Technology in EFL Teaching and Learning in Thailand: An Overview of Research and Issues[1]
เทคโนโลยีในการเรียนการสอนภาษาอังกฤษในประเทศไทย: ภาพรวมของงานวิจัยและประเด็นศึกษา

Poranee Deerajviset[2] / ภรณี ดีราษฎร์วิเศษ

Abstract

Information and Communication Technology (ICT) has become the key issue and has a significant influence on current education (Welch, 2011). As for many other countries, technology has played an important role in education especially in language teaching and learning in Thailand. The application of technology in English as a Foreign Language (EFL) education is also a widely researched subject in Thailand. The aim of this article is to provide a review of current research on technology in EFL education in Thailand. The review aims to examine the effectiveness of technology for improving EFL teaching and learning, in relation to the language skills and areas. It also explores the limitations of current research on technology in EFL education in Thailand and provides implications for future research. Such knowledge will hopefully guide further development in research on technology in EFL teaching and learning in Thailand.

Keywords: Technology, Information and Communication Technology (ICT), English as a Foreign Language (EFL), Computer-Assisted Language Learning (CALL), English Language Teaching (ELT)

บทคัดย่อ

เทคโนโลยีสารสนเทศและการสื่อสารกลายเป็นสิ่งสำคัญและมีอิทธิพลยิ่งต่อการศึกษา
ในปัจจุบัน (Welch, 2011) เช่นเดียวกับประเทศอื่นๆ เทคโนโลยีมีบทบาทสำคัญต่อการศึกษา
โดยเฉพาะอย่างยิ่งการเรียนการสอนภาษาในประเทศไทย การใช้เทคโนโลยีในการเรียนการสอน
ภาษาอังกฤษยังถือเป็นหัวข้อวิจัยที่แพร่หลายในประเทศไทย บทความนี้มีวัตถุประสงค์เพื่อนำเสนอ
การทบทวนงานวิจัยในปัจจุบันที่เกี่ยวข้องกับเทคโนโลยีในการเรียนการสอนภาษาอังกฤษในฐานะ
ภาษาต่างประเทศในประเทศไทย การทบทวนงานวิจัยนี้มีจุดมุ่งหมายเพื่อศึกษาประสิทธิภาพของ
เทคโนโลยีในการพัฒนาการเรียนการสอนภาษาอังกฤษในฐานะภาษาต่างประเทศในแง่ของทักษะ
ทางภาษา นอกจากนี้บทความยังได้ศึกษาข้อจำกัดของงานวิจัยในปัจจุบันและเสนอแนะประเด็น
สำหรับงานวิจัยในอนาคต อันจะส่งผลต่อการพัฒนางานวิจัยเกี่ยวกับเทคโนโลยีในการเรียนการสอน
ภาษาอังกฤษในฐานะภาษาต่างประเทศในประเทศไทยในอนาคต

คำสำคัญ: เทคโนโลยี เทคโนโลยีสารสนเทศและการสื่อสาร ภาษาอังกฤษในฐานะภาษา
ต่างประเทศ คอมพิวเตอร์ช่วยสอนภาษา การสอนภาษาอังกฤษ

Introduction

There is a significant change in teaching and learning across the
world in the era of Information and Communication Technology (ICT) (Barrett,
Higa, & Ellis, 2012). The introduction and development of technology has
been causing numerous changes in education, especially with respect to
educational delivery (Garrison, 2011). One of the strongest arguments for
promoting technology lies in its potential to improve and even revolutionise
teaching and learning (OECD, 2005). Technology also has the potential to
enhance traditional teaching methods and enrich students' learning
experience (Pedro, 2005). In addition, technology is viewed as having a
major role to play in supporting authentic, interactive, reflective, and collaborative
learning (Richards, 2006; Voogt & Plomp, 2010). As a result, technology has
inevitably become very important in the educational context of Thailand.

Nowadays, the range of technology available for use in language teaching and learning has become very diverse (Motteram, 2013). It appears much research attempting to develop English language teaching and learning by using technology (Chapelle, 2004; Mullamaa, 2010; Yang & Chen, 2007). The potential impact of technology on language education is profound (Conroy, 2010). Technology is extensively integrated into EFL teaching and learning to help learners experience the target languages and cultures (Amaral & Meurers, 2011). Technology can also develop learners' particular language skills and increase learner autonomy (Timucin, 2006). Hence, integrating technology into language teaching and learning is considered useful.

In Thailand, technology has become the key issue and has a significant influence on current education. Thailand has placed the issue of technology in education into its priority of concern (Ministry of ICT, 2009). Technology has been implemented throughout all levels of education for a variety of objectives (Ministry of ICT, 2009). Most universities use technology as a supplementary tool to enhance classroom instruction (Siritongthaworn & Krairit, 2006). The idea of incorporating technology in classroom instructions has always been the focal point of discussions and debates due to its potential to enhance classroom instruction. The next section will provide a review of research on technology in EFL education in Thailand.

Research on Technology in EFL Education in Thailand

There has been a growing interest in incorporating technology in the field of EFL education. The applications of technology to enhance teaching and learning have been established in EFL research. There have been a considerable large number of research studies conducted in relation to the use of technology in EFL teaching and learning in Thailand (Khamkhien,

2012). Conducting such a broad review of technology in use for EFL education is theoretically and methodologically beneficial. This article therefore provides a review of what researchers have been doing in the field of technology in EFL teaching and learning in Thailand. The objectives of this review are (1) to understand how technology has been used to support EFL education in Thailand and (2) to examine the overall effectiveness of technology in terms of enhancing language skills. This review will also discuss the implications for future research directions of technology-supported EFL education in Thailand.

In this review, research studies on technology in EFL teaching and learning were identified from graduate theses in Thai universities. The review has a scope on research studies published during the period 2004-2013 inclusive in Thai Library Integrated System (ThaiLis) which is Thai Digital Collection (TDC) of research and publications. Focusing on research over the past ten years can provide sufficient insight into the practices of technology applications in EFL education in Thailand. A total of 165 EFL research studies on technology were found in ThaiLis and were selected for this review.

The definition of technology used in this review is that adopted by Januszewski and Molenda (2008). In this review, technology refers to all technologies available for use in teaching and learning including computers, multimedia, the Internet, or any other electronic or interactive media. Given what appeared in EFL research studies during 2004-2013, it is possible to articulate a set of research in relation to the major language skills and areas. The language skills and areas were examined because such a division is familiar to language teaching professionals and provides an effective structure for representing the wide scope and range of technologies in use in EFL education (Levy, 2009). These research studies on technology were sorted

into the following categories organized accordingly to the highest frequencies of studies found from the review: (1) vocabulary (23%), (2) reading (19.4%), (3) grammar (15.8%), (4) writing (13.3%), (5) listening (9.1%), (6) speaking (6.7%), and (7) other integrated skills or areas (12.7%), which will be discussed in the following sub-sections respectively.

The focus of this review is presented in two aspects: (1) EFL research practice of technological applications and (2) implications for further research. In the following sections, discussions of the effectiveness of particular technology in different instructional settings in terms of enhancing language skills or areas are presented. Examples of research studies are included to illustrate the relationship between technology and the specific skills or areas. A summary of sample research studies on technology in EFL which are representative of a certain language skills and areas is alphabetically provided in Appendix.

Research on Technology for Vocabulary

Vocabulary is essential for second language acquisition and can be acquired implicitly and explicitly (Nation, 2001; Schmitt, 2000). There were 38 research studies on using technology for teaching and learning vocabulary, accounting for 23 per cent of the reviewed studies. Vocabulary is the most frequently addressed area in EFL research on technology in Thailand. From the review, research on vocabulary have focused on an extensive range of technologies to assist the acquisition and retention of L2 vocabulary ranging from Computer-Assisted Language Learning (CALL), Computer-Assisted Instruction (CAI), multimedia games, videos, e-books, and concordances.

From the review, CALL and CAI have attracted a great deal of attention in vocabulary research. A number of studies have been carried out to investigate the effectiveness of CALL and CAI in teaching and learning

vocabulary. Beatty (2013: 7) defined CALL as "any process in which a learner uses a computer, and as a result, improves his or her language". CALL is related to CAI, a broad term which refers to teaching and learning through computer interaction for all disciplines, but not necessary with a language focus (Beatty, 2013). It can be seen that the terms CALL and CAI have been used interchangeably in the context of EFL research on technology in Thailand which can be found throughout the review. There are many characteristics in common between CALL and CAI. In this review, both CALL and CAI refer to the use of a computer to support language teaching and learning.

In addition, there were a number of studies using CALL to enhance vocabulary acquisition and retention (e.g., Phetchmunee, 2004; Raksasab, 2010; Lasombat, 2011). These previous studies concerning the use of CALL for vocabulary learning have yielded positive results. For example, Phetchmunee (2004) investigated the effects of CALL reading package on students' acquisition and retention of English vocabulary among first-year students at Prince of Songkla University. The findings showed that students acquired an average of 63% of the tested words immediately after using CALL and retained an average of 20% of the words two weeks afterward. Students perceived that the CALL reading package provided them with essential techniques for independent learning.

Closely related to CALL, there were a number of studies using CAI to enhance vocabulary learning achievement (e.g., Rithaporn, 2004; Jala, 2005; Promsup, 2006; Leelakajomjit, 2009; Musika, 2010; Sumalee, 2010; Chaihong, 2010; Tipayanon, 2011; Pawatho, 2011). These studies investigating the effect of CAI showed a positive influence on EFL students' vocabulary achievements. Also, students' attitudes toward learning with CALL and CAI programs on vocabulary were highly positive. Several studies

developed CAI for learning English vocabulary by using folktales (e.g., Promsup, 2006), conversation and pictures (e.g., Leelakajomjit, 2009), and photographs and cartoons (e.g., Sumalee, 2010). To conclude, both CALL and CAI are an effective means for vocabulary learning.

Furthermore, there were several studies regarding the use of multimedia games to improve vocabulary acquisition (e.g, Chandagul, 2010; Phokhee, 2012). The majority of studies were conducted with young learners at a primary school level. The results of these studies demonstrated that multimedia games with its interactive capabilities were seen as a tool to enhance vocabulary learning. Active participation in vocabulary games will lead to learning reinforcement. Students enjoyed and were able to learn new vocabulary using multimedia games. Another related aspect is that, in the context of games, vocabulary skill can be acquired without pressure. Overall, the findings of reviewed studies indicated that one of the benefits of multimedia games is an increase in students' motivation, as fun and games are being brought into the classroom.

Another multimedia technology for supporting vocabulary learning is videos that have both visual and audio content. An example of recent work on the use of videos to acquire vocabulary was conducted by Boonchom (2011). The study used video clips as a supplementary activity to enhance English vocabulary of non-English majors at Ubon Ratchathani Rajabhat University. From a practical point of view, students can listen to new vocabulary items separately and in context from flash audio player to play sound files in videos. Captioned videos capture students' attention, and its multisensory presentation of information decreases the difficulty of learning new words. It is also possible to state the advantages of videos in terms of flexibility by addressing different learners and learning styles.

In addition, the applications of e-books for enhancing vocabulary learning were also found in several studies (e.g., Udkamtiang, 2009; Puangwipart, 2011). The e-book is an electronic format and digitizing content that can be displayed, accessed, published on a computer or on any electronic device supported (Duran, 2013). Puangwipart (2011) constructed the storytelling e-book for teaching English vocabulary for primary school students. The findings revealed that students who read the e-book exhibited significant progress in word meaning and word reading compared to the control group. The e-book allows students to follow the text tracking which appears in units of sentences, phrases, or separate words as many times as they like. The study concluded that the e-book in combination with a text definition is effective in teaching unknown vocabulary.

From the review, concordance is worthy of special note in the recent development of technology in vocabulary learning. Barlow (2004) defined concordances as transformations of a text, giving the analyst the opportunity to view different perspectives on a text. There were studies on using online concordance to promote students' vocabulary. For example, Rachbuanoy (2007) investigated whether M.A. in English students at the School of Liberal Arts, King Mongkut's University of Technology Thonburi can use concordance to identify and revise vocabulary use in their written assignments. The findings revealed that the use of concordance facilitated students' vocabulary acquisition; however, the students could not use concordance to revise vocabulary errors. The findings indicated that noticing multi-word units is a key role in using concordance successfully since some target words are not a single word, so collocation is another issue that learners should take into consideration. In addition, teachers need to consider English proficiency of each learner since their abilities in using

concordance are different. Thus, the techniques and instruction in using concordance effectively are needed to suit each individual learner.

All in all, the reviewed studies illustrated that technology can be used in order to develop the vocabulary acquisition of students. There are several ways in which technology can be used to enhance vocabulary teaching and learning. Vocabulary learning could be greatly enhanced by incorporating a variety of annotations for words through visual media in multimedia technology. The results of the reviewed studies on technology for vocabulary yielded similar aspects: (1) technology had the effectiveness in improving students' vocabulary learning, and (2) students had a high satisfaction in learning vocabulary using technology.

Research on Technology for Reading Skills

Reading is an important skill that supports the acquisition of knowledge and exchange of information (Grabe, 2009). In this review, there were a total of 32 studies on technology in relation to reading skill, accounting for 19.4 per cent of the reviewed studies. Reading is one of the language skills that has been frequently investigated in EFL research. From the review, a wide range of technologies and approaches for EFL reading include Computer-Assisted Language Learning (CALL), Computer-Assisted Instruction (CAI), Web-Based Instruction (WBI), online lessons, multimedia, and the Internet.

Several studies aimed to improve students' reading comprehension through the use of CALL (e.g., Phongpradit, 2004; Simthamnimit, 2004; Jansangsri, 2007) and CAI (e.g., Malathong, 2010; Rattanasriha, 2010). For instance, Jansangsri (2007) developed a CALL program to improve low-motivated students' reading comprehension. The findings indicated that

the CALL program can help low-motivated students gain a higher learning achievement at the significant level of .01. The students also had positive attitudes towards studying though the CALL program as it delivered a high-quality independent learning experience. Findings of other studies were also consistent that CALL and CAI can improve the reading comprehension of EFL learners. The students who were taught by CALL and CAI significantly performed better than students who were taught by traditional instruction. As these studies revealed, the computer has a positive effect on reading comprehension, helps increase achievement scores, and enhances motivation to read. Reading activities provided by CALL and CAI are also more challenging, interesting, motivating

In relation to WBI, studies (e.g., Chuthachindaket, 2005; Kongkapet, 2007) investigated the effectiveness of WBI on reading comprehension. Review of studies suggested that WBI, with student involvement in authentic tasks, have potential in improving students' reading comprehension ability. For instance, Kongkapet (2007) examined the effects of Web-based English reading instruction using project-based language learning on students' reading comprehension abilities. In relation to this study, it is particular interesting that technology seems to be particularly successful when integrated into project-based language learning (Beckett & Miller, 2006), where English can be acquired naturally through themed activities. In addition, students reflected their positive attitudes toward WBI. They were able to practice their reading strategies, receive immediate feedback, and choose reading texts according to their needs. Students' interaction was also increased as they had chances to interact with their teacher, peers, and online resources.

Multimedia technology with its interactive capabilities was used in research studies (e.g., Saykhaow, 2011; Sudtho, 2012) as a tool to enhance reading comprehension. For example, Sudtho (2012) used video clips to improve students' reading comprehension. The results showed that video clips in combination with a text definition or multimedia annotations have been effective means to enhance reading comprehension in terms of providing the variety of modality cues for reading.

The Internet has been increasingly integrated in EFL teaching and learning. Research studies (e.g., Thepseenu, 2005; Ngamsomjit, 2006) investigated the use of Internet for reading instruction. Ngamsomjit (2006) examined how reading materials retrieved from the Internet were used, the perception of teachers and students, the restrictions, and the criteria for selecting the reading materials. The results of the study indicated that the Internet provides a very large source of authentic reading materials and massive opportunities for practice reading. The perception of students and teachers towards using the Internet-retrieved materials was positive. Teachers and students agreed that reading materials from the Internet are beneficial and worth using. Moreover, web-based lessons offer a wide selection of topics and genres to satisfy students' different interests and purposes for reading. However, they were conscious of its restrictions regarding ungrammatical and informal language, source reliability, and appropriateness.

In summary, there are several ways in which technology can be used to improve reading comprehension. The reviewed studies confirm the positive effect of technology on EFL students' reading skill. One of the most significant advantages of using CALL and CAI in the development of reading comprehension, often mentioned by several studies, is individualized instruction.

Using computers allows students to work at their own pace. Computer-assisted technology can provide additional reinforcement exercises that are motivating for students to practice reading in a supportive environment, where the quality of feedback has been shown to be particularly beneficial. In addition, the Internet is a rich source of authentic reading materials that can contribute to both the improvement of reading skills to higher levels.

Research on Technology for Grammar

Grammar has been one of the focus areas of research on technology in EFL education in Thailand. From the review, there were 26 studies on using technology in grammar instruction, accounting for 15.8 per cent of the reviewed studies. Various technologies were applied in different aspects of teaching grammar such as tenses (e.g., Yingyuen, 2007; Prachanpol, 2009; Saengkham, 2009; Sutthirad, 2009; Thinkhamchoet, 2009; Kaiyarach, 2010; Jittreethat, 2011; Manyawech, 2012), nouns (e.g., Panyarom, 2006; Khamphusiri, 2009; Rungrat, 2009), adjectives (e.g., Khrueaphan, 2009), question words (e.g., Srilapo, 2007), comparison (e.g., Namlao, 2007), and subject-verb agreement (e.g., Buangam, 2010).

From the review, a number of studies examined the use of CALL for teaching grammar (e.g., Yingyuen, 2007; Khrueaphan, 2009; Saengkham, 2009; Buangam, 2010) and CAI (e.g., Khamphusiri, 2009; Thinkhamchoet, 2009; Rungrat, 2009; Manyawech, 2012). A recent study by Manyawech (2012) examined the cooperative learning–based CAI on "Present Continuous Tense" for primary school students. The CAI program consisted several help tools, including links to grammar explanations. The CAI program can automatically mark student input, which has the potential to impact on the timeliness of feedback. The findings revealed another benefit of CAI which is

the encouragement of collaboration and communication in grammar learning activities. Findings from other studies also demonstrated that both CALL and CAI with drill exercises allowed students the chances to practice answering activities and revising learned grammatical items on their own pace.

In addition, WBI has also yielded positive contributions in teaching grammar. WBI in teaching grammar were found in several studies (e.g., Prachanpol, 2009; Kaiyarach, 2010; Jittreethat, 2011). The results of these studies showed that WBI allows students to practice a variety of grammatical items and language features presented to them in interactive learning activities by accessing grammar websites on the Internet. This, consequently, enhances students' ability to notice certain grammatical items in the presented contexts. WBI also offers enriched incorporated multimedia grammar contents with clarifications on grammar structures which are accessible for students to learn and practice grammar independently. Similar studies on grammar teaching were found with a different technology tool like e-books (e.g., Inchai, 2011). A summary of the grammar points and explanatory notes was made as link to the relevant page in the e-book to facilitate students. The findings of these studies showed that the students enjoyed learning through the e-book. It is apparent that because of its visual and audio elements, the e-book could facilitate learning grammar and make it more enjoyable.

In summary, implementing technology in teaching grammar is another field of investigation in EFL research. The previous studies indicated the effectiveness of using technology for grammar instruction. Technology ranging from CALL and CAI programs, web-based lessons, and e-books, permits interactions with the learners through giving feedback and explanations of some grammatical elements which makes such technology

tools effective in teaching grammar. In addition, technology can provide students greater flexibility for practice and increase students' motivation in learning grammar.

Research on Technology for Writing Skills

Writing is another skill which has been investigated in research on technology in EFL in Thailand. There were 22 studies using technology for teaching writing, accounting for 13.3 per cent of the reviewed studies. These studies were conducted to examine the effects of different technology on learners' writing ability. Technology for writing includes CALL programs, e-mails, the Internet, and Web-based lessons, that assists writing instruction and supports students in developing their own writing.

From the review, CALL continues to be used for all sorts of specific language learning activities, including writing skill development. Several studies on using CALL for writing were found (e.g., Fukham, 2004; Lamjuanjit, 2009; Vichaidit, 2012). For example, Lamjuanjit (2009) conducted a study to enhance university students' writing strategies through a constructed CALL program. The main methodology in enhancing strategies was having the subjects learn seven writing strategies based on Oxford (1990) through the CALL program. The findings revealed that the subjects employed greater numbers of writing strategies in comparison with the pre-enhancing phase. The subjects had positive attitudes toward the general use, contents, and design of the constructed CALL program. They also suggested the program to be designed as a game to increase program-user interaction. The findings of other previous studies (e.g., Fukham, 2004; Vichaidit, 2012) also support the effectiveness of CALL in terms of improving students writing and promoting learner autonomy.

Along with the use of CALL programs, e-mails have been used as asynchronous communication tool in developing writing skills. The use of e-mails in teaching writing was found in several studies (e.g., Chan, 2004; Loha, 2004; Duangkhamchan, 2005). For instance, Duangkhamchan (2005) examined the effect of the use of e-mail correspondence to enhance students' writing accuracy for secondary school students. The students interacted with each other via e-mail discussing essays and exchanging essays for peer review. The findings indicated that the use of e-mail correspondence was effective in enhancing students' writing skill in relation to task fulfillment and grammatical accuracy. The teaching model helped improved students' writing skills and promoted students' motivation toward learning how to write via e-mail correspondence. Students also reported positive attitudes towards e-mail writing in improving their writing skills. E-mails make the students use the language for authentic purposes; moreover, they can use it to make new friends and learn new cultures.

The findings are similar to previous studies (e.g., Chan, 2004; Loha, 2004) which showed that e-mails can support writing development by reinforcing the correspondence between the spoken word and the written form. The findings revealed that the interactivity among students was the key to the successful online writing class. The e-mail exchange helps students gain self-assurance which can contribute to their English writing improvement as students' confidence was strengthened because of the feedback they received in terms of e-mail responses. Using e-mails as a supplement to the classroom curriculum can be effective as e-mails provide students the opportunity to practice writing and to collaborate with peers and teachers.

Another technology for supporting teaching writing is the Internet. The Internet serves both as a communication tool and as an information

resource. The use of the Internet has been investigated in many studies in the area of EFL writing (e.g., Saeheaw, 2005; Srinut, 2005). The findings showed that the English writing skill of the students after learning though the Internet learning lessons was improved. In addition, the students' English learning motivation was higher after being taught though the Internet. It is recommended that using the Internet to teach writing requires changes in teachers' roles, approaches, and attitudes toward teaching.

In conclusion, the review of research findings provided convincing evidence that technology could be used to promote writing. Various technological tools for writing have enabled learners to communicate with each other in text. CALL programs were found to enhance the writing process and improve student writing. In addition, the pedagogical benefits of technology as facilitated through e-mails have become one of the most commonly discussed research areas. Moreover, e-mail exchange is suggested to encourage students' reflective collaborative writing. In addition, the Internet as an information resource for writing also helps learners create, analyze, and produce ideas easier and more efficiently than the way they traditionally do.

Research on Technology for Listening Skills

In the attempt to enhance students' listening ability, several studies focusing on the use of technology have been carried out. There were 15 studies which employed technology for teaching listening found, accounting for 9.1 per cent of the reviewed studies. There are various technologies for enhancing students' listening ability such as CAI, WBI, and multimedia like digital videos and DVDs.

Regarding the use of CAI, Srithaweep (2006) developed CAI to find its efficiency on English listening skill practice. The majority of tasks involved

listening comprehension practice which captures the usage of English in the real world. In general, this computer-based listening instruction enhanced students' listening ability and had positive effect on their attitudes towards computer use. Student motivation was also increased, especially when a variety of listening activities were offered. The findings of other studies (e.g., Kanjiak, 2006) also demonstrated that CAI could appeal to different modalities and could effectively deal with different learning styles.

Furthermore, several previous studies examined the effectiveness of multimedia technology over simple audio equipment in promoting listening skills (e.g., Yodthong, 2005; Boonjun, 2006; Chamnanya, 2009; Jungsatidkul, 2012). Multimedia technology allows integration of text, graphics, audio, and motion video that can provide learners to interact with textual, aural, and visual media in a wide range of formats (Meskill, 1996). From the review, listening is the predominant skill among other language skills in presenting movies in EFL classrooms as found in several studies (e.g., Noowongsri, 2004; Suthapan, 2008; Homla, 2009; Karnjanaboon, 2012). The findings of these studies indicated that by providing congruent text with spoken words, DVD-based films facilitated acquisition of listening skills. In addition, DVD-based films also helped the students develop significantly better understanding of the target culture. Movies assist the students' comprehension by enabling them to listen to exchanges and see such visual supports as facial expressions and gestures simultaneously. Students indicated that using audio-visual elements in movies can provide them enjoyable language learning opportunities.

The review of previous studies emphasizes the positive effects of using multimedia technology to enhance listening skill. In particular, previous studies have advocated the benefits of using digital videos in relation to

movies in facilitating listening instruction in terms of offering authenticity, motivation, and interest. Movies can be considered as valuable resources for listening as they provide exposure to real language uttered in authentic settings. This allows for listening competencies to be taught in a more authentic environment.

Research on Technology for Speaking Skills

Speaking is less explored skill in research on technology compared with other language skills or areas. From the review, there were a total of 11 studies on technology for speaking, accounting for 6.7 per cent of the reviewed studies. Several technologies such as CALL, CAI, and multimedia have been employed to help learners improve their speaking competence and pronunciation.

Several studies investigated how CALL and CAI could be used to promote speaking skills (e.g., Latthikun, 2004; Dee-in, 2007; Buaparung, 2008; Khotmongkhon, 2011; Singsri, 2011; Srichom, 2011). The findings of these studies revealed that both CALL and CAI were effective in promoting speaking skills, and the students' level of satisfaction was at a high level. Apart from using CALL and CAI with language learners in classroom contexts, there were some studies conducted with participants in different contexts such as nurses (Singsri, 2011) and tour-guide volunteers (Latthikun, 2004).

Regarding the use of multimedia, Rukprom (2009) investigated the effectiveness of native conversation media in improving spontaneous students' speaking skills. The subjects were assigned to study and practice English with the native conversation media (VCD) in Self-Access English Language Center after school for 40 minutes every day in a 10-week period. The results indicated that after the students used the native conversation media (VCD),

their speaking ability was improved in terms of fluency and comprehensibility. The native conversation media (VCD) enabled most students to create more words in a spontaneous English conversation.

In terms of pronunciation, there were several studies using technology for improving pronunciation (e.g., Buaparung, 2008; Khotmongkhon, 2011; Singsri, 2011; Srichom, 2011). The findings showed that technology application has been successfully integrated for pronunciation drills. The findings revealed that technology can be applied to training students' pronunciation by having them loudly read out the vocabulary to reinforce memorization of the vocabulary. Both CALL and CAI programs can analyse a student utterance and display the features visually. With the advancement of speech recognition technology, students can receive feedback in more effective ways.

In conclusion, the findings of previous studies suggest that technology is beneficial for improving students' speaking skills and developing their communicative competence. The characteristics of the interactive nature that benefits from technology facilitate speaking drills. As students often lack opportunities to practice speaking in the target language, technology has potential for supporting students to practice speaking English individually anytime and anywhere. In traditional instructional settings, feedback and modelling are often provided by an instructor. Technology can provide a high degree of interactivity and has a positive impact and washback effect in the classroom.

Research on Technology for Integrated Skills and Areas

Some current approaches to teaching EFL strive to integrate the four skills in pedagogy. EFL research studies have indicated the significance of

integrated skill teaching approach for improving language learning outcomes (Hinkel, 2006). The integrative skills also include associated areas such as knowledge of vocabulary, grammar, spelling, pronunciation, and etc. The remaining 21 research studies, accounting for 12.7 per cent of the reviewed studies, looked at other integrative skills and areas of language in relation to technology use.

Several studies examined combined skills like listening and speaking (e.g., Kaewphaitoon, 2006; Wongrak, 2006; Boonkhrong, 2009; Yaibuates, 2011; Phooprasartporn, 2012), interaction (e.g., Phudpha, 2008; Rukprom, 2008; Wong-a-sa, 2010). For example, Boonkhrong (2009) investigated the effects of using CAI to improve students' ability in English listening and speaking skills. The results of the study revealed that the use of CAI program was effective in improving students' listening and speaking ability. Students also had positive attitudes towards using CAI in terms of enthusiasm and participation. The findings of other studies also indicated that computer technology can increase students' opportunities to communicate with each other, allowing them to improve their oral skills. The computer environment creates real situations which motivate students' interest in a non-threatening environment. Such environment will also allow dialogue and communication, enhance interaction, and strengthen communication skills.

From the review, several studies on technology integrate reading skills with other language skills or areas such as writing (e.g., Kleebkaesorn, 2008), vocabulary (e.g., Mongphet, 2007; Chaikum, 2010; Chamkam, 2011), and word spelling (e.g., Jaturapol, 2012). The interdependence of reading and writing cannot be over-emphasized as Corbett (2008: 1) stated that "reading makes the writer". The importance of technology in developing reading and writing ability has been established in previous studies. For

instance, Kleebkaesorn (2008) developed the WBI by using cartoon animation as English reading kit in teaching reading and writing English course for undergraduate students. In the study, students were asked to summarize or analyse their readings in written form, thus activating their writing skills. The findings indicated that benefit of using computers for reading and writing instruction is that the computer offers immediate feedback on performance. Students could improve their sight word vocabulary, fluency, and comprehension.

All in all, the use of technology has been shown in several studies to facilitate EFL learning in a variety of ways. Technology can be used not only as a means of classroom facilities but also as an effective teaching tool for English language learners in integrated skills and areas such as listening and speaking, interaction, communication, reading and vocabulary, writing and vocabulary, reading and writing, and etc. The use of the computer can be a useful supplement to traditional EFL classroom.

Implications for Further Research on Technology in EFL Education in Thailand

This review of research was conducted to provide an overall picture of the inconclusive findings of the use of technology in EFL education in Thailand. This review provides current practices in the application of technology and its effectiveness. Understanding the effectiveness of technology is a crucial step in integrating technology into EFL education successfully. The review of research on technology-supported EFL teaching and learning reveals a number of interesting implications and recommendations for further research as follows:

First, in Thailand, technology continues to be used for all sorts of language skills development. Most of the studies have been conducted on aspects of major language skills or areas such as listening, speaking,

reading, writing, vocabulary, grammar, and integrated skills. The main conclusion drawn from the review of research was that technology has a great potential as a supporting pedagogical tool. A consistent pattern of positive effects of technology on students' learning and language competency is found across research studies. The overall findings of previous studies imply that technology can help EFL students develop their English language skills, facilitate authentic and purposeful language learning, and enhance students' motivation. The review of research studies also demonstrates that students in general have enthusiastic responses and positive attitudes towards the integration of technology into language learning. Using technology in language learning enables new ways for learners to learn language as it is not dependent on time and space in the same way as traditional class teaching.

Second, the review of research seems to indicate that the greatest need for software development is in the area of speaking since it was found to be sparsely represented. As for speaking, it is considered as the least conducted research studies among other skills and areas. One of the reasons is that speaking is considered the hardest skill to be taught and tested through computers (Levy & Stockwell, 2006), which might explain the lack of representativeness of studies focusing on speaking. More research in the less explored areas such as speaking in particular should be conducted. This makes the integration of communicative speaking into technological tools an interesting challenge for further EFL research in Thailand.

Third, in terms of research methods, it can be observed that there is a significant trend towards the application of more empirical research. Technology is seen as a treatment applied to learners, and the effect of the treatment on learning is then measured. The majority of previous studies were experimental in nature focusing on the use of pre-test and post-test.

Most empirical studies on technology in EFL concentrated on the effectiveness of technology itself, particularly in comparison with conventional teaching tools. 64.5% of all studies were one group pre-test/post-test design, and 35.5% followed a pre-test/post-test control group design which consists of an experimental group and a control group. Further research in the field should advocate more qualitative studies to capture a deeper and richer range of data in order to be able to examine the fuller view of technology-enhanced language learning environment.

Finally, most of the previous studies were small-scale and conducted within a short period of time. Research studies on technology were small-scale in nature, focusing on efficacy in tightly controlled contexts rather than on large-scale use. Most of these efforts were fairly small sample sizes carried out by individual teachers in EFL classroom settings. In addition, most of the studies were about the application of a single technology and about one or two aspects of language skills or areas. Furthermore, the experiments were often short-term lasting from a few hours (e.g., Srichom, 2011) to a few weeks (e.g., Phokhee, 2012). The review found a very limited number of efforts that attempted to evaluate the effectiveness of technology over a longer period of time (e.g., Rukprom, 2009). This raises the issue of the reliability of findings over time, across changing technologies. Therefore, for further research, more comprehensive use of multiple technologies to the whole process of language teaching and learning in larger groups of students to determine the effectiveness of technology should be carried out. In addition, longitudinal studies that measure the long-term effects and learning outcomes expected from the use of technology should be conducted in further research.

Conclusion

This article encompasses a broad spectrum of research practice in EFL education supported by the use of technology in Thailand. This review of research studies illustrates how technology is being employed to support EFL teaching and learning in various aspects including listening, speaking, reading, writing, vocabulary, grammar, and other integrated skills or areas. It is apparent from the review that the use of technology has positive effects on language learning. However, in exploiting technology, it should be noted that the effectiveness of technology on language learning is dependent on how it is used. It is necessary for teachers to know how to teach using technology, and for students to know how to learn and engage in that environment. Thus, to encourage the understanding of pedagogical approaches to technology and to develop the know-how skills are necessarily required for successful use of technology in EFL education. Finally, it is hoped that this review of research studies will serve as a contribution to as well as a practical guideline for effective integration of technology in EFL teaching and learning in Thailand.

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Appendix

Table 1 Summary of Sample Research on Technology for Vocabulary

Study	Technology Used	Sample size	Level
Boonchom (2011)	Video clips	49	University
Chaihong (2010)	CAI	10	Primary school
Chandagul (2010)	Multimedia games, CAI	30	Primary school
Jala (2005)	CAI	80	Primary school
Lasombat (2011)	CALL	30	Primary school
Leelakajomjit (2009)	CAI	43	Primary school
Musika (2010)	CAI	35	Primary school
Pawatho (2011)	CAI	80	Secondary school
Phetchmunee (2004)	CALL	73	University
Phokhee (2012)	Multimedia games	34	Primary school
Promsup (2006)	CAI	33	Primary school
Puangwipart (2011)	E-books	60	Primary school
Rachbuanoy (2007)	Concordance	4	University
Raksasab (2010)	CALL	27	University
Rithaporn (2004)	CAI	40	Secondary school
Sumalee (2010)	CAI	40	Primary school
Tipayanon (2011)	CAI	32	Primary school
Udkamtiang (2009)	E-books	22	Primary school

Table 2 Summary of Sample Research on Technology for Reading Skill

Study	Technology Used	Sample size	Level
Chuthachindaket (2005)	WBI	21	Secondary school
Jansangsri (2007)	CALL	36	University
Kongkapet (2007)	WBI	23	University
Malathong (2010)	CAI	45	University
Ngamsomjit (2006)	Internet	61	University
Phongpradit (2004)	CALL	5	Secondary school
Rattanasriha (2010)	CAI	39	Secondary school
Saykhaow (2011)	Multimedia	15	Secondary school
Simthamnimit (2004)	CALL	47	University
Sudtho (2012)	Video clips	20	Secondary school
Thepseenu (2005)	Internet	75	University

Table 3 Summary of Sample Research on Technology for Grammar

Study	Technology Used	Sample size	Level
Buangam (2010)	CALL	30	Secondary school
Inchai (2011)	E-books	22	Secondary School
Jittreethat (2011)	WBI	36	Primary school
Kaiyarach (2010)	WBI	30	Primary school
Khamphusiri (2009)	CAI	33	Secondary school
Khrueaphan (2009)	CALL	30	Primary school
Manyawech (2012)	CAI	35	Primary school
Namlao (2007)	CAI	19	Secondary school
Panyarom (2006)	CAI	42	Primary school
Prachanpol (2009)	WBI	98	Secondary school
Rungrat (2009)	CAI	30	Primary school
Saengkham (2009)	CALL	30	Secondary school
Srilapo (2007)	CAI	40	Primary school
Sutthirad (2009)	CAI	45	Secondary School
Thinkhamchoet (2009)	CAI	42	Primary school
Yingyuen (2007)	CALL	30	Secondary school

Table 4 Summary of Sample Research on Technology for Writing Skill

Study	Technology Used	Sample size	Level
Chan (2004)	E-mails	4	University
Duangkhamchan (2005)	E-mails	8	Secondary school
Fukham (2004)	CALL	9	University
Lamjuanjit (2009)	CALL	9	University
Loha (2004)	E-mails	6	University
Saeheaw (2005)	Internet	53	Secondary school
Srinut (2005)	Internet	33	University
Vichaidit (2012)	CALL	30	Secondary School

Table 5 Summary of Sample Research on Technology for Listening Skill

Study	Technology Used	Sample size	Level
Boonjun (2006)	Digital videos	10	University
Chamnanya (2009)	Digital videos	38	Secondary school
Homla (2009)	Multimedia	25	University
Jungsatidkul (2012)	Multimedia	20	Primary school
Kanjiak, 2006	CAI	20	Adult learners
Karnjanaboon (2012)	Multimedia	5	University
Kongseedee (2008)	WBI	40	Primary school
Noowongsri (2004)	VDO, VCD	10	University
Srithaweep (2006)	CAI	20	University
Suthapan (2008)	Multimedia	43	Secondary school
Yodhong (2005)	Multimedia	30	University

Table 6 Summary of Sample Research on Technology for Speaking Skill

Study	Technology Used	Sample size	Level
Buaparung (2008)	CAI	30	Primary school
Dee-in (2007)	CAI	30	University
Khotmongkhon (2011)	CALL	30	Primary school
Rukprom (2009)	Multimedia, VCD	12	University
Latthikun (2004)	CALL	7	University
Singsri (2011)	CAI	16	Adult learners
Srichom (2011)	CAI	37	Primary school

Table 7 Summary of Sample Research on Technology for Integrated Skills
and Areas

Study	Technology Used	Sample size	Level
Boonkhrong (2009)	CAI	6	Secondary school
Chaikum (2010)	CAI	11	Secondary school
Chamkam (2011)	E-books	16	Secondary school
Jaturapol (2012)	CALL, Multimedia	40	Primary school
Kaewphaitoon (2006)	CALL	85	University
Kleebkaesorn (2008)	WBI	70	University
Mongphet (2007)	Electronic dictionaries	6	University
Phooprasartporn (2012)	Multimedia	25	University
Phudpha (2008)	Multimedia	7	Primary school
Rukprom (2008)	CAI, Multimedia	7	Primary school
Wong-a-sa (2010)	CALL	6	University
Wongrak (2006)	CALL	14	University
Yaibuates (2011)	CALL	20	Secondary school