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Enhancing Active Grammar Learning in a Synchronous Online EFL Undergraduate Classroom: Development and Assessment of the LPCR Online Instructional Model

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Abstract

In synchronous online EFL classrooms, students often exhibit passive participation and boredom when learning grammar. This research study presents the development of an online active grammar learning instructional model, named LPCR, which incorporates Byrne's Presentation-Practice-Production (PPP) approach and Fink's holistic view of active learning. LPCR was employed as an eclectic approach for teaching grammar and utilized four online applications in a synchronous online classroom. The study involved 40 second-year nursing students enrolled in an EFL undergraduate course at a public university in Thailand from January to April 2022. The effectiveness of LPCR was assessed through a grammar test, a questionnaire, and semi-structured interviews. The students' grammar scores were analyzed using the Paired Samples t-Test and Cohen's d, which revealed the positive effect of LPCR with a medium effect size. Also, students' attitudes toward LPCR were assessed through a seven-point Likert-scale questionnaire and semi-structured interviews, employing the Technology Acceptance Model (TAM) as the theoretical framework. The results indicated that, on average, students considered LPCR useful and easy to use, and they had positive attitudes toward using LPCR and behavioral intention to use it. Additionally, the results of a path analysis with the students' questionnaire responses showed both significant and non-significant direct and indirect effects of the four TAM variables: perceived usefulness, perceived ease of use, attitude toward use, and behavioral intention to use. Pedagogical and research implications are drawn from the findings, and recommendations for implementing LPCR in future instances of English grammar instruction in synchronous online classrooms are offered.

INTRODUCTION

English serves as a lingua franca in many countries, including Thailand, where English is used as a foreign language. In English language learning, learners need to master four skills of English (i.e., reading, writing, listening, and speaking). In order to do so, apart from vocabulary, they need grammar skills as a foundation (Asifayanti et al., 2021; Wilkins, 1972). For years, in teaching grammar to English as a second language (ESL) and English as a foreign language (EFL) students,

teachers have depended on the grammar translation method and audiolingual method, both which are replete with drills and practices (Baleghizadeh & Oladrostan, 2011). Consequently, learners have perceived learning grammar as boring and monotonous (Jean & Simard, 2011). However, grammar learning should be fun and provide students with opportunities to actively engage in the process in order for them to attain better results (Baleghizadeh & Oladrostan, 2011). In the current technology-reliant era, the teaching of the English language, including grammar instruction, cannot shy away from its use, especially once technology's importance in an educational context was demonstrated during the COVID-19 pandemic, when physical social distancing was strictly applied to everyone, everywhere (Sobaih et al., 2020). When the "stay home and stop the virus for our nation" campaign was launched by the Thai government on March 17, 2020 (Patcharanaruamol et al., 2020), academic institutions at every educational level immediately shifted instruction from face-to-face (F2F) classrooms to online ones (Chang, 2020). To maintain the activities of schools and universities during the pandemic, computer-based technology was required and became a mandatory component of education in one form or another (Coman et al., 2020; Radha et al., 2020), and synchronous online classroom (SOC) became a necessary alternative for many learning contexts.

In an SOC, where learning and teaching occur simultaneously in real time, and students and teachers participate in online sessions from different locations, teachers have the capability to teach and communicate with students in real time using online conferencing applications (Memari, 2020). However, maintaining students' attention and engagement via a computer monitor presents challenges due to various limitations and obstacles, such as technical issues, the absence of a physical classroom environment, and reduced interaction opportunities (Watanapokakul, 2022). Nevertheless, e-learning, the delivery of learning through digital resources, offers opportunities for active learning online (Lee et al., 2019), and both synchronous and asynchronous e-learning modes have been shown to significantly enhance students' grammar knowledge (Memari, 2020). Although there are numerous methods, approaches, and techniques for teaching grammar, including in the online mode, there is no single best way to teach grammar, as each has its own strengths and weaknesses (Richards & Renandya, 2002). In recognizing the absence of a singularly superior method, an eclectic approach–a combination of various teaching methodologies–(Rivers, 1981) was employed to develop an online active grammar learning instructional model from an integration of Presentation-Practice-Production (PPP) (Byrne 1986) and the holistic view of active learning (Fink, 2003), executed with four online applications. This model was introduced as the "new normal" instruction method in an EFL synchronous online classroom at a public university in Thailand in 2021, aiming to enhance students' grammar proficiency, facilitate active learning, and promote interaction and engagement during the COVID-19 pandemic, when the learning process was met with numerous challenges.

After implementing this instructional model to teach grammar in an SOC at a public university in Thailand in 2021, classroom observations and semi-structured interviews were administered. The effectiveness of the model and students' attitudes toward its use were of particular interest, and empirical evidence was collected to determine them. After some instructional modifications, the model was subsequently utilized for teaching grammar in an SOC for second-year students at a public university in Thailand in 2022, and its effectiveness was assessed in this follow-up

study. Furthermore, the importance of students' attitudes toward the model could not be overlooked. Based on TAM or the Technology Acceptance Model (Davis et al., 1989), technology users' attitudes toward use (A), as influenced by perceived usefulness (U) and perceived ease of use (E), can impact their behavioral intention to use (BI) the technology. Hence, this follow-up study also explored students' attitudes toward this instructional model based on TAM and investigated the relationships and impacts of the four variables of the model.

LITERATURE REVIEW

This literature review consists of three parts. The first part relates to teaching grammar. The second part discusses the development of an active learning instructional model for teaching grammar in an SOC. The third part pertains to attitudes based on TAM (Davis et al., 1989).

1. Teaching grammar

Grammar is "a system of lexicogrammatical patterns that are used to make meaning in appropriate ways" (Larsen-Freeman, 2014, p. 258). Grammar is important for language users as grammar skills can assist learners in organizing words for effective communication through four skills, like building better sentences in speaking and writing and performing well in listening, speaking, reading, and writing (Asifayanti et al., 2021; Ellis, 2006; Mart, 2013; Phuwarat & Boonchukusol, 2020). "Without grammar, we would have only individual words or sounds, pictures, and body expressions to communicate meaning" (Azar, 2007, p. 2).

In ESL and EFL pedagogy, teaching grammar is essential since it can contribute to second and foreign language learning achievement (Azar, 2007; Larsen-Freeman, 2014; Richards & Renandya, 2002). In the literature, there are two core approaches in grammar teaching depending on how grammar rules are presented: deductive and inductive (Chalipa, 2013; Nešić & Hamidović, 2015; Widodo, 2006). A deductive approach is a rule-driven approach, in which learners are provided with the presentation of a general rule; this is followed by learners applying the rule to some language examples and honing their use of the rule through practice exercises (Thornbury, 1999). Although the deductive approach is teacher-centered and not engaging (Obeidat & Alomari, 2020), it helps a teacher to get straight to the grammar point, which can save time in the classroom, as grammar rules are directly, simply, and quickly explained without asking the students to try to infer the rules from examples (Thornbury, 1999). In contrast, an inductive approach starts with some examples, and the teacher asks the students to notice something from them in order to infer the grammar rules from these provided examples (Obeidat & Alomari, 2020; Thornbury, 1999). It is said that the inductive approach is much more student-centered, and allows learners to use noticing strategies to derive rules of grammar (Chalipa, 2013). However, the inductive approach of teaching English grammar is time- and energy-consuming, and students may also infer the wrong rules from the examples, or students' version of the rules may be either too broad or too narrow in application (Widodo, 2006).

2. Development of an active learning instructional model for teaching grammar in an SOC

There are many grammar teaching methods, approaches, and techniques, ranging from the Grammar Translation Method to Communicative Language Teaching (Azar, 2007; Larsen-Freeman, 2014; Richards & Renandya, 2002; Richards & Rodgers, 2001; Thornbury, 1999). Teachers may not be able to teach grammar effectively by using only a single method, approach, or technique, as there is no single best method for grammar instruction (Richards & Renandya, 2002). Therefore, an eclectic approach (Rivers, 1981) can help by integrating methods, approaches, and techniques suitable for learners to learn grammar more effectively (Rao, 2018).

After reviewing the literature, PPP (Byrne, 1986) and the holistic view of active learning (Fink, 2003) were employed for developing an active learning instructional model for teaching grammar in an SOC. PPP is one of the most useful approaches for teaching grammar as it provides clear and direct instruction (Lasmiatun & Munir, 2018). Meanwhile, active learning can enhance students' learning and participation (Fink, 2003). Therefore, these would seem to be the best approaches to integrate in order to create an appropriate learning environment in an SOC.

2.1 PPP

Presentation, Practice, and Production (PPP) (Byrne, 1986), while not an instructional methodology per se, is a paradigm for structuring language lessons that involves the introduction and practice of new language features (Swan, 2005). Based on behaviorist theory, which asserts that learning a language is just like learning any other skill, PPP starts with a classic deductive approach with grammar rules being explicitly introduced in the Presentation stage (Maftoon & Sarem, 2012) before having learners practice to automatize the behavior (Ur, 1996). The high degree of teacher control in Presentation and Practice reduces as the instruction proceeds, permitting learners to gradually shift away from the teacher's support to more autonomous Production (Anderson, 2016; Maftoon & Sarem, 2012; Ur, 1996).

PPP is a well-known form-based approach and has been effectively used in the teaching of language, especially the grammar component of it (Li, 2020), due to its benefits for both teachers and students. In a PPP classroom, the role of the teacher is very direct and clear, and the teacher can control and manage the pace of the lesson easily (Lasmiatun & Munir, 2018). For students, apart from its effectiveness in improving different aspects of their language ability, such as their grammar (Hellström, 2015), PPP offers a clear model of instruction and makes the learning materials easier to understand (Astria, 2016). However, PPP has been deemed teacher-centered and offers limited student engagement (Li, 2020), and if used repeatedly, it can bore students, especially students with higher language proficiency.

2.2 Active learning

Bonwell and Eison (1991, p. 2) define active learning as "anything that involves students in doing things and thinking about the things they are doing". Chickering and Gamson (1987) advocated for active learning and consider it a good practice for effective learning. The application

of more active instructional methods has been shown to result in increased student learning and improved retention (Bonwell & Eison, 1991; Fink, 2003). Thus, it may be argued that students should be offered an active learning experience rather than merely sitting in a class participating and practicing nothing. Building on the definition of active learning from Bonwell and Eison (1991), Fink (2003) introduced three integral components to be used directly or indirectly in an activity to create active learning (as illustrated in Figure 1): information and ideas, experiences, and reflecting. Previous studies in EFL contexts have demonstrated the positive impact of Fink's holistic view of active learning on enhancing English language achievement, improving performance, increasing learning engagement, and cultivating active, enjoyable, and collaborative learning environments, as well as how it is associated with more favorable learning attitudes and heightened motivation among students (Caine, 2020; Saiphet, 2018; Seemanath & Watanapokakul, 2024; Watanapokakul, 2011; Yusuk, 2021).

Figure 1 A holistic view of active learning (Fink, 2003, p. 107)

2.3 Use of online applications for teaching and learning

In 21st century education, the role of technology cannot be ignored, especially in the learning and teaching process. Nowadays, numerous educational digital tools, such as online applications, have been developed to facilitate effective and sustainable English language learning and teaching (Al-Malki, 2020), and many of them are free of charge. These online applications can be seamlessly integrated into English instruction to improve the instruction and enhance the overall learning experience, fostering greater engagement and motivation among learners (Bikowski, 2018; Girik Allo, 2020; Røkenes & Krumsvik, 2016). Table 1, adapted from Pyper's classification system (2021), provides examples of online applications for learning and teaching, categorized based on their educational purposes, with some falling into more than one category.

Table 1

Examples of online applications for learning and teaching (Adapted from Pyper, 2021)

Educational Purposes	Online Applications
Backchanneling and Polling	*AnswerGarden, Backchannel Chat, Chatzy, Google Forms, Mentimeter, Padlet, Poll Everywhere, Slido, Socrative, Tricider, Twitter, Wooclap, YoTeachApp*
Collaboration	*Actively Learn, Creately, Edji, Flipgrid, Google Docs, Google Jamboard, Google Keep, Google Slides, GooseChase, Kanbanchi, Miro, MoocNote, Padlet, Trello, Wakelet, Whiteboard.chat, VoiceThread*
Formative Assessment	*Actively Learn, AnswerGarden, Classkick, Flipgrid, Formative, GimKit, Google Forms, GooseChase, Kahoot, Nearpod, Plickers, Quizalize, Quizizz, Quizlet, Socrative, Spiral, The Answer Pad, Triventy*
Games	*Crossword Puzzle, Deck.Toys, Educaplay, Factile, Flashcard Stash, Flippity, GimKit, GooseChase, Hooda Math, Illuminations, Jeopardy Labs, Jeopardy Template, Kahoot, LearningApps.org, PlayingCards.io, Quia, Quizizz, Quizlet, Seterra, Socrative, Triventy, Wheel Decide, Word Search, Wordwall*
Interactive Lessons	*Actively Learn, Blendspace, Classkick, Deck.Toys, EdPuzzle, EverFi, Google Jamboard, Nearpod, Pear Deck, PlayPosit, Symbaloo Learning Paths, Timelinely, VoiceThread, Whiteboard.chat*
Interactive Whiteboards	*Chrome Canvas, Google Jamboard, Microsoft Whiteboard App, Miro, Mural, Whiteboard.fi, Whiteboard.chat*
Presentation	*Adobe Spark, Book Creator, Buncee, Canva, Circly, Classroomscreen, Flipgrid, Google Slides, Nearpod, Pear Deck, PowToon, Prezi, SlideDog, SlidesCarnival, Slidesgo, SlidesMania*

The importance of these technologies in education is undeniable. In an online classroom, however, these technologies are both fundamental and supplemental to the learning process.

2.4 Development of LPCR

Based on the characteristics of the key components mentioned above, an online active learning instructional model for teaching grammar via four online applications in an SOC was developed. This instructional model, named LPCR (Learning via a lecture-Practicing-Creating sentences-Reflecting), is visually presented in Figure 2.

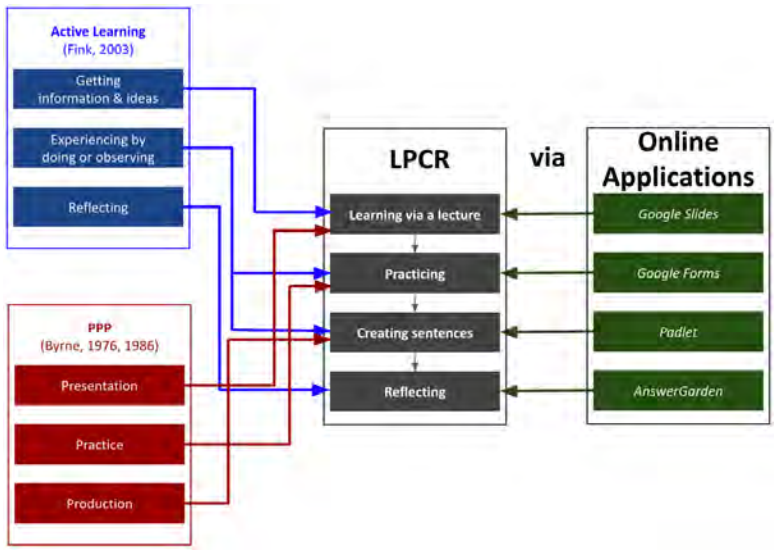

Figure 2 Development of LPCR

LPCR integrates components from the holistic view of active learning (Fink, 2003) and PPP (Byrne, 1986), resulting in a four-step instructional model designed for implementation through four online applications for teaching grammar in a one-hour session in an SOC.

The first step, **Learning via a lecture**, is drawn from the "Getting information and ideas" component of Fink's active learning and the "Presentation" component of PPP. In this phase, students engage with a 10-to-15-minute lecture on grammar using *Google Slides* (https://docs.google.com/presentation), a free online slideshow maker.

Following the lecture, the second step is **Practicing** grammar through a series of exercises delivered via *Google Forms* (https://docs.google.com/forms), a free online application for creating and distributing surveys and quizzes. This step aligns with Fink's "Experiencing by doing and observing" and the "Practice" portion of PPP. This practice session also takes 10 to 15 minutes.

In the third step, **Creating sentences**, students apply their acquired grammar knowledge by constructing sentences through a free online post-it wall called *Padlet* (https://padlet.com), which takes 15 to 20 minutes. This step is influenced by Fink's "Experiencing by doing and observing" and the "Production" portion of PPP.

Finally, in **Reflecting** on the learned grammar point through *AnswerGarden* (https://answergarden.ch), a free online tool for eliciting short text-based feedback, students dedicate 5 to 10 minutes to this step, which aligns with Fink's "Reflecting" component.

3. Attitudes toward use of technology

According to Lubis (2015, p. 18), "language attitude studies explore how people react to language interactions and how they evaluate others based on the language behavior they observed." In language learning, apart from intellectual capacity, learner attitude plays a crucial role since it can influence a learner's failure or success (Fakeye, 2010; Lambert, 1987). Therefore, in an ESL or EFL classroom, teachers must not disregard or dismiss the significance of students' attitudes. According to Bacon (2016), the effectiveness of learning and teaching should be assessed through not only actual learning (measurable knowledge change through rigorous assessments), but also perceived learning (a student's self-reported perception of knowledge gain through reflection and introspection). Thus, in an ESL or EFL classroom, teachers should take both students' scores and their attitudes into consideration.

When technology is integrated into learning and teaching, it becomes essential to consider students' attitudes toward the technology in use. Davis (1989) developed the Technology Acceptance Model (TAM) to identify the factors that influence users' acceptance or rejection of information technology. Adapted from TAM (Davis et al., 1989, p. 985), Figure 3 posits that perceived usefulness (U) and perceived ease of use (E) serve as "antecedents" to attitude toward use (A), which can later lead to behavioral intention to use technology (BI). Moreover, E has a direct impact on U, and U also has a direct effect on BI.

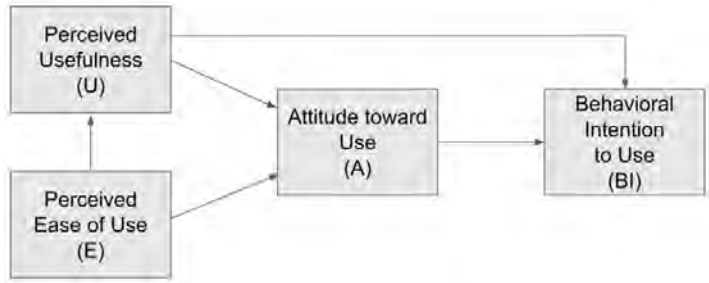

Figure 3 Technology Acceptance Model (TAM) (Adapted from Davis et al., 1989, p. 985)

Perceived usefulness (U) of a particular technology refers to the degree to which a user thinks that implementing the technology can improve his/her performance or productivity (Davis, 1989). U has a significant influence on users' A (Davis et al., 1989; Teo, 2012). In other words, when users perceive that a technology is useful, they tend to have positive attitudes toward it (Davis et al., 1989; Teo, 2016).

Perceived ease of use (E) is the extent to which a user perceives that using a particular technological system is effortless. E has a significant relationship with and influence on users' attitude toward use of technology (Teo, 2010). Essentially, when a technology is easy to use, it fosters positive feelings among users. In contrast, if users find a technology difficult to use, they may explore other alternatives or stick with what is familiar (Davis, 1989).

Attitude toward use (A) is the extent of a user's positive feelings when using technology (Teo, 2019). Positive attitudes toward technology are influenced by two main factors: perceived usefulness and perceived ease of use. If a user perceives a technology as both useful and easy to use, the user is more likely to maintain a positive attitude, which can lead to a strong behavioral intention to use (BI) of the technology (Davis et al., 1989; Teo, 2019).

Research questions

1. To what extent can LPCR enhance the students' grammar proficiency when it is used for learning grammar in an SOC?
2. When LPCR is used for learning grammar in an SOC, what are the students' attitudes toward it, based on the four variables of TAM?
3. What are the effects of the four TAM variables on LPCR?

Research hypotheses

Based on the literature review, three main hypotheses were identified in order to answer the research questions:

1. On average, the students' grammar posttest scores are significantly higher than their pretest scores.

2. Due to the four TAM variables, there are four sub-hypotheses as follows:
   2.1 On average, the students perceive LPCR to be useful.
   2.2 On average, the students perceive LPCR to be easy to use.
   2.3 On average, the students have positive attitudes toward use of LPCR.
   2.4 On average, the students have behavioral intention to use LPCR.

3. Based on TAM of LPCR, there are ten sub-hypotheses as follows:
   3.1 U has a significant direct effect on A.
   3.2 E has a significant direct effect on A.
   3.3 A has a significant direct effect on BI.
   3.4 U has a significant direct effect on BI.
   3.5 E has a significant direct effect on BI.
   3.6 E has a significant direct effect on U.
   3.7 U has a significant indirect effect on BI when A acts as a mediator.
   3.8 E has a significant indirect effect on BI when A acts as a mediator.
   3.9 E has a significant indirect effect on BI when U acts as a mediator.
   3.10 E has a significant indirect effect on BI when U and A act as mediators.

METHODOLOGY

This is mixed methods research, which collects and utilizes both quantitative and qualitative data. The students' pretest and posttest scores were used in a one-group pretest-posttest quasi-experimental design to assess the effectiveness of LPCR in learning grammar in an SOC. Additionally, based on TAM, students' responses from questionnaires and semi-structured interviews were analyzed to assess students' attitudes toward LPCR and the direct and indirect effects among the four variables of TAM.

1. Participants

There were 40 second-year students from the Faculty of Nursing enrolled in one class of the *Reading and Writing English for Communication* course during the second semester of the academic year 2021 (January-May 2022) at a public university in Thailand. All of the students (38 female, 1 male, and 1 unspecified) willingly volunteered to be part of the study.

All of the participants were aged 18 or older. The proposal for this research was submitted for approval to the Central Institutional Review Board of the university, where the study was conducted, to ensure the rights and well-being of the research participants. The board granted approval to the study.

2. Implementation of LPCR in an EFL course

Due to the spread of COVID-19 during the study period, the *Reading and Writing English for Communication* course was delivered entirely through synchronous online instruction, with a focus on enhancing students' English reading and writing skills for communication. The course

spanned 15 weeks, during which students attended a total of 15 three-hour lessons, each divided into three sessions: grammar, reading, and writing. For the grammar session, 15 grammar points (shown in Table 2) were drawn from the reading and writing lessons and classified into 10 categories. Although capitalization is part of writing mechanics, in this study, it is included in the 10 categories of grammar points taught to the students since it helps convey information and can affect sentence interpretation and accuracy (Diasamidze, 2019).

Table 2

Grammar points drawn from the reading and writing lessons

Categories	Grammar Points
1. Noun	- Articles and quantifiers - Countable and uncountable nouns
2. Pronoun	- Pronoun references
3. Verb	- Subject-verb agreement - Verb tenses - Active and passive voices - Verb forms
4. Modifier	- Adjectives - Adverbs
5. Preposition	- Preposition usage and collocation
6. Conjunction	- Conjunction usage
7. Word choice	- Word choices
8. Word order	- Word orders
9. Sentence problems	- Sentence problems (i.e., fragments, run-ons, comma splices, and parallelism)
10. Capitalization	- Capitalization

3. Research instruments

Three main research instruments were used in the study: an online grammar test, a student online questionnaire, and semi-structured interview questions.

The online grammar test, used for assessing the students' grammar proficiency, was administered through *Google Forms*, and served as both a pretest and a posttest. It contained 30 error identification items, corresponding to the 15 grammar points taught during the course, as shown in Table 2. There were two test items for each grammar point. Each test item included a sentence composed of 15 to 25 words. The students had to perform two tasks for each test item: (1) choosing A, B, C, or, D, one of which contained a grammatical error worth 1 point and (2) correcting the grammatical error by typing the correction into the provided blank (also worth 1 point). The maximum score attainable on the grammar test was 60. Below is a sample grammar test item.

Directions: In each item, 1. choose A, B, C, or D that contains a grammatical error; and
2. correct the grammatical error in the blank provided.

I am (A) indebted to many people who (B) substantially provided me (C) with comments, (D) suggests, and revisions.

Answer: D (suggestions)

The student online questionnaire comprised six parts. Part 1 had seven closed-ended questions asking for participants' demographic information and their attitudes toward English language and grammar learning. Part 2 consisted of six closed-ended questions aimed at gauging respondents' attitudes toward learning English grammar, both in general and in an SOC. Parts 3 to 6, designed based on the four main variables of Davis et al. (1989)'s TAM, consisted of eight, five, four, and four questions, respectively. These sections, intended to assess the students' attitudes regarding perceived usefulness (U), perceived ease of use (E), attitude toward use (A), and behavioral intention to use (BI) of LPCR, used a seven-point Likert scale ranging from 1 (Extremely unlikely) to 7 (Extremely likely), which Davis (1989), Khamaruddin et al. (2017), and Teo (2019) used in their studies to determine technology users' attitudes based on the TAM variables.

The semi-structured interview questions were developed in line with the questionnaire to elicit students' in-depth attitudes toward LPCR for learning grammar in an SOC. There was a total of 15 questions:

1. What are your thoughts on learning English grammar?
2. How do you feel about learning English grammar in an SOC? (Is it different from learning English grammar in an F2F classroom? Why or why not?)
3. What do you think about the four steps of LPCR (Learning via a lecture-Practicing-Creating sentences-Reflecting) for learning grammar in an SOC?
4. What do you think about using LPCR to learn grammar in an SOC?
5. What do you think about using LPCR to learn grammar in an SOC during the COVID-19 situation?
6. Do you find LPCR useful for learning grammar in an SOC? Why or why not?
7. Is LPCR easy to use for learning grammar in an SOC? Why or why not?
8. Do you like studying grammar through LPCR in an SOC? Why or why not?
9. How does the usefulness of LPCR impact your attitudes toward use and behavioral intention to use it for learning grammar in an SOC?
10. How does the ease of use of LPCR impact your attitudes toward use and behavioral intention to use it for learning grammar in an SOC?
11. How does your attitude toward use of LPCR impact your behavioral intention to use it for learning grammar in an SOC?
12. How does the ease of use of LPCR impact its usefulness for learning grammar in an SOC?
13. When the COVID-19 situation improves, and you have the option to study in F2F classrooms, would you prefer to learn grammar in an SOC using LPCR? Why or why not?
14. From your experience, what do you consider to be the strengths of LPCR for learning grammar in an SOC?
15. From your experience, what do you perceive as the weaknesses of LPCR for learning grammar in an SOC?

All of the research instruments underwent validation by three experts in the field of English Language Teaching, using the index of item-objective congruence (IOC) (Rovinelli & Hambleton, 1977)–a process by which content experts rate each item or question based on how effectively it measures specific purposes listed by the developer. The IOC values of the grammar test, the

questionnaire, and the interview questions were 0.82, 0.83, and 0.91, respectively, indicating that the research instruments had valid objectives (Turner & Carlson, 2003). After that, a pilot study was conducted with a group of 39 second-year nursing students during the second semester of the academic year 2020. Cronbach's alpha coefficient was used to assess the internal consistency of the grammar test and the questionnaire, resulting in coefficients of 0.74 and 0.94, respectively. These values demonstrate acceptable and excellent levels of internal consistency and reliability, respectively (George & Mallery, 2003, as cited in Wadkar et al., 2016, p. 116).

4. Data collection

Due to the COVID-19 situation, the *Reading and Writing English for Communication* course was conducted online via *Zoom*, an online conferencing platform, and accordingly, data collection for the study was also carried out online. Before commencing the study, all participants were informed about the research and their rights while it was being run, and they had the option to withdraw at any time if they felt uncomfortable participating. Consent forms were administered online. The data collection process was anonymous, and participant responses were kept confidential and later destroyed upon completion of the study.

At the beginning of the semester, the students were asked to do the online grammar test through *Google Forms* within a 40-minute time frame during their first class. The test served as the pretest, and the scores were collected and retained for analysis.

After receiving grammar instruction with LPCR in an SOC throughout the semester, the students were asked to do the same online grammar test as the posttest. The test item sequences were randomly shuffled with a feature offered by *Google Forms*. Additionally, students were given an online questionnaire through *Google Forms* to elicit their attitudes toward the use of LPCR for learning grammar in an SOC. Before concluding the online questionnaire, the students were presented with the option to participate in a semi-structured interview. Eight students (20%) were randomly selected from the volunteer list for interviews conducted through *Zoom*. Each individual interview lasted approximately 20 to 30 minutes and was conducted in Thai to avoid any language barriers. The interviews were audio-recorded for further analysis.

5. Data analysis

Both quantitative data, in the form of test scores and responses from questionnaires, and qualitative data from interviews were collected in this study. The Paired Samples *t*-Test and Cohen's *d* were employed to analyze and compare the students' pretest and posttest scores. Descriptive statistics were used to quantitatively analyze the responses from the 40 questionnaires, using frequency and percentage for Parts 1 and 2 of the questionnaires as well as mean (*M*) and standard deviation (*SD*) for Parts 3 to 6. The interpretation of the 7-point Likert-scale questions on the questionnaire was based on intervals and descriptions adapted from Pimentel (2019, p. 189), as shown in Table 3. Moreover, Mplus Version 8.8, a statistical modeling program, was used for path analysis of the questionnaire responses to examine and quantify the direct and indirect effects of the TAM variables (namely, U, E, A, and BI).

Thematic analysis was also employed to analyze the responses from the semi-structured interviews to "identify patterns within and across data in relation to participants' lived experiences, views and perspectives, and behavior and practices" (Clarke & Braun, 2017, p. 297).

Table 3

Likert scale values, intervals, description, and interpretation of the seven-point Likert-scale questionnaire (Adapted from Pimentel, 2019, p. 189)

Likert Scale Values	Intervals	Descriptions	Interpretations
7	6.16 - 7.00	Extremely likely	Very high
6	5.30 - 6.15	Quite likely	Rather high
5	4.44 - 5.29	Slightly likely	High
4	3.58 - 4.43	Neither	Neutral
3	2.72 - 3.57	Slightly unlikely	Low
2	1.86 - 2.71	Quite unlikely	Rather low
1	1.00 - 1.85	Extremely unlikely	Very low

FINDINGS

The findings from both quantitative and qualitative data will be presented in three parts, aligned with the three previously-mentioned research questions and the set hypotheses.

1. Students' grammar proficiency

Table 4

Findings from Paired Samples *t*-Test and Cohen's *d*

	N	Min	Max	*M*	*SD*	*t*	df	*p* (1-tailed)	Cohen's *d*
Pre-test	40	6	20	11.75	3.61	-4.313	39	.000	0.682
Post-test	40	8	47	18.53	9.10				

The findings from the Paired Samples *t*-Test and Cohen's *d* analysis, as presented in Table 4, indicate that the students' average score on the grammar posttest (M = 18.53, SD = 9.10) was significantly higher than that on the pretest (M = 11.75, SD = 3.61); $t(39) = 4.313$, $p < .001$. A p-value is reported in line with the set hypothesis, and the null hypothesis (H0) was rejected. This suggests that, on average, the students' grammar proficiency showed a significant improvement after learning grammar through LPCR in an SOC compared to their grammar proficiency before being exposed to LPCR. Regarding the effect size of the LPCR treatment, the calculated Cohen's d was 0.682, indicating a medium effect size (Cohen, 1992; Sawilowsky, 2009). This suggests that, on average, students initially ranked in the 50th percentile before receiving the treatment and subsequently moved to the 73rd percentile after the treatment. In other words, their grammar proficiency improved by approximately 23 percentile ranks (Becker, 2000), suggesting the effectiveness of LPCR in improving the students' actual learning of grammar.

2. Students' attitudes toward LPCR

The findings from Parts 2 to 6 of the 40 questionnaires and the eight individual semi-structured interviews were analyzed, and a weaving approach (Fetters & Freshwater, 2015, p. 210) was then used to report the study's findings theme by theme. This was followed by incorporating the qualitative findings from the semi-structured interviews to further support and clarify the quantitative data. The findings from the questionnaires are presented separately in Tables 5 to 9, followed by relevant interview extracts which were translated from Thai.

Table 5

Students' attitudes toward learning English grammar

Items	Positive	Negative
1. My attitude toward learning English language	31 (77.5%)	9 (22.5%)
2. My attitude toward learning English language in an SOC	29 (72.5%)	11 (27.5%)
3. My attitude toward learning English grammar	19 (47.5%)	21 (52.5%)
4. My attitude toward learning English grammar in an SOC	24 (60.0%)	16 (40.0%)
5. My attitude toward using computer technology for teaching and learning English grammar	38 (95.0%)	2 (5.0%)
6. My attitude toward using computer technology for teaching and learning English grammar in an SOC	39 (97.5%)	1 (2.5%)

Table 5 shows that most students (77.5%) had positive attitudes toward learning English, and almost three-fourths (72.5%) had positive attitudes toward learning English in an SOC. Here are some reasons from the student interviews:

Extract 1

> *"I like learning English because it is important to my life and future career."*
>
> (Student 2)

Extract 2

> *"Learning English in a synchronous online class is convenient. I can study on my bed and have some snacks while learning."*
>
> (Student 4)

However, slightly more than half of the students (52.5%) had negative attitudes toward learning English grammar, though 60% of the students had positive attitudes toward learning English grammar in an SOC. Here are some explanations from the interviews:

Extract 3

> *"I had bad experiences learning English grammar when I was in high school. My teachers were very strict, and they told me to memorize all of the grammar rules. For me, English grammar was very difficult. When I could not answer the questions correctly, my teachers scolded me in front of the class. I was very humiliated, and I hate learning grammar."*

(Student 1)

Extract 4

> *"When I study English grammar in an SOC, I feel secure. I can hide in the silence when I am not ready to answer the questions."*

(Student 4)

As for using computer technology for teaching and learning grammar, almost all of the students had positive attitudes, both in a conventional classroom (95%) and in an SOC (97.5%).

Extract 5

> *"Some applications that the teacher used for teaching grammar in our SOC were wonderful. For example, we could write the answer in the Padlet application, and the teacher and the students could see it synchronously. Also, the teacher could give us feedback right away."*

(Student 6)

To conclude, although some students had bad past experiences and negative attitudes toward learning English grammar, most of them had positive attitudes toward learning English and using computer technology for English grammar instruction in both F2F classrooms and SOCs.

Table 6 shows the findings regarding perceived usefulness of LPCR.

Table 6

Perceived usefulness (U) of LPCR

Items	*M*	*SD*	Interpretation
1. Learning English grammar through LPCR in an SOC could help me understand English grammar better.	5.55	1.13	Rather high
2. Learning English grammar through LPCR in an SOC could help me improve my English grammar proficiency.	5.45	1.08	Rather high
3. Learning English grammar through LPCR in an SOC could help me use English grammar more correctly and effectively.	5.38	1.19	Rather high
4. LPCR benefited English grammar learning in an SOC.	5.63	1.23	Rather high
5. LPCR helped me learn English grammar in an SOC more easily.	5.15	1.37	High

Items	*M*	*SD*	Interpretation
6. Learning English grammar through LPCR in an SOC could make the class less boring.	5.48	1.30	Rather high
7. Learning English grammar through LPCR in an SOC could make me participate more in the classroom activities.	5.65	1.14	Rather high
8. Learning English grammar through LPCR in an SOC could encourage me to actively interact with the teacher during the class.	5.55	1.13	Rather high
Total	**5.48**	**1.20**	**Rather high**

The students perceived that the model could help them better understand (*M* = 5.55), improve (*M* = 5.45), and correctly and effectively use English grammar (*M* = 5.38). Here is an explanation from a student interview:

Extract 6

> *"With this instructional model, now I better understand many grammar points, and I am more confident creating English sentences."*
>
> (Student 3)

Moreover, learning grammar through LPCR via online applications made the online classroom less boring (*M* = 5.48) and interactive (*M* = 5.55), and encouraged the students to partake in the classroom activities (*M* = 5.65).

Extract 7

> *"The steps of teaching allowed the students to do the activities at their own pace and immediately get feedback from Google Forms and the teacher. Learning grammar with these steps was much better than passively listening to the lecture. I interacted with the teacher during the grammar session more than the other sessions and more than in other subjects."*
>
> (Student 5)

Extract 8

> *"I was hardly bored during the grammar session since the teacher provided us with various activities, starting from an easy one (choosing the correct answer via Google Forms) to a more challenging one (creating sentences). When I made errors in a sentence, the teacher gave me feedback, and then I promptly corrected the sentence. Also, I could see the sentences created by my classmates and learn from them when the teacher gave them feedback."*
>
> (Student 1)

To summarize, on average, the students' perceived usefulness of LPCR was at a rather high level (*M* = 5.48). It seemed that it could not only help students understand and improve their

grammar knowledge, but also enhance their active interaction and participation, as well as create a fun atmosphere during learning grammar in an SOC.

Table 7 shows the findings regarding students' perceived ease of use of LPCR.

Table 7

Perceived ease of use (E) of LPCR

Items	*M*	*SD*	Interpretation
1. The steps of LPCR used in an SOC were not complicated.	5.53	1.24	Rather high
2. The steps of LPCR used in an SOC were clear.	5.50	1.24	Rather high
3. I could easily follow the steps of LPCR used in an SOC.	5.55	1.28	Rather high
4. Learning English grammar through the steps of LPCR in an SOC was not complicated.	5.40	1.46	Rather high
5. The steps of LPCR were easy to use for learning English grammar in an SOC.	5.48	1.22	Rather high
Total	**5.49**	**1.28**	**Rather high**

The students perceived that the steps of LPCR were uncomplicated (*M* = 5.53), clear (*M* = 5.50), and easy to follow (*M* = 5.55). Also, learning grammar through LPCR in an SOC was easy (*M* = 5.48) and not complicated (*M* = 5.40). The following interview extract supports these findings:

Extract 9

> *"I could follow the instructional steps easily. When I had learned grammar with this model a couple of times, I got used to its steps."*
>
> (Student 8)

From the quantitative findings, on average, the students' perceived ease of use of LPCR was at a rather high level (*M* = 5.49).

Table 8 shows the findings regarding the students' attitudes toward use of LPCR.

Table 8

Attitudes toward use (A) of LPCR

Items	*M*	*SD*	Interpretation
1. I liked learning English grammar in an SOC through LPCR.	5.03	1.27	High
2. In an SOC, I have positive attitudes toward learning English grammar through LPCR.	5.28	1.15	High
3. LPCR was suitable for learning English grammar in an SOC.	5.35	1.33	Rather high
4. In an SOC, I enjoyed learning English grammar through LPCR.	5.18	1.38	High
Total	**5.21**	**1.28**	**High**

The students' agreement with the appropriateness of using LPCR for learning grammar in an SOC was at a rather high level (*M* = 5.35). However, their preference (*M* = 5.03), positive attitudes (*M* = 5.28), and enjoyment (*M* = 5.18) regarding using LPCR to learn grammar in an SOC were just at high levels. These quantitative findings are supported by the following interview extracts:

Extract 10

> *"The four steps of the instructional model were a good combination. The model provided the students with step-by-step instruction, starting from easy tasks to challenging ones. What I liked most was that I could assess my comprehension after each grammar lesson by completing a set of exercises through Google Forms, allowing me to view my score right away after submitting my answers."*

(Student 7)

Extract 11

> *"I like learning grammar through this instructional model. My experience learning English grammar in this online class is totally different from that in my high school classes; This is much better and more enjoyable."*

(Student 8)

To summarize, on average, the students showed a high agreement level with the questionnaire items regarding attitudes toward use of LPCR (*M* = 5.21).

Table 9 shows the findings from the questionnaires in terms of the students' intention to use LPCR to learn grammar.

Table 9

Behavioral intention to use (BI) LPCR

Items	*M*	*SD*	Interpretation
1. I would like other teachers to use LPCR to teach English grammar in my other English SOCs.	5.25	1.33	High
2. When the COVID-19 situation subsides, and I can study in the F2F classroom, I would like to learn English grammar through LPCR in an F2F classroom.	5.45	1.13	Rather high
Total	**5.35**	**1.23**	**Rather high**

The students' intention to learn grammar in other English courses through LPCR in an SOC was at a high level (*M* = 5.25), while their intention to do so in an F2F classroom was at a rather high level (*M* = 5.45). These interview extracts lend support to these findings.

Extract 12

> *"These four steps worked well in our online class. I think they will be effective for teaching and learning grammar in other synchronous online EFL classes."*

(Student 2)

Extract 13

> *"I'd like the teacher to use this model in teaching English grammar in the F2F classroom. I think it must be very effective and convenient because we can use the screen in the classroom as the main device, and each student uses their mobile phone, iPad, or laptop for doing tasks via online applications. The classroom atmosphere must be very active and enjoyable."*

(Student 6)

To sum up, on average, the students' behavioral intention to use LPCR was at a rather high level (M = 5.35).

All in all, the findings derived from the student questionnaires and semi-structured interviews indicated that, on average, the students had a rather high acceptance level toward LPCR in terms of its perceived usefulness, perceived ease of use, and behavioral intention to use, and the students showed favorable attitudes toward use of LPCR. However, while students, on average, exhibited positive attitudes toward learning grammar through LPCR, they mentioned certain challenges during the interviews, as seen in the following extracts:

Extract 14

> *"Some online applications, like Padlet and AnswerGarden, were new for us. It would be helpful if the teacher introduced these applications to the students before using them."*

(Student 6)

Extract 15

> *"When the teacher required us to use more than one application simultaneously, it was not convenient for some students who learned through a mobile phone because they couldn't use the multi-screen function on their phone, unlike the students who used a laptop."*

(Student 5)

Extract 16

> *"Sometimes my internet connection was bad, and it affected me when I was using the online application while learning."*

(Student 8)

Apart from the challenges encountered during the grammar instruction through LPCR, some students also shared a common suggestion in regards to the instructional model as follows:

Extract 17

> *"I appreciate our grammar instruction, but I recommend that the teacher incorporate online games for grammar practice and revision. This will be more enjoyable and engaging than relying on only grammar exercises through Google Forms every week, and it will foster greater enthusiasm for learning grammar."*

(Student 3)

3. Effects among the four TAM variables of LPCR

In the context of path analysis, two distinct types of effects–direct and indirect–were computed using Mplus Version 8.8. A direct effect is observed when a variable exhibits a unidirectional arrow pointing toward another variable, indicating a direct influence, while an indirect effect manifests when a variable exerts an influence on another variable through a sequence of intermediary variables, thereby establishing an indirect causal pathway (Lleras, 2005). These analytical distinctions play a fundamental role in elucidating the statistical relationships within the path analysis framework. The questionnaire findings from the path analysis of the four variables within TAM are presented in Table 10. A weaving approach (Fetters & Freshwater, 2015, p. 210) is used to report the quantitative and qualitative findings.

Table 10

Path analysis of the four variables of TAM

Effects	Paths (Hypotheses)	*b*	*SE*	*B**	*p*	Results
Direct	U → A	.521	.128	.456	.000	Accepted
	E → A	.511	.112	.510	.000	Accepted
	A → BI	.736	.200	.740	.000	Accepted
	U → BI	.222	.192	.195	.249	Rejected
	E → BI	-.032	.175	-.032	.855	Rejected
	E → U	.756	.070	.862	.000	Accepted
Indirect	U → A → BI	.383	.140	.338	.006	Accepted
	E → A → BI	.376	.131	.378	.004	Accepted
	E → U → BI	.168	.146	.168	.251	Rejected
	E → U → A → BI	.290	.109	.291	.008	Accepted

**B* = Standardized coefficient

Beginning with the direct effects, it was observed that U showed a significant direct effect on A (B = .456, p < .001). From the interviews, all of the students acknowledged that usefulness positively affected their attitudes toward learning grammar via LPCR. Here is an observation that supports this conclusion from the interviews:

Extract 18

> *"Obviously, the online instruction through these four steps could help me better understand grammar, so I was highly motivated to learn grammar through them."*
>
> (Student 7)

Likewise, E showed a significant direct effect on A (B = .510, p < .001). From the interviews, all students recognized that the ease of use of LPCR via online applications positively influenced their attitudes toward learning through this model. This can be seen from the following extracts from the interviews:

Extract 19

> *"If learning through online applications is complicated, I will feel frustrated and demotivated. However, in our class, I felt comfortable while learning grammar."*
>
> (Student 3)

Extract 20

> *"Not all of the students are tech-savvy. Using easy applications and providing the students with clear steps and instructions are desirable; the easier and clearer, the better."*
>
> (Student 2)

Moreover, A showed a significant direct effect on BI (B = .740, p < .001). In the interviews, students noted that positive attitudes toward use of online instruction affected their intention to use it. This is seen in the following interview extracts:

Extract 21

> *"If a student has positive attitudes toward an online application or instruction, he/she will feel comfortable and motivated to learn with it."*
>
> (Student 4)

Extract 22

> *"There is no reason not to learn grammar through LPCR. For me, I enjoyed learning grammar with it. It worked so well in an SOC that I looked forward to learning grammar through this type of instruction every week."*

(Student 8)

Moreover, E showed a significant direct effect on U (B = .862, p < .001). A student mentioned this point in an interview:

Extract 23

> *"It was easy to follow the instructional steps and to use online applications, so I considered this grammar learning useful."*

(Student 1)

However, the findings revealed that U showed a non-significant direct effect on BI (B = .195, p > .05). Although some students mentioned in the interviews that if the online applications were useful, they would use them often, some students thought differently.

Extract 24

> *"I realized the benefits of the online applications used in the grammar session. However, the use of too many applications confused me. Also, while I was trying to familiarize myself with them, I struggled to follow the teacher. I felt disoriented and had to call my friends on the phone for assistance. This was so frustrating that I did not want to learn grammar with these applications. However, after a few weeks of grammar instruction, I got used to these applications, and I felt more comfortable."*

(Student 5)

Extract 25

> *"In the class, while learning grammar through online applications, there were times when I needed more than one electronic device. For instance, I used my phone to access the synchronous online class, but when the teacher asked us to complete a task using an application called Padlet, I could not utilize the multi-screen feature on my phone, unlike my friends who used notebook computers or iPads. Although I understood that doing a task through the Padlet application allowed us to see our friends' work and that the teacher could provide us with immediate feedback, it was not convenient for me to use the application on my mobile phone while also participating in the online class. This demotivated me to participate in the class activities."*

(Student 7)

Likewise, the results revealed that E had a non-significant direct effect on BI (B = -.032, p > .05). Here is a possible explanation from a student interview:

Extract 26

> *"I don't believe that the ease of use of this online grammar instruction will directly influence my intention to use it. Other factors, such as the content's complexity, my level of fatigue, and my mood, also play a role."*

(Student 3)

Regarding the indirect effects, U had a significant indirect effect on BI, with A acting as a mediator in this effect (B = .338, p < .01). Here is an extract from a student's interview that supports this result:

Extract 27

> *"The grammar instructional method used in this class helped me understand the content, and I had a chance to practice and create my own sentences with the grammar point learned. I might have felt a bit uncomfortable and inconvenienced at first, but after getting used to it, I came to like and enjoy learning. After that, I began to look forward to learning grammar with this instructional method."*

(Student 1)

Likewise, E had a significant indirect effect on BI, with A acting as a mediator for this effect (B = .378, p < .01). Here is a potential reason as to why from a student interview:

Extract 28

> *"Certainly, I was happy to use this grammar instructional method every week as it was easy to use and user-friendly. I didn't get frustrated while using it."*

(Student 5)

However, the findings revealed that E showed a non-significant indirect effect on BI when U acted as a mediator for this effect (B = .168, p > .05). The following extract seems to support this result:

Extract 29

> *"I can provide an example. When Kahoot was popular, every teacher used it in the classroom. Although we could capably use it, and it effectively assisted students in reviewing the lessons learned and improving classroom dynamics, I lost my enthusiasm for using it after it became a frequent choice among teachers."*

(Student 2)

Lastly, E had a significant indirect effect on BI with mediation by U and then A (B = .291, p < .01). This interview extract supports this finding:

Extract 30

> *"In the grammar session, I didn't have to put in much effort when learning online with these four steps, and I found them useful. They made me feel free to learn grammar online and motivated me to want to learn more."*

(Student 4)

From the findings, it can be concluded that U had a significant direct effect on A, and so did E on A. Also, A exhibited a significant direct effect on BI, and E had a significant direct impact on U. U and E showed non-significant direct impacts on BI, though U and E showed significant indirect effects on BI when A acted as a mediator. Additionally, E had a significant indirect impact on BI when U and A served as mediators. However, E showed a non-significant impact on BI when U acted as a mediator.

DISCUSSION

The discussion of the findings is divided into two sections based on the research findings: the effectiveness of LPCR in enhancing students' grammar proficiency and their attitudes toward this online instructional model.

Firstly, recognizing that "there is no one best method of teaching grammar" (Richards & Renandya, 2002, p. 145), LPCR was conceived as and functions as an eclectic approach. It integrates what have been shown to be the most effective techniques of active learning (Fink, 2003) and PPP (Byrne, 1986) into grammar teaching procedures using four online applications. As there does not appear to be prior research specifically addressing the incorporation of Fink's holistic view of active learning with PPP through online applications, LPCR represents a novel online instructional model and might be seen as a viable alternative for active grammar instruction in an SOC, given its demonstrated effectiveness in enhancing students' grammar proficiency.

Secondly, regarding the students' attitudes, it is evident from both the quantitative and qualitative findings that the students held positive attitudes toward learning grammar through LPCR through the four online applications across the four aspects of TAM. That is to say, the students perceived LPCR as useful and easy to use and also had positive attitudes toward using this instructional model and behavioral intention to use it. Furthermore, the path analysis of students' attitudes provided results that are consistent with the interplay posited by Davis et al. (1989)'s TAM in many respects. First, both perceived usefulness and perceived ease of use had direct effects on students' positive attitudes in using LPCR. When students perceived that LPCR could help them learn and understand grammar points more effectively, they developed positive attitudes toward it. Similarly, when students perceived that using LPCR for

grammar instruction in an SOC was not complicated, their attitudes toward it were also positive. Furthermore, perceived ease of use had a direct impact on perceived usefulness. Students were more likely to find LPCR useful when it did not demand much effort to use. Additionally, positive attitudes toward LPCR influenced students' behavioral intention to use it. Finally, perceived ease of use did not have a direct effect on students' behavioral intention to use the model.

However, the study findings also revealed explicit contradictions with Davis et al. (1989)'s TAM. While Davis et al. (1989)'s TAM shows that perceived usefulness has a direct effect on users' behavioral intention to use technology, and perceived ease of use has an indirect effect on behavioral intention to use technology when perceived usefulness acts as a mediator, the findings of this study did not demonstrate these relationships. The study's findings show that students' attitudes toward use of LPCR serve as a vital mediator between both indirect effects of perceived usefulness on behavioral intention to use and perceived ease of use on behavioral intention to use. Thus, to increase students' behavioral intention to use LPCR, both perceived usefulness and perceived ease of use are vital variables to consider if one wishes to influence students' attitudes toward use of LPCR, finally leading to their behavioral intention to use it. This aligns with the findings of several studies (Cheung & Vogel, 2013; Teo, 2012; Teo, 2016; Teo, 2019; Wang et al., 2022). In conclusion, LPCR was considered useful and easy to use, which created students' positive attitudes toward it, finally contributing to their behavioral intention to use this instructional model.

IMPLICATIONS AND RECOMMENDATIONS

Drawing from the research findings, some pedagogical and research implications as well as recommendations are provided in the following section.

To begin with, as LPCR integrates technology into instruction to enhance and transform the learning process, the SAMR model, which conceptualizes the level to which technology is integrated into an educational context, as illustrated in Figure 4, (Puentedura, 2013)–comprising Substitution, Augmentation, Modification, and Redefinition–should be considered. In the SAMR model, Substitution reflects ways technology acts as a direct substitute for another tool, without major changes in the technology's application. Augmentation is when technology replaces another tool, with an increase in its functionality. Substitution and Augmentation are the uses of technology to enhance learning and add value (Best, 2015). According to Terada (2020), when transitioning to an online format of instruction, teachers often operate within the first two levels of the SAMR model, wherein there are a replacement of traditional materials with digital ones, such as switching out conventional activities and materials (e.g., in-class lectures or paper worksheets) with digital counterparts and an enhancement of lessons by making use of functions of online tools that would not be available otherwise, like the ability to share immediate feedback via an online word processor with a number of students simultaneously. In this study's context, LPCR aligns with these first two levels of the SAMR model: Substitution and Augmentation. For instance, in the steps **Learning via a lecture, Practicing, Creating sentences,** and **Reflecting**, traditional in-class lectures, paper-based

exercises, and paper-based reflective writing tasks were substituted by and augmented with the online applications *Google Slides*, *Google Forms*, *Padlet*, and *AnswerGarden*.

Figure 4 The SAMR model (Adapted from Puentedura, 2013)

Lobo and Jiménez (2017) recommend that when integrating technology into online instruction, educators should enhance their pedagogical practices and advance their lesson and activity design to reach higher tiers of the SAMR model to significantly improve the quality of education and enhance learning outcomes (Romrell et al., 2014). Therefore, the implementation of LPCR could be redesigned to reach the two higher levels of the SAMR model: Modification and Redefinition, which aim to transform the learning experience and enable new possibilities depending on the chosen technology (Puentedura, 2013). For example, in the **Creating sentences** step of LPCR, students' end products from *Padlet* can be downloaded and shared via *Google Classroom* (https://classroom.google.com) for revision by every student. If time allows, collaborative activities, such as creating short video clips in groups to apply the lessons learned and publishing them on platforms like *YouTube* (https://www.youtube.com) and *Facebook* (https://www.facebook.com), can be offered to the students because they provide the students with opportunities to create new learning products that could not be made in traditional learning contexts. With this redesign, it would be crucial to investigate the effectiveness and students' satisfaction of utilizing LPCR along the four-tiered hierarchical continuum of SAMR for teaching grammar in an SOC. Also, a comparative study should assess the effectiveness of using two different versions (original and redesigned) of the LPCR model, and their possibly varying impacts on learners' attitudes when learning grammar in an SOC. Furthermore, considering the effectiveness of LPCR from students' improved actual learning and positive perceived learning in an SOC, noting the positive responses from the student questionnaires and interviews indicating their intention to use LPCR in F2F classrooms, and recognizing the unexplored potential of LPCR for teaching and learning English grammar in F2F classrooms, this instructional model might pique the interest of other teachers seeking to implement it in F2F grammar classrooms. Thus, further research is warranted to investigate the effectiveness of LPCR (via students' actual learning and perceived learning) in F2F grammar classrooms. Moreover, a comparative study should examine the effectiveness of using LPCR to teach grammar in two different settings: online and F2F.

Of similar importance, to bolster students' behavioral intention to use LPCR, the major role of the positive attitudes toward its use should be noted, including how these are influenced by its perceived usefulness and ease of use. Although the four steps of this online instructional model are sequential, thanks to the variety of available online applications, a teacher can choose other online applications to suit his/her preferences and familiarity if they fit the main learning objective of each step of the model. For example, in **Learning via a lecture**, *Google Slides* can be replaced by other online presentation applications like *Canva* (https://www.canva.com). In **Practicing**, instead of *Google Forms*, an online interactive worksheet, namely *Liveworksheets* (https://www.liveworksheets.com), can be another platform to provide students with opportunities to practice the lessons learned and get immediate feedback. Alternatively, *Google Forms* can be replaced by other online applications for formative assessment, such as *Quizizz* (https://www.quizizz.com) and *Plickers* (https://www.plickers.com) if a teacher would like to create a fun and exciting learning atmosphere. Also, other brainstorming and collaborating online applications, like *Miro* (https://miro.com), can be used to replace *Padlet* in **Creating sentences**, and an online interactive polling tool, namely *Mentimeter* (https://www.mentimeter.com), can replace *AnswerGarden* in **Reflecting**. Students' actual learning and perceived learning of using other online applications to replace *Google Slides*, *Google Forms*, *Padlet*, and *AnswerGarden* can be then assessed in future studies.

However, apart from teachers' familiarity and set purposes, it is recommended that the selected online applications and devices to be used should be familiar and easy to use for the students as well in order to lessen their technological burdens and facilitate, as well as enhance, their scaffolded learning, which can help shape the students' attitudes toward their use (Ajzen, 2002, as cited in Basar et al., 2021). When teachers develop an instructional model using technology, besides usefulness, ease of use is another important factor that they must be aware of in order to increase students' positive attitudes toward the model (Davis et al., 1989; Teo, 2012; Teo, 2016; Teo, 2019), as these finally make them eager to use it (Davis et al., 1989; Hussein, 2017; Teo, 2012; Teo, 2016). From the interviews, the students mentioned that at the beginning of the course, when some of the online applications were new to them, they felt disoriented during the instruction. Therefore, it is important to provide the students in the beginning of the course with a brief introduction or orientation to the online applications used through LPCR and let students have trials with them in order to reduce their anxiety and increase their self-confidence and readiness (Abdous, 2019). This can help ensure that every student is familiar with the applications to be used with LPCR. Moreover, considering the students' comments from the interviews, the use of multiple applications during instruction may burden and frustrate some students who primarily use a mobile phone for online learning due to its limited screen size (Ortiz & Green, 2019) and the lack of flexibility in supporting multi-screen use and keyboards (Dolgunsöz & Yildirim, 2021). Therefore, the teacher should carefully select online applications to align with students' limitations and resources, with the aim of enhancing the perceived ease of use of the technologies.

To enhance users' positive attitudes toward technology, besides perceived usefulness and perceived ease of use of technology, some students mentioned in the interviews that teachers should use online games for practicing grammar to enhance students' enjoyment during the LPCR instruction. This aligns with a study by Taylor et al. (2023), which highlighted that

perceived enjoyment is another factor that can contribute to users' positive attitudes toward using technology and then lead to their behavioral intention to use it. Since digital games can enhance students' grammar proficiency in a playful way (Castillo-Cuesta, 2020), in the **Practicing** step of LPCR, instead of solely using *Google Forms* for grammar practice and instant feedback, incorporating various online formative assessment tools for creating game-based educational exercises, such as *Blooket* (https://www.blooket.com), *Wordwall* (https://wordwall.net), and *Quizlet Live* (https://quizlet.com/gb/features/live), and different types of interaction including individual games and team games, can be an effective and fun way to promote active learning (Mitchell et al., 2017), as they have the potential to motivate students, establish a fun, competitive, and challenging environment (Hashim et al., 2019; Mokeddem et al., 2019), fully engage them in grammar learning (Castillo-Cuesta, 2020), and enhance their knowledge and skills (Mitchell et al., 2017; Watanapokakul, 2018). Consequently, it is recommended that online language games be integrated into online grammar instruction through LPCR in an SOC in order to create perceived enjoyment, which can enhance students' positive attitudes (Taylor et al., 2023). Subsequently, conducting studies on the integration of online educational games into LPCR for grammar instruction in an SOC and exploring learners' attitudes toward their inclusion are recommended.

Last but not least, considering the continuously evolving nature of technology, it is imperative that training and workshops for the introduction of online applications and technology in English language teaching be consistently offered to teachers and technicians to ensure that they can keep their knowledge up-to-date (Nguyen, 2022; Watanapokakul, 2022). Furthermore, the faculty and the university should proactively strategize the provision of online learning equipment and facilities such as tablets and internet connections for students in the event that future situations require social and/or physical distancing and online learning.

LIMITATIONS OF THE STUDY

Given that this was an action research study, the primary limitation is centered around the small number of participants involved. This may have an impact on both the statistical significance of the findings and the generalizability of the study.

CONCLUSION

As many teachers are aware, teaching English grammar can often be challenging, especially in SOCs where students may not actively participate verbally and can become disengaged. As there is no one-size-fits-all teaching method for grammar instruction, an online active learning instructional model, called LPCR, was developed by combining the holistic view of active learning and PPP and utilizing four online applications in a synchronous online EFL undergraduate classroom. This study demonstrated that LPCR effectively improved students' grammar proficiency and fostered active interaction and participation within the online classroom environment. Additionally, students perceived this online instructional model as useful and easy to use, and also showed positive attitudes and behavioral intention to use it. Furthermore,

perceived usefulness and perceived ease of use had significant indirect effects on behavioral intention to use this instructional model, with attitudes toward use acting as a mediator. This suggests that students' favorable attitudes toward LPCR were influenced by its perceived usefulness and ease of use, ultimately driving their intention to continue using the model. While LPCR was initially developed as part of the "new normal" in response to the challenges posed by the COVID-19 pandemic, it can serve as a viable alternative means of online active grammar instruction in tertiary education. With its seeming effectiveness, LPCR may emerge as the "next normal" for active grammar learning in synchronous online EFL undergraduate classrooms in the post-COVID-19 era and potentially find application in F2F settings where technology integration in English language teaching is promoted.

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