Technological Pedagogical and Content Knowledge of Pre-service Teachers' Self-Assessment

Sri Oktaviana Nurlaila[a], Rosi Anjarwati[b*]

[a,b] *Universitas PGRI Jombang, Indonesia*
Corresponding author. E-mail address: rosi.stkipjb@gmail.com

ABSTRACT

Technological improvements in the twenty-first century have had a significant impact on the development of education today. The integration of technology into the classroom has an impact on the learning process as well as how teachers implement and improve classroom learning activities. The ability of teachers to master technology in learning can be viewed through their Technological Pedagogical and Content Knowledge (TPACK). This study aimed to find out about the pre-service teachers' self-assessment English teachers of their TPACK. This study used a quantitative design to determine pre-service teachers' self-assessment of the TPACK framework. A survey was undertaken to view and gather data on TPACK using self-assessment questionnaires; participants were given the questionnaire, which had four Likert scale scales, to obtain data. The subjects of this research were 47 participants of pre-service teachers in English Language Education at STKIP PGRI Jombang. The conclusion of this study is that the overall TPACK of pre-service has an average value of 2,96 with the high category.

Keywords: pre-service teachers, self-assessment, TPACK.

INTRODUCTION

One of the most distinguishing features of education in the twenty-first century is the more interconnected world of information, which means that their synergy is rising rapidly.. Education in the 21st century integrates knowledge, skills, behavior, and students' mastery of ICT (Faisal, 2019). The application of digital media and technology, which is continually expanding, helps to speed the rise of knowledge (Muliastrini, 2020). Thus, 21st-century learning requires teachers to have teaching skills that are always creative and innovative.

One of the learning innovations that is growing is technology-based learning. This is based on technology breakthroughs that grow day by day. Moreover, in the Merdeka Curriculum 2022, teachers must be able to master content and methodology, and they are also expected to use technology in learning. Improving teacher quality is not only in terms of teacher welfare but can also be achieved by increasing teacher professionalism and teaching abilities(Turmuzi & Kurniawan, 2021). The professional and pedagogical abilities of teachers are crucial for teachers. Koehler, Shin & Mishra (2012) state that teaching is a difficult activity that involves a wide range of information. Learning activities are based on knowledge of the topic to be taught (content knowledge), how to teach a material (pedagogical knowledge), and knowledge of the use of various technologies (technological knowledge). Have intersections or intersections to support one another.

The TPACK framework developed by Mishra & Koehler contains seven TPACK categories. The TPACK component explained by Koehler & Brant Ley-Dias (2008), as previously said, TPACK comes from knowledge that extends beyond all three main components (Content, Pedagogy, and Technology). Technological pedagogical content knowledge is an understanding that results from interactions between content, pedagogy, and technology knowledge. TPACK is quickly becoming an important paradigm embraced by many academics and educators to improve teacher pre-service expertise in integrating digital technology into teaching and learning in the classroom. (Irwanto et al., 2022).

Upon graduation, Pre-service teachers must be ready to teach in a way that matches the current need, which means they must have sufficient TPACK to achieve it. One way for pre-service teachers to prepare for this is by taking PLP *(Pengenalan Lingkungan Persekolahan)* program in which the students do a real teaching practice in a real school situation. As education students, pre-service English teachers are assigned to carry out a PLP program that requires direct contact with students in senior high schools. The PLP program enables pre-service teachers to gain practical experience in the teaching process with guided and supervised instruction. In the PLP STKIP PGRI Jombang 2022 program, pre-service teachers are faced with the 2022 Merdeka curriculum. The curriculum needs pre-service teachers to be able to master subject and pedagogy, as well as the ability to use technology in learning. Pre-service teachers of STKIP PGRI Jombang 2019 have been prepared for direct contact with students in high schools, so they already have TPACK.

Based on the conditions, the researcher was interested in surveying self-assessment pre-service on their TPACK. Efforts to improve and develop TPACK pre-service teachers require the development and improvement of knowledge of pre-service teachers in the complex relationship between pedagogic, content and technology because this understanding can be used to develop strategies, approaches, media, methods, and teaching techniques according to the Merdeka Curriculum 2022.

Several studies related to self-assessment pre-service teachers about TPACK that previous researchers have conducted have shown many similar results. Septiyanti et al. (2020) esearched the TPACK perceptions of Lampung University English Education students, the methods by which students gain TPACK in learning, and the role of lecturers in aiding students in acquiring TPACK in learning. Mixed approaches were used to collect the data, including surveys and interviews. The result stated that the students' TPACK perception was generally good, as the score of all domains measured (Technological Knowledge/TK, Technological Content Knowledge/TCK, Technological Pedagogical Knowledge/TPK, Technological Pedagogical Content Knowledge/TPCK, and Technology-related Learning Experiences/TLE) was categorized as high. Another study by Wijaya et al (2022) focused on determining student-teacher perceptions of TPACK. The study used a quantitative design questionnaire to examine student-teacher opinions of the TPACK framework, and the findings indicate that student-teachers are favorable about the implementation of TPACK in the teaching process. The two prior investigations had the same goal, namely, to determine the impressions of English students at their university, and both studies yielded good perception outcomes, differing only in the research methodology.

The next research on the self-assessment pre-service teacher of TPACK was also carried out by Irwanto, et al (2022). It seeks to investigate pre-service teachers' attitudes toward TPACK in connection to their age, gender, and grade level. This quantitative non-experimental study used a survey design, with data analyzed using independent t-tests, ANOVA, and Pearson correlation. The findings indicated that pre-service teachers had the highest self-confidence

level in pedagogy knowledge but the lowest in technological knowledge. They ranked themselves higher than four on a five-point scale. There were no significant variations in gender or age across the TPACK characteristics. There was also a considerable disparity between pre-service instructors at the undergraduate and postgraduate levels. Furthermore, there was a strong positive and significant association between all six TPACK domains.

Based on the elaboration in the previous section, the researchers want to examine more deeply the self-assessment of pre-service teachers at STKIP PGRI Jombang 2019 English Language Education regarding their Technological Pedagogical and Content Knowledge (TPACK). The research question proposed in this research is "how is the pre-service teachers' self-assessment on their Technological Pedagogical and Content Knowledge (TPACK)?"

METHOD

The approach of this study used quantitative method based on the aims and the needs of the research. Quantitative research was a strategy for testing objective ideas by examining the relationships between variables. (Cresswel, 2014). The design of this study is classified as a survey design. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. The purpose of this survey was to explain the characteristics of a population. To find out the pre-service teachers' self-assessment on their TPACK, researchers used a survey design to describe and interpret what it is.

The population of this study is pre-service teacher at English Education Department 2019 of STKIP PGRI Jombang who had taken PLP course. The sampling approach utilized in this study is non-random sampling, which means that the researcher does not offer members of the population the same chance of being members of the sample (Sugiyono, 2016). The use of non-random sampling is based on the consideration that the authors use all the member of the pre-service teacher who had taken PLP courses. With these considerations, the sampling technique suitable for use is Saturation Sampling. Saturation method sampling is a sampling method that includes all members of the research sample population. In this study, the sample population are 60 pre-service English teachers who have taken PLP courses.

The research instrument used in this study is a questionnaire. Rukminingsih (2020) explained that a questionnaire is a method of collecting a list of written questions given to respondents to be answered either directly or indirectly. Thus, So, the questionnaire was a list of questions written by the researcher, and each question connected to the research problem. The questionnaire used by the researcher in this study is a close-ended question. According to Ary (2010) the respondents can answer closed-ended questions more easily and quickly because it does not provide much insight into whether respondents have any information about the topic. The close-ended questionnaire is used to generate the results of each item, which will then be examined using descriptive statistics (mean score).

In this study, the researchers collected data by using a questionnaire where the contents were adopted from Chai, et al (2013). The content of questionnaire is 31 questions that following some section, those are: Content Knowledge (CK) 4 questions, Pedagogical Content Knowledge (PCK) 5 questions, Pedagogical Knowledge (PK) 5 questions, Technological Pedagogical and Content Knowledge (TPACK) 5 questions, Technological Content Knowledge (TCK) 4 questions, Technological Pedagogical Knowledge (TPK) 4 questions, Technological Knowledge (TK) 4 questions. The response of questionnaire for each item is provided in the form of Likert scale. The researcher used a 4-point Likert scale for each

statement to determine whether they agree, strongly agree, disagree, and strongly disagree with the statement. Respondents answered questions using the 4-point scale.

Based on Widoyoko in Purnomo & Palupi (2016), the questionnaire in this study was used to group students based on Technological Pedagogical and Content Knowledge (TPACK) criteria into four groups namely very good, good, medium, and low as shown in Table 1.

Table 1. TPACK Category Level (Adapted from Widoyoko, 2016)

Variable	Category	Interval
TPACK	Very good	$3{,}26 < x \leq 4{,}00$
	Good	$2{,}51 < x \leq 3{,}25$
	Medium	$1{,}76 < x \leq 2{,}50$
	Low	$0{,}00 < x \leq 1{,}75$

In collecting the data, the researchers prepared the instrument by creating a questionnaire using Google Form and then shared the linked questionnaire with the participant by WhatsApp. Once the data was finished, the SPSS program was used to analyze and compute it.. The researchers use descriptive statistical analysis by searching for data averages (mean). Next, the researchers groupi the average (mean) based on Technological Pedagogical and Content Knowledge (TPACK) criteria adapted from Widoyoko (2016) into four groups, namely very good, good, medium, and low. And then draw the conclusion based on the result of analysis.

FINDINGS AND DISCUSSION

FINDINGS

From total 60 pre-service English teacher, the researcher had distributed the questionnaires to 47 respondents in pre-service English teacher at STKIP PGRI Jombang 2019 who had taken PLP course. The data from the questionnaire was analyzed to answer the research question relate to "self-assessment pre-service teachers of their Technological Pedagogical and Content Knowledge (TPACK)".

THE RESULT OF SELF-ASSESSMENT PRE-SERVICE TEACHERS

The descriptive data presented includes the mean. This means that it is the calculated average. The results of the respondents' questionnaire answers are presented in Table 2.

Table 2. The Results of the Respondents' Questionnaire Answers

No	Item	Mean
1	Content Knowledge (CK)	2,98
2	Pedagogical Content Knowledge (PCK)	2,71
3	Pedagogical Knowledge (PK)	3,02
4	Technological Pedagogical and Content Knowledge (TPACK)	2,92
5	Technological Content Knowledge (TCK)	3,02
6	Technological Pedagogical Knowledge (TPK)	3,02
7	Technological Knowledge (TK)	3,11

Pre-Service Teachers self-assessment on their Technological Pedagogical and Content Knowledge (TPACK) include 7 components: Content Knowledge (CK), Pedagogical Content Knowledge (PCK), Pedagogical Knowledge (PK), Technological Pedagogical and Content Knowledge (TPACK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Knowledge (TK). Based on table 2, the TPACK of the pre-service is good with average mean score of Content Knowledge (CK) 2,98; Pedagogical Content Knowledge (PCK) 2,71; Pedagogical Knowledge (PK) 3,02; Technological Pedagogical and Content Knowledge (TPACK) 2,92; Technological Content Knowledge (TCK) 3,02; Technological Pedagogical Knowledge (TPK) 3,02; and Technological Knowledge (TK) 3,11.

FINDING OF EACH TPACK COMPONENT

CONTENT KNOWLEDGE (CK)

Content Knowledge is the first component that includes 4 statements. The researcher finds out the result of Content Knowledge component of pre-service teacher' self-assessment response in the questionnaire in Table 3.

Table 3. Score Pre-Service teachers' self-assessment for Content Knowledge (CK)

No. Item	Items	Mean
1	I have sufficient knowledge about my teaching subject.	2,98
2	I can think about the content of my teaching subject like a subject matter expert.	2,89
3	I am able to gain deeper understanding about the content of my teaching subject on my own	3,04
4	I am confident to teach the subject matter.	3,02
	Average Mean	**2,98**

Based on Table 3, the researcher finds out the most average mean pre-service CK is in the good category (2,98). The highest mean is a statement about understanding the content of learning material with mean of 3,04 and statement about confident to teach the subject matter with the mean 3,02. The lowest mean is in the statement pre-service can think about the content of their teaching subject like a subject matter expert with mean 2,89.

PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

Pedagogical Content Knowledge is the second indicator that includes 5 statements. The researcher finds out the result of Pedagogical Content Knowledge indicator of pre-service teacher' self-assessment response in the questionnaire in Table 4.

Table 4. Score Pre-Service teachers' self-assessment for Pedagogical Content Knowledge (PCK)

No. Item	Items	Mean
5	Without using technology, I can help my students to understand the content knowledge of my teaching subject through various ways.	2,66
6	Without using technology, I can address the common learning difficulties my students have for my teaching subject.	2,62
7	Without using technology, I can facilitate meaningful discussion about the content students are learning in my teaching subject.	2,70
8	Without using technology, I can engage students in solving real world problem related to my teaching subject.	2,74
9	Without using technology, I can support students to manage their learning of content for my teaching subject	2,83
	Average Mean	2,71

Based on Table 4. the researchers find out that the average mean pre-service PCK score is in the good category (2,71). The highest mean is a statement about pre-service support students to manage their learning of content for their teaching subject without technology with mean 2,83 and pre-service can engage students in solving real world problem related to their teaching subject without technology with mean 2,74. The lowest mean is in the statement pre-service can address the common learning difficulties their students have for their teaching subject without technology with mean 2,62.

PEDAGOGICAL KNOWLEDGE (PK)

Pedagogical Knowledge is the third indicator that includes 5 statements. The researcher finds out the result of Pedagogic Knowledge indicator of self-assessment pre-service teacher response in the questionnaire in Table 5.

Table 5. Score Pre-Service teachers' Self-Assessment for Pedagogical Knowledge (PK)

No. Item	Items	Mean
10	I am able to stretch my students' thinking by creating challenging tasks for them.	3,00
11	I am able to guide my students to adopt appropriate learning strategies.	3,02
12	I am able to help my students to monitor their own learning.	2,98
13	I am able to help my students to reflect on their learning strategies	3,00
14	I am able to guide my students to discuss effectively during group work	3,13
	Average Mean	3,02

Based on Table 5, the researchers reveal that the average mean pre-service PK score is in the good category (3,02). The highest mean is the statement pre-service able to guide my students to discuss effectively during group work with mean 3,13 and the lowest mean is in the

statement pre-service can be able to help the students to monitor their own learning with mean 2,98.

TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK)

Technological Pedagogical and Content Knowledge (TPACK) is the fourth indicator that includes 5 statements. The researcher finds out the result of Technological Pedagogical and Content Knowledge indicator of pre-service teacher' self-assessment response in the questionnaire in Table 6.

Table 6, Score Pre-Service teachers' Self-Assessment for Technological Pedagogical and Content Knowledge (TPACK)

No. Item	Items	Mean
15	I can formulate in-depth discussion topics about the content knowledge and facilitate students' online collaboration with appropriate tools. (e.g., Google Sites, Discussion Forums)	3,04
16	I can structure activities to help students to construct different representations of the content knowledge using appropriate ICT tools (e.g., Webspiration, Mindmaps, Wikis).	2,85
17	I can create self-directed learning activities of the content knowledge with appropriate ICT tools (e.g., Blogs, Webquests).	2,87
18	I can design inquiry activities to guide students to make sense of the content knowledge with appropriate ICT tools (e.g., simulations, web-based materials)	2,85
19	I can design lessons that appropriately integrate content, technology and pedagogy for student-centred learning	3,00
	Average Mean	2,92

Based on Table 6, the researcher finds out that the most average mean pre-service TPACK score is in the good category (2,92). The assertion that pre-service teachers can create in-depth discussion topics concerning the subject matter and use the right technologies to support students' online cooperation has the highest mean (3,04). With the same mean of 2,85, the statement "Pre-service can design inquiry activities to guide students to make sense of the content knowledge with appropriate ICT tools" has the lowest mean. Pre-service can also organize activities to assist students in creating various representations of the content knowledge using appropriate ICT tools.

TECHNOLOGICAL CONTENT KNOWLEDGE (TCK)

Technological Content Knowledge (TCK) is the fifth indicator including 4 statements. The researcher finds out the result of Technological Content Knowledge indicator of pre-service teachers' self-assessment response in the questionnaire in Table 7.

Table 7. Score Pre-Service teachers' Self-Assessment for Technological Content Knowledge (TCK)

No. Item	Items	Mean
20	I can use the software that are created specifically for my teaching subject. (e.g., e-dictionary/corpus for language; Geometric sketchpad for Maths; Data loggers for science)	2,87
21	I know about the technologies that I have to use for the research of content of my teaching subject	3,11
22	I can use appropriate technologies (e.g., multimedia resources, simulation) to represent the content of my teaching subject	3,09
23	I can use specialized software to perform inquiry about my teaching subject	3,04
	Average Mean	3,02

Based on Table 7, the researcher finds out that the average mean pre-service TCK score is in the good category (3,02). The highest mean is the statement pre-service know about the technologies that they must use for the research of content of my teaching subject with mean 3,11. The lowest mean is in the statement pre-service can use the software that are created specifically for their teaching subject with mean 2,87.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (TPK)

Technological Pedagogical Knowledge (TPK) is the sixth indicator that includes 4 statements. The researcher finds out the result of Technological Pedagogical Knowledge indicator of pre-service teachers' self-assessment response in the questionnaire in Table 8.

Table 8 Score Pre-Service teachers' Self-Assessment for Technological Pedagogical Knowledge (TPK)

No. Item	Items	Mean
24	I am able to use technology to introduce my students to real world scenarios	3,09
25	I am able to facilitate my students to use technology to plan and monitor their own learning.	2,96
26	I am able to facilitate my students to use technology to construct different forms of knowledge representation.	3,00
27	I am able to facilitate my students to collaborate with each other using technology	3,04
	Average Mean	3,02

Based on Table 8, the researcher finds out that the average mean pre-service TPK score is in the good category (3,02). The lowest mean is in the statement that students can facilitate students using technology to plan or monitor learning with mean 2,96 and the highest score is in the statement that pre-service can be able to use technology to introduce the students to real world scenarios with mean 3,09.

TECHNOLOGICAL KNOWLEDGE (TK)

Technological Knowledge is knowledge the seventh indicator that includes 4 statements. The researcher finds out the result of Technological Knowledge indicator of pre-service teachers' self-assessment response in the questionnaire in Table 9.

Table 9. Score Pre-Service teachers' Self-Assessment for Technological Knowledge (TK)

No. Item	Items	Mean
28	I have the technical skills to use computers effectively	3,09
29	I can learn technology easily	3,21
30	I know how to solve my own technical problems when using technology	3,02
31	I keep up with important new technologies.	3,15
	Average Mean	3,11

Based on Table 9, the researcher finds out that the average mean pre-service TK score is in the good category (3,11). The highest mean is in the statement pre-service can learn technology easily with mean of 3,21. The lowest mean is in the statement pre-service know how to solve their own technical problems when using technology with mean 3,02.

DISCUSSION

In the first component, that is Content Knowledge (CK) consisting of 4 statements, the average mean pre-service CK score is in the good category (2,98). This shows that pre-service English teachers at STKIP PGRI Jombang 2019 have sufficient knowledge of English theory for the material to be taught and they have good confident to teach but they are still lacking in terms of material knowledge and in mastering the material they will teach.

In the second component, namely Pedagogical Content Knowledge (PCK) which includes 5 statements. In line with the previous component, the average mean pre-service PCK score is in the good category (2,71). This shows that pre-service teachers can understand how to display and present material so that the material will be taught in class in various ways. This also proves that with a high PCK category, the pre-service English teacher at STKIP PGRI Jombang 2019 has been able to be placed in various conditions.

The next component, namely Pedagogical Knowledge (PK) which includes 5 statements, it is gotten that the average mean of pre-service PK score is in the good category (3,02). The results obtained show that pre-service English teachers have good pedagogical knowledge. Pre-service is enough to master basic knowledge in the field of education, such as the development of lesson plans, class management, evaluation Lessons, models, methods, and learning strategies.

The fourth component, namely Technological Pedagogical and Content Knowledge (TPACK) which includes 5 statements reveal the average mean pre-service TPACK score is in the good category (2,92). This shows that pre-service English teachers at STKIP PGRI Jombang can integrate technology, content, and pedagogy into the learning process. Similar to the previous component, the fifth component, namely Technological Content Knowledge (TCK) which includes 4 statements indicates the average TCK score is in good category (3,02). This shows that pre-service English teachers at STKIP PGRI Jombang can use technology to convey material.

The sixth component is Technological Pedagogical Knowledge (TPK) which includes 4 statements shows the mean score of pre-service TPK is in the good category (3,02). This indicates that the pre-service can select and use technology appropriate in the learning process to achieve learning objectives. Then the seventh component is Technological Knowledge (TK) which includes 4 statements shows the mean score of pre-service teacher students is in the good

category (3,11). This matter points out that pre-service can keep up with developments technology well and can utilize technology in the field of education.

The findings of this study have similarities with previous study conducted by Septiyanti (2020) in which the TPACK perception of the students was generally good. But this study just focuses on analyzing 4 components of TPACK (TK, TCK, TPK, TPACK). While in this study researchers used 7 components of TPACK. Furthermore, the findings also support the research done by Irwanto, et al (2022) which indicate all TPACK components of pre-service teachers were in the good category. Moreover, resemblance was also found in the findings of the study by Wijaya, et al (2022) that discovered that pre-service teachers perform well in all areas of TPACK implementation when teaching English, which improves the way teachers transmit knowledge to students in the classroom. Students' learning environment and continuity are positively impacted when technology is used to assist with English language instruction. Pre-service English instructors can design the learning process to occur even in the face of constraints by incorporating TPACK into their lesson plans. (technology or each other). The results in this study show that pre-service English teachers at STKIP PGRI Jombang 2019 have good category in 7 components of TPACK. This shows that pre-service has been able to integrate technology, content, and pedagogy in the learning process. As Kohler, et al (2012) stated that TPACK emphasize relationships between technology, content, and approach pedagogy to show how the teacher's understanding of technology, content, and pedagogy can interact with one another to produce discipline-based and efficient teaching.

CONCLUSION

Based on the results of the analysis of the self-assessment pre-service English teachers at STKIP PGRI Jombang 2019 about their TPACK, it can be concluded that the overall TPACK of the pre-service is good with average mean score 2,98. To be specific the average score of each component are Content Knowledge (CK) 2,98; Pedagogical Content Knowledge (PCK) 2,71; Pedagogical Knowledge (PK) 3,02; Technological Pedagogical and Content Knowledge (TPACK) 2,92; Technological Content Knowledge (TCK) 3,02; Technological Pedagogical Knowledge (TPK) 3,02; and Technological Knowledge (TK) 3,11. This answers the research question that most of the pre-service English teachers at STKIP PGRI Jombang 2019 have good category of several TPACK , namely the PK (3,02); TCK (3,02); TPK (3,02); and TK (3,11).

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