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Research Article

Exploring Thai EFL pre-service teachers' technology integration based on SAMR model

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ABSTRACT

This study investigated how Thai EFL pre-service teachers (PSTs) use technology in their classrooms and the level of substitution, augmentation, modification, and redefinition (SAMR) they implement. Seven English education majors enrolled in the course "teaching internship 2" in their fourth year at a Thai university participated in the study. Due to COVID-19, the participants were trained to teach online, but during their teaching practicum, they were required to teach in a traditional on-site setting. Because of this novel arrangement, it was essential to investigate how these PSTs incorporate technology into the classroom. For the purpose of analyzing the process of educational technology integration, this study employed SAMR model. Observations and semi-structured interviews were used as data collection methods. Throughout the semester, observations were conducted twice. SAMR observation form was used to investigate how PSTs used technology in their teaching. Participants were asked to participate in an interview after each observation. The interviews included open-ended questions based on the conceptual framework of SAMR. Observation results show that technological tools were used to engage students, check comprehension, create teaching content, and evaluate students' understanding. For the study, the participants were divided into three groups based on the extent of technological tools used. One participant was deemed to be in the substitution stage, five participants in the augmentation stage, and only one participant in the modification stage. The results of the interviews indicated that teacher motivation and the availability of ICT equipment, as well as familiarity with technological tools, played a significant role in PSTs' integration of technology into the classroom. The study's conclusions are helpful in developing PSTs' technology integration in EFL classrooms. SAMR model should be introduced to PSTs to let them critically reflect on and develop their own technology integration.

Keywords: EFL, pre-service teachers, SAMR model, Thai students, technology integration

INTRODUCTION

Technology has been a part of peoples' lives for centuries, changing their daily activities, which in the 21st century can be performed by using mobile phones, computers, and other devices (Hamilton et al., 2016). In education, the integration of technology in the classroom is viewed as an important strategy to increase the effectiveness of the teaching and learning process (Howard et al., 2000; Mirzajani et al., 2016). Technology integration, even in so simple a form as searching for information on the internet encourages more active learning for students, makes learning enjoyable and helps students to learn more (Baytak et al., 2011). Thus, effective teaching requires effective technology use (Ertmer, 2005).

Before the COVID-19 pandemic, everyone acknowledged that technology has numerous benefits for teaching and learning. Incorporating technology in the classroom can make learning more pleasant and enjoyable. Nonetheless, between 2020 and 2022, the COVID-19 pandemic severely impacted teaching and

learning. Teachers and students both had to adapt to technology-intensive online education. Teachers can no longer avoid using technology in the classroom; it is required when teaching online. However, as the post-COVID-19 situation improved, the form of instruction in Thai schools switched from 100% online to physical onsite in many institutions, with some hybrid classrooms being used in others depending on the situation. Nonetheless, even today, technology plays a greater role in online classrooms.

In this study, students in the fourth year of an English education program at a Thai university enrolled in "teaching internship 1 and 2" courses, which required them to complete two semesters of practicum teaching English to students in public primary or secondary schools. However, these PSTs were unable to attend the school of their choice because of a number of factors to consider, including teaching position availability, school specific requirements, student distance from home to school, and the consideration of lecturers in the education programs. As a result, pre-service teachers (PSTs) had to complete their teaching practicum in slightly different teaching environments, predominantly depending on the school size, i.e., whether small, medium, or large. This diversity in school size directly impacted students' access to school support and type of facilities, as well as the availability of English teachers as mentors; sometimes none were available.

According to the Thai educational system, primary and secondary schools in Thailand are categorized into four primary categories based on their size (Office of the Teacher Civil Service and Educational Personnel Commission, 2011). A small school has 1 to 499 students, whereas a medium school has 500 to 1,499 students. If a school has between 1,500 and 2,499 students, it is classified as a large school, and schools with more than 2,500 students are classified as extra-large. The size of the school, as measured by the number of students, impacts the government's allocation of funds to the school, as well as the facilities, infrastructure, and number of teachers at the school. There is a presumption that teachers in small or medium-sized schools will face difficulties and challenges due to the fact that government funding for school facilities varies in this way. Because of their fewer facilities and resources in small or medium-sized schools, the researchers deemed it particularly interesting to investigate how PSTs in small and medium-sized schools incorporate technology in the classroom. In addition, compared to previous generations, PSTs in the study are rather proficient in using technology; they are 'digital natives'. Creighton (2018) noted that the first generation of digital natives are those born between roughly 1980 and 1994, and they represent the first generation to grow up with new technology and have been characterized by their familiarity with, and confidence in, information and communication technologies.

In Thailand, PSTs during 2020-2022 were uncertain as to which mode they would be teaching in during their teaching practicum due to the fact that teaching in online, onsite, or hybrid modes was dependent on the COVID-19 pandemic and school policies. Many teacher education programs prepared their students to teach in an online environment, but when they began their teaching practicum, these students actually taught in a traditional classroom. It might have been challenge and difficult for the students because what they had studied, and the actual internships were different. The researchers deemed it worthwhile examining how these PSTs who were trained to teach online integrated technology and adapted their teaching when teaching in a traditional classroom.

Educators have introduced several technology integration frameworks to support EFL lecturers' digital literacy competence, such as technological pedagogical content knowledge (TPACK), substitution, augmentation, modification, and redefinition (SAMR), RAT, PICRAT, Wheels, and TIM (Muslimin et al., 2023). However, SAMR model was used in this study because it emphasizes integrating technology across all of the stages of designing an activity or task and so allows for technology interaction and increased student engagement (Khalidi, 2021). This research relies on the use of Puentedura's (2014) SAMR model for analyzing the process of educational technology integration. Use of SAMR model to explore how teachers at a site are integrating technology may show areas that need further development (Jenkins, 2021). Some studies focus on EFL in-service teachers' technology integration (Almalki, 2020; Boonmoh et al., 2022a; Boonmoh et al., 2022b; Chaaban & Cherif, 2017; Wang, 2022); however, little research concerns how EFL PSTs integrate technology based on SAMR model. The expected outcomes of this study will be beneficial to the university's English education program as educators can use them to draw up guidelines for developing the use of technology in English language teaching courses more effectively. In designing the course description of integrating technology course, more modern and appropriate content could be developed for learners. Furthermore, the research outcomes will reflect the current situation of teaching and learning English in Thai

schools. The limitations and factors, which affect PSTs' technology integration are also revealed in the study. We thereby obtain a better understanding of how EFL PSTs integrate technology in their teaching. Additionally, the results are useful in developing more efficient and practical training programs for English Education students. The research therefore contributes to the field of technology integration in EFL classrooms. To sum up, the purpose of this study is to explore how Thai EFL PSTs use technology in their teaching and the level of SAMR implemented by such teachers.

LITERATURE REVIEW

In recent years, technology and education have been integrated; technology has been an effective tool for teachers and students in the teaching-learning process (Akcil et al., 2021). Because of the COVID-19 pandemic, a variety of technology and techniques are now utilized in classrooms in order to help develop students' language skills (Khatoony & Nezhadmehr, 2020; Serhan, 2020). The following is a short comprehensive review of previous research on integrating technology in language learning, particularly SAMR model with technology integration and especially PSTs' technology integration.

Technology integration is defined as how teachers utilize technology to make class activities more efficient and the way this usage could re-shape classroom activities (Gilakjani, 2013). According to Spaulding (2016), technology integration can enhance student achievement and prepare students for a "digital society". Several factors affect the integration of technology in education, namely the expansion of global economic competition (Leu & Kinzer, 2000; Mundy et al., 2012), the availability of facilities (Abbott, 2001; Leu & Kinzer, 2000), teachers' willingness (Alonso et al., 2019; Khamprem & Boonmoh, 2019; Taghizadeh & Hasani Yourdshahi, 2020), the students themselves (Kannan & Munday, 2018; Petersen & Sachs, 2016), and policies from both governmental and institutional contexts (Buasuwan, 2018; Goodman, 2017; Vungthong et al., 2017; Wiangsima & Boonmoh, 2018).

Currently, teachers are more open-minded concerning technology integration in the class, as it allows teachers to deliver meaningful tasks to students (Ondrashek, 2019). Because of the increasing number of technology integration practices in classrooms, studies in the field have also drawn more attention. In the context of English as a foreign language (EFL) learning, numerous studies indicate that integrating technology in English learning can effectively improve students' attitudes (Idowu & Gbadebo, 2017; Sabti & Chaichan, 2014; Wang & Hsu, 2020), motivation (Lamb & Arisandy, 2020), independent learning (Jose & Abidin, 2015; Shevchenko, 2015), and English language skills (Balbay & Kilis, 2017; Howlett & Zainee, 2019; Taj et al., 2017). From the studies, it can be seen that technology integration offers benefits for language learning in many ways. SAMR model has been used as a framework to help determine a teacher's level of technology integration as used for instruction in the classroom (Geer et al., 2017). SAMR model has been implemented in order to help teachers to reflect on their technology pedagogy. Developed by Puentedura (2006), SAMR model was designed to describe the level of technological integration into teaching and learning. SAMR Model, frequently referred to as a "ladder," is represented by four levels, as it is an approach to selecting, using, and evaluating technology in education.

As illustrated in **Figure 1**, the first level of SAMR model is substitution. At this level, teachers use technology to replace traditional tools (Puentedura, 2006). Examples of technology use at the substitution level would be using Microsoft Word instead of using paper, reading texts online instead of reading them in books, and using PowerPoint slides to present learning materials to substitute white board presentation. At the augmentation level, the technology serves as a tool, but there are functional changes. For example, students use online dictionaries, study guides, and history sites, to supplement reading; they also use the Internet to independently research a topic, as opposed to relying on teacher input. In addition, students add interactive media to their presentations, such as hyperlinks, audio files, and videos, to provide more engagement and depth to the assignment. The third level of SAMR model is modification. At this level, the technology begins to alter how tasks are completed; this level begins to transform the learning. Examples of technology being used at the modification level would be students sharing a PowerPoint presentation and working collaboratively with peers to give and receive feedback (Puentedura, 2014). Students produce podcasts summarizing a topic, which can then be accessed by other students as a revision resource. Furthermore, students put their presentations on a blog or online classroom to write learning reflections, post comments,

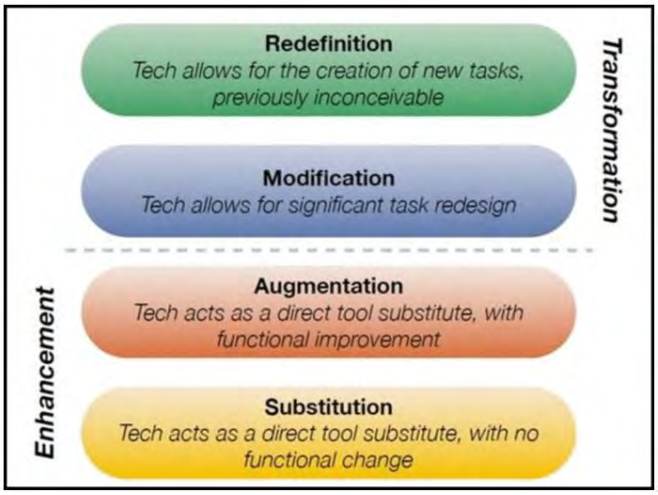

Figure 1. Puentedura's (2006) SAMR model

and discuss peer learning. In the final level of SAMR, redefinition, technology is transformative in the classroom and creates new tasks, ones which were previously inconceivable. For example, in the development of a story, students might use a publicly accessible online site to work collaborative with peers and individuals from other schools or even countries to share work and add to the progress of the story, including the various story elements (Puentedura, 2014). Another example of redefinition would be students using Google Earth to discover their chosen location and connect with school children from the locale to interview them and find out more about the place. Finally, it is assumed that teachers use technology more efficiently at the levels of modification or redefinition, as opposed to the levels of substitution or augmentation.

SAMR model has been researched in many studies (Jenkins, 2021; Martin, 2020; Moya & Serrano, 2022; Setyaningsih et al., 2020; Tseng, 2019). Using SAMR model, Martin (2020) investigated 74 teachers in the United States about the effect of teacher perceptions and self-efficacy in technology. The findings indicated that teachers perceived technology to be a tool that could enhance instruction but often is limited due to available time. Moreover, the findings showed that their use of technology was basic, and the majority of their responses fell within the substitution tier or in the beginning of the augmentation tier from SAMR model. Moya and Serrano (2022) surveyed the perceptions of 31 Ecuadorian teachers of SAMR model in their English classes. The results showed that even though teachers had little knowledge of using SAMR model to integrate technology in their classes, they had been using it indirectly. They could integrate technology based on SAMR model by basically using their teaching experience and first considering using SAMR model to use different technological tools to help students practice and improve their language skills. Setyaningsih et al. (2020) examined 40 English teachers' practices and their perceptions of technology integration in Indonesia. The results found that the teachers generally held positive views on the use of technology although they also indicated concern over the challenges and the requirements for successful implementation. According to SAMR model, the teachers' technology integration practices mostly fell into substitution and augmentation.

In addition, SAMR model has been adopted to measure the level of technology integration. Jenkins (2021) explored teachers' technology integration based on SAMR model using 12 elementary teachers in the United States. The findings revealed that though teachers are integrating technology, integration is typically more teacher-centered or at the substitution and augmentation levels when student-centered. Tseng (2019) adopted SAMR model to examine the degree of four Taiwanese EFL teachers enacted their TPACK in the context of teaching English with iPads. TPACK is a technology integration framework, which identifies three types of knowledge, namely technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), interact with each other (Mishra & Koehler, 2006). The findings showed that the levels of the four teachers' TPACK enactments were mostly at the level of substitution and augmentation in SAMR model. The results suggested that, although some of the teachers' iPad-based teaching indicated competency in transforming their teaching, their teaching was predominantly enhanced by the tablets as a substitute to deliver linguistic input to their students in conventional teacher-centered classrooms.

Budiman et al. (2018) investigated an Indonesian EFL schoolteacher's beliefs and practices in the integration of ICT in English language teaching. The findings showed that teacher believed that integrating ICT was very important as it had the ability to transform all aspects of education through making use of it to attain instructional objectives then the quality of teaching and learning will improve. However, the teacher was still at the substitution and augmentation stages in integrating ICT and hardly achieved any steps in the modification and redefinition stages.

According to recent research conducted before the COVID-19 pandemic, although teachers realized the significance of using technology in class, the level of technology integration of in-service teachers based on SAMR model is at the substitution and augmentation stages. For PSTs, in order to become future teachers, it is essential to develop their ability to integrate technology in the classroom. For this reason, some studies investigated technology integration by PSTs. Park and Son's (2020) study interviewed six EFL PSTs to explore their readiness in the use of CALL in Hong Kong. The findings revealed that they utilized many types of software and web resources, such as digital audio editors, recording programs, online quiz applications, learning management systems, and video sharing websites. Akayoglu et al. (2020) surveyed the digital tools, which 113 Turkish PSTs used. The results reported that PSTs implemented multiple digital tools, such as social media tools, learning management tools, quiz maker platforms, material design applications, presentation tools, and online storage applications. In addition, the findings showed that the most frequently used digital tools were social media tools, such as Facebook, Twitter, Instagram, and WhatsApp. The PSTs mentioned that they shared, recorded, and created files and/or videos for personal and educational reasons.

Tomczyk (2020) examined 450 PSTs' attitudes and self-evaluation of fluency in using new digital devices, websites and software. The findings revealed that almost half of them definitely agreed that using ICT in schools positively impacted students' motivation and engagement. Another study, by Mustafa and Sinan (2021), explored the self-efficacy beliefs of 439 PSTs in four different teacher education programs of a Turkish university. The results revealed that their technology integration self-efficacy beliefs seemed very high, which their self-efficacy beliefs in using computer technology was found to be slightly around average, and their self-efficacy beliefs in helping others use computer technology was rather low. Vo et al. (2020) interviewed seven Vietnamese pre-service English teachers to understand how they integrated technology in their teaching practicum. The results showed that they simply used PowerPoint in their teaching, which indicated that their level of technology integration was at the beginning or substitution stage of SAMR model. Five of the seven participants were not confident with technology because of their limited computer ability. Although they mentioned that ICT should be adopted in their teaching, they did not know how to integrate it into their class. To sum up previous studies, PSTs have a generally positive attitude toward using technology in the lesson; however, they do not always have adequate knowledge of how to implement technology integration in language teaching.

As demonstrated by the above review of the literature, technology integration has an important role in teaching and learning processes. Even though many studies have been conducted to understand PSTs' technology integration, studies have typically focused on their attitudes towards, beliefs about, and self-efficacy in using technology. Little research has investigated how EFL PSTs have integrated technology in lessons, especially in the Thai context. In the present study, the COVID-19 situation is improving, and participants were observed twice in order to assess their development in how they integrated technology in their teaching, as well as measure the level of technology integration according to SAMR model. The findings of this study will be beneficial to English Education programs as they can use them to shape guidelines for teaching and learning the better use of technology in English language teaching courses. As researchers, we will obtain a better understanding of how EFL PSTs integrate technology in their teaching. The objective of this study is therefore to investigate how Thai EFL PSTs use technology in their teaching and the level of SAMR implemented by Thai EFL PSTs.

Purposes of the Study

The purposes of this study are to find out the following:

(a) According to SAMR model, how do Thai EFL PSTs integrate technology in their teaching?

(b) Which levels of SAMR model are implemented by Thai EFL PSTs and what are their rationales for technology integration?

MATERIALS AND METHODS

Instruments

Two research instruments were employed in this study: observations and interviews. Observations were conducted twice for each participant over a three-month period. SAMR observation form was used to investigate how PSTs used technology in their teaching. The observations were limited to 50 minutes. The second instrument was semi-structured interviews. Semi-structured interviews were used to ensure that not only the required information was provided but also to leave room for unanticipated responses, which might contribute to the findings (Tunjera & Chigona, 2020). The interviews included open-ended questions based on the conceptual framework of SAMR. The semi-structured interviews' findings were compared with the data obtained from the observations.

Participants

Participants consisted of seven fourth-year English education students at a Thai university enrolled in "teaching internship 1 and 2" courses, which required them to complete two semesters of practicum teaching English to students in public primary or secondary schools. All participants consented to participating in study and having their data collected by researchers.

Procedure

The study enlisted seven fourth-year English major students at a Thai university. The participants were enrolled in the "teaching internship 2" course. They were asked to attend an online meeting one week before the second semester of the 2022 academic year. In the meeting, all the participants were encouraged to utilize technology and applications more efficiently in their class. They were informed that observations would be conducted twice in the semester. In each observation, SAMR observation form was used to investigate how Thai EFL PSTs used technology in their teaching. The activities of using technological tools were analyzed based on SAMR model to explore PSTs' integration of technology.

After each observation, each participant was asked to participate in an interview. In these semi-structured interviews, the researcher began with one open-ended question, and this led to another based on the responses given by each interviewee (Merriam, 2009). The participants were asked all the same questions, about what, whys and hows of the technology and media used in their teaching. Moreover, they were asked to reflect on the problems and obstacles they encountered when integrating technology in their teaching and learning. The interviews were conducted by telephone and took place during a time chosen by the PSTs and lasted a maximum of 30 minutes. The participants determined the best time and date for their interviews. Due to ethical considerations, a consent form was provided to all the participants, and they were notified that they had the right to withdraw from the study at any time.

Data Analysis

Data from observations

The data collected were analyzed according to SAMR model, comprising substitution, augmentation, modification, and redefinition (Puentadura, 2014). Descriptive statistics were used to analyze the data. In analyzing the observation forms, the technology and applications used in class were categorized based on the stage of teaching, such as elicitation, presentation, production and practice. The occurrence and the purposes of technology and applications used in classrooms activities was counted. Each application was analyzed in order to indicate the level of SAMR for each participant. The data for each participant was compiled and presented separately and then summarized as a group.

Table 1. Technological tools in classroom

Variable		Values						
Participant		T 1	T 2	T 3	T 4	T 5	T6	T 7
Type of school		S	S	S	M	M	M	M
Grade participant taught		7-9	4 & 8	5, 7, & 9	7	11	8	7
Facilities provided	TV	✓	✓	✓			✓	✓
	Projector				✓	✓	✓	
	Computer					✓	✓	
	Wi-Fi	✓	✓	✓	✓	✓	✓	
Percent of students' smartphone		0	90	90	80	100	90	90

Table 2. Purposes of technological tools

	Engaging students				Checking comprehension				Teaching material				Evaluation		Others (random)
	YouTube	PowerPoint	Wordwall	Bamboozle	MS Word	PowerPoint	Kahoot	Keynote	PowerPoint	Canva	GT	Keynote	Kahoot	Wordwall	Wheel of name
T1	✓ (S)									✓ (S)					
T2		✓ (A)		✓ (A)					✓ (S)	✓ (A)					✓ (S)
T3	✓ (S)	✓ (A)							✓ (S)	✓ (A)	✓ (A)			✓ (A)	
T4	✓ (S)		✓ (A)			✓ (A)			✓ (S)						
T5					✓ (A)		✓ (A)		✓ (S)	✓ (A)					✓ (S)
T6	✓ (S)	✓ (A)			✓ (A)				✓ (S)	✓ (A)			✓ (A)		
T7								✓ (M)			✓ (A)	✓ (A)	✓ (A)		
Total	4	3	1	1	2	1	1	1	5	5	2	1	2	1	2

Data from interviews

The data obtained from the interviews were audio recorded, transcribed, and analyzed. The content analysis approach was utilized to analyze transcripts for each participant in order to understand their opinions about using technology. The keywords from the participants' responses were identified and categorized based on their answers in order to understand how these PSTs used technology in their teaching.

RESULTS

In order to answer RQ1, the notion of technological tools in the classroom must be explained. **Table 1** provides information about the factors, which affect how the participants used technology in class. The factors consisted of school size, grade taught, equipment, facilities, and access to mobile devices.

As seen in **Table 1**, the participants were from two sizes of schools: small and medium-sized. T1, T2, and T3 taught in small schools, while T3 to T7 taught in medium-sized schools. Considering the grade each participant taught, the participants from small schools needed to teach more than one level because of the lack of English teachers. The facilities in small schools were the same, i.e., there were TVs and wi-fi for teachers. For medium-sized schools, there were projectors instead of TVs for T4 and T5. Interestingly, for T6, who also worked in medium-sized schools, the facilities were rather complete. There were TVs, projectors, computers, and wi-fi in the classroom. However, T7 worked in a medium-sized school, and the facilities were less complete than in small schools, where there were only TVs.

It may have been difficult for T7 to use technology in class. Although there were personal computers in the classrooms of T5 and T6, all the teachers had their own laptops. Moreover, the results showed that most students had their own smartphone, except in T1's school, where smartphones were not permitted in school. Thus, this affected how T1 used technology for teaching, as she needed to create lesson plans in which students did not need to use smartphones.

Table 2 shows the technological tools used by participants. It can be seen that these tools can be used for many purposes, such as engaging with students, checking comprehension, delivering teaching material, evaluating, and using randomizing tools. The primary purpose was to engage students' attention. The most frequently used was YouTube, by T1, T3, T4, and T6, followed by PowerPoint, by T2, T3, and T6. Word wall was

Table 3. Teachers' use of technology

	1st observation		2nd observation		SAMR	Note
T1	Canva & YouTube	Teacher's input	Canva & YouTube	Interview (students'	S	Same
T2	PPT	(encouragement)	Bamboozle, Canva, & WoN,	justification)	S & A	MAs
T3	PPT, GT, & Wordwall,		Canva, GT, Wordwall, & YouTube,	supervisor,	S & A	MAs
T4	PPT & YouTube		PPT, Wordwall, & YouTube,	motivation, &	S & A	MAs
T5	MS Word & PPT		Canva, Kahoot, & WoN	mentors	S & A	MAs
T6	PPT & YouTube		Canva, Kahoot, & MS Word		S & A	MAs
T7	GT & Keynote		Kahoot & Keynote		S, A, & M	Same

Note. Mas: More applications

used by T4 to review previous content by game and Bamboozle was used by T2 to elicit students 'vocabulary. It should be noted that T5 and T7 did not use tools in engaging because they used pictures from textbooks to lead students into the lesson. As can be seen, YouTube was categorized as substitution; all of the participants had just let students watch videos. While PowerPoint was used at the level of augmentation, T2, T3, and T6 created hidden pictures games by using custom animation in PowerPoint. Wordwall and Bamboozle were used as games before teaching contents.

Next, in checking comprehension, T1, T2, and T3 did not use any tools to check students' understanding because they asked students to do exercises on paper handouts. MS Word was used by T5 and T6 in order to show paper handouts on projectors. They typed answers and interesting things, and they highlighted important points for students to see clearly. T4 used PowerPoint; she asked students to play a hidden pictures game in PowerPoint while T5 used Kahoot to check students' comprehension. MS Word, PowerPoint, and Kahoot were used at the level of augmentation. Since T7 used a MacBook in creating a presentation, he utilized the Keynote program in checking comprehension. Keynote is Apple's presentation tool for the iOS, and its users can create slideshows that include images from the device's camera roll, text, and charts, and they can select themes, fonts, styles, transitions, and animations from a variety of choices. T7 used iPad to take photos of some students' answers and sometimes asked them to write on his iPad and displayed it on the screen. Keynote was categorized as modification in SAMR model.

The third purpose of tools was as a teaching material. The most frequently used was PowerPoint, by T2 to T6, followed by Canva, by T1, T2, T3, T5, and T6. Google Translate was another tool used by T3 and T7. Moreover, Keynote was used by T7 only to make presentations. PowerPoint was used at the level of substitution because the participants only showed the content to students. They said that it was useful when showing content from books because some students did not have textbooks in class. While Canva was used only at the substitution stage by T1. T2, T3, and T5, and T6 used Canva at the augmentation stage, they made use of several useful functions in Canva. They searched for pictures, photos, or videos from Canva directly, without using Google. Google Translate was categorized as augmentation. T3 asked students to listen to how to pronounce each word using Google Translate. Similarly, T7 let students practice listening in class by listening to the audio from Google Translate. Finally, Keynote was used at the level of augmentation, as T7 inserted audio in Keynote to let students practice listening.

The next aspect was evaluation, where Kahoot was used by T6 and T7, and Wordwall was used by T3. The participants utilized Kahoot and Wordwall to evaluate and summarize content, which was categorized as at the augmentation stage. In contrast, T1, T2, T4, and T5 did not use any tool for evaluation because the content in their lessons did not end during the period of observation. Some of them asked students to complete paper handouts. In addition, 'wheel of name' was another tool used by T2 and T5 to select random students and topics in class. This was classified at the substitution level.

We now answer RQ2, "which levels of SAMR model were implemented by Thai EFL PSTs?" The findings were compiled based on observations and interviews with participants. The results were divided into three groups, group 1, group 2, and group 3, based on the level of technological tools used, i.e., the following criteria:

1. Group 1: Same level of SAMR + same applications or less
2. Group 2: Same level of SAMR + more applications
3. Group 3: Development of SAMR+ same or more applications

As can be seen in **Table 3**, T1 was in group 1, and the participant used the same applications in both the first and second observations. T2 to T6 were categorized into group 2; they were at the substitution and augmentation stages but used more applications in the second observation. T7 was the only participant who had development in SAMR; he used the same number of applications in both observations.

Group 1: Beginner User

Group 1 comprised participants in small-sized schools; T1 was in this group. There was some technological support, namely TV and wi-fi. She was required to teach students in grades 7-9. She utilized Canva and YouTube. Canva was used as a teaching material while YouTube was opened to engage students at the beginning of the class. This instance of technology integration was rated at the level of substitution. According to the interview data, various factors prevented the teachers' use of technology in the classroom. In the case of T1, the participant was aware of the features and usefulness of the tools but did not have the opportunity to explore them owing to a variety of issues. Main problem was a lack of equipment; smartphones are not permitted in T1's school. T1 stated that her use of technology was influenced by her students' smartphones:

> In my school, students cannot take smartphones to school. So, I cannot ask them to play Kahoot or some games (T1, observation 1).

Another reason was the lack of sufficient teachers and the lack of time; there was only one English teacher in this school. Thus, her mentor teacher had to teach grades 1-6 and responsible for all the English-related duties in the school. Also, T1 was tasked with assisting her mentor and teaching all the secondary students. T1 thought that basic technological tools were adequate for the students in this school.

> My mentor teacher is very busy; only one English teacher is not enough. She needs to teach every level of primary students. Although my mentor tries to look after me in teaching, she rarely has free time to advise me. I often help her doing school jobs; I do not have much time to prepare for teaching. At least, I try to use some technology, find interesting pictures and videos for students. I think using the basic technology that the school provided is okay (T1, observation 2).

Consequently, the reasons why the participant from Group 1 did not use technology much was because of the lacking facilities and situation of the English mentor sole teacher in this small school. Also, smartphones were not allowed in class.

Group 2: Competent Users

This group comprised participants in small- (T2 and T3) and medium-sized schools (T4, T5, and T6). They were assessed as being at the same level of SAMR but used more applications. As can be seen from **Table 3**, the participants in group 2 used more teaching tools in the second observation. From the interviews, they shared some common details about using technology in class. Although they knew about other programs to create presentations, they chose the most familiar program because of a lack of time, confidence, and training. PowerPoint and Canva were used depending on the activities in class. When the participants wanted to play hidden pictures games in order to engage the students' attention or check students 'comprehension, PowerPoint was employed. Using custom animation in PowerPoint to create hidden pictures games was categorized as augmentation.

> Sometimes, there is so much work at school, I do not have much time to prepare the teaching. PowerPoint is easy to use; you can use custom animation to order things and objects on slides. So, when I want to play hidden pictures games with students, I choose PowerPoint. I think Google Slides is also good, but I rarely use it. I do not know much about the features in Google Slides. When I create slides using PowerPoint, I do not need to think or learn new functions (T2, observation 1).

> I always use PowerPoint because it's convenient, so I think I am good at using it. I put all the content in PowerPoint, it's clearer than only looking in the book. I think there are no mistakes if I use the program that I am confident with the most. I need to face a lot of school workloads helping my mentor teacher. Using a familiar program saves my time (T3, observation 1).

Beside using PowerPoint in the first observation, in the second observation the participants in this group used Canva to create slide presentations, except T4. Canva was utilized because of its useful and convenient functions; users can search for pictures, photos, or videos directly from Canva. In addition, the templates on Canva are more beautiful and modern. This was deemed to be at the augmentation level.

> Although PowerPoint is safe for me, I think Canva is also good. When I use Canva, I can link to videos from YouTube, Facebook, Instagram; there is no need to download. It's convenient when I do not need to switch to other programs. However, the drawback is I need to control the video carefully; otherwise, the video will be played automatically. So, I have to press stop video first (T3, observation 2).

> My friends in other schools suggested I try Canva; I think the templates and animation on Canva are more beautiful. It's easy and convenient; I can search for pictures in Canva, no need to search in Google (T5, Observation 2).

> I use Canva because there are more templates than PowerPoint; they are also more modern. There are some beautiful animation patterns; I do not need to decorate by myself. That's very good for me to save time; there is always too much workload in school. I do not have much time to prepare teaching. Before the teaching practicum, I was quite familiar with using Canva (T6, observation 2).

The participants from group 2 used game-based learning platforms: Wordwall, Kahoot, and Bamboozle. They stated that these platforms were very useful to make classes more fun, and they also created a competitive atmosphere. Furthermore, they were convenient for letting students know the answers immediately. These technologies were categorized as augmentation. Furthermore, it was found that suggestions and encouragement from supervisors and mentor teachers played an important role in PSTs using technology. They consequently tried to use more tools in class.

> My mentor teacher always suggests things and encourages me to use game-based platforms in class. So, I like using Wordwall in order to check and summarize the contents because it's fun for the students. For Wordwall, there are random bonus rounds for players. My students are in Grade 7; they like competition. When they saw their scores, it was more exciting. I like the atmosphere in my class when my students enjoy playing games. Also, the forms on Wordwall are pre-created; it's ready for teachers to use (T3, observation 2).

> After the first observation, I was encouraged by the advisor to used tools more effectively; I decided to use Wordwall to reviews the previous lesson. There are a variety of games on Wordwall. It's also free. I think Wordwall can be used both at the beginning and at the end of the class to let students practice the lesson. It's convenient that the students know the answers immediately, whether they are correct or incorrect. However, some students have not got their own smartphone; I let them help each other to answer in groups (T4, observation 2).

> I realized that using games in class are important. The previous observation, I let students do paper handouts; they looked bored and sleepy. The advisor asked me to teach and use technological tools more creatively. So, I remember when the teacher at the university let me, and my friends play Kahoot in class; it was very fun and exciting. This time, I let them play Kahoot, they were more active and enthusiastic to answer my questions about the lesson. I think my students love playing Kahoot, and I should find games to use in class more (T6, observation 2).

> After the first observation, my advisor encouraged me to use technological tools more creatively. So, I planned to use more tools that I remember from technological tools training at university. The students pay more attention when I use games at the beginning of the class. I feel that the students have more fun when I let them play games in Bamboozle or randomize something using wheel of name. They look more excited and alert (T2, observation 2).

In showing videos from YouTube to engage students at the beginning of the class, T3, T4, and T6 let students watch and write or memorize words from videos, which can be categorized as substitution. When T5 and T6 asked students to do paper handouts, MS Word was a tool used to show the paper handouts using a projector. They typed answers and interesting things, and they highlighted important points for students to see clearly. They also used useful functions in MS Word, such as correcting words and finding synonyms. This instance of technology integration was rated as augmentation. Google Translate was used by T3 to let students listen how to pronounce each word from Google Translate, then repeat them. Google Translate was thus used at the level of augmentation.

One interesting point is that, although the facilities in class had no problems, and TVs or projectors were available, some participants prefered using tangible materials. For instance, T3 asked students to complete matching paper pictures on the board, while T4 made a tangible paper clock for students to practice telling the time in English. In the interview, the PST stated the following:

> I often let students see vocabulary on the slides; I think it might be amazing if I used paper pictures instead. From my observation, the students like tangible things they can touch and grab. They like the activities that let them come in front of the class and choose tangible materials (T3, observation 2).

> I think the students will have more fun if they practice telling the time and setting the clock by themselves. A tangible clock is good material; they can also play with it with friends (T4, observation 2).

Group 3: Expert User

Group 3 comprises the participant who developed in terms of SAMR. T7 was in this group; he had access to fewer facilities. There was only a TV in his class, but he tried his best to integrate technology into his teaching. There was no wi-fi; therefore, T7 need to use his own Internet and sometimes share his wi-fi with his students. Three technological tools were used by T7: Keynote, Kahoot, and Google Translate. In making presentations, Keynote was utilized, and it was only used to make presentations. All of his devices were Apple products, namely his smartphone, iPad and MacBook. Although T7 did not use many programs for teaching, he used his tools creatively. In the first observation, T7 let students practice listening in class by listening to the audio, which was recorded from Google Translate. The audio tracks were inserted in the keynote slide, thus, this was categorized as augmentation. In the second observation, T7 used his iPad as a remote control. Thus, he could walk around the classroom, and there was no need to control the slides from his MacBook in front of the class. In order to check his students' understanding, he used iPad to take photos of some students' answers and sometimes asked them to write on his iPad and displayed it on the screen. There was thus development of SAMR; this technology was categorized as modification.

> I think teachers need to have enough equipment when teaching. For me, all of my devices are Apple products; I can sync everything. It is quite easy when I want to insert some files from the Internet into Keynote (T7, observation 1).

> After the first observation, my supervisor encouraged me to use tools more creatively. So, this time I used my iPad as a remote control to control slides. I do not need to stand only in front of the class. Moreover, I think the students pay more attention to class when I ask them to write on my iPad. Sometimes, I just take photos of students' answers and show them on TV; it's fast and convenient. They look like they're having fun and enjoy studying in my class. That motivates me a lot to use technological tools like this (T7, observation 2).

It can be seen that T7 had a positive attitude towards technology integration. However, for teachers to use more technology, it is necessary for them to first have adequate equipment. Moreover, motivation is an important factor, which affected how teachers uses technology. In addition, T7 thinks that using familiar platform like Kahoot, used as augmentation, was suitable for students.

> The students are quite familiar with Kahoot, so they can use this platform quickly. Furthermore, I used to see a computer teacher use Kahoot with students. So, I am quite sure that there is no problem. For Kahoot, it's easy and interesting for students. There are characters, which they can dress or decorate according to their chosen style. When I ask students to play Kahoot, they share one smartphone between two students. Some students do not have the Internet for their smartphones. I share my hotspot Wi-Fi (T7, observation 2).

One interesting factor, which affected the teacher's use of technology was his mentor teacher, who he mentioned in the interview. A lot of valuable advice from his mentor teacher was beneficial to his teaching.

> My mentor teacher often comes to see my class; she always suggests I try a variety of tools. I think her advice is very helpful and makes me want to teach more creatively. In addition, she asked me to observe her teaching and apply some activities to my class. She said that we are not in the past, we are modern teachers. We have to use technology with our students (T7, observation 2).

DISCUSSION AND CONCLUSIONS

According to the findings of this study, all the participants integrated technological tools in their classrooms. The results were consistent with several studies, which indicated that teachers regularly implemented technology in their teaching (Alonso et al., 2019; Canbay, 2020; Liu et al., 2018; McGarr & Gallchóir, 2020; Schmid et al., 2021; Taghizadeh & Hasani Yourdshahi, 2020).

The technological tools they used, and the number of tools were different. These tools were used for four purposes: engaging students, checking comprehension, creating teaching content, and evaluating students' understanding. Applying SAMR model, the participants were categorized into three groups according to the level of technological tools used. One participant in the substitution stage, five were in the augmentation stage, and only one was in the modification stage. The results were consistent with the findings of Budiman and Rahmawati, Khalidi (2021), Tseng (2019), and Ulfa (2018), who found that teachers mostly integrate technology at a lower level (substitution and augmentation). The possible reasons why PSTs tended to implement technology at the enhancement level were the lack of facilities, the lack of time, and their level of familiarity with technological tools.

Technology availability was a necessary factor for teachers to use technology. This could be seen in T1's class, which was classified at the substitution level. If smartphones were allowed in class for learning, the teacher might create more creative activities using more applications. Another reason was the lack of time; PSTs encountered a huge school workload. This indicates that the number of teachers in small- and medium-sized schools was insufficient. In order to implement technological tools at a higher level, it was necessary for teachers to have adequate time to prepare effective lesson plans. Regarding familiarity with technological tools, it can be seen that the participants did not use a variety of technological tools; they tended to use familiar tools, which were easy and convenient. These findings are similar to those of Ranellucci et al. (2020), who reported that the ease of use and usefulness of technological tools significantly influenced how PSTs adopted technology. Despite the fact that PSTs were digital natives and knew many applications, they did not know many of their functions or how to use them efficiently. This implies that PSTs need to be trained more in the functions of technological tools and how to apply them in actual classrooms. They might then be able to integrate technology at the transformation level. Therefore, familiarity with technological tools was one critical factor for teachers to effectively integrate technology in teaching. In contrast, when Warsen and Vandermolen (2020) examined the extent to which individual computing devices enhanced the learning experience of 500 students in grades six to twelve in the United States, they discovered that 86% were using them at the higher levels of SAMR model, i.e., modification or redefinition. It can be assumed that technology availability supports teaching and learning; it can increase efficiency and create engagement in classroom. When every student has their own device, it is easier for them to learn or do tasks. Moreover, it can create a competitive atmosphere when students are asked to play games in class individually.

Jenkins (2021) similarly found that teachers implemented technology at the substitution and augmentation levels of SAMR more frequently, and seldom integrated technology at the modification and redefinition levels. In the present study, only one participant was at the modification stage. According to the results, teacher

motivation was a significant factor, which affected PSTs in integrating technology into the classroom. The participants mentioned that encouragement from advisors and mentor teachers can motivate them to implement technological tools more effectively. For PSTs who were new in school and had no teaching experience, these suggestions and words of encouragement were very significant and helpful. If advisors and mentor teachers frequently provide guidance and care as well as support to PSTs, their teaching will be more efficient. For this reason, such encouragement was one beneficial factor for supporting PSTs in technology integration.

In this study, one participant reached the modification stage. T7 was in the school with the fewest facilities. However, he had a positive attitude towards using technology in class. T7 put in effort and tried his best to integrate as much technology as possible. This result was comparable to that of Boonmoh et al. (2022), who discovered that teachers in the small schools seemed to have made more effort in using technology and had more positive attitudes towards technology use for educational purposes. Moya and Serrano (2022) claimed that when teachers integrate technology, it can motivate them and enable them to be more creative in teaching the language. In addition, motivation derived from the students was a factor in teachers using technological tools more creatively. This suggests that the more students enjoyed learning in class, the more teachers wanted to develop their teaching so that it was more interesting. Ciampa and Gallagher (2013) similarly stated that using technology can increase student engagement and their motivation to learn.

Lastly, it is a fact that technology currently plays a significant role in teaching and learning. Nevertheless, in some contexts, technological tools are not provided, or students do not have smartphones, so tangible materials are necessary. It could be seen in T3's and T4's class that tangible materials are still useful and sometimes these materials can grab students' attention as well. This indicates that PSTs should be trained to apply both technological tools and tangible materials in their teaching. In summary, PSTs mostly integrated technology at the level of substitution and augmentation. Teacher motivation and the availability of ICT equipment, as well as familiarity with technological tools were significant factors for PSTs to integrate technology into the classroom.

Pedagogical Implications

The findings of the study suggest the following pedagogical implications for English education programs. Before the teaching practicum, PSTs should be trained in how to use technological tools and applications more effectively. They need to learn useful functions and teaching techniques as well as how to apply technological tools and applications in each stage of teaching. Next, in the English Teaching Methodology course, technology integration should be emphasized in order to let PSTs practice applying these tools in teaching practice more efficiently. If PSTs frequently use technological tools and they are more familiar with these tools, it is possible that they will incorporate technology at a higher level. Later on, in order to select appropriate schools for the teaching practicum, a survey should investigate the facilities provided in schools. Moreover, during the practicum, advisors should encourage PSTs to integrate technology more effectively and creatively. Advisors should convey the fruits of their teaching experience and provide helpful suggestions in implementing technology in class. Finally, SAMR model should be introduced to PSTs in order to let them critically reflect on and develop their own technology integration.

Limitations of the Study

The present study was conducted with a small group of participants from a single university in Thailand covering a small number of provinces, likely affecting the criterion of generalizability. Furthermore, observations were conducted only twice; hence, the data obtained might not be sufficient to indicate the highest level of SAMR that each participant could reach. Therefore, further research should be conducted with larger samples in different provinces in different countries to obtain a better understanding of PSTs' technology integration according to SAMR model.

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