International Journal of Education and Literature (IJEL)
Amik Veteran Porwokerto
https://ijel.amikveteran.ac.id/index.php/ijel/index

E- ISSN : 2829-6249
P -ISSN : 2829-6656

Literature Review: TPACK-Based Science Learning in Supporting Teacher Quality in Indonesia

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ARTICLEINFO

Article history:
Received 20 Juni 2022
Received in revised form 30 Juni 2022
Accepted 19 Juli 2022
Available online 10 August 2022

Keywords:
Learning, Natural Sciences, TPACK, Teacher Quality

ABSTRACT

In the era of globalization, the world of education has made very significant progress in all fields. All have been based on the use of information and communication technology in the teaching and learning process. Technology acts as a tool to help students and teachers in conveying information more effectively. However, students have not been able to master technology-based learning materials. So, teachers must facilitate and monitor student performance so that they can more easily and quickly master the material. The professional quality of teachers in Indonesia is still relatively low. This is because the human resources of the Indonesian people are still lagging behind compared to other countries. The quality of teachers in Indonesia needs to be improved by using a learning approach. Learning approach based on Technology Pedagogical Content Knowledge (TPACK). This TPACK approach makes it easier for teachers to master technology that is by learning content so that students are motivated and active in learning. This study aims to determine TPACK-based learning in supporting the quality of teachers in Indonesia. This research uses the type of library research. Research samples from literature studies sourced from Google Scholar and Eric Journal. The criteria for the data to be sampled are articles published in 2015-2022. The data that was used as a sample amounted to 15 articles that were following the research variables. Data analysis is qualitative data analysis. The results show that from 15 articles that have been analyzed, TPACK-based science learning is very helpful for science teachers in Indonesia. TPACK-based science learning enhances the professionalism of teachers in teaching science material. Furthermore, the TPACK approach greatly helps teachers' professional performance to be more effective and efficient in mastering technology for learning facilities.

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INTRODUCTION

In the current era of globalization, the world of education is progressing very rapidly in the learning process (Amalia et al., 2022; Fradila et al., 2021). Learning has been technology-based which aims to help the learning process of teachers and students (Eichelberger & Leong, 2019; Model, 2021). In learning the teacher acts as a facilitator (Yusuf et al., 2020). So, teachers are required to have high professionalism in teaching (Tican & Deniz, 2018; Santosa & Sepriyani., 2020). v(Chong, 2009;Oktarina et al., 2021; Kereluik et al., 2013). Learning is a process of changing knowledge, psychomotor and affective behavior in achieving learning objectives (Santosa, Razak, Lufri, et al., 2021);. Learning objectives are something the teacher wants to achieve in the teaching and learning process (Ferdyan et al., 2021; Santosa & Yulianti, 2020). The learning is directed at 21st century learning.

21st century learning, a teacher must have an expertise in his field (Kuloğlu & Karabekmez, 2022). In the 21st century, teachers must master the competencies of digital age literacy, inventive thinking, effective communication and high productivity (Fongkanta et al., 2022; Zorlu & Zorlu, 2021; Husain & Kaharu, 2021). These competencies play an important role in training students in critical thinking, creative, communication and collaboration skills.) (Razak et al., 2021; Davis & Jayaratne, 2015; Orak & İnözü, 2014). In addition, these skills are very necessary for students in mastering science learning (Cevik & Senturk, 2019).

Science learning is a learning based on natural phenomena that occur biologically, chemically and physically (Khusniati, 2014). According to Rahayu et al., (2012) Science learning is learning that studies natural phenomena related to living or non-living things. So, science learning becomes a vehicle for students to develop their knowledge in everyday life (Listyawati, 2016;Widiana, 2016; Rachmawati et al., 2019; Santosa et al., 2021). Therefore, teachers are required to be able to guide students in understanding science learning materials to be more effective. The problems found in Indonesia are that the skills of teachers are still low in learning science, the skills of teachers in using technology are still low and the level of use of learning media is still low. According to Suyamto et al., (2020) Teachers in Indonesia have low technology mastery skills compared to other countries. This is because teachers are the main element in improving the quality of education in Indonesia (Darmawan, 2016). In addition, the quality of teachers is low in applying learning content by integrating it into technology (Putriani & Sarwi, 2014).

According to Ichsan et al., (2018) teachers must adjust the science-based learning approach so that students do not get bored in learning science. One approach that teachers can use is the TPACK approach (Koh et al., 2015). Technology Pedagogical Content Knowledge (TPACK) approach is an approach that integrates technology in the field of pedagogical Content Knowledge (PCK) (Desstya, 2018; Chaidam & Poonputta, 2022; Dewi et al., 2021; Joldanova et al., 2022). Professional teachers who are able to combine knowledge of content, pedagogy and technology in science learning (Nasar & Daud, 2020; Salas-Rueda, 2019). Not only that, teachers must improve their learning abilities about the latest technology that can be used in learning (Wati & Nafiah, 2020; Santosa et al., 2021).

Based on research by Sinaga et al., (2021) This TPACK approach is able to optimize the quality of Indonesian teachers through TPACK . Research by Gustavo et al., (2021) Science learning based on the Technology Pedagogical Content Knowledge (TPACK) approach is more in supporting the skills of teachers in mastering technology. Accoeding to Irmita & Atun, (2018) TPACK-based science learning concepts are able to improve the literacy skills of teachers and students in learning. Research by Istiningsih, (2022) TPACK-based science learning affects the quality of teachers in carrying out the learning process. Based on these problems, this study aims to determine TPACK-based learning in supporting the quality of teachers in Indonesia.

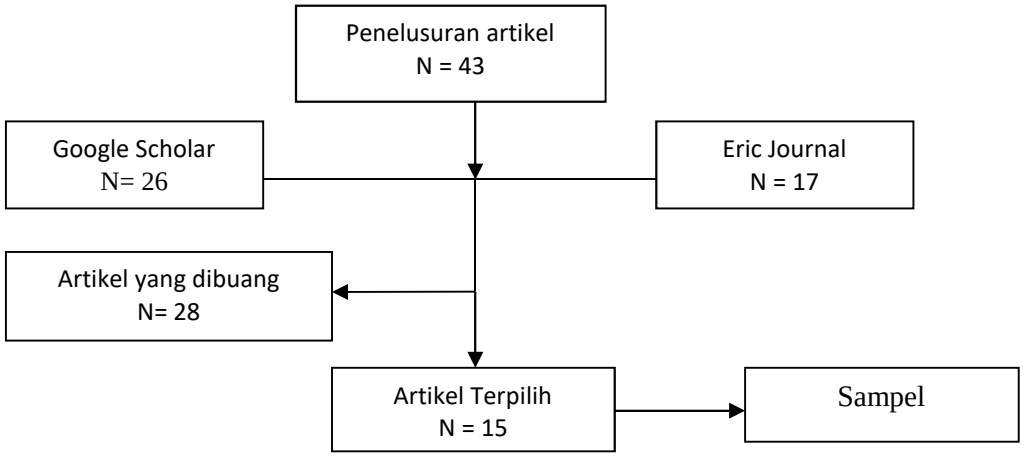
RESEARCH METHODS

This research is a type of library research by understanding various sources of relevant information. The data source comes from the analysis of 15 articles that have been published from 2015-2022. Search data sourced from Google Scholar and Eric Journal. The sampling technique used as the data is purposive sampling. The data that can be sampled has a relationship with TPACK-based science learning. Data analysis in this research is descriptive qualitative data analysis.

RESULTS AND DISCUSSION

Result

From the results of a literature search, 43 articles were obtained consisting of 26 articles sourced from Google Scholar and 17 articles sourced from Eric journals. From the 43 articles, 15 articles were found that matched the research variable, namely TPACK-based science learning. Furthermore, the 15 articles can be seen in Figure 1.



Gambar 1. Digram Flow dalam Seleksi Artikel

1. TPACK Learning Concept

Technology Pedagogical Content Knowledge (TPACK) is a learning approach that integrates technology, materials, and pedagogy that are integrated into technology (Mairisiska et al., 2014; Baran et al., 2011; Sahin, 2011). According to Wijaya et al., (2020) The TPACK approach is a knowledge of the material being taught (CK), an approach to teaching a material (PK) and knowledge of technology (TK). Learning based on Technology Pedagogical Content Knowledge (TPACK) is able to support the mastery of technology for teachers and students (Nugroho et al., 2019; Christopher & Robert, 2011). TPACK learning is very much to support the quality of teacher learning in Indonesia. In addition, this TPACK approach affects the quality of teacher teaching skills (Shafira & Minsih, 2022; Mutiani et al., 2021).

This Technology Pedagogical Content Knowledge (TPACK) approach is able to improve students' higher-order thinking skills (Hayati et al., 2014). In the TPACK approach, a teacher is able to master knowledge and content. Professional teachers must be able to apply TPACK into four competencies consisting of pedagogic, professional, personality and social competencies (Nofrion et al., 2012; Jamieson-Proctor et al., 2013; Lin et al., 2013). TPACK lessons give students more active learning (Nasution et al., 2021). According to Sitompul et al., (2018) TPACK learning helps teachers and students use technology for teaching and learning tools (Sitompul et al., 2018; Baran et al., 2019).

Furthermore, learning Technology Pedagogical Content Knowledge (TPACK) makes students learn more actively and efficiently (Stefani et al., 2021). Teachers must apply TPACK by reflecting after carrying out the teaching and learning process. This is because the teacher must understand the teaching material in accordance with the subject (Jang & Chen, 2010). In addition, the mastery of TPACK for teachers in Indonesia is still experiencing problems (Yurinda & Widyasari, 2022), because many teachers do not understand technology. Furthermore, the TPACK approach becomes a new challenge for teachers in improving the quality of 21st century skills in students.

2. TPACK-Based Science Learning in Supporting Teacher Quality in Indonesia

Science learning is a lesson that learns about natural phenomena that occur in everyday life (Etkina & Heuvelen, 2007; Cheng & Tsai, 2013). Science learning is a compulsory subject in elementary to middle school. The quality of science learning in Indonesia is largely determined by professional teacher resources. According to Rahma & Agustin, (2021) Natural Science learning (IPA) is learning that plays an important role in supporting students' 21st Century skills. The concept of learning Natural Sciences (IPA) in Indonesia is emphasized to improve students' mastery of concepts (Elvianasti et al., 2021). Students who understand science learning should be able to understand themselves and their surroundings (Wibowo, 2018; ningrum et al., 2020). Furthermore, science learning is essentially a product, process and application (Widiana, 2016; Koizumi, 2004). The quality of science learning in Indonesia is still relatively low.

Based on data from the United Nations Development Project, which explains that the Human Development Index (HDI) of the quality of science education in Indonesia is ranked 110th in the world. (Jampel et al., 2018; Fahmi et al., 2021; Haryanto & Arty, 2019). In addition, the quality of science learning is also determined by the media, methods, approaches and teaching materials used by the teacher. According to Taufiq et al., (2014) the quality of learning is largely determined by the use of methods and approaches used by teachers in learning. Science learning has the characteristics of a scientific concept based on students' critical thinking and problem solving skills (Tasiwan et al., 2014). Science learning has the purpose and function of developing students' abilities in critical thinking in life problems (Suhaimi et al., 2022).

Furthermore, science learning is a very important learning for students as a means to master the development of science and technology (Santosa et al., 2021). According to The Program For International Student Assessment, in 2018 the quality of science learning was in the low category. This can be seen from the result of a score of 396 and it is far behind other countries with a score of 489 .(Rosyada et al., 2021). In addition, based on the results of the 2009 PISA research, the ability of Indonesian students to master science is still in the low category with a score of 383 .(Wulandari et al., 2019; Suryawati & Osman, 2018; Maison et al., 202). Science learning studies four dimensions consisting of science as a way to think, science as a way to investigate, science as the body of science and science interacting with technology and society (Rahayuni, 2016).

CONCLUSION

From the research above, it can be concluded that from 15 articles that have been analyzed, TPACK-based science learning is very helpful for science teachers in Indonesia. TPACK-based science learning enhances the professionalism of teachers in teaching science material. Furthermore, the TPACK approach greatly helps teachers' professional performance to be more effective and efficient in mastering technology for learning facilities.

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