Profiling the TPACK Level of Indonesian Pre-Service Teachers

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ABSTRACT
The goal of this study was to examine the profile of the EFL pre-service teachers' level of Technological Pedagogical Content Knowledge (TPACK). Survey design was implemented. A questionnaire of TPACK adapted from Archambault & Crippen (2009) was used to measure teachers' TPACK knowledge. Descriptive statistics was used to assess the purposes of this study. The participants of this study were thirty-eight EFL pre-service teachers at the English education department in one of the state universities in Indonesia. The findings showed that the TPACK level of EFL pre-service teachers was overall high across seven domains (M=3.97, SD=0.70). The highest value was technological pedagogical knowledge (TPK) (M=4.05, SD=0.66), technological content knowledge (TCK) (M=4.02, SD=0.68), and pedagogical content knowledge (PCK) (M=4.00, SD=0.71). In specific, technological knowledge (TK) domain (M=3.99, SD=0.70) was highly valued than pedagogical knowledge (PK) (M= 3.88, SD=0.71) and content knowledge (CK) (M=3.84, SD=0.73). Furthermore, it was suggested to EFL pre-service teachers to improve their pedagogy and content knowledge. Continuous training for pre-service teachers' technological knowledge was strongly advised. Further research should be conducted with different subjects of participants or longitudinal studies in order to elaborate a deeper explanation regarding variables.

Keywords: *technological knowledge, pedagogical knowledge, content knowledge, technology integration*

1. INTRODUCTION

Nowadays, the integration of information communication and technologies (ICT) is increasing rapidly in many aspects of our communities. All technological advancements have been crucial in promoting and changing the majority of how people think, work, and live [1]. In recent decades, technology has become a significant aspect of education. The late generation of students born into this digital environment is sometimes referred to as "digital natives" by earlier generations [2]. It implies that these individuals are born with the ingenuity to use technology effectively without guidance [2]. In terms of education, the utilization of ICT creates new concerns in all parts of classroom instruction, requiring a modification of the conventional educational paradigm that has been utilized for millennia [1]. It indicates that teaching and classroom instruction must encourage highly innovative activities. Students may enhance their performance, particularly in English as a foreign language (EFL) class, by taking advantage of technological advancements.

Many studies have revealed that the utilization of technology in learning provides many positive benefits, such as providing learning opportunities without conducting face-to-face classes [3], bringing easy to convey and receive knowledge with the flexibility of time and place [4], and offering unlimited information and resources [5]. However, due to the variety of hardware and software available, finding the most effective and suitable technological tools takes time and effort. Selecting the appropriate technology-enhanced learning exposes teachers to new issues and challenges, such as updating their teaching, when and how to integrate new digital technology, and how to adapt to the most recent changes in educational trends. It is also essential to determine the technological equipment and learning devices required to accomplish the EFL teaching objectives [6]. Yet, it was found that teachers were not

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able to easily adapt to innovations due to a lack of knowledge of new technology and pedagogy which were important for online teaching and learning [7].

One of the fundamental stages that must be followed to apply technology into classroom activities to accomplish the success of instructional process by integrating technology is to examine teachers' technological knowledge. According to Mishra and Koehler [8], teachers should understand the technological pedagogical and content knowledge (TPACK) to properly incorporate technology in the online learning system. TPACK is a conceptual framework for understanding how teachers use various instructional techniques, methods, and technologies for conveying new knowledge to students [8]. It is a type of teachers' knowledge that is required for effective teaching and learning process by using technology. According to Spector, et al. [9], TPACK provides a new perspective in comprehending the complex connections between technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) that can lead to effective technology integration.

Koehler, et al. [10] characterized TPACK as the knowledge required by a teacher for improved technology integration. The TPACK framework is built on three primary knowledge components in particular: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Then, the interconnections between and among these areas of knowledge, indicated as PCK (pedagogical content knowledge), TCK (technological content knowledge), TPK (technological pedagogical knowledge), and TPACK, are equally fundamental to the model (technology, pedagogy, and content knowledge).

Teachers' understanding of technology integration gives valuable insight into their ability to teach with technology, especially for pre-service teachers. Pre-service teachers must be prepared with the required abilities to effectively combine educational technology with content and pedagogy in order to better fulfil the technological needs of the modern day. However, new technologies provide challenges for pre-service teachers, requiring the acquisition of new skills and knowledge in order to use new technology in pedagogically useful ways. According to [8], successful ICT integration is dependent on the ability of teachers to connect what they teach (content knowledge) with how they instruct (pedagogical knowledge) and with what technology to employ and why (technological knowledge).

TPACK is a measurement of a teacher's knowledge to effectively apply the use of technology inside the classroom [11]. According to Koehler and Mishra [12], promoting the quantity of technology in the classroom was not enough to improve teachers' technological practices. There also needed to be a development in the teacher's pedagogical practices. If a teacher has sufficient TPACK understanding, this knowledge should be put into practice in the classroom. Some scholars are already concerned about TPACK and technology practices of teachers in International settings. Ruggiero, et al. [13] examined classroom teachers' daily experiences using various types of technological advancement to offer educational opportunities for students in the United States. According to survey results, the implementation of technology in school was sometimes merely for individual purposes. It was also found that there was a strong correlation between technology use and instructional approaches. However, there were external obstacles that impacted technology integration, including a lack of suitable technology and training, but internal factors such as attitudes and beliefs on technology integration, were important predictors of technology integration success. Meanwhile, Castéra, et al. [14] examined the basic seven domains of TPACK model in the context of many different countries and investigated demographic factors impacting individual TPACK level, including national context, age, and gender of teacher educators from six different countries in Europe and Asia (Bhutan, Denmark, Estonia, France, Malaysia, and Pakistan). Overall, the result of cross-national teachers' TPACK perception clearly indicated the necessity for teacher educators to get training not only on how to use technology (TK) but also on how to utilize it to enhance content and/or pedagogical knowledge (TCK, TPK, and TPC). In addition, age was hypothesized to be correlated to TPACK perceptions among the demographic characteristics. The difference between groups was particularly significant in terms of TK score. The score for the youngest group was significantly higher, while the score for the oldest group was significantly lower.

In the Indonesian context, a number of research studies focusing on EFL teachers' TPACK and technology integration have been carried out. One study by Tyarakanita, et al. [15] evaluated the development of EFL teachers' TPACK level after involvement in WhatsApp-based online community of practice (OCP). According to the research findings, it showed that the development of teachers' TPACK was still not fully achieved, and they needed to design the best way of OCP in order to make the teachers' experience meaningful and achieve a significant TPACK level. Another study by Aniq and Drajati [16] focused on how EFL teachers viewed seven different areas that compose the TPACK framework. According to the findings of this case study, EFL teachers perceived greater levels of domain knowledge about PK, PCK, and CK, rather than domain knowledge about technology, particularly TK, TCK, TPK, and TPACK. In their teaching-learning process, the majority of them believed that CK and PK were more important than technology-related knowledge.

Dewi, et al. [17] explored the Indonesian teacher students' views on their level of TPACK understanding. According to the study's finding, pre-service teachers lacked technology integration, but they were competent at pedagogical knowledge. This was due to a lack of unsupported technological tools, networking issues, and inconsistent training on the use of certain platforms for learning.

Today, the implementation of various technological tools inside the instructional setting has proven to be beneficial to education around the world. Many schools, education boards, scholars, and school administrators are becoming more conscious of the value of technology in a student's education. In recent years, there has been a lot of discussion about how to integrate technology into the class. According to Ertmer, et al. [18], technology integration is the process of bringing technological tools into classroom instruction to enable meaningful learning through the application of knowledge to cooperate, communicate, problem-solve, and accomplish learning goals. Pierson (1999), cited from Gunuç and Babacan [19] pedagogical, and subject expertise held by teachers and the students they taught. In other words, technology integration refers to the efficient and beneficial application of technology in the educational setting for the specific subject matter and following the curriculum to achieve learning goals.

Because of the adaptation of technology into the process of language instruction, the method of language teaching has undergone significant change. Technology integration is transforming the way language teachers teach and language learners learn. Many researchers suggested that technology can be employed in the classroom as an instructional tool. It has numerous advantages, such as creating a learning environment that is both engaging and beneficial in regard to enhancements [20]. The use of technology-assisted learners in becoming more involved, motivated, and interested [21]. Gilakjani [22] also demonstrated that technology could be beneficial in the classroom by improving collaboration, developing educational materials, and promoting learners' participation.

There have been a lot of previous studies regarding TPACK knowledge. However, it is important to examine the level of EFL pre-service teachers of TPACK knowledge. As a future teacher, it is essential to find out how far the EFL pre-service teachers can understand the pedagogical and content knowledge they have learned during their study in the teaching preparation program. In addition, it is necessary to assess the technological knowledge of EFL pre-service teachers that is one of knowledge required in the twenty-first century. Therefore, it is worthwhile to examine that this knowledge has correlation with the implementation in the classroom, especially by EFL pre-service teachers. The TPACK framework assesses the understanding of EFL pre-service teachers in how they utilize technology in the classroom. In sum, this study explores the profiles of EFL pre-service teachers' level of technological pedagogical content knowledge.

2. METHOD

This study employed survey design. The data of this study were the EFL pre-service teachers' scores of technological pedagogical content knowledge. The pre-service teachers' TPACK score was obtained by distributing the TPACK survey designed by Archambault and Crippen [23]. There were 38 pre-service teachers (8 male and 30 female) who completed their teaching practices through the teaching internship program voluntarily involved in this study.

The TPACK survey designed by Archambault and Crippen [23] was adapted. The purpose of the use of TPACK survey was to assess pre-service teachers' self-assessment of TPACK. This instrument involved 22 lists of items to investigate the TPACK framework's seven areas. There were several items that changed to be more targeted at the subject of English, such as knowledge of the 4 basic language skills: listening, reading, writing, and speaking. To be more specific, TK domain comprised three questions for item number 1, 2, and 3. It measured how a teachers' ability to successfully use technology in teaching, such as solving computer difficulties. PK domain had three questions for item number 4, 5, and 6. Those items assessed a teacher's ability to instruct successfully. CK domain had three questions for item number 7, 8, and 9. Those items tested the capacity of a teacher to successfully convey subject matter. TPK domain comprised three questions for item number 10, 11, and 12. This domain assessed a teacher's ability to take proper pedagogical instruction and use technology ways to educate teaching. PCK domain comprised three questions for item number 13, 14, and 15. This domain measured the capacity of a teacher to successfully deliver material with proper methodologies. TCK domain comprised three questions for item number 16, 17, and 18. This domain assessed the capacity of a teacher to convey topic knowledge to students via technology. Finally, TPACK domain comprised four questions for item number 19, 20, 21, and 22. Those items measured the capability of the teachers to effectively integrate technology into teaching practice.

Finally, data were tabulated and analysed using descriptive statistics. These statistics included the mean, percentage, and the standard deviation. This analysis was carried out with the intention of providing an overview of the results.

3. RESULTS AND DISCUSSION

The value of reliability coefficient of the TPACK had a Cronbach alpha value of 0.93. Overall, TPACK instruments can be categorized as a very high-test reliability. On the other hand, the TTIS instrument had Cronbach alpha value of 0.81, demonstrating that the TTIS instrument being tested had a reliability value higher than 0.80. Therefore, the statistical evidence showed that the TTIS questionnaire was very highly reliable.

The first finding of this study revealed that the level of EFL pre-service teachers was overall high across seven domains (M=3.97, SD=0.70).

Table 1. Perception of TPACK with respect to All Domains

Sub-domains	Mean	SD
Technology knowledge (TK)	3.99	0.70
Pedagogical knowledge (PK)	3.88	0.71
Content knowledge (CK)	3.84	0.73
Technological Pedagogical knowledge (TPK)	4.00	0.71
Pedagogical Content knowledge (PCK)	4.02	0.68
Technological Content knowledge (TCK)	4.05	0.66
TPACK	3.97	0.73
TOTAL	**3.97**	**0.70**

Table 1 presented the descriptive statistics of seven domains of TPACK. As seen in the table, the results showed the major knowledge component of TPAK was higher than 3.5. The overall mean was 3.97, with a standard deviation of 0.70. It indicated that EFL pre-service teachers' level of TPACK was generally high. More specifically, the findings suggested that EFL pre-service teachers' knowledge of Technology Content was found as the highest with the mean score of 4.05, and the standard deviation of 0.66. However, the Content Knowledge was the lowest aspect of TPACK carried by EFL pre-service teachers with the mean score of 3.84 and the standard deviation of 0.73.

Furthermore, it was discovered that EFL pre-service teachers have better skills in the three components, which had the mean score more than 4.00 including Technology Content Knowledge (M=4.05, SD=0.66), Pedagogical Content Knowledge (M=4.02, SD=0.68), and Technological Pedagogical Knowledge (M=4.00, SD=0.71). These

mean scores can be classified as a good level. Furthermore, when compared among three main knowledge of TPACK, the table revealed that technological knowledge (TK) of EFL pre-service teachers had the highest mean score of 3.99, with the standard deviation of 0.70. Meanwhile, the pedagogical knowledge (PK) showed the mean score of 3.88, (SD=0.71), and content knowledge (CK) showed the mean score of 3.84 (SD=0.73).

Table 2. Perception of TPACK with respect to Technology Knowledge (TK)

No	Item Statements	Mean	SD
	Technology Knowledge (TK)	**3,99**	**0,70**
1.	I am able to troubleshoot and fix any technological issues that arise	3,95	0,70
2.	Technology is not difficult for me to understand	4,03	0,68
3.	I am updated with importance new technology	4,00	0,74

Table 2 displayed EFL pre-service teachers' Technological Knowledge (TK). Regarding the EFL pre-service teachers' statement number 2 about the EFL pre-service teachers' capacity to acquire technology easily showed the highest score of M = 4.03 and SD = 0.68, 79% of them stated that they agreed with the statement, while 21% selected neutral option. It is followed by item number 3 referring to updating with the importance of new technology (M = 4.00, SD = 0.74). 79% of the participants agreed with the statement, however, 3% of them disagreed. Regardless of the fact that the responses of EFL pre-service teachers demonstrated that they can readily acquire technology and keep up-to-date with important new technologies, their response to item 1 regarding the ability to fix any technological issue had the lowest mean score (M = 3.95, SD = 0.68). Most of the participants (87%) agreed with the statement, and 3% of them disagreed. Technological Knowledge (TK) had an overall mean of 3.99 and a standard deviation of 0.70.

Table 3. Perception of TPACK with respect to Pedagogy Knowledge (PK)

No	Item Statements	Mean	SD
	Pedagogical Knowledge (PK)	**3,88**	**0,71**
4	I am able to evaluate the academic achievement of students in the classroom	3,84	0,68
5	I am able to employ a diverse variety of instructional strategies in the classroom context	3,89	0,80
6	I am competent in the organization and maintenance of classroom management	3,89	0,65

Table 3 depicted the second domain of EFL pre-service teachers' perceptions on the use of TPACK in their teaching. The results showed that item 6 regarding understanding how to organize and sustain classroom management had the greatest mean and standard deviation (M = 3.89, SD = 0.65). The majority of participants (58%) said they agreed, with 16% of them strongly agreed. However, 10 participants (26%) believed that they had an average degree of arranging and maintaining classroom management. In contrast, none of the respondents were classified as unable to manage the class.

The second order of PK referred to the statement 5 about being able to employ a diverse variety of instructional strategies in class (M = 3.89, SD = 0.80). According to table 4.3, 74% of respondents agreed that they may employ a variety of teaching styles during the teaching-learning process, while the remaining 21% of respondents classified themselves as able or unable to use a variety of instructional methods. Nonetheless, 5% of them acknowledged using the same teaching style or getting bored during the educational process.

The lowest score in the PK area was item 4 about EFL pre-service teachers' understanding of how to assess students' achievement in the classroom (M = 3.84, SD = 0.68). The findings showed that 68% of the participants agreed with the statement, and 11% of them strongly agreed. There were also 16% of participants who were neutral between knowing and not knowing how to evaluate students' performance. However, 5% of them were unable to evaluate the students' performance. The overall mean score for the domain Pedagogical Knowledge (PK) was 3.88 and a standard deviation of 0.71.

Table 4. Perception of TPACK with respect to Content Knowledge (CK)

No	Item Statements	Mean	SD

	Content Knowledge (CK)	**3,84**	**0,73**
7.	I am competent in all four areas of language skill: reading, writing, speaking, and listening.	3,71	0,77
8.	I am able to think with an English approach	3,84	0,64
9.	I strengthen my English skills in several ways.	3,97	0,79

Table 4 displayed the result of Content Knowledge (CK) on EFL pre-service teachers perceived about using TPACK in their instruction. According to the results, the statement 9 regarding the English proficiency of EFL pre-service teachers may be improved through the use of a variety of strategies (M = 3.97, SD = 0.79) showed the highest mean score for CK. From 38 EFL pre-service teachers, 21 (55%) of them agreed with this statement, and 9 (24%) strongly agreed, while 16% chose the neutral option. However, 5% of them claimed to not have a variety of methods and strategies for enhancing their English proficiency.

It was then followed by a statement 8 concerning the ability to use the English way of thinking (M = 3.84, SD = 0.64). The majority of participants (58%) thought they were good at it, some of them (13%) scored very well. Nonetheless, 29% of respondents are undecided. None of them claimed to have never used the English way of thinking (0%). Furthermore, item 7 pertaining to adequate comprehension of the English skills, including listening, reading, speaking, and writing, showed the lowest mean score of CK (M = 3.71, SD = 0.77). According to the research, 63% of EFL pre-service teachers considered their English skills adequate. 32% were unclear whether they had sufficient English knowledge. However, 5% of respondents classified themselves as having insufficient English knowledge. Therefore, the mean score for all Content Knowledge (CK) domain items was 3.84, with a standard deviation of 0.73.

Table 5. Perception of TPACK with respect to Technological Pedagogical Knowledge (TPK)

No	**Item Statements**	**Mean**	**SD**
	Technology Pedagogy Knowledge (TPK)	**4,00**	**0,71**
10.	I am able to provide an environment in which learners may acquire new information and capabilities through the online	4,03	0,72
11.	I am able to incorporate a variety of teaching strategies via the use of the online	3,95	0,66
12.	I am able to stimulate students' participation in online activities	4,03	0,75

Table 5 displayed descriptive data on the frequency, mean, and standard deviation of teachers' perceptions of using TPK in the classroom. In the item statement number 10 regarding the capacity to create a setting in which students may learn new information and gain new skills via the use of online resources, the average score was 4.03 with the standard deviation of 0.72. According to 82% of participants, providing an online environment while teaching was sufficient for developing students' new knowledge and abilities. However, 3% stated that he or she lacked the skills to construct an online environment.

The second order of TPK was followed by statement 12 regarding the capacity to encourage student engagement in activities that are conducted online (M = 4.03, SD = 0.75). The findings revealed that 79% of them had a great capability to encourage student involvement in an online class. However, 18% of the participants were uncertain by

the statement, and 3% of participants stated that it was insufficient to stimulate online interaction. The lowest TPK mean score was on item statement number 11 regarding the ability to adopt multiple online teaching approaches (M = 3.95, SD = 0.66). 76% of participants claimed that they are competent in using various teaching strategies in an online class. However, 24% of them selected the neutral option. The good news is that none of them acknowledged becoming bored with online education techniques. The total mean score of all TPK domain items was 4.00, with a standard deviation of 0.71.

Table 6. Perception of TPACK with respect to Pedagogical Content Knowledge (PCK)

No	Item Statements	Mean	SD
	Pedagogy Content Knowledge (PCK)	**4,02**	**0,68**
13.	I am able to distinguish between a student's correct and incorrect attempts to solve an issue	3,97	0,68
14.	I am able to predict the misconceptions that learners may have on a certain topic	3,97	0,72
15.	I am able to create a lesson plan that has an appropriate for the subject.	4,11	0,65

Table 6 provided the results of the PCK domain by EFL pre-service teachers. According to the data obtained, it was discovered that the item statement number 15 about creating a lesson plan that is appropriate for the subject (M = 4.11, SD = 0.65) was the highest mean of PCK. According to 84% of 38 EFL pre-service teachers, they could create an appropriate lesson plan based on the topic. Only 16% of the participants chose a neutral option.

The statement 13 regarding the ability to identify whether or not a student has attempted a proper solution to an issue was in the second order of PCK (M = 3.97, SD = 0.68). The majority of EFL pre-service teachers (55%) claimed that they agreed with the statement and 21% strongly agreed. There were 9 participants (24%) who chose the neutral option. Next, the last order of PCK was related to item 14 concerning the ability to identify misunderstandings that learners may have about a certain topic (M = 3.97, SD = 0.72). 50% of participants agreed with the statement, while 24% of them strongly agreed. However, 10 of the participants (26%) said they were unclear about the statement. Furthermore, the mean score for the Pedagogical Content Knowledge (PCK) domain was 4.02, with a standard deviation of 0.68.

Table 7. Perception of TPACK with respect to Technological Content Knowledge (TCK)

No	Item Statements	Mean	SD
	Technology Content Knowledge (TCK)	**4,05**	**0,66**
16.	I am able to illustrate a certain concept via the use of technological representation	4,05	0,61
17.	Instruction may be delivered by me using a variety of different technology instruments.	4,18	0,61
18.	I can implement curricula in an online environment	3,92	0,75

Table 7 displayed the results of the Technological Content Knowledge of EFL pre-service teachers (TCK). The majority of participants claimed that they can deliver instruction by using a variety of different technology tools (M = 4.18, SD = 0.61). 90% of them agreed with the statement 17, while 11% chose the neutral option. None of the participants claimed that they lacked the ability to employ technology tools for English teaching.

The participants also claimed that they can employ technological representation (for example, multimedia and visual demonstration) to illustrate a certain concept in English (M = 4.05, SD = 0.61). The results suggested that 84% agreed with the statement 16. However, 16% of them classified themselves as doubtful regarding the statement. Following that, the lowest TCK mean score was on implementing curricula in an online setting (M = 3.92, SD =0.75). 30 of the respondents (79%) agreed with the statement 18, while 16% were undecided. However, 5% of respondents indicated that they lacked the capability to integrate curricula in an online context. Generally, TCK had a total mean score of 4.05 and a standard deviation of 0.66.

Table 8. Perception of Technological Pedagogical Content Knowledge (TPACK)

No	Item Statements	Mean	SD
	TPACK	**3,97**	**0,73**
19.	I may adapt my course using online student assessments	4,00	0,87
20.	I comprehend how to utilize technology to identify students' abilities of a given subject	4,08	0,63
21.	I can utilize technology to construct effective materials that differ from textbook	4,08	0,63
22.	I am capable of meeting the overall requirements of online teaching	3,74	0,79

Table 8 showed the data of EFL pre-service teachers' TPACK domain. The TPACK domain with the highest mean score was shown by item statement number 20 and 21 regarding capability to employ technologies to assess the knowledge and abilities of students with regard to a specific subject matter and create useful materials that differ from textbooks (M = 4.08, SD = 0.63). 85% of the participants agreed with those statements, whereas 16% were doubtful.

The following TPACK sequence was followed by statement 19 regarding EFL pre-service teachers' capacity to adapt the online course through students' assessment (M = 4.00, SD =.87). The majority of them (76%) agreed with the statement, although 3% of participants appeared to lack the necessary understanding to use online assessments for education. Furthermore, item 22 concerning the ability to fulfil the overall requirements of online teaching showed the lowest mean score of the TPACK domain (M = 3.74, SD = 0.79). The majority of them (68%) felt adequate in terms of addressing the overall demand for English online teaching. However, 8% of the participants lacked appropriate knowledge or skill in relation to the statement. Overall, TPACK domain showed the mean score of 3.97 and standard deviation of 0.73.

In this context, it may be stated that the overall TPACK level of EFL pre-service teachers in this study was high. All domains were statistically greater than 3.5. It was discovered that the EFL pre-service teachers showed positive responses of their TPACK knowledge that they implemented in teaching practice. The main point of these results suggested that technological knowledge (TK) was more highly mastered by EFL pre-service teachers than pedagogical knowledge (PK) and content knowledge (CK). Therefore, TCK and TPK's interaction was viewed as a

strong TPACK component, in which EFL pre-service teachers were capable of using technology into their pedagogical practice and specific learning objectives.

This study revealed that EFL pre-service teachers rated their understanding at the high level for the domains of intersection between three bodies of knowledge: technological content knowledge (TCK) (M=4.05, SD=0.66), technological pedagogical knowledge (PCK) (M=4.02, SD=0.68), and pedagogical content knowledge (TPK) (M=4.00, SD=0.71). These average scores can be classified as good. It revealed that EFL pre-service teachers believe their knowledge was enough for incorporating the three main knowledge areas. The current research findings tended to show that they were capable of understanding technology knowledge and employing it in the teaching-learning process.

The study also demonstrated that technological knowledge (TK) was highly valued than pedagogical knowledge (PK) and content knowledge (CK). It was not surprising that their interaction, TCK and TPK, was regarded as high TPACK components. Furthermore, the interaction between those three fundamental knowledge domains (TPACK) was in the fifth order, with a mean score greater than the PK and CK domains (M=3.97). It is reasonable to suppose that the attitude of EFL pre-service teachers of utilizing technology applications was effective for communication between teacher and students, implementation of an online environment, and instructional objectives. As a result, the EFL pre-service teachers had relatively strong beliefs about the significance of TK, which influenced their beliefs about other TK-integrated with CK and PK, specifically, TCK and TPK, and, eventually, TPACK.

These findings of this study were similar to other previous research. According to the findings of [24], pre-service teachers lack pedagogical understanding yet believed they were competent at incorporating technology into their teaching. This study was also similar to [25] who investigated English pre-service teachers' perceptions of TPACK. According to the study, English pre-service teachers had a positive view toward TPACK in their English teaching. Furthermore, Nisa, et al. [25] discovered that the highest percentages of TK, TPK, and TPACK were informed, followed by PK, CK, PCK, and TCK.

In contrast to this study, Archambault and Crippen [23] discovered that online teachers' self-reported knowledge levels were greatest for items related to pedagogy, content, and pedagogical content. According to Archambault and Crippen [23], it might be impacted by a different aspect, such as teaching experiences. Akturk and Ozturk [26] study discovered that the CK and PCK of Turkish in-service teachers were at a high level when compared to the TK, PK, TPK, TCK, and TPACK domains. In line with findings by Castéra, et al. [14], teacher educators had considerably lower PCK, TK, TPK, and TCK scores. This result was also contradictory to the findings of Alnajjar and Al-Jamal [27], who discovered that EFL in-service teachers had insufficient understanding of technological concepts and related domains, which comprised TCK, TPK, and TPACK, when compared to their knowledge of CK and PK.

According to the findings of the study, all seven TPACK components (TK, PK, CK, TPK, PCK, TCK, and TPACK) were important in EFL teaching, but at various degrees. When compared to in-service teachers, pre-service teachers saw digital technology as more significant and used it more frequently to make lessons interesting for their students. Responses from EFL pre-service teachers revealed that they are more digitally literate and have a better perception toward the implementation of digital technology into language instructional settings [28, 29]. As a result, they focused their TPACK on technological knowledge rather than pedagogical knowledge. It was supported that the more experienced in-service teachers thought that CK and PK were more essential than technology-related knowledge and preferred to adopt traditional approaches in their teaching practice [30, 16]. In accordance with the study of Arkturk and Ozturk [26], teachers with less teaching experience had a higher TPACK level than teachers with 21 years or more of experience.

A high TPACK score, as mentioned in the literature, should be supported with practical application of this knowledge in the classroom. As EFL pre-service teachers are more likely to think how technology may be successfully implemented and valuable to students in the context of academic objectives.

AUTHORS' CONTRIBUTIONS

The authors of this paper work collaboratively in the process of completing research.

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