The Effect of Technology Based Instruction Lesson Plan on EFL Pre-Service Teachers' TPACK Self-Efficacy

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Abstract

This study aims at delving into the effect of applying TbI (Technology based Instruction) lesson plan to pre-service teachers' (PSTs) Technological Pedagogical Content Knowledge (TPACK) self-efficacy in a microteaching course. TbI lesson plan was developed following Niess's technology integration framework. The experimental research with pre-post measurements design was conducted in an English Department in a public university in West Nusa Tenggara, Indonesia. The data-gathering process was done by administering the TPACK self-efficacy questionnaire and conducting a semi-structured interview. The participants were 23 PSTs who joined a microteaching course where the researcher became the teacher. The quantitative data were analyzed statistically through SPSS 24 version and supported by the PSTs responses which were thematically analyzed. The results showed that the treatment affected positively to PSTs' self-efficacy which was later recommended to inhibit technological knowledge prior to other TPACK divisions to PSTs. This favorable effect was confirmed by six participants' post-interview comments, in which they claimed all of the benefits of using a TbI lesson plan to improve their microteaching performance and confidence to use technology for EFL teaching. Henceforth, this study implies the urgency to apply similar instruction to mediate challenges of technology integration in EFL teaching.

Keywords: EFL, Pre-service teachers (PSTs), TbI Lesson Plan, technology based instruction, TPACK self-efficacy

1. Introduction

Technology is inseparable from education in the present situation, pandemic Covid-19 (Alverde-Berrocoso, 2021), or even in the post-pandemic era due to its effectiveness to mediate teaching and learning as well as providing a scaffold to mediate obstacles (Janson, Sollner, & Leimeister, 2020). Technology helps teachers to maintain students' engagement in distance learning. Technology aids teachers in providing more interesting, interactive, and effective materials for teaching (Fitriah, 2018). Technology also can mingle students in a collaborative learning environment using any platform, i.e Schoology, Edmodo, Google Doc, etc. (Dewi, 2014). Moreover, technology may influence teachers' psychological and professional preparedness, such as self-efficacy (Zhang, Chen, Ma, Liu, 2021).

One of the frameworks that underlie theories to embody technology in teaching is TPACK (Technological Pedagogical Content Knowledge) which was first introduced by Mishra and Koehler (2006). This framework contains three domains, namely Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). In more comprehensive empirical practice, TK is about the teachers' ability to use technology to aid teaching and enhance students' learning, PK is related to the teachers' capacity in designing and applying teaching strategies for better teaching in the classroom, and CK is about teachers' mastery and comprehension of teaching materials. In the framework, they are connected and develop subsets namely TCK, TPK, and PCK as seen in figure 1.

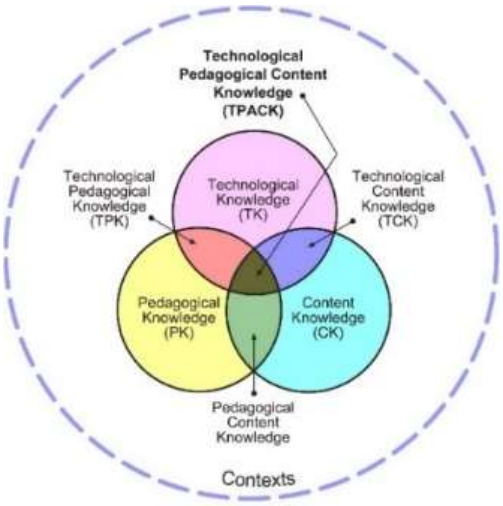

Figure 1. TPACK Framework by Mishra and Koehler (2006)

There has been few research related to the use of technology as part of TPACK in EFL teaching, especially by the pre-service teachers in their lesson planning. Kwangsawad (2016) stated that PSTs considered teaching complex activities which require serious attention in planning and preparation. However, the study revealed that good TPACK integration in lesson planning led to successful EFL teaching. Syamdianita and Yudi's (2021) study showed that lesson plan which integrates technology through LBD model could help PSTs to enhance their ability to design teaching materials. Similarly, Megawati et al. (2021) stated that exploring features of technology for educational purposes contributes to strengthening teacher professional development, particularly in lesson planning. These results implied the effect of technology integration as part of TPACK on the PSTs' teaching performance. Therefore, future studies at knowing alternative models to integrate technology into the lesson plan are required to know its effectiveness on EFL teaching.

Niess et al. (2013) introduced a Technology-based Instruction (TbI) model containing Recognizing, Accepting, Adapting, Exploring, and Advancing to aid teachers, including PSTs in inhibiting technology in EFL teaching instructions. Janson and Lazonder (2015) state that PSTs grabbed the benefits of TbI-infused lesson plan. Reviewing the good practices of TbI lesson planning implementation for teachers including PSTs, the adoption of TbI lesson plan was done to aid PSTs' teaching practice in microteaching class at an English Department in a public university in West Nusa Tenggara Province, Indonesia. This idea came up since most of the PSTs in the research setting did not integrate technology in teaching English. However, the use of technology could mediate deficiencies in online teaching, such as students' lack of motivation, low engagement, and less autonomous in learning, due to Covid-19 pandemic situation by creating a more attractive and meaningful teaching and learning process (Fitriah, 2018). Therefore, due to the limited number of EFL TbI lesson planning investigations this research was aimed at knowing the effect of TbI lesson plan on EFL PSTs' TPACK self-efficacy.

2. Literature Review

Niess et al. Model based TbI

Niess et al. (2013) introduced a new model for teacher to integrate a specific technology in teaching and learning. According to Niess et al., a teacher level of technology integration in teaching can be categorized into the following levels: (1) Recognizing (knowledge); (2) Accepting (persuasion); (3) Adapting (decision); (4) Exploring (implementation); (5) Advancing (confirmation). These levels are transformed into sequential steps for teaching. In this research, PSTs start helping students to recognize the technology used for EFL learning and to make students accept it. Then, PSTs trained students to learn and adapt learning materials from the existed resources in the technology. After that, PSTs guide students to explore the technology features for constructing their compositions. Finally, PSTs let students use technology for presenting publicly, comparing and contrasting with others, getting feedback, or even inviting another technology to enhance the quality of their compositions. These teaching processes in this research are called Technology-based Instruction (TbI).

Figure 2. TbI teaching process based on Niess et al. (2007) model

TbI Lesson Plan

PSTs, as potential teachers, will act as agents of change, integrating technology into the classroom. It is in conformity with the Indonesian National Qualification Framework (KKNI) standard and the Regulation of the Minister of Research, Technology, and Higher Education (Permenristekdikti) number 55 of 2017. These standards require teachers to be able to use information and communication technology in the planning, organizing, evaluating, and managing of learning, as well as to be able to apply information technology knowledge and skills in the context of scientific development and implementation of a field of expertise, mastering the integration of technology, pedagogic, and scientific content. Technology integration in teaching is part of TPACK framework. TPACK is a body of knowledge that instructors must learn in order to effectively use technology in the classroom. To achieve technology-integrated learning, TPACK must be used in the learning process. The use of TPACK in the learning process may be shown in teacher teaching performance (Paidi et al., 2019). In the present research, PSTs teaching performance should be based on the use of TbI lesson planning that the teaching procedure should apply Niess et al.s' (2013) components namely recognizing, accepting, adapting, exploring, and advancing. The template of the TbI lesson plan is available in Appendix A.

TPACK Self-Efficacy

Technological integration is obviously tied to a teacher's technology knowledge and self-efficacy views (Abbitt, 2011). As a result, educational reforms including technology integration must carefully analyze how to give effective chances for teachers to improve their technological knowledge and create self-efficacy beliefs in order to improve technology integration. More precisely, a teacher's ideas about their TPACK are critical when it comes to the use of technology in the classroom since a teacher's beliefs about their capacity to utilize technology are a potential predictor of how well they will actually use technology (Lee & Tsai, 2010). Thus, this PSTs' TPACK self-efficacy in the present research was delved into through the use of TbI lesson plan.

3. Method

The present research employed an experimental research method with pre-test and post-test design in an English Department in a famous public university in West Nusa Tenggara, Indonesia. The experiment was done by applying a treatment (TbI Lesson Plan) that students had developed to investigate their TPACK self-efficacy prior to and after the treatment.

Instruments

To gather the data, the researchers employed TPACK self-efficacy questionnaire adapted from Kiray (2016). The questions of the questionnaire were distributed based on subdivisions of TPACK framework, they are TK (Q1-Q5 or 5 questions), PK (Q6-Q10 or 5 questions), CK (Q11-Q15 or 5 questions), TPK (Q16-Q21 or 6 questions), TCK (Q22-Q28 or 7 questions), PCK (Q29-Q33 or 5 questions), and TPACK (Q34-Q36 or 3 questions). The number of questions in the used questionnaire were decided based on the adjustment to meet the present study context which was about EFL PSTs' TPACK self-efficacy in the microteaching course by employing TbI lesson plan. The questionnaire comprises scales from 1 to 5 with the description of the average score as stated in Table 1.

Table 1. Description of Average Scores in TPACK Self-Efficacy Questionnaire

Categories	Range of points	Indication
Very High	4.1-5.0	Indicates a very high level of TPACK self-efficacy
High	3.1-4.0	Indicates a moderately high level of TPACK self-efficacy in EFL microteaching performance.
Moderate	2.1-3.0	Suggests moderate TPACK self-efficacy in most microteaching performance situations but no severe that the individual cannot cope and be a successful teacher to integrate technology in teaching EFL.
Low	1.1-2.0	Suggests a moderately low level of TPACK self-efficacy. People with such scores will tend to avoid using technology for teaching EFL.
Very Low	0.0-1.0	Indicates a very low level of TPACK self-efficacy in teaching. People with these scores will go to considerable lengths to avoid all types of technology integration for teaching EFL.

Moreover, a semi-structured interview was used to confirm the result of quantitative data. The interview blueprint

was developed based on the components of TPACK self-efficacy questionnaire and also Niess et al.s' (2013) technology integration components for teaching. The validity of the instruments had been achieved as they had been tested in Kirey's (2016) study. Then, to achieve the reliability of the instruments for the context of this research, the tests were conducted through SPSS 24 version with the results presented in Appendix B and C.

Participants

The participants were the 23 PSTs in an English Department in a public university in West Nusa Tenggara, Indonesia who joined microteaching class A in the department in the odd semester of the academic year 2021-2022. The class was chosen because of the principle of feasibility as the researcher became the teacher in the class.

Data Collection Procedures

To collect the data, TPACK self-efficacy questionnaire had been distributed twice, prior to and after the treatment of TbI lesson plan in the microteaching course. To confirm the obtained data from the questionnaire, a semi-structured interview was conducted after the experiment. However, the six participants who were chosen randomly using a lottery as the representatives of all participants were offered a letter of consent to avoid the ethical issue of this research.

Research Analysis and Procedures

The present research was conducted during eight meetings of the microteaching course in an English Department in a famous public university in West Nusa Tenggara, Indonesia. Each of PSTs performed teaching as a teacher based on their own lesson plan. The research implementation of this research followed procedures as stated in Table 2.

Table 2. Research Implementation Procedures

Prior Experiment	1.	Administering TPACK-Self-Efficacy questionnaire
	2.	Delivering materials and modeling TbI lesson plan (Recognizing, Accepting, Adapting, Exploring, and Advancing)
Whilst Experiment	3.	Giving treatment TbI lesson plan to infuse students' teaching performance in microteaching class
After Experiment	4.	Administering TPACK-Self-Efficacy questionnaire
	5.	Conducting semi-structured interview

To analyze the data, the quantitative data were analyzed statistically through SPSS 24 version. Then, the perceived numbers of calculations were described and interpreted based on the underlying theories of TPACK self-efficacy. Then, to analyze each subdivision of TPACK achievement percentage, the total of question items in each subdivision that achieved high and very high levels were totaled, and calculated to find the percentage following the formula:

TPACK Subdivisions (i.e TK) Percentage = [(Total Qs with "High & Higher levels": Total Qs) x 100%]

Furthermore, the findings of the quantitative data were supported by the results of the interview data. The interview for each participant was carried out for 15 minutes to meet the whole answers to all questions. The data were analyzed by coding the gathered data from the transcription of the audio recording. As these data were qualitative, we adopted a thematic analysis approach. The collected data were examined and grouped according to themes that emerged. Codes were then given to concepts and the items similar to each other were grouped. By grouping and differentiating the data, the categories were identified (Ezzy, 2002). Finally, the data were simplified and organized around specific concepts and themes and they were accordingly interpreted.

4. Findings

The present study was aimed at delving into the effect of TbI lesson plan on pre-service teachers' (PSTs) TPACK self-efficacy in the microteaching course. Therefore, the findings would be presented to meet this objective. Based on the administration of the questionnaire in two different periods, prior to and after the treatment of TbI lesson plan, the obtained quantitative data are presented in Figure 3 and Figure 4.

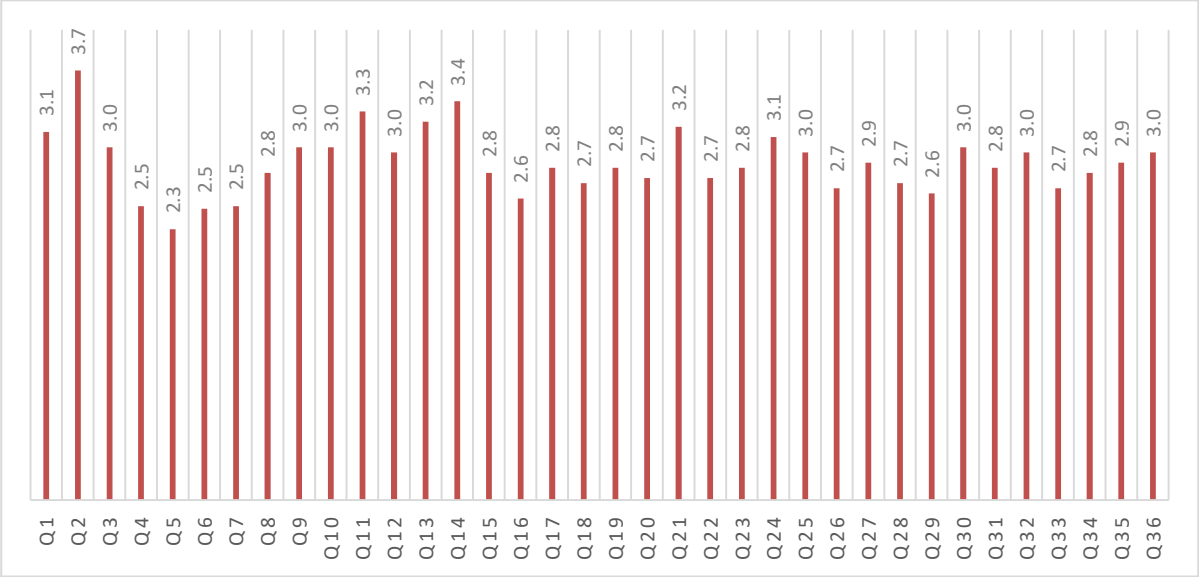

Figure 3. TPACK Self-Efficacy prior to TbI Lesson Plan Treatment

Figure 3 depicts PSTs' responses as self-reflection to measure their TPACK self-efficacy prior to the treatment. The findings show that dynamic results were pictured in Figure 3 with the peak score was 3.7 for question no. 2 which discussed PSTs' ability to communicate through the internet using various online applications such as WhatsApp, email, and Skype. The second highest score was shown by question no. 14 with an average score of 3.4. This question investigated students' responses to students' knowledge about practical skills such as interpretation, translation, and public speaking. However, PSTs' responses were still under favorable requirements since the responses to question no. 5 scored lower (2.3) than the average score of TPACK self-efficacy questionnaire scales (2.5). This data pictured PSTs' unreadiness to use software or application for teaching English (Mentimeter, Wattpad, Kahoot, etc.) which in this study became the focus of analysis. Nevertheless, the overall average score of the questionnaire showed that prior to the treatment of TbI lesson plan to the PSTs, they showed a moderate level of TPACK self-efficacy as proven by the average questionnaire scores of 2.87 or slightly higher than the average TPACK self-efficacy questionnaire scales (2.5).

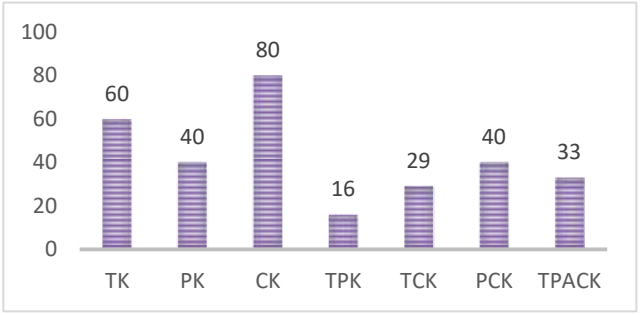

Figure 4. TPACK Subdivisions that Achieved High and Very High Levels of Self-Efficacy prior TbI Lesson Plan Treatment (in Percentage)

Figure 4 depicts the percentage of TPACK subdivisions that achieved high and very high levels of self-efficacy as the result obtained from the questionnaire administration. The highest percentage was shown by CK self-efficacy with 80% achievement while the lowest percentage was in TPK with 16% achievement. These data indicated that PSTs were confident with their content mastery prior to their microteaching performance but they were not with their ability to manage their teaching plan as it should employ any technology for teaching. Figure 4 also shows that only two TPACK subdivisions achieved percentages above 50% (TK and CK) while the others were below it.

After the implementation of TbI lesson plan to infuse PSTs' microteaching performance in microteaching course, different findings as the results of TPACK self-efficacy questionnaire administration were shown in Figure 4.

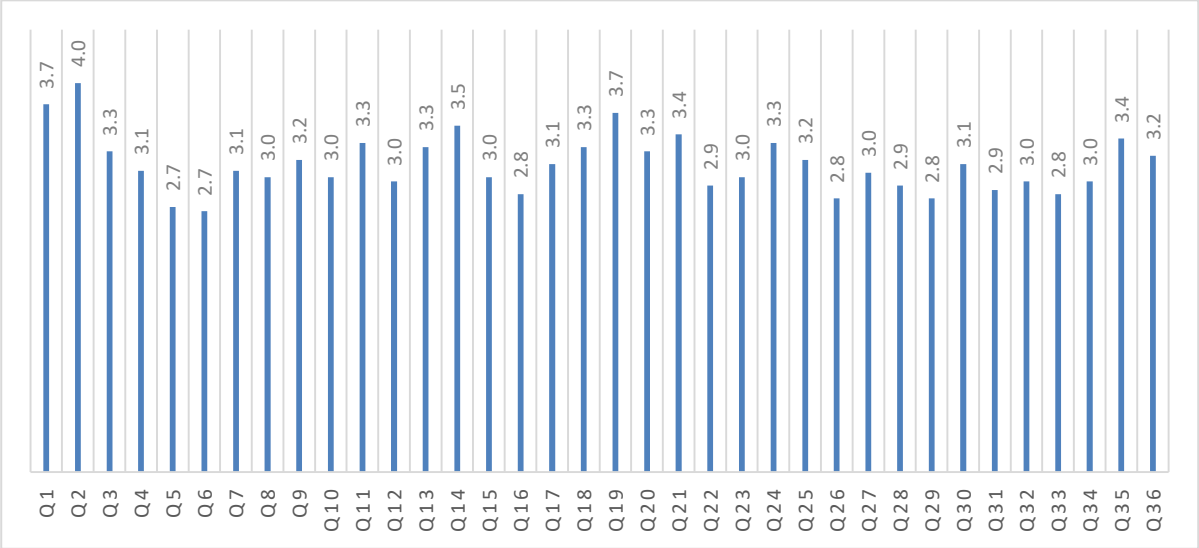

Figure 5. TPACK Self-Efficacy after TbI Lesson Plan Treatment

The findings which are exhibited in Figure 5 describe that there was an effect after the implementation of TbI lesson plan to infuse PSTs' microteaching performance in the microteaching course. It was proven by the increasing score of the overall average score obtained from the questionnaire (3.13) which was higher than the average of TPACK self-efficacy questionnaire scales (2.5) and the average score of questionnaire administration prior to the treatment (2.87). 86% of questionnaire items' increasing scores supported this increasing score. Unless questions no. 10, 11, 12, 31, and 32 which remained similar. These question items discussed PSTs' ability to implement various teaching techniques, comprehend EFL skills contents, master all micro and micro skills of English, apply various teaching strategies to teach any micro and macro skills of English, and use different teaching methods in teaching.

The highest score was shown by question no. 2 with the inclining score of 0.3. This finding supported the result of questionnaire administration prior to the treatment that PSTs were familiar with internet-based communication using various applications. Then, question no. 5 which was under the average score of the questionnaire scale, was now slightly above it with 2.7 average scores. It shows that PSTs admitted that there was an effect of the implementation of TbI lesson plan on their TPACK self-efficacy.

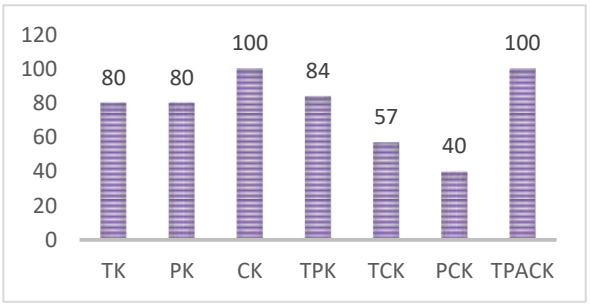

Figure 6. TPACK Subdivisions that Achieved High and Very High Level of Self-Efficacy after TbI Lesson Plan Treatment (in Percentage)

Similar to the findings on the comparison of TPACK self-efficacy scores prior to and after the treatment, there were some increasing percentages in some TPACK subdivisions' achievement levels. The increasing numbers were: TK's and CK's percentages increased 20%, PK's percentage inclined 40%, TPK's percentage escalated from 16% to 84%, TCK's percentage raised from 29 to 57, and the overall efficacy of TPACK elevated from 33% to 100%. However, PSTs' PCK self-efficacy percentage remained the same with 40% achievement. The highest percentage was shown by CK which indicated the PSTs' confidence even increased after the treatment of TbI Lesson Plan in microteaching performance. This analysis was in line with PSTs' responses when they should measure their TPACK self-efficacy during their microteaching performance. Unveiling the fact that there were contradictory percentage results between TPACK and PCK, the 100% of TPACK self-efficacy percentage was not actually representing the complete or

perfect self-efficacy of TPACK, but it was representing the achievement of question items' average scores in "high and very high levels". According to PSTs' responses (items no. 34, 35, & 36) in Figure 3 and Figure 5, average scores of TPACK self-efficacy for those items were slightly different (Prior treatment = 2.9 or moderate level, after treatment = 3.2 or high level).

To confirm the findings which were obtained from the administration of TPACK self-efficacy questionnaire, semi-structured interview was conducted with six PSTs. Their responses were thematically coded based on the subdivisions of TPACK self-efficacy framework (TK, CK, PK, TPK, TCK, PCK, and TPACK). The details of the responses are presented below

Technological Knowledge (TK) responses

"This lesson plan model obligates me to integrate any technologies for teaching English. It also increases practices to use them before I apply it in real practice in microteaching". (Participant 1)

"I learned to use many teaching technologies from the internet as I have to choose the best technology to aid me teaching reading. I must activate my students' interest to join my class" (Participant 3)

Content Knowledge (CK) responses

"As a good teacher, I must master the content that I will teach. This course trains me to prove my content comprehension in the lesson plan for microteaching and I think it works". (Participant 1)

"Actually, I wanted to teach syntax in my microteaching practice, but I found syntax materials are quite complicated to be understood without a thorough explanation from the teacher. Moreover, it is complicated to integrate technology to teach it. So, I moved to teach listening. Then, I met many websites to help me to teach this" (Participant 2)

Pedagogical Knowledge (PK) responses

"This course teaches me to be a good planner in teaching. I practice planning suitable test formats for my students. Instead of testing students' comprehension, I use interactive technology for testing in my lesson plan". (Participant 5)

"Being organized is good for a teacher. Therefore, the use of technology, the strategies for teaching, and the materials for teaching are components that I should be thought about in developing my lesson plan". (Participant 6)

Technological Pedagogical Knowledge (TPK) responses

"The experience to match technology for certain teaching strategy such as Jigsaw will be useful experience for my teaching preparation in the future" (Participant 3)

"Not all applications can be used in both online and offline teaching. For example, I cannot use an android-based application with my students to conduct offline learning. Hence, projector or audiotape will be more applicable." (Participant 4)

Technological Content Knowledge (TCK) responses

"The lesson plan development process and my microteaching practice aided me to seek the detailed features of an application for certain language skills. Like, Wattpad is good for teaching reading and writing". (Participant 3)

"I used Quilbot to train my students to do paraphrase. It gives a model for students to choose the synonym of words." (Participant 6)

Pedagogical Content Knowledge (PCK) responses

"I know some teaching strategies like Jigsaw, presentation, discussion, and lecturing. But actually, I am not sure to use a strategy for any specific skill teaching. Just not sure and maybe I need modeling from my teacher". (Participant 2)

"I like teaching with some interesting activities. Therefore, I compete with students in a game to take the score of their achievement". (Participant 4)

Technological Pedagogical Content Knowledge (TPACK) responses

"My students, who are actually my classmates, improved my motivation to be an English teacher in the future as they said that I could create an interesting class with the use of interactive games in Mentimeter during my

microteaching performance to teach grammar". (Participant 4)

"This course is very important for PSTs since it prepares students with communication skills, pedagogical skill, content mastery skill, and skill to mediate online teaching with appropriate technology". (Participant 5)

5. Discussion

According to the findings of the present study, the implementation of TbI lesson plan to infuse PSTs' microteaching performance gave a positive effect on their TPACK self-efficacy as shown by the increasing TPACK self-efficacy scores from 2.87 (moderate level) to 3.13 (high level). The inclining percentage of each TPACK subdivisions percentage also supported this positive effect. This finding was supported by some previous studies which mentioning TPK, TCK, and PCK support the growth of TPACK (Canbazoğlu-Bilici & Baran, 2015; Kirey et al., 2018). Prior to the treatment, only TK and CK which the percentage of PSTs' TPACK self-efficacy average scores were above 50%. But, more TPACK divisions (TK, PK, CK, TPK, TCK) percentages achieved higher than 50%. So, it could be comprehended that the positive effect of TPACK self-efficacy due to the treatment of TbI lesson plan was supported by the majority of each TPACK subdivision's achievement of percentage. In addition, the last three questions in TPACK self-efficacy questionnaire supported those findings as TPACK percentage had jumped from 33% achievement to 100%. All of these positive effects were supported by various positive responses from participants after the interview. The participants said that they found TbI lesson plan could increase their attempt to practice using various technologies and software, train their intuition to decide the best technologies or software for certain teaching purposes, force them to master the content, train them to always be prepared and ready teacher with various teaching strategies in various teaching context (Kwangsawad, 2016), motivate and improve PSTs' confidence in teaching with technology, and equip PSTs with TPACK self-efficacy.

Discussing the relationship of TPACK subdivisions, the low TPACK self-efficacy prior to the treatment was affected by the low percentages of TPK, TCK, and PCK percentages. The equal relationship was depicted by the increasing percentage of TPACK self-efficacy after the treatment which was supported by the increasing percentages of TPK, TCK, and PCK. Then, the increasing percentage of TPK after the treatment was supported by the inclination of TK's and PK's percentages. Kirey et al. (2018) stated that TK and PK are interrelated and affect each other. This interrelation influenced their effect on the growth of their combination. The PSTs' responses in the interview support this finding. They said that their technological knowledge supports their use of teaching strategies in microteaching. They tried to mix and match any teaching strategies with the technology they would use and vice versa to meet the desired teaching plan. However, Günbatar et al., (2017) support the fact found in this study that PK might have more relationship to TPK's increasing percentage as PK's percentage raising margin was higher (40%) than TK's percentage raising margin (20%). This finding was assumed to be correlated with PSTs' habit to think about the teaching strategy or method earlier before choosing technology to use for support, like what was said by Participant 5. The fact that PK has a greater influence on TPK than TK in this study shows that the technological integration process should be based on pedagogy. In recent years, technology integration models have shifted from technology-focused models to pedagogical-focused models. In other words, pedagogy-focused models strive to combine teachers' understanding of technology usage with pedagogical knowledge throughout their teaching, whereas technology-focused models aim to have instructors develop knowledge and skills for the use of technology (Baran & Uygun, 2016). So, PSTs' choice of technology might be decided by their teaching pedagogy (Beschorner & Kruse, 2016).

TK and CK, according to the quantitative data, might also show a relationship with the increasing percentage of TCK. Both TK and CK had 20% increasing margin from prior to and after TbI lesson plan treatment in PSTs' microteaching course. This similar increasing margin could indicate that both contributed similar weight to the increasing percentage of TCK. Moreover, the increasing score of TK and CK had affected PSTs' perception of their TCK self-efficacy as its percentage inclined from 29% to 57%. Kirey et al. (2018) stated that TK and CK positively influenced TCK. Participants 2 and 3 responses supported the development of TCK percentage as she learned to adjust the content, and she mastered the most suitable technology to apply in microteaching. When PSTs believe they own enough content knowledge, according to some studies (Akarsu & Güven, 2014; Kafyulilo, et al., 2014), they would be successful to choose the best technology to aid their teaching.

The unique results were shown as the present study discussed the percentage scores of PCK prior to and after the TbI lesson plan treatment. PCK, according to theories, was a subset of PK and CK. The findings showed that both PK and CK had increasing percentages from prior to after the treatment. However, the PCK's percentages remained similar both prior to and after the treatment. Therefore, the discussion to delve into this uniqueness was worth conducting. First, based on PCK quantitative data calculation, PCK average scores had inclined from 2.80 (before

treatment) to 2.95 (after treatment). So, the inclining percentage of PK and CK was still relevant as PCK scores were also parallel though in very slight difference. Second, PSTs' responses as prescribed in the findings mentioned that they comprehended some teaching strategies and they mastered the contents. But they could not integrate the strategies and contents together to make an interesting microteaching performance. Hence, Cengiz (2013) stated that PSTs should be taught to integrate two specific domains in TPACK framework to avoid disconnections between them. This response reflected the need for a teacher in TEFL (Teaching English as Foreign Language) or TELL (Technology Enhanced Language Learning) courses to guide PSTs with not only knowledge but also practices to implement the knowledge in various settings and contexts. Consequently, most of PSTs in the present study still put their PK and CK in different spaces and they did not have any information to link them.

All in all, discussing which subdivision (TPK, TCK, and PCK), according to this study, affected the improvement of TPACK self-efficacy (Zhang, et al., 2021), the relevant answer was TPK. Hetcher et al. (2012) stated that to develop TPACK self-efficacy, PSTs should pay attention to TK or Technological Knowledge first. Technology integration in teaching enabled PSTs to mediate challenges during online teaching such as creating interactive teaching and communicative activities (Fitriah, 2018; Janson et al., 2020). Henceforth, PSTs exploration of technological knowledge and function would leverage their professionalism (Megawati, et al., 2021) and be relevant with the *Permenristekdikti* number 55 of 2017. In addition, TK was the only subdivision that possessed a very high level of the questionnaire (score of 4.0) after the treatment, which indeed contributed more to the increase of TPACK score. Therefore, relevant to the implementation of TbI (Technology based Instruction) lesson plan as the treatment for 23 PSTs in microteaching course, their TPACK self-efficacy score had impacted positively from moderate level to high level. Nevertheless, some previous studies (Beschorner & Kruse, 2016; Çelik et al., 2014; Janson & Lazonder, 2015) claimed PCK was the most influential to TPACK self-efficacy, further investigation on different strategies or methods used as a treatment to check its effectiveness to TPACK self-efficacy would be worthful to conduct.

6. Conclusion

This study was intended to scrutinize the effect of TbI (Technology based Instruction) lesson plan on the PSTs' self-efficacy. The findings produce parallel ideas, as stated by some studies (Hero, 2019; Hetcher, 2012; Naaz, 2018) that the technology and how it would be applied should be the focus to master by PSTs. Therefore, the implementation of TbI lesson plan which was the instructional procedure for teaching EFL in the classroom followed the technological integration model proposed by Nies et al. (2013), successfully increased and affected positively to PSTs' TPACK self-efficacy score. This positive effect was affirmed by six participants' responses after the interview that they stated all benefits of applying TbI (Technology based Instruction) lesson plan to infuse their microteaching performance and confidence to use technology for EFL teaching.

The present study offers pedagogical information to apply TbI (Technology based Instruction) lesson plan to improve EFL PSTs' TPACK self-efficacy. The research procedures can be adopted to conduct a similar research focus and the model of TbI lesson plan can be adapted as a model to integrate technology for teaching instruction. However, further investigation toward the implementation of the variables for different teaching context and participants are preferable for a more comprehensive understanding and practices. Finally, this study also opens view for modifying the TbI lesson plan with any other technology integration framework which later can be used for future studies with various research designs.

References

Abbitt, J. T. (2011). An investigation of the relationship between self-efficacy beliefs about technology integration and technological pedagogical content knowledge (TPACK) among pre-service teachers. *Journal of Digital Learning in Teacher Education, 27*(4), 134-143. https://doi.org/10.1080/21532974.2011.10784670

Akarsu, B., & Güven, E. (2014). Fen ve teknoloji öğretmen adaylarının teknolojik pedagojik alan bilgilerinin incelenmesi. *Gaziantep University Journal of Social Sciences, 13*(2), 515-524. https://doi.org/10.21547/jss.256825

Alverde-Berrocoso, J., Fernández-Sánchez, M. R., Revuelta-Dominguez, F. I., & Sosa-Díaz, M. J. (2021). The educational integration of digital technologies preCovid-19: lessons for teacher education. *PLoS ONE, 16*(8), 1-15. https://doi.org/10.1371/journal.pone.0256283

Baran, E., & Uygun, E. (2016). Putting technological, pedagogical, and content knowledge (TPACK) in action: An integrated TPACK-design-based learning (DBL) approach. *Australasian Journal of Educational Technology, 32*(2), 47-63. https://doi.org/10.14742/ajet.2551

Beschorner, B., & Kruse, J. (2016). Pre-service teachers' use of a technology integration planning cycle: a case study.

International Journal of Education in Mathematics, Science and Technology, 4(4), 258-271. https://doi.org/10.18404/ijemst.73952

Canbazoğlu-Bilici, S., & Baran, E. (2015). Fen bilimleri öğretmenlerinin teknolojik pedagojik alan bilgisine yönelik öz-yeterlik düzeylerinin incelenmesi: boylamsal bir araştırma. *Gazi Eğitim Fakültesi Dergisi, 35*(2), 285-306.

Çelik, I., Şahin, I., & Aktürk, A. O. (2014). Analysis of the relations among the components of technological pedagogical and content knowledge (TPACK): a structural equation model. *Journal of Educational Computing Research, 51*(1), 1-22. https://doi.org/10.2190/EC.51.1.a

Cengiz, D. (2013). Eğitimde BİT'in betimleyici ve kuralcı yönleri-FATİH projesi örneği. In XVIII. *Türkiye'de İnternet Konferansı* (pp. 201-205). İstanbul.

Dewi, F. (2014). EDMODO: A social learning platform for blended learning class in higher education. *Research in Education Technology: Pedagogy and Technology Journal. SEAMEO-SEAMOLEC, XI*(2), 1-11.

Ezzy, D. (2002). *Qualitative analysis, practice and innovation*. London: Routledge.

Fitriah. (2018). The role of technology in teachers' creativity development in English teaching practices. *TEFLIN Journal - A publication on the teaching and learning of English, 29*(2), 177-193. https://doi.org/10.15639/teflinjournal.v29i2/177-193

Günbatar, S. A., Damar, S. Y., & Boz, Y. (2017). Teknolojik pedagojik alan bilgisi (TPAB) kavramının yakından incelenmesi: İlköğretim fen bilgisi öğretmen adaylarının TPAB'ının modellemesi. *İlköğretim Online, 16*(3), 917-934. https://doi.org/10.17051/ilkonline.2017.330232

Hero, J. (2019). The impact of technology integration in teaching performance. *International Journal of Sciences: Basic and Applied Research (IJSBAR), 48*(1), 101-114.

Janson, N., & Lazonder, A. W. (2015). Implementing innovative technologies through lesson plans: what kind of support do teachers prefer? *JSTOR, 24*(6), 910-920. https://doi.org/10.1007/s10956-015-9573-5

Jonson, A., Sollner, M., & Leimeister, J. M. (2020). Ladders for learning: is scaffolding the key to teaching problem-solving in technology-mediated learning contexts? *Academy of Management Learning and Education, 19*(4), 439-468. https://doi.org/10.5465/amle.2018.0078

Kafyulilo, A., Fisser, P., & Voogt, J. M. (2014). Determinants of the sustainability of teacher design teams as a professional development arrangement for developing technology integration knowledge and skills. In M. Searson, & M. Ochoa (Eds.), *Proceedings of society for information technology & teacher education international conference 2014* (pp. 2130-2136). Chesapeake, VA: AACE.

Kirey, S. A., Celik, I., & Colakoglu, M. H. (2018). TPACK self-efficacy perceptions of science teachers: a structural equation modeling study. *Education and Science, 43*(195), 253-268. https://doi.org/10.15390/EB.2018.7538

Kwangsawad, T. (2016). Examining EFL pre-service teachers' TPACK trough self-report, lesson plans and actual practice. *Journal of Education and Learning (EduLearn), 10*(2), 103-108. https://doi.org/10.11591/edulearn.v10i2.3575

Lee, M. H., & Tsai, C. C. (2010). Exploring teachers perceived self-efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web. *Instructional Science, 38*(1), 1-21. https://doi.org/10.1007/s11251-008-9075-4

Megawati, F., Mukminatien, N., Permana, A. I., Dewi, L. A., & Fitriati, F. (2021). Emergency remote teaching and learning: technology-based instructional plan across grade levels. *Teaching English with Technology, 21*(2), 112-126.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. *Teach. Coll. Rec., 108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Naaz, S., & Khan, Z. N. (2018). Measuring the Technological Pedagogical Content Knowledge (TPACK) of Pre-service Teachers in relation to their Gender and Streams. *American International Journal of Research in Humanities, Arts and Social Sciences, 22*(1), 50-55.

Niess, L., & Sadri. (2013). Central component descriptors for levels of technological pedagogical content knowledge. *Journal Educational Computing Research, 48*(2), 173-198. https://doi.org/10.2190/EC.48.2.d

Paidi, S. B., Astuti, F. E. A., & Hapsari, N. (2019). Teaching performance of high school biology teachers in applying

TPACK: a descriptive study. *Advances in Social Science, Education and Humanities Research, 401*, 95-99.

Syamdianita, & Cahyono, B. Y. (2021). The EFL pre-service teachers' experiences and challenges in designing teaching materials using TPACK framework. *Studies in English Language and Education, 8*(2), 561-577. https://doi.org/10.24815/siele.v8i2.19202

Zhang, J., Chen, Z., Ma, J., & Liu, Z. (2021). Investigating the influencing factors of teachers' information and communications technology-integrated teaching behaviors toward "learner-centered" reform using structural equation modeling. *Sustainability, 13*(22), 1-17. https://doi.org/10.3390/su132212614

Appendices

Appendix A. The template of TbI Lesson Plan

SCENARIO (ONE PAGE LESSON PLAN)

Title……

1	Goal:	To improve students' ability in…
2	Language Function:	… (description of language function taught in class)
3	Language Focus:	… (description of language focus to be taught)
4	Level:	… (the level of students)
5	Time:	… minutes
6	Preparation:	… (Description of technologies and any gadgets will be used for EFL teaching and learning)
7	Steps:	Based on Technology based Integration (TbI) model by Niess at al. (2013)
	a. Recognizing	Description of steps…. (PSTs start helping students to recognize the technology used for EFL learning)
	b. Accepting	Description of steps…. (PSTs start helping students to accept and use technology for learning)
	c. Adapting	Description of steps…. (PSTs trained students to learn and adapt learning materials from the existed resources in the technology)
	d. Exploring	Description of steps…. (PSTs guide students to explore the technology features for constructing their compositions)
	e. Advancing	Description of steps…. (PSTs let students use technology for presenting publicly, comparing and contrasting with others, getting feedback, or even inviting another technology to enhance the quality of their compositions)

Appendix B. Reliability Test Result for Prior-Treatment Questionnaire

Cronbach's Alpha	N of Items
.984	36

Appendix C. Reliability Test Result for After Treatment Questionnaire

Cronbach's Alpha	N of Items
.969	36