TPACK Competence In Teacher Professionalism: Trends, Challenges, And Opportunities In 21st Century Learning

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Abstract: Technological Pedagogical Content Knowledge (TPACK) is a relevant framework that is useful in providing evaluation and improving teacher competence in facing challenges in learning. TPACK provides a framework for teachers to design learning that focuses not only on conveying information, but also on developing students' critical and creative skills. This article aims to find out TPACK competencies in current trends, identify challenges and explore opportunities that can be utilised to shape the future of education in the 21st century. The research method in writing this article by applying qualitative methods with literature studies. The results of the study show that the Application of TPACK in 21st Century Learning The application of TPACK in 21st century learning is very important to facilitate interactive and technology-based learning. There are several challenges faced by teachers in mastering and implementing TPACK. These challenges include gaps in technology access, teachers' limited digital literacy, and professional burnout. TPACK competency development has several opportunities that can be utilised to improve teachers' ability to implement TPACK effectively.

Keywords-component; TPACK; Education, 21st Century Learning

1. INTRODUCTION

Technological Pedagogical Content Knowledge (TPACK) competence is an important issue in teacher professionalism in 21st century teaching. The current digital era exposes teachers to challenges in integrating technology into learning activities. TPACK includes technological, pedagogical, and content knowledge that teachers must possess to improve learning effectiveness. TPACK is a relevant framework that is useful in providing evaluation and improving teachers' competence in facing challenges in learning. In education, the TPACK framework has become a popular construct in preparing professional teacher competencies [1]. TPACK competence can be defined as a framework that includes the knowledge required by teachers in integrating technology into learning [2].

The main challenge teachers face is how to optimally apply technology in the learning process. However, the lack of adequate training and support from educational institutions in developing TPACK competencies is a challenge that teachers must face. Professional development programmes and teacher training should be implemented so that teachers can understand and apply the three areas of TPACK: technology, pedagogy and content [3]. This condition creates a gap between theoretical understanding and practical skills, where teachers have knowledge but have not been able to apply it effectively. Thus, there is a need for research that understands how teachers are equipped with the necessary skills to integrate technology in the learning process.

The application of TPACK also encourages innovation in learning design. By integrating technology, pedagogy and content, teachers can create more creative and relevant learning experiences [4]. TPACK provides a framework for teachers to design learning that focuses not only on delivering information, but also on developing students' critical and creative skills. For example, teachers with online platforms that create collaboration, feedback and ideas can improve the quality of learning [5]. The use of online learning platforms and collaborative tools allows teachers to create flexible and adaptive learning environments, which can be tailored to students' needs.

The results of research by Madileng & Ndlangamandla show that the gap between technology and language education in the 21st century must be bridged. It is necessary to conduct technology and communication training and consider competencies in 21st century learning with new technologies [6]. The results of the study by Cabero & Barroso showed the importance of emphasising pedagogical and content knowledge not just technological aspects [7]. The results of Harris and Hofer's research show several points, namely first, teacher participation in the selection and use of learning activities and technologies becomes more conscious, strategic, and varied; second, instructional planning becomes more student-centred, focusing primarily on students' intellectual, rather than affective, engagement; and third, quality standards for technology integration are raised, resulting in deliberate decisions for more thoughtful use of educational technology [8].

TPACK is one way to navigate digital transformation in education as an essential way. TPACK emphasises that teachers in the 21st century not only need to understand technology and course content, but they also need to integrate them harmoniously and thoughtfully to create optimal learning

experiences for students. TPACK is a holistic framework that views technology not as a separate entity, but as an integral part of pedagogical and subject content. It is therefore important to explore in depth how education is moving in the increasingly dynamic and complex 21st century and how TPACK can be a useful framework in understanding trends, identifying challenges and maximising opportunities.

2. DESTINATION

This article will delve deeper into the current trends in education influenced by TPACK, identify the challenges faced in its implementation, and explore the opportunities that can be utilised to shape the future of education in the 21st century.

3. RESEARCH METHODS

The research method in writing this article by applying a qualitative method with a literature study . Literature study is a study used by collecting data information from various sources in the form of documents, books, articles and so on [9]. The literature used in this article is obtained from various sources including: article books and scientific journals and other relevant reading materials.

4. RESULTS AND DISCUSSION

4.1 TPACK Competence in Teacher Professionalism

Application of TPACK in 21st Century Learning The application of TPACK in 21st century learning is essential to facilitate interactive and technology-based learning. TPACK as a competency must be mastered by teachers to support and assist the implementation of learning [10]. TPACK assists teachers in designing learning experiences that not only rely on technology, but also consider pedagogical aspects and relevant content[11]. Thus, the application of TPACK allows teachers to create a learning environment that is more dynamic and adaptive to the needs of students in the digital era.

The integration of TPACK in various subjects shows that this approach can improve the quality of learning. The use of technology by teachers must be able to facilitate students in understanding learning and still pay attention to pedagogical aspects, for example in the development of learning media for abstract mathematics [12]. The integration of TPACK in learning with proper implementation can enrich students' learning experience and improve their understanding of the material. Discussing the issue of technology integration into learning practices by teachers is important because technology integration shows good results in increasing student engagement. By integrating TPACK, teachers can create more contextualised and relevant learning, which in turn can increase students' motivation and interest in learning [13].

Improving teachers' competence in TPACK can be achieved through structured training programmes so that teachers can integrate it in learning appropriately. Training that focuses on developing TPACK has been proven effective in improving teachers' ability to manage the classroom and use technology optimally. These training programmes not only provide knowledge about technology, but also teach teachers how to integrate technology with appropriate pedagogy for the content being taught [14]. Thus, good training can help teachers to be more confident in using technology in their teaching, which ultimately has a positive impact on their professionalism as educators.

4.2 Challenges in Mastering and Implementing TPACK

There are several challenges faced by teachers in mastering and implementing TPACK. These challenges include the technology access gap, teachers' limited digital literacy and professional burnout. Each of these challenges has a significant impact on teachers' ability to effectively implement TPACK in the learning process. The technology access gap is one of the main challenges in implementing TPACK. In many areas, especially in rural areas, access to information and communication technology (ICT) is still very limited. This digital divide relates not only to the availability of devices, but also to the quality of adequate internet access [15]. The potential of digitisation can empower rural communities, making access to information, education, healthcare and other essential services easier. Thus, the technology gap can make it difficult to utilise technology in learning, which in turn hinders the mastery of TPACK. Teachers who do not have adequate access to technology tend to be unable to keep up with the latest developments in technology-based teaching methods, leaving them behind in terms of TPACK competence.

Limited digital literacy among teachers is also a significant challenge in mastering TPACK. Although many teachers have access to technology, not all of them have the necessary skills to utilise such technology effectively in learning [16]. Research shows that many teachers do not feel confident in using digital tools and often do not know how to integrate technology with appropriate pedagogy [17]. This results in suboptimal use of technology in the learning process, which in turn reduces their teaching effectiveness. An in-depth understanding of the use of technology in learning and curriculum is necessary to provide teachers with the necessary skills [18]. By improving digital literacy, teachers will be better able to integrate TPACK in their teaching, which will ultimately have a positive impact on students' learning experience. Therefore, ongoing training programmes and support in digital skills development are essential to address this challenge.

Professional burnout is another challenge faced by teachers in mastering and implementing TPACK. Many teachers feel overwhelmed by the demands of constantly learning and adapting to new technologies, which can lead to stress and burnout. This fatigue is often caused by the lack of adequate support and resources to assist them in the technology-based learning process. When teachers feel burnt out, their motivation to learn and apply TPACK in teaching may decrease, which negatively affects the quality of education they provide. To address this issue of professional burnout, it is important for educational institutions to provide

adequate support for teachers, including time and resources for training. Thus, training can equip teachers to acquire teaching strategies and integrate technology actively [19]. Attention to teachers' welfare is crucial in improving their mastery and implementation of TPACK in education.

4.3 TPACK Competency Development Opportunities

TPACK competency development, has several opportunities that can be utilised to improve teachers' ability to apply TPACK effectively. The 21st century is becoming an unprecedented transformation in various aspects of life including education fuelled by rapid advances in technology [20]. Government Policy Support Government policy support is one of the key factors in developing TPACK competencies among teachers. The government can play an important role by formulating policies that support technology integration in education. For example, policies that encourage TPACK training for teachers can improve their understanding and skills in using technology effectively in learning. Policies that support the development of TPACK can also include relevant curriculum development and continuous training for teachers to ensure that they stay up-to-date with the latest technological developments. Thus, teachers' integration of TPACK can be confidently implemented by teachers and improve their competence in designing learning [21].

The issue of teachers' technology integration practices is important to address because technology integration has been shown to increase student engagement and achievement [22]. The need for collaboration between educational institutions and the technology industry also offers great opportunities for the development of TPACK competencies. The technology industry can contribute by providing software, applications and learning tools that can be used in the classroom, as well as training on how to integrate them with appropriate pedagogy. This collaboration is not only beneficial for teachers, but also for students, as they will get a more interactive and engaging learning experience. In addition, this collaboration can open up opportunities for teachers to participate in research and development projects related to educational technology, which can further enhance their TPACK competencies.

The establishment of teacher communities of practice is another significant opportunity in the development of TPACK competencies. This community can be a platform for teachers to share experiences, strategies and resources related to implementing TPACK in learning. Through collaboration and discussion in communities of practice, teachers can learn from each other and be inspired by the best practices implemented by their peers. Communities of practice can also provide emotional and professional support for teachers, who often face challenges in integrating technology into their teaching. With this support network in place, teachers will be more motivated to continue developing their TPACK competencies and apply technology effectively in the classroom. In addition, communities of practice can serve as platforms for organising training, workshops and seminars that focus on

TPACK development, thereby strengthening teachers' ability to face educational challenges in the digital era.

5. CONCLUSION

The application of TPACK in 21st century learning has significant implications for improving student learning outcomes, strengthening teacher competence, and innovating learning design. By effectively integrating technology, pedagogy and content, teachers can create more interactive and relevant learning experiences, which not only improve students' academic outcomes but also prepare them to face challenges in an increasingly complex world. Therefore, it is important for all stakeholders in education to support the development of TPACK competencies among teachers, so that education can be more responsive to the demands and needs in this digital era. The programme should focus on improving teachers' digital literacy, as well as providing support in terms of access to technology and resources needed to implement TPACK effectively. In addition, it is important to build a community of practice among teachers so that they can share their experiences and strategies in implementing TPACK. Thus, it is expected that teachers can be better prepared to face the challenges of education in the 21st century and improve the quality of learning for students.

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