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The Impact of Technological Pedagogical and Content Knowledge on Teacher Professional Development in Technology Integration Practices

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Abstract

This study aims to explore the impact of TPACK on technology integration practices among teachers.This study aims to determine whether TPACK has an impact on teachers' technology integration practices in learning activities. This study is a descriptive qualitative study with a literature study method. The type of research used is library research, namely research that uses library data to be studied more deeply and reviewed in order to obtain objective results. The results of the study indicate that teachers' TPACK has an impact on the development of teacher professionalism related to technology integration in learning. Technology in learning makes learning more innovative and helps teachers experience a more productive teaching process. In conclusion, the TPACK framework can develop teacher professionalism in facing the challenges of 21st century learning to teach with technology. The use of technology in learning will be able to improve the quality of learning so that it has an impact on learning achievement and student involvement in learning.

Keywords: TPACK, technology integration, teacher professionalism,classroom learning

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INTRODUCTION

Along with the development of information and communication technology (ICT), it has an influence on the field of education, especially on learning.(Anderson, Griffith, and Crawford, 2017). Technological developments in the last decade have demanded the integration of technology in learning with the aim of increasing the effectiveness of the learning process.teach(Twiningsih, Gunarhadi, & Musadad, 2024). The challenges of utilizing technology in learning are increasingly felt as the world is hit by the Covid-19 pandemic (Sailer et al., 2021). One ofThe policy taken by the Indonesian government to prevent the spread of Covid-19 is that learning that was previously carried out in schools must be done from home online (Rizqiyah, 2021). ICT is the main means and media used to change the learning process (Twiningsih et al., 2024). HoweverChanges in learning conditions during the Covid-19 pandemic are a challenge in themselves because most teachers are not ready and accustomed to technology in learning (Westbroek, De Vries, Walraven, Handelzalts, & McKenney, 2019).

The integration of technology in education is a demand of the times that cannot be avoided, but its implementation still faces various challenges.(Indriawati,

Prasetya, Susilo, Sari, & Hayuni, 2020). Many teachers do not yet have adequate competence in utilizing technology effectively and meaningfully in the learning process (Guggemos & Seufert, 2021). Problems such as limited training, low understanding of selecting technology that is appropriate to the characteristics of teaching materials, and inappropriate implementation of digital pedagogy are still often encountered (Irmita & Atun, 2018). In addition, limited infrastructure and access in several areas are also major obstacles to equalizing technology integration (Education, Voogt, & Mckenney, 2017). This has an impact on the less than optimal teaching and learning process which should be supported by various digital innovations (Rizqiyah, 2021). This is where the importance of implementing the TPACK (Technological Pedagogical and Content Knowledge) concept as the basis for teacher professionalism in the digital era lies (Voogt & McKenney, 2017). TPACK emphasizes the teacher's ability to integrate technology harmoniously with teaching methods and the content being taught (Westbroek et al., 2019). By understanding and implementing TPACK, teachers can design more relevant, interactive, and contextual learning strategies (Palieraki & Koutrouba, 2021). Not only does it improve the quality of learning, mastery of TPACK is also part of the ongoing development of teacher professionalism.(Quddus, 2020). Therefore, increasing teacher capacity in TPACK aspects should be a primary focus in various training programs and education policies.

The issue of teachers' technology integration practices is important to discuss because technology integration has been shown to increase student engagement and learning achievement (Voogt & McKenney, 2017). Provide meaningful learning experiences for students. The importance of technology integration in learning has led to many studies highlighting factors associated with teachers' technology integration practices (Suprapto et al., 2021). Some of these factors such as lack of teacher knowledge in managing classes or pedagogical knowledge, level of self-efficacy when using technology, and teacher beliefs and attitudes towards technology are considered important for teachers in technology integration (Schmid, Brianza, & Petko, 2021).

Apart from the above factors according to(Guggemos & Seufert, 2021) Teachers will integrate technology well into their teaching if they have knowledge of content, pedagogy, and technology. Ait El Mokhtar et al., 2023). These three components of knowledge were introduced by Mishra & Koehler (2006) with the term technological pedagogical content knowledge (TPACK) (Pasani, 2018). According to(Rahayu, 2019) The three TPACK knowledge domains and their interactions are considered as complex knowledge components for teachers to integrate technology (Aizenkot and Ben David, 2023). While the research (Schmid et al., 2021)reveals that the three components of knowledgemay be the strongest factor in predicting teachers' intentions to use technology in learning. In accordance with the opinion (Dewi et al., 2021) that effective technology integration in learning will occur if there is careful alignment between content, pedagogy, and consideration of the potential of technology. Therefore, in the research conducted (Irmita & Atun, 2018). It is said that TPACK will be a very important framework for the successful implementation of teacher technology integration in learning (Abaniel, 2021).

Knowledge of technology, pedagogy, and content(TPACK) is defined asinterconnections and intersections of content knowledge, pedagogical practice

knowledge, and technological knowledge in educational contexts(Handini & Mustofa, 2022)The TPACK framework is widely used in various studies that link the concepts of knowledge about technology, pedagogy and content with teacher professional development in technology integration (Handini & Mustofa, 2022). The purpose of this article is to examine the extent to which TPACK impacts teachers' technology integration practices through a literature study.

METHOD

This study uses a descriptive qualitative research method and collects various literature.related to TPACK in teacher technology integration. The technique used in this article is to use literature study, namely by examining and understanding document references that are relevant to the impact of TPACK on teacher technology integration. The type of research used is library research, namely research that uses library data to be studied more deeply and reviewed in order to obtain objective results. The source of literature study data uses scientific journal articles using the Google Scholar database with the help of the Publish Or Perish application. The data analysis technique uses descriptive qualitative analysis with the procedure According to Miles and Huberman, there are four stages in data analysis, namely:

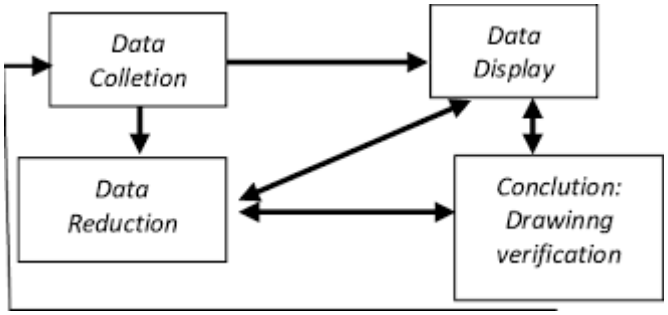

Figure 1. Interactive data analysis scheme (Miles and Huberman, 1992)

RESULTS AND DISCUSSION

Results

Technological Pedagogical Content Knowledge (TPACK)

TPACK is a concept formulated by Mishra & Koehler (2006), which is a combination of three main knowledge that forms a framework, namely technological knowledge, pedagogy, and content. TPACK can be interpreted as knowledge that teachers must have about how to combine content knowledge (teaching materials) with pedagogical knowledge accompanied by the use of modern technology to facilitate learning for their students. Teachers' knowledge of technology in general does not yet allow teachers to integrate technology into learning. Several researchers such as (Voogt and McKenney, 2017). Indonesian:(Guggemos & Seufert, 2021)argues that teachers need knowledge that can be a guide for teachers to use technology in the teaching and learning process.

According to(Westbroek et al., 2019). The TPACK conceptual framework is expected to be a guide forteachers or practitioners in facing the urgency of technological growth in the field of education that reflects the context of 21st century learning.

The interaction of the three main components of knowledge in TPACK will form seven different domains that teachers need to successfully integrate technology into the teaching and learning process (Figure 1). In detail explained, Technological knowledge (TK) refers to the teacher's ability to operate technology in learning ranging from simple ones such as whiteboards to computerized technologies such as the internet and mobile devices. Pedagogical knowledge (PK) is defined as the teacher's understanding of the procedures and strategies used to plan learning, manage classes, and evaluate student learning outcomes. Content knowledge (CK) is the teacher's knowledge of the subject matter to be taught. Technological pedagogical knowledge (TPK) is conceptualized as the teacher's understanding of the use of certain pedagogical strategies to suit the affordances of technology. Technological content knowledge (TCK) relates to the teacher's knowledge of how learning materials can be represented through the use of various technologies. Pedagogical content knowledge (PCK) relates to the teacher's knowledge in implementing teaching strategies to represent content, to overcome student difficulties and improve student understanding. Technological pedagogical content knowledge (TPACK) will then highlight the teacher's sensitivity to the relationship between the three components of knowledge, namely technology, pedagogy, and content.

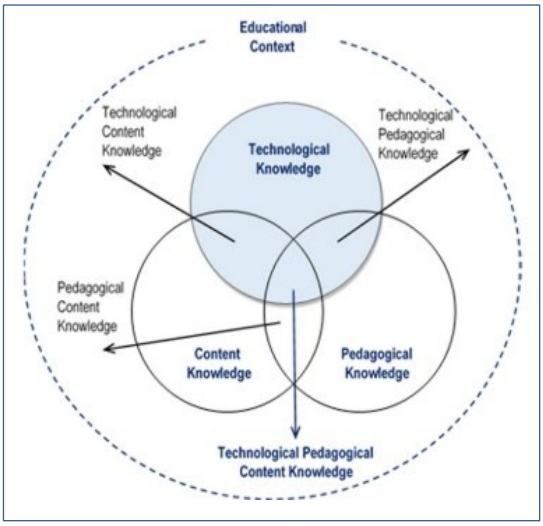

Figure 2. TPACK Dimensions *(*Source: Mishra & Koehler, 2006)

IntegrationTechnology

Technology makes education easier, especially in the process.teaching and learning. The use of technology in education can then be defined according to aspects of its use (Susanti, 2013). explainthat technology integration in learning is a series of activities carried out by teachers by utilizing technology to develop students' thinking skills. (Widiyono & Millati, 2021)Technology integration is the coordinated use of technological tools or digital and computing devices as a

means of solving problems to gain deeper understanding and learning. According to (Darmawan, 2011) technology integration in learningcan involve web-based technologies, mobile devices and applications, computers, tablets, multimedia, and can include all activities that are digital in nature or a mix of activities that use digital devices (Susanti, 2013).

Several experts have stated the importance of technology integration in learning, such as,(Amer, Sidhu, Bo, & Srinivasan, 2022) said that the use of technology in learning needs to be done to change the context of modern teacher thinking.now we have to consider and adapt to the demands of 21st century learning. While (Bada & Jita, 2022) explains that teachers need to use technology in their teaching to keep up with the times, create interactive learning, and vary learning methods.(Abaniel, 2021).

Technology is a very important element in creating an effective learning atmosphere for students in discovering and creating knowledge.(Alhothali, 2021)revealed that the integration of ICT in learning is considered good in relation to the quality of education because it is considered to make teaching and learning activities interesting. Ghavifekr & Rosdy (2015) said that the use of ICT for instructional learning purposes has a positive impact on students, because technology offers relevant and interesting opportunities for meaningful learning experiences.(Quddus, 2020).

The practice of technology integration in the field is certainly not as easy as imagined, teachers have practical obstacles.(Education, Voogt, & Mckenney, 2017)identify factors that hinder teachers' integration of technology into learning, including the lack ofteachers' computer skills, lack of time for teachers to implement technology-integrated learning, and lack of technical support to support teachers' skills and knowledge. Meanwhile(Rahayu, 2019)sayThat to successfully integrate technology in learning, teachers must have good skills and preparation related to technical, pedagogical, and content knowledge. In this case, teachers' TPACK is a predictor that has an impact on teachers' technology integration practices.(Schmid et al., 2021).

Discussion

Integration of technology in the teaching and learning process is a process where technology is used as a tool to support the teaching and learning process both indoors and outdoors.(Anthonysamy, Choo, & Hin, 2019)Technology integration is considered important for student success in the learning process.(Barquilla & Cabili, 2021)Integration of technology in learning will be realized well if teachers are diligent in using various technologies and are able to determine their roles and apply the technology appropriately.(Irmita & Atun, 2018).

TPACK is a special professional knowledge that teachers must have in order to be skilled in using technology effectively in the teaching and learning process. TPACK describes a framework of knowledge that teachers must have that explains important parameters for determining an effective teaching system and improving the quality of student learning with technology.(Pasani, 2018).

Previous researcher's research(Widiyono & Millati, 2021)reported that technology in learning has a significant impact on the teaching and learning

process. Technology in learning makes learning more innovative and helps teachers experience a more productive teaching process.(Guggemos & Seufert, 2021)in his research stated that TPACK has a significant influence on teachers' technology integration practices. The results of this study are in line with(Rahayu, 2019) which also states that TPACK is a framework that can support the development of teacher professionalism in utilizing technology that is in accordance with the goals and demands of 21st century learning. The TPACK framework can be used as a basis for teachers to teach professionally with technology.(Rahayu, 2019).

The application of TPACK (Technological Pedagogical and Content Knowledge) in teaching practice brings significant changes in teacher professional development.(Rizqiyah, 2021). Teachers who master TPACK are able to unite three important domains—technology, pedagogy, and content—so that the learning process becomes more contextual, relevant, and effective.(Voogt & McKenney, 2017). In this context, teachers not only understand how to use technology, but are also able to select and adapt technology according to learning objectives and student characteristics.(Westbroek et al., 2019). This encourages teachers to continue to learn, evaluate, and develop their teaching practices sustainably, which is the core of teacher professionalism in the 21st century.(Dewi et al., 2021).

In addition, TPACK encourages teachers to be more reflective about their learning methods and more creative in designing technology-based learning strategies.(Farikah & Firdaus, 2020). Teachers who are trained with the TPACK approach tend to be more adaptive to new technological developments and better prepared to face the challenges of digital learning, including online and hybrid learning.(Dillon, 2022). This creates a culture of innovation in teaching and strengthens the position of teachers as agents of change in the world of education.(Dostal, 2023). In other words, TPACK is not only a technical framework, but also a strategic tool in encouraging the improvement of teacher quality holistically and professionally.

CONCLUSION

Based on the literature review that has been explained above, it can be concluded that TPACK has an impact on teachers' technology integration practices. TPACK has an impact on teacher professionalism. So to improve the quality of professionalism, further research needs to be carried out in order to perfect the literature research that has been carried out.

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