Technological Pedagogical Content Knowledge (TPACK) in Action: Unraveling Indonesian English as a Foreign Language Teachers' TPACK by Implementing Telegram

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Abstract

The shift in teaching instruction from traditional to online-based approaches has led to the change from pedagogical to technological pedagogical content knowledge (TPACK). Thus, this case study aims to observe and theorize the implementation of TPACK by an English as a Foreign Language (EFL) teacher who migrated from instant and commercial online learning platforms to a self-designed Telegram Bot application for teaching purposes. The subject was an English teacher from one of the outstanding vocational high schools in Malang, Indonesia. Data were collected through observation by participating in a class for one semester and through in-depth interviews based on TPACK theory. Thematic analysis using an inductive approach was simultaneously applied to the TPACK framework. The results indicated that the technological, pedagogical, and content knowledge from the Telegram Bot were shifting, applying, representing, and modeling. The four commonalities of TPACK theory mainly represent the successful implementation of teacher-made teaching applications using the Telegram Bot.

Keywords: Mobile learning model, Technological pedagogical content knowledge, English as a Foreign Language, Telegram Bot

Introduction

Teachers today face challenges and questions regarding when and how to integrate new digital technologies with those developed for teaching and learning. One of the most challenging issues is the ideal use of technology in English language teaching for teachers with limited access to technology and limited experience with free or commercial online learning platforms. In traditional teaching, English as a Foreign Language (EFL) teachers and learners face only teaching content knowledge. In recent times, however, competence in technological pedagogical content knowledge (TPACK) is required in the technology-based environment. In the field of EFL, the study on

TPACK among pre- and in-service teachers, learners, and other relevant areas is widely investigated.

Studies on traditional and online-based platforms in the global context have scrutinized the pedagogical content knowledge and TPACK of in- and pre-service teachers (Tai, 2015; Graziano et al., 2017; Koçoğlu, 2009; Koh et al., 2017; Kurt et al., 2014; Limbong, 2017; Naaz & Khan, 2018; Tan et al., 2018; Tseng, 2014; Tseng et al., 2011) and EFL learners (Arifani et al., 2020). Further, scholars have focused on online and traditional collaboration (Bueno-Alastuey, 2018); theoretical frameworks (Archambault & Barnett, 2010); TPACK instruments (Schmid et al., 2020; Yurdakul et al., 2012); training of TPACK among pre-service English teachers (Bugueño, 2013; Kurt et al., 2014; Limbong, 2017); development of TPACK components (Liu & Kleinsasser, 2015; Tseng et al., 2011); strategies for their development (Bugueño, 2013); and measurement of the development of TPACK among pre-service English teachers (Baser, Kopcha, & Ozden, 2016; Koçoğlu, 2009; Muntaha, 2018; Setiyanti & Hunt, 2017). For example, Tai (2015) used the TPACK framework to prepare English teachers to use technology. Furthermore, the authors designed a workshop for a training program for English teachers and then tested their proficiency in TPACK. The study found that all participants displayed varying TPACK development processes.

Concerning TPACK practices in Indonesia, Mahdum (2015) surveyed how in-service English teachers in senior high schools in Pekanbaru advance and engage TPACK in teaching. Using a self-assessment instrument, the results indicated that the TPACK of English teachers was favorable, which implied that it can be adopted for teaching. Conversely, Cahyono, Kurnianti, and Mutiaraningrum (2016) designed a TPACK application for in-service teachers. Twenty Indonesian EFL teachers in secondary schools were introduced to the framework of their courses as part of in-service education for a master's degree. The results revealed a significant improvement among teachers in formulating an instructional design. In addition, the framework helped teachers in preparing the instructional design and improving their teaching practices.

As previously discussed, studies on TPACK for English teachers generally focused on TPACK development, TPACK components, instrument development and validation, strategies, collaboration, and measurement of teachers' TPACK. Notably, however, previous studies did not theorize the implementation of Telegram in teaching. Therefore, the current study aims to describe how English teachers demonstrate TPACK in teaching English using Telegram Bot.

Research question

How do English teachers demonstrate TPACK in teaching activities using Telegram?

Literature Review

A systematic review of TPACK

According to Shulman (1986), content knowledge (CK) and pedagogical knowledge (PK) compose a teacher's knowledge of the teaching and learning process in the classroom. The author further defined the knowledge of teaching materials as pedagogical content knowledge and identified pedagogical content and knowledge as specific components of knowledge in teaching. It is a combination of pedagogical content and understanding of the organization, representation, and adaptation of particular topics and issues to the diverse interests and abilities of students, which are transmitted through instruction. Hence, pedagogical content and knowledge is the easiest method for distinguishing the understanding of specialist content among educators (Koçoğlu, 2009).

TPACK is a combination of three knowledge domains, namely, content, pedagogy, and technology. It aims to develop basic knowledge, such as when a teacher learns the subject matter and understands how technology can improve learning opportunities and experiences for students. At the same time, it seeks to increase the content of learning. In English education, teachers with a TPACK perspective are required to understand the correct pedagogy concept using technology in teaching and learning activities. In this manner, students are engaged and motivated to explore English learning content to a higher level. Using the appropriate TPACK, teachers can encourage students to further explore English learning content. The model demonstrates that CK that integrates technology and pedagogical skills is essential for facilitating effective and innovative classroom teaching (Mishra & Koehler, 2006). Studies on prospective teachers using this technology indicate significant differences in actions taken during the application of various teaching approaches (traditional and online instructions; Niess, 2005; Niess et al., 2008). Such differences are evident in the knowledge of content, particular technologies, and pedagogy.

The current study uses TPACK as a theoretical basis because it will support and help teachers identify the aspects required for using information and communication technology (ICT) in learning. Furthermore, TPACK will guide teachers in designing and implementing strategies that will promote the development of the application for e-learning (Schmidt et al., 2009). The TPACK framework and components present a review of teacher knowledge that relatively differs from the traditional concept and emphasize the pedagogical content more than it does technology. Recently, teacher knowledge is represented as a dynamic equilibrium between several domains of knowledge (i.e., technology, pedagogy, and content) and skills required to teach specific content at particular class levels.

Knowledge pertains to the amount of information required to achieve functions and goals and to transform compiled data into useful and meaningful information. It also denotes the capacity and attitude that underlie creativity, interpretation, and action (Beijerse, 2000). Therefore, the TPACK model is an integrated knowledge and strategic thinking form that determines when, where, and how to use specific knowledge domains and strategies during teaching using appropriate ICT (Shavelson et al., 2003). TPACK supports teachers in organizing, implementing, criticizing results, abstracting detailed lesson plans, and identifying students' needs when integrating appropriate technology.

Specifically, Niess (2005) described the reasons and processes operated by English teachers in integrating technology in the classroom as follows:

a. A concept of the purpose of combining technology in teaching the subject matter. In other words, prior knowledge and beliefs by the teacher regarding a selected topic and how technology supports teaching are vital for student learning. Hence, this concept serves as the foundation for learning decisions.
b. Students' knowledge of understanding, thinking, and learning of the subject matter using technology. Teachers facilitate learning based on their knowledge and beliefs about these concepts using technology.
c. Knowledge of curriculum material that integrates technology in learning and teaching the subject matter. Referring to this component, teachers are expected to apply various technologies in teaching specific topics and to conceptualize and process the subject matter in a manner that improves the technological environment, which should be organized, structured, and following the curriculum.
d. Knowledge of strategies and representation of teaching and learning activities using technology. Teachers create designs to guide students in learning about certain technologies in the subject matter.

The four components suggest that the current needs of teachers pertain to more than mere learning about technology. Instead, they should consider the concept of content/material and the impact of using certain technologies in developing strategies for learning and teaching the content. This notion rejects the following assumptions: (1) in-depth knowledge of content is sufficiently supportive of teaching using technology and (2) developing pedagogical content knowledge without regard for technological suitability in teaching is considered sufficient to implement teaching and learning activities using technology. Shreitcr and Ammon in Parkay and Stanford (2009) stated that the tendency of teachers to adapt learning practices by integrating certain technologies as a form of support can be attributed to the assimilation and accommodation processes that result in changes in personal thoughts and experiences. In essence, the preparation program should accommodate the knowledge and beliefs of prospective teachers into the program, which can lead to the development of TPACK in teaching using this technology.

Moreover, Niess, Lee, Sadri, and Suharwoto (2012) compiled a description of five levels of TPACK in teachers as follows:

a. **Recognizing knowledge**: teachers use a specific technology and identify the compatibility between the technology and its content. At this level, teachers scarcely consider integrating technology with learning and address technology as a low-level tool for teaching.
b. **Accepting persuasion**: teachers develop preferences toward the use of technology in teaching and learning activities. At this level, teachers apply technology in learning but do not consistently support learning using other materials.
c. **Adapting decision**: this level involves teachers' decisions to accept or refuse a technology for teaching and learning activities. At this level, teachers tend to apply ideas to integrate technology in teaching content. However, students continue to employ low-level cognitive activities using the technology. Many

teachers use specifically prepared worksheets to guide students toward the presented concepts of learning.

d. **Exploring**: teachers actively integrate technology in teaching the subject matter. At this level, teachers employ various strategies for teaching and demonstrate new ways of thinking about concepts using technology. In addition, teachers are more likely to allow students to explore the use of technology using student-centered strategies.
e. **Advancing expert** (confirmation): teachers evaluate the results of integrating technology in learning. At this level, teachers willingly use technology through various approaches to develop concepts and ideas from the learning material. They deliberately encourage students to explore and experiment using technology and include it as part of student assessment.

Telegram

Two brothers, namely, Nikolai and Pavel Durov, founded Telegram in 2013 and aimed to provide a secure messaging function for users who lack an understanding of technology. Furthermore, the application enabled users to send text messages and voicemails and communicate in groups (Saribekyan & Margvelashvili, 2017). It is a free application and will remain free without ads or fees. Many users reported that sending messages via Telegram is faster than other applications because it is cloud-based. Hence, Telegram does not occupy storage space on smartphones. Notably, Telegram occupies nearly zero space on smartphones due to its cloud base and cache management options.

Telegram is one of the social networks full of unique features, such as bots (Telegram Bot). With its open features, users are free to utilize any function on the application. The application programming interface (API) of Telegram offers developers a platform for the easy capture of sensor data and converting such data into useful information. Telegram Bot API is used to send data to the cloud using an Internet-enabled device (Saribekyan & Margvelashvili, 2017).

Telegram is accessible on personal computers or laptops, and, as a cloud-based messenger application, features a smooth synchronization process. When users are using a PC or laptop, mobile phone applications can remain in action to save on battery. Apart from sending messages, photos, and videos, Telegram provides various methods of sending files using extensions such as .doc, .zip, and .mp3 with a maximum of 1.5 GB per file.

Ramadhan and Wibawa (2018) report that Telegram is very beneficial for teachers and students because it can be installed on smartphones and PCs and can be used anytime and anywhere. For teachers, the application offers a compelling opportunity for creating an interactive online learning environment that enables students to explore various materials for English learning.

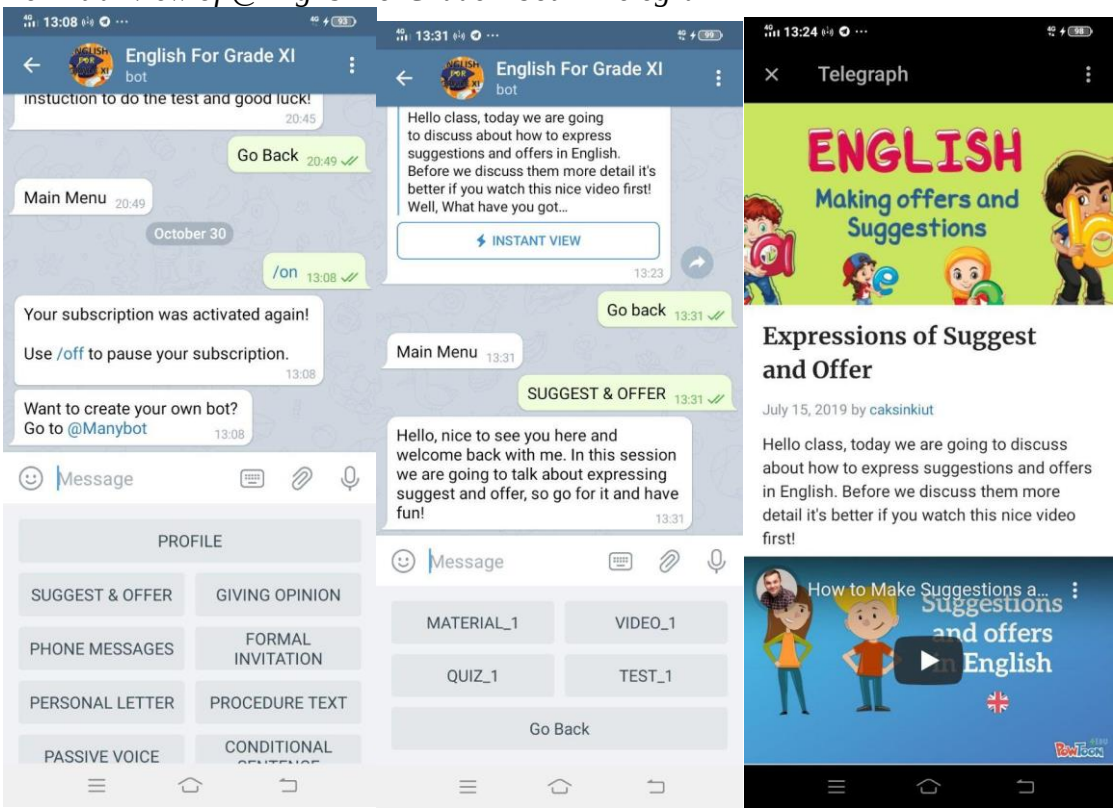
Teachers can use group chat as a class or channel for managing classroom activities (Muchlisin, 2019). According to Wardhono and Spanos (2018), its features make Telegram the most attractive and supportive mobile application compared with other mobile applications. It is used not only for chatting but also for sending files of any type. Moreover, the application uses channels intended only for downloading

materials. In this manner, students are discouraged from chatting. Another exceptional feature of Telegram for teaching and learning is that its programmable bots enable the automatic delivery of testable items and feedback to learner responses. Through a program called Chatfuel, the bot is programmed to send instructions and learning materials to students (Wardhono & Spanos, 2018).

Telegram Bot and the current study

The subject of the case study is a teacher who constructed a bot named @EnglishForGradeXIbot using Telegram. All students can access this bot after installing the Telegram application. This bot consists of materials used for one academic year in the eleventh grade of a vocational high school in Malang, Indonesia. The concepts covered are *suggesting and offering help* and *giving opinions* as well as *phone messages*, *formal invitations*, *personal letters*, *procedure text*, *passive voice*, *conditional sentences*, *factual reports*, *analytical exposition*, and *biography*. Each material consists of videos and its discussion, exercises, and a formative test (Figure 1).

Figure 1
The initial view of @EnglishForGradeXIbot in Telegram



Methodology

Research design

The current study aims to explore and theorize the TPACK of EFL teachers from the uniqueness of a single subject: an EFL teacher implementing teaching and learning activities using the Telegram Bot for more than two years. Consequently, the case study is qualitative to systematically investigate an event or series of related events as an interesting or unique phenomenon. This notion is in line with that of Creswell and Poth (2018), who described a case study as an in-depth description and analysis of a phenomenon, social unit, or system connected by place and time.

Study participant

This study focuses on an EFL teacher from an exemplary vocational high school in Malang, Indonesia. The subject is initiated as MM, a 37-year old teacher who holds a master's degree in English Language Education. He graduated from a reputable public university in Malang. He is teaching for over 11 years and using the Telegram Bot for more than five years. In addition, he is an active Youtuber who promotes his innovative online teaching medium using Telegram Bot. He developed his Telegram Bot application to contain lesson plan menus; online integrated course contents, such as reading, grammar, vocabulary, writing, and listening materials; an online dictionary and library; presentations; interactive dialogues; recordings; group discussions; quizzes; online attendance list, and formative, mid-test, and final tests. These contents are designed under a single Telegram Bot application. The data collection approach is in line with the ethical code of practice of the British Educational Research Association (BERA, 2004).

Procedure for data collection and analysis

To understand how the subject demonstrates TPACK using the Telegram Bot, data are collected through participatory analysis. The researcher participates in his online class using the Telegram Bot with their students for one semester. Toward this end, the researcher observes the implementation of the teaching and learning process weekly. The observation activities involve designing the Telegram Bot, course contents, activities, assessments, interaction with the teacher, learners, and online course activities. Moreover, the researcher conducts an in-depth interview with the subject to understand the researcher’s experiences during every meeting throughout the course program. The interview protocol uses learner responses, activities, tasks, tests, and notes to guide the interview process.

Data analysis on TPACK is focused on the constructs related to the domains of knowledge associated with the technological component (Jaipal & Figg, 2010). In this regard, Graham et al. (2012) refer to technological knowledge (TK) as a related construct of TPACK. The domain of knowledge related to technology consists of TK, technological content knowledge (TCK), technological pedagogical knowledge (TPK), and TPACK. The four emerging themes from the four constructs are then transcribed, coded, displayed, and interpreted using an inductive model of thematic analysis proposed by Creswell and Poth (2018). To avoid subjectivity in interpretation, the research team conducts a cross-check of interpretations. Each excerpt with its emerging themes of TPACK is interpreted by at least two individuals (researcher and co-author).

In addition, the study employs the aid of a university professor in justifying interpretation bias.

Results

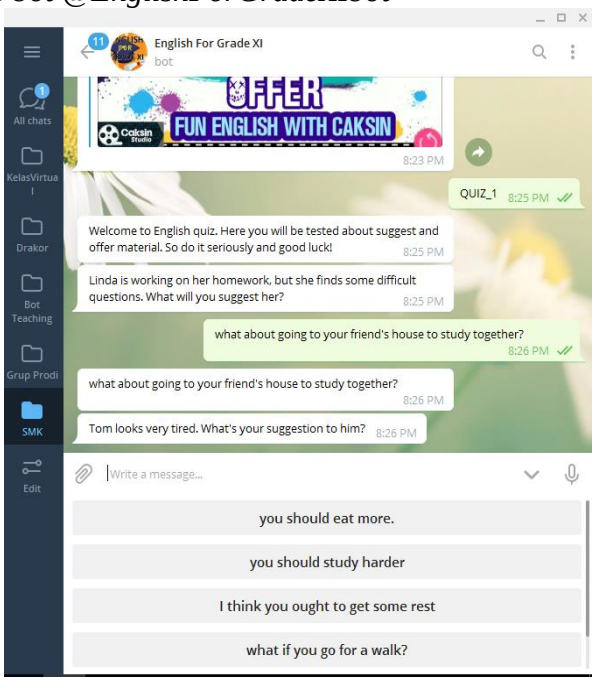
Teaching activities in Telegram

The observations revealed that MM prepared the teaching activity for one session by asking students to tidy their uniforms. The teacher then opened the class by greeting the students and asking about their condition. The teacher sang a yell–yell to boost the students' enthusiasm, to which the students responded. Furthermore, a pre-activity was implemented by asking students about the previous material learned. Afterward, learning activities began with the delivery of learning objectives, which were previously opened with a prayer. MM delivered the material for study, which is *suggesting and offering help*. The students were asked to install Telegram applications on their mobile phones, and a group named http://t.me/ximmaaye_was created. The group was intended for communication between the teacher and students. Furthermore, it aimed to manage the students' activities as they use Telegram (Muchlisin, 2019).

Using the Telegram group, MM and the students shared photos and assignments and kept in touch with one another. In Telegram, the students' names automatically appear, such that the teacher is not required to save their names. Hence, if the teacher wanted to chat with a student in private, then the teacher can click on the student's name in the Telegram group to give feedback or appreciation about a job or other assignments.

The students were instructed to join a bot named @EnglishForGradeXIbot or @English_For_Grade_XI_bot by clicking it in the search menu. A game was then added to the reading section (fun game: Chinese whisper), which is based on the telegraph included in the bot by clicking *MATERIAL_1* https://telegra.ph/Expressions-of-Suggest-and-Offer-07-15. In this bot, the teacher explained the concept of *suggesting and offering help* by watching a YouTube video about making offers and giving suggestions through this link https://youtu.be/8Adh5InzxLs. Afterward, the students were allocated several minutes to read *MATERIAL_1* in the menu. The material contained the concept of suggestions, how to express suggestions (i.e., making, accepting, and declining), recommended sentence structures, and examples in conversations. Moreover, it provided lessons on offering help and responding to offers (i.e., making, accepting, and declining offers) and several examples. The students were instructed that "yes" in the dialogue indicates the acceptance of an offer. However, if yes was followed by "but," then the offer was rejected. In addition, the students were advised to help others in need. Afterward, the students were instructed to open *QUIZ_1*, which contained exercises that could be completed using mobile phones. The teacher allocated several minutes for responding to multiple-choice questions (Figure 2).

Figure 2
Online quiz using the bot @EnglishForGradeXIbot



Telegram is a tool that enables users to create richly formatted publications with photos, videos, and other embedded content, such as Youtube, which is frequently called anonymous blogging. Telegram publications appear through an Instant View button, which allows the readers to open articles with zero page-load time. In other words, the articles open instantly without launching the browser and waiting until the page loads. The teacher can use the tool to encode a discussion and send it to the bot (Smykalov, 2018). In the same manner, Telegraph can enhance the students' activities through this feature by encoding and sending a link to the class (Muchlisin, 2019).

The Telegram Bot is an application hosted on a server that uses bot API to connect to its messenger clients (Zaff, 2017). Furthermore, it is similar to a virtual robot, which is programmed with instructions and answers to interact with users. Thus, teachers can create the bot to render lessons interactive for students by interacting with the bot similar to real-life teachers. Students can click the menu for the materials required and read the discussion or view the embedded learning videos. Moreover, students can take quizzes through the bot in format multiple-choice, simple question, and multiple answer formats (Muchlisin, 2019). Therefore, learning through Telegram can bring unique technological and pedagogical advantages for EFL learners and significantly influence vocabulary learning and development (Heidar & Kaviani, 2016).

TPACK in teaching using Telegram

Technological knowledge

Based on the TK observed, MM is competent in using Telegram technology. The knowledge possessed is observed based on the understanding of the subject in improving mobile learning through Telegram and creating a personal YouTube channel

that contains subject matter in English. The subject can operate many menus prepared by Telegram, such as the group chat, channels in libraries, telegraphs, or blogs, and learning bots for one academic year. In other words, MM technically mastered the use of Telegram as an e-learning platform for English lessons. Moreover, the subject can troubleshoot problems during the use of the application. Apart from the abovementioned knowledge, the subject believes that using Telegram is one of the solutions for increasing students' interest and enthusiasm for learning using new media.

Technological pedagogical knowledge

TPK observed in this study pertains to MM's use of the learning strategy and integrating it with a specific technology, which is, in this case, the Telegram application. TPK is evident when MM revealed that using Telegram for mobile-assisted language learning during the teaching and learning process is more effective because it supports student-centered learning and student-based learning. All materials are prepared in the Telegram Bot, whereas several animations are uploaded on the YouTube channel and entered in the Telegram Bot @EnglishForGradeXIbot. During the interview, the subject mentioned that animation for the material is presented during the discussion to build students' knowledge.

MM aims to implement student-centered learning by providing students with a direct experience of applying English conversations through animations in YouTube videos, which are embedded in @EnglishForGradeXIbot. The application supports group discussion activities, such as giving explanations, asking questions, and clarifying materials that the students cannot understand. MM uses inquiry-based learning, where learning occurs by collaborating inquiry strategies with technology. Moreover, MM applies the discovery method through group discussions in Telegram.

Technological Content Knowledge

The study observed TCK, such as making animated videos about conversation practices for suggestions and offering help, which was uploaded on the Telegram Bot. Meanwhile, MM used Telegram to present materials, which were stored in @EnglishForGradeXIbot. MM prefers Telegram because it is more practical and comfortable to use in the teaching and learning process in class because all students use smartphones in school.

Technological Pedagogical Content Knowledge

TPACK is evident when MM presented @EnglishForGradeXIbot in class, which featured the subject matter in English for one academic year with animated videos, quizzes, and tests. The subject applies discovery-based learning to facilitate the students' understanding of the material and implements the teaching and learning process by distributing worksheets in the form of games in groups. Moreover, TPACK is observed when MM uses representations in animated videos to increase students' understanding of English expressions and utilizes pronunciation bots in Telegram to demonstrate correct English pronunciation. The students are taught how to use an

electronic dictionary in a Telegram Bot named @Translate_id to facilitate the students' understanding of English text as they read.

In addition, TPACK is observed when MM explains the material in the animated videos and considers the students' daily conditions, which enabled students to better understand the videos. Seemingly, the subject uses analogy strategies to enhance students' understanding.

Discussion

The findings are centered on an English teacher's TPACK, which is related to teaching using technology, which Jaipal and Figg (2010) stipulated as the technological component. Meanwhile, Graham et al. (2012) described it as a TK-related construct. Hence, the domain of knowledge related to technology consists of TK, TCK, TPK, and TPACK.

Concerning the TK observed in the study, the subject is knowledgeable in using technology, namely, Telegram and demonstrates technological skills by creating a bot that features the subject matter for one semester with question-and-answer quizzes, practice questions, mid-term and final tests, and troubleshooting solutions for possible problems. Such skills are following the concept of TK, which focuses on the technical abilities of a teacher and competence in using technological tools. Moreover, teachers should deal with problems related to the technology used, which is called technical troubleshooting (Pamuk et al., 2015). The findings indicate that the self-designed Telegram Bot is more suitable compared with the other instant e-learning applications, which frequently fail to fulfill students' learning and technological needs. Harmonizing the two needs is essential for promoting learning. Students' may perceive online learning content as understandable despite the impracticality of the technical use of online learning. However, it may cause learning barriers as learners will not fully engage in learning due to technological barriers. In relation, Arifani et al. (2020) and Koehler et al. (2017) stated that fulfilling learners' technological needs and their need to use practical online technology are crucial to the effectiveness of the learning process. The authors also demonstrated that the self-design and simple learning applications using Telegram provide evidence for the abovementioned constructs.

In addition to TK in using Telegram, the current study found that MM was confident in using the technology for learning because it enabled students to address problems in their listening skills, which frequently becomes an obstacle for many teachers when providing audio materials. This is in line with the concept of Mishra and Koehler (2017), where the technology referred to in TPACK construction is the formulation of a tool produced by human knowledge to solve problems and to meet the needs and desires of users. Notably, teachers' belief in technology is a key factor in the use of technology. If a teacher's optimism about technology is minimal, then the teacher is more likely to refrain from using technology (Zhao & Frank, 2003). In terms of teachers' belief in implementing technology, Zhao and Frank offer a different paradigm: beliefs in technology use are insufficient for fulfilling learners' practical technology needs and course contents. The findings also illustrated that teachers should design a more appropriate technology for use in teaching and learning. With their knowledge about the students' technological needs, teachers should create or adapt and develop

technology-based teaching that meets such needs. If students are familiar and skillful with mobile applications, such as Telegram or other mobile applications due to their simplicity, then teachers should utilize such mobile applications to facilitate an extensive English learning exposure.

In contrast, Pulham and Graham (2018) used the term TK.tg (general technology) to indicate that TK can be used in all fields of science, such as Word processing and Powerpoint, but do not contain specific materials in a particular area. However, the current study uses TK.st (specific technology) to refer to teachers' knowledge in using technology tailored to the content. Telegram is a cloud-based social media application that can rapidly transmit conversations between smartphones, the web, and desktops. The application can also share pictures and videos, transfer documents, and send the current location with ease. Telegram has various features, such as other social media applications that can be used for conversations (chat) and group chat rooms and can send files without size restrictions. In this manner, Telegram is superior to other applications due to its size restrictions for file transfer. Another excellent feature of Telegram is the bots, which are programs developed by bot developers that perform specific jobs automatically. Modules and learning media can be created using this feature (Saribekyan & Margvelashvili, 2017; Sušánka & Kokeš, 2017). Hence, technology, such as the Telegram, can provide positive experiences for students in understanding the four basic English skills and increase their motivation for learning (Wahyuni, 2018).

Conclusion

The study draws the following conclusions after observing TPACK in an English teacher that uses the Telegram Bot for teaching:

1. Shifting activity

In this activity, the subject used knowledge about the construction of virtual teaching materials in one package for learning within the academic year in the Telegram Bot and provided a virtual room for discussion and chatting on Telegram (TCK). The subject adopted knowledge in using Telegram (TK), as demonstrated by menus, such as application and troubleshooting of Telegram and belief in using Telegram.

2. Applying representation activity

For the application of representation activity, the subject used knowledge in teaching one skill, for example, listening. The subject used the knowledge for audio listening using a speech in Telegram Bot, which created audio conversations according to the themes discussed in class (TCK). For mastery in speaking skills, the subject gave examples of conversations through YouTube channel links about suggested expressions after discussing and showing examples of conversation texts. For reading skills, the subject provided examples of text on a specific topic and illustrated images in the text by utilizing application features in Telegram (TPK). Furthermore, for writing skills, the subject showed knowledge in teaching writing using Telegram features and provided

examples of writing on blogs via Telegram features (TPK) to motivate students and address their difficulties in writing.

3. Modeling activity

The subject used knowledge of learning strategies on a specific topic using another Telegram Bot (TPACK), which demonstrated strategies and provided examples. Moreover, the students were asked to follow what the teacher did to understand the subject matter.

Suggestion

This study reveals the knowledge of the subject in using Telegram based on the TPACK framework. The results indicate that many of the activities using this application enhanced students' understanding by taking advantage of the chat feature and by collecting assignments. However, the broad use of technology (aside from Telegram) can be examined in further studies to refine the conclusions of the current study. Each type of technology carries features that teachers can use for learning with different strategies, which requires additional technological knowledge.

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