeline/learningtheory.html

Celce-Murcia, M. (1991). Language Teaching Approaches: an overview. Cambridge: Cambridge University Press.

Celce-Murcia, M., Brinton, D.M., & Goodwin, J. M. (1996). *Teaching Pronunciation.* Cambridge: Cambridge University Press.

Chambliss, J.J. (1996). *Philosophy of education: An encyclopedia*. New York: Garland.

Chen, I. (2000).Technology and learning environment: An electronic textbook. Retrieved April 24, 2012 from http://www.coe.uh.edu/~ichen/ebook/ET-IT/cover.htm

Chen, S.H., & Liang, Y.M. (2003).The influence of phonetic multimedia software on the oral conversation of the students in the elementary school: In the case of Talkworks. In *Proceedings of the Twelfth International Symposiums on English Teaching* (pp. 60-75). Taipei: Crane.

Chiu, M. (2003). *Computer-assisted language learning: attitudes of Taiwanese college students* (Doctoral dissertation). West Florida University. Retrieved May 25, 2013 from https://ir.csu.edu.tw/bitstream/987654321/619/1/00212939.pdf

Chu, C. (2012). Hong Kong ESL learners' acquisition of English stress and assessment of an online tutoring program. *TESOL Journal*, *6*(1), 45-62.

Chun, D. M. (1989). Teaching tone and intonation with microcomputers. *CALICO Journal*, *7*(1), 21-46.

Chun, D. M. (1998). Signal analysis software for teaching discourse intonation. *Language Learning and Technology*, *2*(1), 61-77. Retrieved June 5, 2013 from http://llt.msu.edu/vol2num1/article4/index.html.

Colwell, S., & Carter, E. (2012). *Introduction to statistics for social sciences*. New York: McGraw-Hill.

Cook, V. (1985). Chomsky's Universal Grammar and Second Language Learning. *Applied Linguistics*, *6*(1), 2-18.

Coplan, J. (2010). *Thorndike & Watson: Founding fathers of behaviorism*. Retrieved July 15, 2014 from http://www.psychologytoday.com/blog/making-sense-autistic-spectrum-disorders/201008/020-thorndike-watson-founding-fathers-behaviori.

Demirenzen, M. (1988). Behaviorist theory and language learning. *Hacettepe Vniversitesi Eğitim Fakültesi Dergis*, *3*(1), 135-140.

Derwing, T., & Munro, M. (2005). Second Language Accent and Pronunciation Teaching: A Research-Based Approach. *TESOL Quarterly*, *39*(3), 379-397.

Deterding, D. H., & Poedjosoedarmo, G. R. (1998). *The sounds of English: Phonetics and phonology for English teachers in Southeast Asia*. Singapore: Prentice Hall.

Dias, J. (2000). Learner autonomy in Japan: transforming 'Help Yourself' from threat to Invitation. *Journal of Computer Assisted Language Learning*, *13*(1), 49-64.

Doughty, C., & Williams, J. (1998). *Focus on form in second language acquisition*. New York: Cambridge University Press.

Draper, J. (2002). School mathematics reform, constructivism, and literacy: A case for literacy instruction in the reform-oriented math classroom. *Journal of Adolescent & Adult Literacy*, *45*(6), 520-529.

Ehsani, F., & Knodt, E. (1998). Speech technology in computer-aided learning: Strengths and limitations of a new CALL paradigm. *Language Learning and Technology*, *2*(1), 45-60. Retrieved January 10, 2014 from http://llt.msu.edu/vol2num1/article3/ index.html.

Ellis, R. (1985). *Understanding Second Language Acquisition*. New York: Oxford University Press.

Ellis, R. (1997). *The study of second language acquisition*. New York: Oxford University Press.

Ertmer, P. A., Addison, P., Lane, M., Ross, E., & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education*, *3*(2), 54-72.

Eskenazi, M. (1999). Using automatic speech processing for foreign language pronunciation tutoring: Some issues and a prototype. *Language Learning and Technology, 2*(1), 62-76. Retrieved June 12, 2013from http://llt.msu.edu/vol2num2/article3/ index.html.

Esling, J. H., & Wong, R. F. (1983).Voice quality settings and the teaching of pronunciation. *TESOL Quarterly, 1*(7), 89-95.

Fanshi, C. (1998). *The teaching of pronunciation to Chinese students of English*. Retrieved June 5, 2013 from http://www.exchanges.state.gov/orum/vols/ fvol36/nol/p37.

Felps, D., Bortfeld, H., & Gutierrez-Osunaa, R. (2009). Foreign accent conversion in computer assisted pronunciation training. *Speech Communication, 51*(10), 920-932.

Ferrier, L., & Reid, L. (2000). Accent modification training in The Internet Way®, In *Proceedings of In STILL* (pp. 69-72). Dundee, Scotland.

Finley, J. (n.d.). Pronunciation Power. Educational Software Review, Learning Village homepage. Retrieved May 10, 2013 from http://www.learningvillage.com/html/guide.html.

Flege, J. E. (1980). Phonetic approximation in second language acquisition. *Language Learning*, *30*(1), 117-134.

Flege, J. E. (1988). The production and perception of foreign language speech sounds. In H. Winitz (Ed.), *Human communication and its disorders, a review* (pp. 224-401). Norwood, NJ: Ablex.

Flege, J. E. (1999). Age of learning and second language speech. In D. Birdsong, (Ed.) *Second Language Acquisition and the Critical Period Hypothesis* (pp. 101-131). Mahwah, NJ: Lawrence Erlbaum Associates.

Foley, J. (2005). English in Thailand. *RELC*, *36*(2), 223-234.

Fosnot, C.T. (1996). *Constructivism: Theory, perspectives, and practice.* New York: Teachers College Press.

Frawley, W. (1997). *Vygotsky and cognitive science: Language and the unification of the social and computational mind*. Cambridge, MA: Harvard University Press.

Gagne, R., Wager, W., & Rojas, A. (1981). Planning and authoring computer-assisted instruction lessons. *Educational Technology*, *21*(9), 17-26.

Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation*. London: Edward Arnold.

Garson, D. G. (2008). *Factor analysis: state notes*. North Carolina State University Public Administration Program. Retrieved April 24, 2012 from http://www2.chass.ncsu.edu/garson/pa765/factor.htm.

Gass, S., & Varonis, E. M. (1984). The effect of familiarity on the comprehensibility of nonnative speech. *Language Learning*, *34*(1), 65-89.

Gilakjani, A. P. (2012). A study on the impact of using multimedia to improve the quality of English language teaching. *Journal of Language Teaching and Research*, *3*(6), 1208- 1215. doi:10.4304/jltr.3.6.1208-1215.

Halpern, O., & Tobin, Y. (2008). 'Non-vocalization': A phonological error process in the speech of severely and profoundly hearing impaired adults, from the point of view of the theory of phonology as human behavior. *Clinical Linguistics & Phonetics*, *22*(11), 824-834.

Harris, J. G. (1972). *Phonetic note on some siamese consonants*. Bangkok: Central Institute of English Language.

Hashim, H. H. (n.d.). Pronunciation teaching technology: An overview. Retrieved July 20, 2014 from http://faculty.ksu.edu.sa/hebahashim/Documents/ Pronounciation%20 Teaching%20Technology.pdf.

Haslam, N. (2010). *The Relationship of three L2 learning factors with pronunciation proficiency: language aptitude, strategy use, and learning context* (Unpublished master thesis). Brigham Young University. Retrieved May 20, 2014 from ProQuest dissertations and theses database.

Hess, G. Jr. (2004). A model for the effective use of computer-assisted instruction for ear training. Retrieved May 10, 2014 from http://music.utsa.edu/tdml/conf-II/II-Hess.html.

Hiller, S., Rooney, E. & Jack, M. (1993). SPELL: An automated system for computer-aided pronunciation teaching. *Speech Communication*, *13*(1), 463-473.

Hirata, Y. (2004). Computer assisted pronunciation training for native English speakers learning Japanese pitch and durational contrasts. *Computer Assisted Language Learning*, *17*(3), 357-376.

Hişmanoğlu, M. (2006).Current Perspectives on Pronunciation Learning and Teaching. *Journal of Language and Linguistic Studies*, *2*(1), 101-110. Retrieved March 25, 2013 from http://www.jlls.org/Issues/Volume%202/No.1/mhismanoglu.pdf

Hişmanoğlu, M. (2011). Internet-based pronunciation teaching: An innovative route toward rehabilitation Turkish EFL learners' articulation problem. *European Journal of Educational Studies*, *3*(1), 23-37.

Hobrom, A. (2004). *Online resources and learner autonomy: A study of college-level students of Arabic* (Doctoral dissertation). University of Texas at Austin, Texas. Retrieved May 10, 2013 from http://repositories.lib.utexas.edu/bitstream/handle/2152/1327/hobromd41980.pdf

Holec, H. (1981). *Autonomy and foreign language learning* (2nd ed.). Oxford: Pergamon

Hubbard, P. (1988). An integrated framework for CALL courseware evaluation. *CALICO Journal*, *6*(2), 51-72. Retrieved June 5, 2013 from http://calico.org/journalarticles.html.

Hung, D. (2001). Theories of learning and computer-mediated instructional technologies. *Education Media International*, *13*(1), 281-287. Retrieved August 5, 2013 from http://www.tandf.co.uk/journals.

Isono, T. (2003). *Japanese Learners' Interlanguage Phonology: with special reference to English vowels and plosives* (Doctoral dissertation). University of Essex, England.

Isono, T. (2005). The acquisition process of L2 pronunciation—based on the acoustic analysis of English vowels produced by Japanese learners. *Goken, 12*(1), 1-16. Retrieved July 5, 2013 from https://leo.aichi-u.ac.jp/~goken/bulletin/pdfs/No12/01-Isono.pdf.

Jamieson, J., Chapelle, C., & Preiss, S. (2005). CALL Evaluation by developers, a teacher, and students. *CALICO Journal*, *23*(1), 93-138.

Janyasupab, T. (1981). *An analysis of English pronunciation of English major students at higher certificate of education level* (Unpublished master thesis). Chulalongkorn University, Bangkok.

Jenkins, J. (2004). Research in teaching pronunciation and intonation. *Annual Review of Applied Linguistics*, *2*(4), 109-125.

Johnson, D. M. (1988). ESL children as teachers: A social view of second language use. *Language Arts*, *65*(2), 154-163.

Jonassen, D. H., & Reeves, T. (1996). *Learning with computers: Computers as cognitive tools*. New York: MacMillan.

Jonassen, D. H., Peck, K., & Wilson, B. (1999). *Learning with technology: A constructivist perspective*. Upper Saddle River, NJ: Prentice-Hall.

Jonassen, D. H. (2000). *Computers as mindtools for schools: Engaging critical thinking*. Columbus, OH: Prentice-Hall.

Kachru, B. (1992). World Englishes: approaches, issues and resources. *Journal of Language Teaching*, *2*(5), 1-14. doi:10.1017/S0261444800006583.

Karadoz, A. (2010). Linguistic acts teacher use in the classroom: verbal stimuli. *Education*, *130*(4), 696-704.

Kaur, R. (2010). Learner autonomy via Asynchronous Online Interactions: A Malaysian Perspective. *International Journal of Education and Development using Information and Communication Technology*, *6*(3), 88-100.

Kawai, G., & Hirose, K. (2000). Teaching the pronunciation of Japanese double-moraphonemes using speech recognition technology. *Speech Communication*, *30*(1), 131-143.

Kenworthy, J. (1987). *Teaching English Pronunciation*. Hong Kong: Longman.

Kenyon, D., & Malabonga, V. (2001). Comparing examining attitudes toward computer assisted and other oral proficiency assessments. *Language Learning and Technology*, *5*(2), 60-83.

Kern, R., & Warschauer, M. (2000). *Theory and practice of network-based language teaching*. In M. Warschauer & R. Kern (Eds.), *Network-based language teaching: Concepts and practice* (pp. 1-19). New York: Cambridge University Press.

Kessler, G., & Bikowski, D. (2010). Developing collaborative autonomous learning abilities in computer mediated language learning: attention to meaning among students in wiki space. *Computer Assisted Language Learning*, *23*(1), 41-58.

Kiparsky, P., & Menn, L. (1987). *On the Acquisition of Phonology*. New York: Newbury House.

Koc, M. (2005). Implications of learning theories for effective technology integration and pre-service teacher training: A critical literature review. *Journal of Turkish Science Education*, *2*(1), 2-18.

Kommissarchik, J., & Komissarchik, E. (2000). Better Accent Tutor – Analysis and visualization of speech prosody. In *Proceedings of In STILL 2000* (pp. 86-89). Dundee, Scotland.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(1), 607-610.

Kruk, M. (2012).Using online resources in the development of learner autonomy and English pronunciation: A case of individual learners. *Journal of Second Language Teaching and Research*, *1*(2), 113-142.

Lado, R. (1957). *Linguistic across cultures: Applied linguistics for language teachers*. New York: University of Michigan Press.

Lai, C., & Kuo, M. (2007). Gender difference in CALL programs for English as a second language acquisition. In *Proceeding of the Annual International Meeting of the Society for Information Technology & Teacher Education (SITE)* (pp. 11-25). Spain.

Lai, Y. S., Tsai, H. H., & Yu, P. T. (2009). A multimedia English learning system using HMMs to improve phonemic awareness for English learning. *Educational Technology & Society*, *12*(3), 266-281.

Lam, W. S. E. (2000). Second language literacy and the design of the self: A case study of a teenager writing on the Internet. *TESOL Quarterly*, *1*(34), 457-482.

Lam, W. S. E. (2003). Second language literacy and identify formation on the Internet (Doctoral dissertation). Available from ProQuest Dissertations and Theses database.

Lambacher, S. G. (1996). Teaching English pronunciation using a computer visual display. Retrieved June 12, 2013 from http://www.uaizu.ac.jp/~steeve/york95.html.

Lambacher, S.G. (1997). Developing English pronunciation skills of Japanese learners using computerized instruction. *Journal of the Phonetic Society of Japan*, *1*(2), 45-52.

Lambacher, S.G. (1998). The uses and limitations of pronunciation technology. TCIS Colloquium on the Uses and Limitations of Pronunciation Technology. In *Proceeding in the 32nd Annual TESOL Convention* (pp. 245-249). Seattle, United States.

Lantolf, J. P., & Thorne, S. L. (2006). *Sociocultural theory and the genesis of second language development*. Michigan: Oxford University Press.

Lara, M. (2009). *The effects of acoustic visual feedback instruction on pronunciation of the English high front vowels by pre-service non-native English teachers* (Doctoral dissertation). Available from ProQuest dissertations and theses database.

LaRocca, S. (1994). Exploiting strengths and avoiding weaknesses in the use of speech recognition for language learning. *CALICO Journal*, *12*(1), 102-105.

Laroy, C. (1995). *Pronunciation*. Hong Kong: Oxford University Press.

Leahey, T. H. (2000). Control: A history of behavioral psychology. *The Journal of American History*, *87*(2), 686-687.

Lee, K.C. (2001). Selecting and integrating CALL software programs into the EFL classroom. In *Proceeding at ITMELT* (pp. 69-88). Singapore: Center for English Language Communication, National University of Singapore. Retrieved January 10, 2014 from http://elc.polyu.edu.hk/conference/papers2001/lee.htm.

Lee, S. (2008). *Teaching Pronunciation of English Using Computer Assisted Learning Software: An Action Research Study in an Institute of Technology in Taiwan* (Doctoral dissertation). Retrieved June 10, 2013 from http://dlibrary.acu.edu.au/digitaltheses/public/adt

Lee, Y. (2007). The Multimedia Assisted Test of English Speaking: The SOPI Approach. *Language Assessment Quarterly*, *4*(4), 352-366.

Lenneberg, E. H. (1967). *Biological foundations of language*. New York: Wiley.

Leont'ev, A. N. (1979). *The problem of activity in psychology*. In J. V. Wertsch (Ed.). *The concept of activity in Soviet psychology* (pp. 37-71). Armonk, NY: M. E. Sharpte.

Lightbown, P.M. (2001). Input filters in second language acquisition. *EUROSLA Yearbook , 1*(1), 79-97.

Lindzey, G., & Aronson, E. (1985). *Handbook of social psychology*. New York: Lawrence Erlbaum.

Liontas, J. (2002). CALL Media Digital Technology: Whither in the new millennium, *CALICO Journal*, *19*(1), 315-330.

Little, D. (1991), *Learner autonomy 1: Definitions, issues and problems*. Dublin: Authentik.

Little, D. (1995).The politics of learner autonomy learning. *Journal of Applied Language Technology*, *2*(4), 7-10.

Littlewood, W. (1996). "Autonomy": An autonomy and a framework. *System*, *24*(4), 427-435.

Liu, Y. (2008). *The effectiveness of integrating commercial pronunciation software into an ESL pronunciation class* (Master thesis). Available from ProQuest Dissertations and Theses database.

Long, M. (1991). *Focus on form: A design feature in language teaching methodology*. Amsterdam: Benjamins.

Long, M.H. (1996). *The role of the linguistic environment in second language acquisition*. San Diego, CA: Academic Press.

Long, M., & Robinson, P. (1998). *Focus on form: Theory, research and practice*. Cambridge: Cambridge University Press.

Lyster, R. (1998). Negotiation of Form, Recasts, and Explicit Correction in relation to error types and learner repair in immersion classrooms. *Language Learning, 48*(1), 183-218.

Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition*, *19*(1), 37-66.

MacKinnon, S. (2002). Technology integration in the classroom: Is there only one way to make it effective? *TechKnowLogia*, *2*(3), 57-60.

Major, R. C. (1987). *A Model for Interlanguage Phonology*. New York: Newbury House.

Major, R. C. (2001). *Foreign Accent: The Ontogeny and Phylogeny of Second Language Phonology*. L. Erlbaum, Mahwah, NJ.

Malinee Phaiboonnugulkij, & Kanchana Prapphal. (2012). Languages for specific purposes (LSP) web-based assessment and the speaking performances of two ability groups. *PASAA*, *44*(1), 1-37.

Markham, D. (1997). *Phonetic Imitation, Accent, and the Learner*. Lund: Lund University Press.

McAllister, R. (1998). *Second language perception and the concept of foreign accent.* In Proceeding. ESCA Workshop on Speech Technology in Language Learning (STiLL 98) (pp. 155-158). Stockholm, Sweden.

McClintock, R. (1992). *Power and pedagogy: Transforming education through information technology*. New York: Teachers College Press.

McLeod, S. A. (2007). *Edward Thorndike*. Retrieved June 12, 2013 from http://www.simplypsychology.org/edward-thorndike.html

Meng, H. (2009). Developing Speech Recognition and Synthesis Technologies to Support Computer-Aided Pronunciation Training for Chinese Learners of English. In *Proceedings of the 23rd Pacific Asia Conference on Language*, information and computation (pp. 40-42). Kowloon Tong, Hong Kong.

Menzel, W., Herron, D., Bonaventura, P., & Morton, R. (2000). Automatic detection and correction of non-native English pronunciations. In *Proceedings of In STILL* 2000 (pp. 49-56). Dundee, Scotland.

Min, B. C. (1998). *A study of the attitudes of Korean adults toward technology-assisted instruction in English-language programs* (Doctoral dissertation) University of Northern Illinois. Retrieved from http://www.dbpia.co.kr/Journal/ArticleDetail/22921.

Ming, R. C. (1993). Changing perspectives on the utility of error correction in second language acquisition. *Foreign Language Annuals*, *26*(2), 172-179.

Mitchell, R., & Myles, F. (1998).*Second language learning theories*. London: Arnold.

Moallem, M. (2001). Applying constructivist and objectivist learning theories in the design of a web-based course: Implications for practice. *Educational Technology & Society*, *4*(3), 2-16.

Mojica-Diaz, C., & Sanchez-Lopez, L. (2010). Constructivist grammatical learning: A proposal for advanced grammatical analysis for college foreign language students. *Foreign Language Annual*, *43*(3), 470-487.

Molholt, G. (1988). Computer-assisted instruction in pronunciation for Chinese speakers of American English. *TESOL Quarterly*, *22*(1), 91-111.

Monthon Kanokpermpoon. (2004). English fricatives: A problematic area of Thai students' pronunciation. *Cultural Approach*, *4*(7), 61-76.

Monthon Kanokpermpoon. (2007). Thai and English consonantal sounds: Problem or a potential for EFL learning? *ABAC Journal*, *27*(1), 57-66.

Morley, J. (1991). The pronunciation component in teaching English to speakers of other languages. *TESOL Quarterly*, *25*(1), 51-74.

Morley, J. (1994). A multidimensional curriculum design for speech-pronunciation instruction. In Morley, J. (Ed.) Pronunciation Pedagogy and Theory. Illinois: TESOL.

Morrison, R., Ross, M., & Kemp, J. E. (2004). *Design effective instruction*. Hoboken, NJ: Wiley.

Munro, M. J. (2003). A primer on accent discrimination in the Canadian context. TESL *Canada Journal*, *20*(2), 38-51.

Murray, D. E. (1995). *Knowledge machines: Language and information in a technological society*. Longman: London.

Murray, G. L. (1999). Autonomy and language learning in a simulated environment. *System*, *27*(3), 295-308.

Mvududu, N., & Thiel-Burgess, J. (2012). Constructivism in practice: The case for English language learners. *International Journal of Education*, *4*(3), 108-118.

Nanana Ronakiat. (2002). *A textbook of sounds, sound system and accents in English*. Bangkok: Thammasat University Press. (In Thai).

Natthaya Supateera, Sasi Jungsatitkul, & Griffith, K. (2012). The development of computer-assisted musical pronunciation courseware for English suprasegmentals. *KKU Research Journal (GS)*, *12*(1), 155-164.

Neri, A., Cucchiarini, C., & Strik, H. (2002a). 'Feedback in computer assisted pronunciation training': Technology push or demand pull? In *Proceeding at the conference of ICSLP* 2002 (pp. 1209-1212). Denver, USA. Retrieved April 9, 2013 from https://lands.let.kun.nl/scratch/pubPERcat.php3?cat=1.

Neri, A., Cucchiarini, C., Strik, H., & Boves, L. (2002b). The pedagogy-technology interface in computer assisted pronunciation training. *Computer Assisted Language Learning*, *15*(5), 441-467.

Neri, A., Mich, O., Gerosa, M., & Giuliani, D. (2008). The effectiveness of computer assisted pronunciation training for foreign language learning by children. *Computer Assisted Language Learning*, *21*(5), 393-408.

Nicholas, H., Lightbown, P.M., & Spada, N. (2001). Recasts as feedback to language learners, *Language Learning*, *51*(1), 719-758.

Oberg, A., & Daniels, P. (2013). Analysis of the effect a student-centered mobile learning instructional method has on language acquisition, *Computer Assisted Language Learning*, *26*(2), 177-196.

Omaggio, A. (1988). *Teaching language in context*. Boston: Heinle & Heinle.

Overskeid, G. (2008). They should have thought about the consequences: The crisis of cognitivism and a second chance for behavior analysis. *The Psychological Record*, *58*(1), 131-152.

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart and Winston.

Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology*, *45*(1), 255-287.

Paracha, S., Mohamad, M., Jehanzeb, S., &Yoshie, O. (2009). Promoting autonomous computer assisted. *Journal of Theoretical and Applied Information Technology, 2*(1), 493-498.

Pearson, P., Pickering, L., & Da Silva, R. (2011). The impact of computer assisted pronunciation training on the improvement of Vietnamese learner production of English syllable margins. In *Proceedings of the 2nd Pronunciation in Second Language Learning and Teaching Conference* (pp. 169-180). Iowa State University, United States.

Penfield, W., & Roberts, L. (1959). *Speech and brain-mechanisms*. NJ: Princeton University Press.

Pennington, M. (1989). *Applications of computers in the development of speaking and listening proficiency.* Houston, TX: Athelstan.

Pennington, M. (1996). *Phonology in English Language Teaching*. New York: Longman.

Pennington, M. (1996). *The power of the computer in language education*. Houston, TX: Athelstan.

Pennington, M. (1998). The teachability of pronunciation in adulthood: A reconsideration. *International Review of Applied Linguistics*, *36*(1), 323-341.

Pennington, M. (1999). Computer-Aided Pronunciation Pedagogy: Promise, Limitations, Directions. *Computer Assisted Language Learning*, *12*(5), 427-440.

Pennington, M., & Esling, J. (1996). Computer-assisted development of spoken language skills. In M. C. Pennington (Ed.) *The Power of CALL* (pp. 153-187). Houston, TX: Athelstan.

Pennington, M., & Richards, J. (1986). Pronunciation revisited. *TESOL Quarterly*, *2*(1), 207-225.

Piaget, J. (1955). *The construction of reality in the child*. London: Routledge.

Pintep Tuaycharoen. (1990). *Phonetics and practical phonetics*. Bangkok: Thammasat University Press. (In Thai).

Pintip Tuaycharoen. (2003). A reflection of Thai English. *Journal of Language and Linguistics*, *21*(2), 47-65.

Praromrat Jotikasthira. (1998). *Elements of spoken English*. Bangkok: Chulalongkorn University Press.

Praromrat Jotikasthira. (1999). *Introduction to the English language: System and structure* (2nd ed.). Bangkok: Chulalongkorn University Press.

Precoda, K., Halverson, C.A., & Franco, H. (2000). Effects of speech recognition-based pronunciation feedback on second-language pronunciation ability. In *Proceedings of In STILL* (pp. 337-341). Dundee, Scotland.

Preston, D. (1981). The ethnography of TESOL. *TESOL Quarterly*, *1*(5), 105-16.

Pu, M. (2009). *An investigation of the relationship between college Chinese EFL students' autonomous learning capacity and motivation in using Computer-Assisted Language Learning* (Master thesis). Available from ProQuest dissertations and theses database. (UMI No. 1132874)

Pujolà, J. (2001). Did CALL feedback feed back? Researching learners' use of feedback. *ReCALL, 13*(1), 79-98.

Qudah, F. (2012). Improving English pronunciation through computer-assisted programs Jordanian Universities. *Journal of College Teaching & Learning*. *9*(3), 201-208. Retrieved March 20, 2014 from http://www.cluteinstitute.com/.

Ratner, C. (2002). *Cultural psychology: Theory and method*. New York: Kluwer/Plenum.

Rampino, T., & Taylor, M. (2013). Gender differences in educational aspirations and attitudes. *Journal of economic and social research*. *15*(1), 1-53.

Roach, P. (2002). *English phonetics and phonology: A practical course* (3rd ed.). Cambridge: Cambridge University Press.

Roblyer, M. D. (2000). *Integrating educational technology into teaching*. New Jersey: Merrill.

Roblyer, M. D., Edwards, J., & Havriluk, M.A. (1997). *Integrating educational technology into teaching*. Columbus, Ohio: Prentice Hall.

Ross, K. (2001). Teaching languages with asynchronous voice over the Internet. In *Proceedings of In STILL*, Euro CALL (pp. 557-583). Nijmegen, Netherlands.

Rummel, E. (2008). Constructing cognition. *American Scientist, 96*(1), 80-82.

Scarcella, R., & Oxford, R. L. (1994). Second language pronunciation: state of the art in instruction. *System*, *22*(2), 221-230.

Scheffler, F., & Logan, J. (1999). Computer technology in schools: What teachers should know and be able to do. *Journal of Research on Computing in Education*, *3*(1), 305-325.

Schmidt, R.W. (1990). The role of consciousness in second language learning, *Applied Linguistics*, 11(1), 129-158.

Schumann, J. H. (1978). *Social and psychological factors in second Language Acquisition.* In J. C. Richards (Ed.). Understanding second and foreign language learning Issues & approaches. Rowley, MA: Newbury House.

Scovel, T. (1988). *A time to speak: A psycholinguistic inquiry into the critical period for human speech*. Issues in Second Language Research. New York: Newbury House.

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics*, *10*(1), 209-231.

Son, J. (2007). Learner experiences in web-based language learning. *Computer Assisted Language Learning*, *2*(1), 21-36. Retrieved January 10, 2013 from http://dx.doi.org/10.1080/09588220601118495

Spector, P. E. (1992). *Summated rating scale construction: An introduction*. Newbury Park, CA: Sage.

St. John, E., & Cash, D. (1995). *Language learning via e-mail: Demonstrable success with German*. Honolulu, HI: Second Language Teaching and Curriculum Center Press.

Suthee Sumdangdej. (2007). *Input and the acquisition of suprasegmental phonology in English by Thai school children* (Master theses), Durham University, England. Retrieved from http://etheses.dur.ac.uk/2479/

Swan, M., & Smith, B. (2002). *Learner English*. Cambridge, UK: Cambridge University Press.

Tanner, M., & Landon, M. (2009). The effects of computer-assisted pronunciation readings on ESL learners' use of pausing, stress, intonation, and overall comprehensibility. *Language Learning & Technology*, *13*(3), 51-65. Retrieved February 14, 2013 from http://llt.msu.edu/vol13num3/tannerlandon.pdf.

Tarone, E., & Yule, G. (1989). *Focus on language learner*. Oxford: Oxford University Press.

Thorne, S. L. (2003). Artifacts and cultures-of-use in intercultural communication. *Language Learning & Technology*, 7(2), 38-67.

Tsubota, Y., Dantsuji, M., & Kawahara, T. (2004). Practical Use of Autonomous English Pronunciation Learning System for Japanese Students. *International Journal of Computer Assisted Language Learning and Teaching*, *1*(10), 139-142.

Tuncok, B. (2010). *A case study: students' attitudes towards computer assisted learning, computer assisted language learning and foreign language learning* (Unpublished master's thesis) Middle East Technical University. Retrieved May 10, 2013 from https://etd.lib.metu.edu.tr/upload/12612479/index.pdf

Tutsui, M., Masashi, K., & Mohr, B. (1999). Closing the gap between practice environments and reality: An interactive multimedia program for oral communication training in Japanese. *Computer Assisted Language Learning*, *11*(1), 125-151.

Valcke, M. (1999). Educational redesign of courses to support large groups of university students by building upon the potential of ICT in Information Technology for Teaching and Training. *The journal of the integrated study of artificial intelligence, cognitive science and applied epistemology*, *16*(1), 11-26.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wachowicz, K., & Scott, B. (1999). Software that listens: It's not a question of whether, it's a question of how. *CALICO Journal*, *16*(1), 253-276.

Warisara Yangklang. (2006).*Improving English final/l/ pronunciation of Thai students through CALL* (Unpublished master's thesis). Suranaree University of Technology, Thailand. Retrieved from sutir.sut.ac.th:8080/sutir/bitstream/ 123456789/.../ warisara_fulltext.pd.

Warschauer, M. (1999). *Electronic literacies: Language, culture, and power in online education*. Mahwah, NJ: Lawrence Erlbaum Associates.

Webb, J. L. (2007). Pragmatisms (Plural) part I: Classical pragmatism and some implications for empirical inquiry. *Journal of Economic Issues*, *41*(4), 1063-1087.

Weegar, M.,& Pacis, D. (2012). A comparison of two theories of learning – Behaviorism and Constructivism as applied to Face-to-Face and online learning. *E leader Manila*, *2*(4), 1-20.

Wei, Y., & Zhou, Y. (2002).Insights into English pronunciation problems of Thai Students. *ERIC*, *1*(10), 2-12.

Wenden, A. (1998). *Learner strategies for learner autonomy.* London: Prentice Hall.

White-Clark, R., DiCarlo, M., & Gilchriest, N. (2008). “Guide on the side”: An instructional approach to meet mathematics standards. *The High School Journal*, *91*(4), 40-45.

Wong, R. (1987). *Teaching Pronunciation: Focus on English Rhythm and Intonation*. Englewood Cliffs, NJ: Prentice Hall.

Wu, M. L. (1997). *The relation research among primary school student’s match learning behavior, computer anxiety and attitude toward computer* (Master thesis). Available from ProQuest Dissertations and Theses database. (UMI No. 2235467)

Xu, J., Feng, R.,& Wu, W. (2004). A survey and analysis of non-English major undergraduates’ autonomous English learning competence. *Foreign Language Teaching and Research*, *36*(1), 64-68.

Yaakub, M. N. (1998). *Meta-analysis of the effectiveness of computer-assisted instruction in technical education and training* (Doctoral dissertation). Retrieved from http://scholar.lib.vt.edu/theses/available/etd-6398-20243/

APPENDICES

APPENDIX A

QUESTIONNAIRE FORM

THE QUESTIONNAIRE

THAI COLLEGE STUDENTS' ATTTIUDES AND AUTONOMOUS LEARNING CAPACITY QUESTIONNAIRE

PART 1: DEMOGRAPHIC INFORMATION OF RESPONDENTS

INSTRUCTION: Check

Age: ☐ 18-20 ☐ 21-24

Gender: ☐ Male ☐ Female

Major: ☐ English ☐ Education (English)

Minor: ☐ Linguistics ☐ Communication ☐ Other _____ (specify)

Years of studying English: _____ years

Have you studied English via any Computer-Assisted Language Learning (CALL) tool before?

☐ Yes ☐ No

PART 2: ATTITUDES TOWARD ENGLISH PRONUNCIATION LEARNING

INSTRUCTION: Items in this part are about attitudes toward learning the English pronunciation with CAPL program. Indicate your attitude toward each item by marking the place of the rating scale which most closely reflects your attitude at

For example:
If you were in agreement with this statement then you would put a mark on Agree

Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Rice is a healthy food.		X			

Statement	Strongly Agree เห็นด้วยอย่างมาก	Agree เห็นด้วย	Uncertain ไม่แน่ใจ	Disagree ไม่เห็นด้วย	Strongly Disagree ไม่เห็นด้วยอย่างมาก
1. I can learn English on my own when using the CAPL programs such as Speexx ฉันสามารถเรียนภาษาอังกฤษด้วยตัวเองเมื่อใช้โปรแกรมคอมพิวเตอร์ (เช่น โปรแกรม Speexx)					
2. The CAPL program is easy to use. โปรแกรมคอมพิวเตอร์ใช้งานง่าย					
3. The CAPL program is interesting and useful. โปรแกรมคอมพิวเตอร์น่าสนใจและมีประโยชน์					
4. The CAPL's activities and exercises are suitable and useful. กิจกรรมและแบบฝึกหัดของโปรแกรมคอมพิวเตอร์นั้นเหมาะสมและมีประโยชน์					
5. The methods and techniques used in CAPL program instruction are effective in improving pronunciation learning. วิธีการสอนที่ใช้โปรแกรมคอมพิวเตอร์สามารถพัฒนาการออกเสียงภาษาอังกฤษให้ดีขึ้น					
6. The feedback provided by the program is useful. Feedback ของตัวโปรแกรมมีประโยชน์ในการเรียนออกเสียงภาษาอังกฤษของฉัน					
7. I would like to use the program again in learning pronunciation. ถ้าต้องเรียนการออกเสียงภาษาอังกฤษอีกครั้ง ฉันต้องการใช้โปรแกรมคอมพิวเตอร์ในการเรียนออกเสียงภาษาอังกฤษอีก					
8. In general, the CAPL is good. โดยรวมแล้ว โปรแกรมคอมพิวเตอร์ที่ช่วยในการเรียนออกเสียงภาษาอังกฤษเป็นโปรแกรมที่ดี					

PART 3: AUTONOMOUS LEARNING CAPACITY

INSTRUCTION: Items in this part are about autonomous learning capacity. Indicate your attitude toward each item by marking the place of the rating scale which most closely reflects your attitude at this time.

Statement	Strongly Agree เห็นด้วยอย่างมาก	Agree เห็นด้วย	Uncertain ไม่แน่ใจ	Disagree ไม่เห็นด้วย	Strongly Disagree ไม่เห็นด้วยอย่างมาก
1. I understand the course requirements and the class requirements. ฉันเข้าใจจุดประสงค์การเรียนรู้ ในวิชา English Phonetics และในห้องเรียน					
2. I am able to turn the teacher's teaching objectives into my own learning objectives. ฉันสามารถนำจุดประสงค์การเรียนรู้ของอาจารย์มาเป็นจุดประสงค์การเรียนรู้ของตนเองได้					
3. I feel I can keep up with the progress of the pronunciation course. ฉันรู้สึกว่าเรียนตามทันบทเรียนที่สอนในวิชาการออกเสียงภาษาอังกฤษ					
4. Besides the class tasks and assignments, I will make my own study plan. นอกจากงานในชั้นเรียนที่อาจารย์สั่ง ฉันยังสามารถวางแผนการเรียนด้วยตัวฉันเอง					
5. I make my own study objectives according to my own situation. ฉันกำหนดจุดประสงค์การเรียนรู้ด้วยตนเองตามความต้องการในการเรียนรู้ของฉันเอง					
6. I adjust my study plan if necessary. ฉันปรับเปลี่ยนแผนการเรียน เมื่อจำเป็น					
7. I make a time plan to study English pronunciation. ฉันได้วางแผนการเรียนออกเสียงภาษาอังกฤษด้วยตัวของฉันเอง					

Statement	Strongly Agree เห็นด้วยอย่างมาก	Agree เห็นด้วย	Uncertain ไม่แน่ใจ	Disagree ไม่เห็นด้วย	Strongly Disagree ไม่เห็นด้วยอย่างมาก
8. I set up my English pronunciation study objectives according to the EN 291 English Phonetics Syllabus. ฉันได้ตั้งจุดประสงค์การเรียนออกเสียงภาษาอังกฤษ ตามเอกสารที่แสดงเนื้อหาของหลักสูตรและการจัดการเรียนการสอน					
9. I adjust my pronunciation learning strategies if I find they are not suitable for me. ฉันปรับเปลี่ยนวิธีในการเรียนออกเสียงภาษาอังกฤษ ถ้าฉันพบว่าวิธีที่ใช้อยู่ไม่ได้ผล					
10. I evaluate my pronunciation learning approaches in order to find problems of my pronunciation study. ฉันประเมินวิธีในการเรียนออกเสียงภาษาอังกฤษ เพื่อหาปัญหาที่ทำให้เรียนไม่ประสบความสำเร็จ					
11. I change my pronunciation learning approach when I find it inappropriate. ฉันจะปลี่ยนวิธีในการเรียนออกเสียงภาษาอังกฤษ ถ้าวิธีที่ใช้อยู่ไม่เหมาะสม					
12. I am aware of whether my learning approaches are suitable to myself or not. ฉันรู้ว่าวิธีเรียนที่ใช้อยู่เหมาะกับตัวฉันหรือไม่					
13. I find opportunities to learn English pronunciation outside classroom. ฉันมีโอกาศในการเรียนออกเสียงภาษาอังกฤษนอกชั้นเรียน					
14. I try to take advantage of the pronunciation learning resources available. ฉันพยายามใช้ประโยชน์จากสื่อต่างๆ เช่น dictionary online, Google, โปรแกรม computer ในการเรียนออกเสียงภาษาอังกฤษ					

Statement	Strongly Agree เห็นด้วยอย่างมาก	Agree เห็นด้วย	Uncertain ไม่แน่ใจ	Disagree ไม่เห็นด้วย	Strongly Disagree ไม่เห็นด้วยอย่างมาก
15. I try to use the new knowledge when I practice my English pronunciation. ฉันลองใช้ความรู้ใหม่ๆ เมื่อเรียนการออกเสียงภาษาอังกฤษในแต่ละครั้ง					
16.I try to cooperate and learn together with my classmates. ฉันพยายามเรียนและให้ความร่วมมือกับเพื่อนในชั้นเรียนอย่างดี					
17. I realize the pronunciation mistakes I have made during my study process. ฉันตระหนักถึงข้อผิดพลาดในการออกเสียงภาษาอังกฤษ จากโปรแกรม ระหว่างที่ฉันเรียนออกเสียงภาษาอังกฤษ					
18. I know the reasons why I make pronunciation mistakes and will take actions to correct them. ฉันรู้ถึงสาเหตุที่ตนเองออกเสียงผิด และพยายามออกเสียงให้ถูกต้อง					
19. I check whether I have finished my study plan when I try to finish a pronunciation learning task. ฉันตรวจสอบทุกครั้งที่ฉันเรียนออกเสียงภาษาอังกฤษ ว่าตนเองสามารถทำได้ตามแผนการเรียนที่กำหนดไว้หรือไม่					
20. I check whether I have learned the previous knowledge when I try to finish a pronunciation learning task. ฉันตรวจสอบทุกครั้งที่เรียนออกเสียงภาษาอังกฤษว่าตนเองเข้าใจในสิ่งที่เรียนไปหรือเปล่า					

APPENDIX B

SEMI-STRUCTURED
INTERVIEW QUESTIONS

The questions of semi-structured interview (adapted by AbuSeileek, 2007)

1) What did you like/dislike about computer-assisted pronunciation instruction and activities?
2) What did you like/dislike about the program and activities?
3) What are your suggestions for improving the program and activities?

BIOGRAPHY

NAME	Narathip Thumawongsa
ACADEMIC BACKGROUND	Bachelor's Degree with a major in Business English from Assumption University, Bangkok Thailand in 2000 and a Master's Degree in Language and Communication at National Institute of Development Administration (NIDA), Bangkok, Thailand in 2005
PRESENT POSITION	Lecturer, Department of Western Languages Faculty of Humanities Srinakharinwirot University, Bangkok, Thailand
EXPERIENCES	Lecturer, English for International Communication Program Faculty of Liberal Arts Saint John University, Bangkok, Thailand Lecturer, Business English Program Faculty of Humanities and Social Science Suan Dusit Rajabhat University, Bangkok, Thailand