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Perceptions of technological, pedagogical and content knowledge (TPACK) among EFL pre-Service teachers in Central Java, Indonesia

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Abstract

Due to the COVID-19 pandemic, the demands of technology in the Twenty-First Century Learning era are crucial. Technology has changed the way of teaching; however, most technologies did not design for education, with the TPACK framework proposed by Mishra and Kohler (2009) can bridge the teacher's pedagogy and the appropriate technology for teaching. TPACK is a framework that describes teachers' understanding of the interrelated interactions between technology, pedagogy, and content knowledge. This paper aimed to investigate how pre-service teachers perceived their technological, pedagogical, and content knowledge regarding the TPACK framework in Indonesia. Six pre-service teachers from secondary schools with technology experience are studied using a sequential qualitatively guided mixed-method approach. Questionnaires and interviews are used as part of the research. The descriptive data analysis was conducted. The results indicated that pre-service teachers lack integration of technology but they perceive that they are good at pedagogical knowledge. The findings are helpful advice for English language teachers, particularly those engaging in the EFL context, who are using TPACK in the classroom.

Keywords**:** EFL Pre- Service Teachers; Perception; Technological, Pedagogical and Content Knowledge; TPACK

Introduction

This research investigates English as a Foreign Language (EFL) teachers' perception by focusing on a period of teaching mode transition during coronavirus disease that is well known as COVID-19 and specifying how this condition turns teacher perceptions of themselves in the use of technology in teaching and learning practice. This condition becomes crucial in education. All schools and colleges are closed temporary and the government takes the path of Online Learning, which means online learning as a solution. Dhawan (2020) revealed that online learning is defined by the capacity to learn from anywhere, at any time, in any rhythm and with any methods using a computer connected to a network. However, online learning is inseparable from the factors that hinder it, such as poor internet connection, in-conducive situation at home, the limited time allotment for each meeting, poor concentration of learning and the cost of online technology (Rasheed et al., 2020). This means teachers need to think carefully about the potential of technology in solving pedagogical problems when designing online learning. Some educational technologists and Computer-Assisted Language Learning (CALL) adopt a more critical stance to the use of technology in education, and believe that technology is only effective when its attributes and affordances align with the subject content and associated theories of learning and teaching practices (Mishra & Koehler, 2006). Pedagogical content knowledge was used to characterize teachers' knowledge of how subject matter should be taught. The teachers not only have to master the subject or the content but also have to master other factors such as classroom management, learning strategies, learning methods and mastery of appropriate

pedagogical approaches for content knowledge to students (Koh et al., 2016). One way to support the use of technology in learning is to use a framework for integrating complex issues of content knowledge, pedagogy and technology.

This Technological, Pedagogical, and Content Knowledge (TPACK) was introduced by Mishra and Koehler (2006) developed on the conceptual framework developed by Shulman (1986) about Pedagogical and Content Knowledge (PCK). Historically, Shulman proposed teachers' knowledge as PCK which means content and pedagogy is bounded. His model consists of three areas of knowledge namely pedagogical knowledge (PK), content knowledge (CK) and PCK. PK deals with the methods and process of teaching covers knowledge in classroom management, assessment, lesson plan development and student learning. CK deals with knowledge of subject matter that is to be learned or taught. PCK refers to the content knowledge that deals with the teaching process. This knowledge also involves a different teaching strategy appropriate for conceptual representations to address learning difficulties and misunderstandings, and fostering meaningful understanding.

Mishra and Koehler (2006) model adding technology to content and pedagogy, which represents how technology is pedagogically used to teach content. They named the model TPACK which is formerly referred to as TPCK pronounced as "tee-pack" to make pronunciation easier (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009, which consists of seven parts and is often presented as a Venn diagram with overlapping circles. The three circles in this model describe basic areas of teacher knowledge (CK, TK, and PK) and the four overlapping parts indicate the integration between these three circles are described below.TK refers to the knowledge of various technologies ranging from low-tech to high-tech. The examples of technology that are used are computers, projectors, digital video, interactive whiteboards and software programs. Technological Pedagogical Knowledge (TPK) represents the knowledge of how various technologies can be used in teaching, and to understand that using technology may change the way of teaching. Technological Content Knowledge (TCK) takes on the knowledge of how technology can create new representations for specific content. And the last, TPACK deals with the knowledge required by teachers for integrating technology into their teaching in any content area. Teachers expect to help their students learn content through the use of specific technology using specific teaching strategies.

This framework, TPACK has gained much attention recently (Mishra & Koehler, 2006). There is an increase due to the need and interest in this framework. In short, TPACK is a framework that provides teachers' view and knowledge in designing lesson plans so that a meaningful learning process occurs (Drajati et al., 2020). The success of learning using this framework will also save teachers time being effective and efficient. Huseyin Oz (2015) stated in his study, all the interviewees expressed their positive attitudes toward the use of mobile language learning. It is revealed that based on the notion of ubiquity or anywhere and anytime, mobile language learning can promote autonomous learning by providing them opportunities to enhance their languge skills. Chai et al (2011) conducted a study for Singaporean primary school pre-service teachers that examines the construct validity of a TPACK survey that was contextualized for the pedagogical approaches employed in a 12-week ICT course designed with reference to the TPACK framework. The results explain that five of the seven TPACK constructs. Nazari et al (2019) from University, Tehran, Iran conducted a study about examining novice and experienced EFL teachers' differences in their perceived TPACK and its influences on their professional development. Since, this is a mixed method study, the quantitative results indicated that experienced teachers were of significantly higher scores in terms of pedagogical knowledge and pedagogical content knowledge subscales, while, novice teachers were of significantly higher scores considering their TK, TCK, TPK, and TPACK. Then, the qualitative results show that novice and experienced EFL teachers favored different professional development programs tailored to their needs. Turgut (2017) has a study about the comparison between pre-service and in-service EFL teachers in turkey. In Indonesia, the research study on

TPACK was conducted by Mahdum (2015) who investigated the use of TPACK among Senior High School EFL teachers in Pekanbaru by using self-assessment questionnaire of the seven sub domains by adapting questionnaire from Schmidt (2009). Baser et al. (2016) conducted a study within the scope of TPACK assessment upon EFL teaching at a major university in Turkey. His study reported the process of validating and developing an instrument of self-assessment for preservice teacher of EFL subject in regards of TPACK. The result of this study offered an instrument in the form of survey questionnaire which could be used for self-assessing teacher's TPACK by employing seven factors.

Based on the previous studies above, more studies of teachers outside native are still needed to explore the possibility of cultural differences teachers' TPACK perception (Koh et. al. 2010). Given the gaps in extant research, this study proposes to examine issues related to the development of TPACK surveys with a study of Indonesian pre-service teachers in Central Java, Indonesia. Although previously, there have been many valid and reliable TPACK instruments in a variety subjects or content areas, such as math, social studies, science, literacy and physics, geography (Schmidt. 2009; Abbit. 2011; Graham 2009; Su, Huang, Zhou, and Chang, 2017), however, a valid and reliable TPACK survey for EFL teachers has still rare. Based on the background above, this study adapts Baser (2016) instruments to find out the TPACK perception of Indonesian EFL teachers within exploring seven domains containing 34 item numbers using 5 Likert scale starting from strongly disagree to strongly agree.

Research Methodology

Based on the research's purpose, it applied the mixed method research type. According to Johnson and Christensen (2019), mixed research is a research type that merges the major concept of quantitative and qualitative methodology. This research employed the sequential qualitative dominant approach, the quantitative data, which are gathered will be "qualitized" by making descriptive summaries in the form of narrative derived from numerical data (Johnson & Christensen, 2019).

This research conducted on Central Java, Indonesia within six English teachers from secondary schools' level participated in this research. Purposive sampling technique is used within criteria the English teachers who are using technology in their teaching. The main data sources consist of quantitative questionnaires and semi-structured interviews. In this study, quantitative explanations were more dominant and then supported by interviews.

Findings and Discussion

The goal of the problem formulation in this study was to describe the extent to which the English teacher's perception of TPACK. To shorten the explanation, the following table will describe the seven domains of TPACK with the highest, enough or lowest category of each domain.

TPACK Domain		M	SD	Categorization
Technological Knowledge (TK)	I can use Office programs (e. g. Word, PowerPoint, etc.) well	4,83	0,41	High
	I can create multimedia (e. g. videos, Google Forms, Google Drive, G-mail, etc.) using text, images, sound and video	4,83	0,41	High
Content Knowledge (CK)	I can express my ideas and feelings by speaking in English	4,83	0,41	High
	I keep up with the new technology	4,50	0,55	High
Pedagogical Knowledge (PK)	I can reflect the experience I have gained from teacher professional development programs into my teaching process	4,17	0,98	High
	I can collaborate with students, parents and teachers to support student learning	3,67	0,82	Enough
Pedagogical Content Knowledge	I can manage the learning	4,33	0,82	High

(PCK)	environment in the classroom			
	I can use appropriate teaching methods and techniques to support students in developing their language skills	4,17	0,75	High
Technological Content Knowledge (TCK)	I can benefit from using technology (e. g. web conferences and discussion forums) to contribute remotely to a multilingual community	4,50	0,84	High
	I can use collaboration tools to work collaboratively with foreigners (e. g. Goggle Doc, Google Drive, Google Forms, Zoom, etc.)	4,17	0,98	High
Technological Pedagogical Knowledge (TPK)	I can meet the individual needs of students by using information technology	4,33	0,52	High
	I can use multimedia such as videos and websites to support students' language learning	4,33	0,52	High
Technological Pedagogical Content Knowledge (TPCK)	I can support students as they use technology to support their own language skills development	4,67	0,52	High
	I can support my professional development by using technology tools and resources to continuously improve the language teaching process	3,84	0,41	Enough

In TK domain above, with an average value of 4.83, item number 4, 6, 5 indicated the highest teacher technology knowledge. This result was also in accordance with the statements of several teachers, T2 said *"Yes, it is very necessary. Especially during a pandemic like now, learning without technology will not work"*, T3 "*It is very necessary, because the world of education develops and follows the times and cannot run away from technology which also influences the development of the world of education"*. T6, *"Yes, I think it is necessary to have knowledge of technology...interactive classes...students today are very familiar with technology"*. This showed their positive perception of technology and attaches importance to the existence of technology. However, T6 said *"Regarding the obstacles I face when teaching using technology, namely the network and the quota that must be issued"*, T4, T5 had a problem about signal. T3 *"is the lack of knowledge or procedures for using the application itself because each application is different, and that must be known first, secondly there are several applications that ask users to pay",* T2 *"a cell phone that lacks support when I use technology such as Google Drive"*. Then, the obstacles that teachers and students faced regarding online learning using technology include signals, quotas, lack of support of the device on mobile phones and paid applications. Regarding the ownership of devices such as cellphones for online learning, it was reported that more students have cellphones than those who don't as evidenced in the statement T5 *"Many already have their own cell phones but there are also some who don't have their own",* T3 *"Almost 90% of my students already have their own cell phones"*

In CK domain, with an average value of 4.83, item number 9 and 12 indicated the highest teacher content knowledge, "I can express my ideas and feelings by speaking in English" and "I can understand text written in English". It means that they were confident about their content knowledge in teaching learning process and it is expected that their knowledge can be explained well to the students.

In PK domain, with an average value of 4.17, item number 14 and 18 indicated the highest teacher pedagogical knowledge, "I can use teaching methods and techniques appropriate to the

learning environment" and "I can reflect the experience I have gained from teacher professional development programs into my teaching process". It indicated that teachers stated good to their teaching and can implement their professional development program. However, in items numbered 15, 16, 17 they stated that they were sufficient, as evidenced by the average values of 3.83 and 3.67. This can be said to be good in PK. Looking at the interview session, T1 and T6 *"Erm, until now I have not received technology training at school… urges me to become self-taught …"* said that they did not receive training in using the platform from the school so they studied on their own, but T2, T3, T4 and T5 stated that they had attended the training and could apply it well in class so as to make their class more interactive, *T2 "Yes, I recently participated in a technology training in learning",* T3 *"Yes, I attended training that covered both the field of education, especially English and technological developments".* It can be concluded that the training on technology for teachers has not been evenly distributed, perhaps suggestions for stakeholders with this finding should be able to provide more equitable training to teachers in schools, this is considering the needs of teachers at this time and their enthusiasm to learn to use technology. It can be obtained also that they considered knowledge of TK and PK to be important, equally important, but many of them answered that they had more control over PK for certain reasons as evidenced in the following statement, T2 *"I'm more into pedagogy"*, T3 *"Ahh yeah pedagogic",* T4 and T6 *"I think for now what I'm better at mastering is knowledge about pedagogy".* Then it can be concluded that they are good in their PK and sufficient in their TK.

In PCK domain, the teachers have high knowledge of pedagogical content and the highest falls on item number 20 with an average value of 4.33 "I can manage the learning environment in the classroom". This is in line with their utterance, T1 *"It would be better if English is learned through technology, so technology is a tool to help improve the effectiveness of learning",* T3 *"because the world of education develops and follows the times and cannot run away from technology",* T5 *"the important thing is that the pedagogical aspect is considered, the content is considered"* and T6 *"what we need to do is direct them so that they can access content or applications in the gadgets".*

In TCK domain, it indicated a high level as evidenced by all items with an average value above 4. The highest average value is in item number 26 "I can benefit from using technology (e. g. web conferences and discussion forums) to contribute remotely to a multilingual community". This was agreed with their statement T2 *"…as a result, my learning is more active than before",* and T5 *"by following technological developments, I can also use various learning strategies with certain applications to better help my students".* Linking to item number 27, all teachers have already used platform in their class. The platforms that they used are vary due to the students' ability and students' background, it is proven with what they said T5 *"Yes...Google classroom, WAG, dan G-Forms",* and T4 *"I often use WA-G, PowerPoint, zoom, google form, and Gmail, so it just depends on the function and how good do students think it is".*

In TPK domain, mostly all teachers agreed that they were able in implementing TPK, with the highest average value 4, 33 in item number 28 dan 34 "I can meet the individual needs of students by using information technology" and "I can use multimedia such as videos and websites to support students' language learning". This is confirmed with T4 said *"making power points with erm, what's the name, the voice has been inserted, and learning videos are uploaded on YouTube so that students and parents can access it",* and T1 *"I use video, audio and power point" and T6 "I use technology in my teaching, such as videos on YouTube and power point".* While, item number 32 indicated that they sufficient in determining when technology will benefit their teaching of certain curriculum standards in the English subject. Perhaps it can be related to the barriers of the technology itself.

In TPACK domain, all teachers had high average score and item number 35 "I can support students as they use technology to support their own language skills development" is the highest one. But item number 37 "I can support my professional development by using technology tools and resources to continuously improve the language teaching process" spoke that some of them had

sufficient knowledge in TPACK. These findings were related to what they say that some of them have already known about TPACK, but two of them T2 *"I don't know exactly what TPACK it is",* T3 *"Yes, I feel new to the term TPACK, … it might be more about how to use technology"* they did not understand the concept of TPACK but unconsciously they have implemented it in teaching so it can be concluded that there were English teachers in schools who already know the concept of TPACK and apply it, but there are also those who did not know the concept of TPACK but have unconsciously applied it.

Thus, this finding was not in line with Luik et al., 2017 that the results indicated that pre-service teachers lack pedagogical knowledge, but they perceived that they were good at integrating technology into their teaching. Luik had as study about TPACK in Estonia, it is different with our country that the finding revealed that pre-service teachers lack integration of technology but they perceived that they were good at pedagogical knowledge.

Conclusion

This study aimed to obtain descriptive information about the TPACK perspective on English teachers in secondary schools. The findings from the descriptive analysis can be used as considerations for further research that is more detailed or specific about the platform used. The results of this analysis can be used as input for teachers to pay more attention to efforts to implement technology in learning.

Based on the statement on the statistical frequency analysis of the answers given to the items in the questionnaire, it shows that most of the English teachers in secondary schools in Central Java, Indonesia had enough knowledge of the ability to use technology in teaching and learning process, as found in the results showed that pre-service teachers lack integration of technology but they perceived that they were good at pedagogical knowledge. This was of course due to the technology's barriers itself such as network trouble, the cost of online tech, unsupported cellphones, lack of technical usage of the platform and uneven training on the use of certain platforms for learning. This can be an input for stakeholders to pay more attention to the needs of teachers and students because the demands of the times are increasingly crucial.

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