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Research Article

Challenges of Teacher Prospective Students on the Preparation of Teaching Materials and TPACK-Based Assessment for Micro Teaching Courses

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ABSTRACT

This study examines two main aspects of the challenges faced by prospective teacher students at Malikussaleh University in compiling teaching materials and assessments based on TPACK and TPACK. The background of the problem includes the need for the integration of technology in education which is increasingly important in the digital age. The purpose of this study is to identify these challenges in depth. The method used was qualitative descriptive with data collection through a questionnaire questionnaire distributed to 50 students. The research instrument consists of questions that cover various aspects of challenges in the preparation of teaching materials and assessments. The results of data analysis show that students face significant challenges, especially in mastery of technology and pedagogical integration, with a fairly high percentage of challenges in the preparation of TPACK and TPACK-based assessments. In conclusion, this study emphasizes the need for more attention from educational institutions in providing support to students so that they can overcome these challenges and improve their ability to develop effective and relevant teaching materials and assessments.

Keywords: TPACK; Student Challenges; Preparation of Teaching Materials; Assessment; Technology

1. INTRODUCTION

The preparation of teaching materials and assessments based on Technological Pedagogical Content Knowledge (TPACK) is one of the main challenges for prospective teacher students in Micro Teaching courses, especially because this skill requires a holistic integration between technology, pedagogy, and subject matter. According to, the TPACK model requires prospective teachers to be able to combine technology knowledge with effective teaching practices and in-depth mastery of content. In the context of teacher education, mastery of TPACK is becoming increasingly crucial in line with the demands of the ever-evolving digital era, where technology plays a central role in the learning process Tschönhens et al., (2024); Listiaji & Subhan, (2021).

In this context, it is important for teacher education programs to design strategies that support the sustainable development of TPACK skills of prospective teacher students. Previous research shows that the optimal use of technology in the learning process does not only depend on access to technology itself, but also on the readiness and pedagogical skills of teachers in integrating technology with meaningful learning (Wang, 2022 ; Malik et al., 2019). This is a challenge for prospective teacher students, who often feel burdened by the demands to master various aspects of TPACK at the same time, namely technology, pedagogy, and content (Satriawati et al., 2022).

However, in practice, many prospective teacher students have difficulty in implementing TPACK optimally, especially in compiling teaching materials that are relevant to technology and designing assessments that are able to measure 21st century skills such as collaboration, creativity, and problem-solving (Yeh et al., 2021). In addition, the difference in the level of technology mastery among prospective teacher students is also an obstacle in the implementation of TPACK in the learning environment (Herizal et al., 2022). Not only that, the implementation of TPACK among prospective teacher students still faces various challenges. One of the main problems is the gap between theory and practice in the application of technology in the classroom, especially when prospective teachers are faced with limited facilities and infrastructure in schools where they carry out teaching practices (Drugova et al., 2021). Furthermore, students' ability to develop TPACK-based assessments is often inadequate, especially in terms of designing

evaluations that not only measure cognitive learning outcomes, but also students' technological and collaborative skills (Choi & Young, 2021).

In this regard, the Micro Teaching program is an important platform to train prospective teachers to be able to integrate technology into their learning and assessment design effectively (Amelia et al., 2023). This is a challenge for prospective teacher students, who often feel burdened by the demands to master various aspects of TPACK at the same time, namely technology, pedagogy, and content (Zahraini et al., 2021). This condition is exacerbated by the limited time available in the Micro Teaching program, where students must be able to design, implement, and evaluate learning in a short time (Faradilla & Putra, 2024).

Another challenge is the lack of in-depth understanding of prospective teacher students about how technology can improve the effectiveness of assessments (Turmuzi & Kurniawan, 2021). In line with the statements of (Sopiyani et al., 2023) many of those who only use technology as a presentation or administrative aid, without really harnessing the potential of technology to develop more authentic and project-based assessments. This is where the urgency lies to provide more intensive training in the development of TPACK-based assessments, so that prospective teacher students can design evaluation instruments that are able to measure various aspects of student competence, including critical thinking skills, communication, collaboration, and creativity (Graham et al., 2012). Therefore, this study aims to identify the challenges faced by prospective teacher students in compiling TPACK-based teaching materials and assessments in Micro Teaching courses and formulate effective strategies that can be used to overcome these obstacles. It is hoped that the results of this research can contribute to the development of teacher education curriculum that is more responsive to the needs of technology-based learning in the digital era. Furthermore, this research is driven by the need to deepen the understanding of the obstacles faced by students in compiling TPACK-based teaching materials and assessments, as well as to provide applicable solutions in supporting their skill development. By analyzing these challenges, it is hoped that this research can provide new insights for teacher education programs in improving the readiness of prospective teacher students to face the demands of 21st century learning. Furthermore, this study seeks to provide recommendations on how teacher education can further support the development of TPACK competencies in a dynamic and technology-based educational environment.

2. RESEARCH METHODS

This research method uses a qualitative descriptive approach implemented in the Mathematics Education Study Program, Malikussaleh University. The research subjects are seventh-semester students who have taken Micro Teaching courses in the 2023/2024 academic year, with a sample selected purposively. This research aims to identify student challenges in compiling TPACK-based teaching materials and assessments. Data were collected through questionnaires and in-depth interviews. The questionnaire was used to explore the challenges faced by students in compiling teaching materials and assessment instruments based on TPACK, while the interview was used to deepen their understanding of their experience in integrating technology, pedagogy, and content in the learning process. In addition, learning products such as semester implementation plans and assessment instruments were analyzed to see the application of TPACK by students. The research procedure began with the distribution of questionnaires, document collection, and interviews with students who had completed the Micro Teaching course. The data was analyzed thematically to identify the main challenges faced by students in developing TPACK-based teaching materials and assessments. The results of this analysis are expected to provide a comprehensive overview of student constraints and provide recommendations to improve TPACK-based learning in teacher education programs.

3. RESULTS AND DISCUSSION

3.1. Student Challenges in the Preparation of TPACK-Based Teaching Materials

Based on the results of research conducted on students in the seventh semester of the Mathematics Education Study Program at Malikussaleh University, several main challenges faced in the preparation of teaching materials and TPACK-based assessments in the Micro Teaching course were found. A total of 50 respondents participated in filling out a questionnaire describing their difficulties in integrating technology, pedagogy, and content into learning and assessment designs. Data analysis shows various obstacles experienced by students, both in the preparation of teaching materials and in making technology-based assessments. To make it easier to understand, the results of the study are presented in the **Table 1**.

Table 1. Data on Challenges in the Preparation of TPACK-Based Teaching Materials

Aspect/Statement	Answer (%)				
	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Challenges in the Use of Technology	50,20	44,60	3,70	0,90	0,60
Challenges in the Integration of Technology and Pedagogy	12,70	42,90	23,60	14,10	6,70
Challenges in Technology and Content Integration	33,60	61,10	3,70	0,70	0,90
Support and Guidance	58,20	40,40	0,70	0,30	0,40
Experience and Confidence	15,50	40,90	23,60	14,00	6,00
Strategies for Overcoming Challenges	32,60	60,30	6,70	0,20	0,20

Based on **Table 1**, above the percentage of respondents to each aspect or statement on the Likert scale. The majority of respondents stated that the challenges in the use of technology are quite significant, with 50.20% strongly agreeing and 44.60% agreeing. In terms of the challenges of technology and pedagogy integration, although 42.90% agreed, 23.60% were neutral, and there were some who disagreed (14.10%). The challenges of technology and content integration are more supported, with 61.10% agreeing and 33.60% strongly agreeing. Support and guidance were also rated very good, with 58.20% strongly agreeing and 40.40% agreeing. However, the experience and confidence aspects showed variation, with 40.90% agreeing but still 23.60% neutral and 14% disagreeing. On the strategy to overcome challenges, 60.30% agreed and 32.60% strongly agreed, indicating that respondents felt that the strategy was quite effective. The following bar chart will visualize this data more clearly, providing a comparative view of the percentages for each aspect.

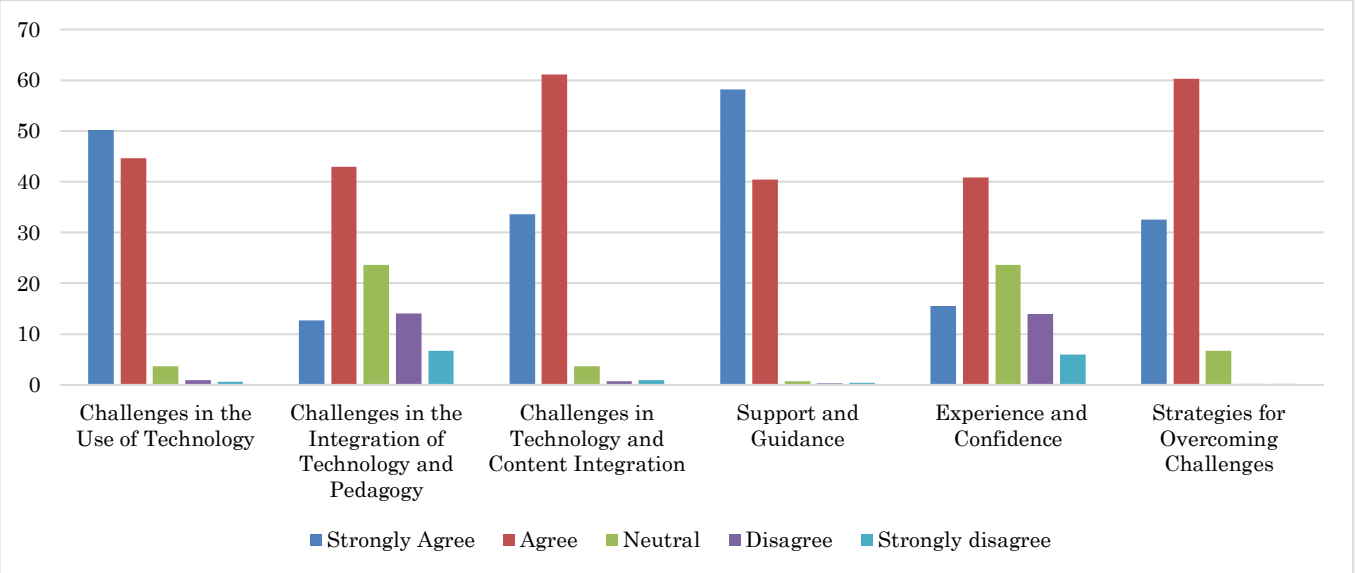

Figure 1. Diagram of the results of the analysis of student challenges in the preparation of teaching materials.

Based on **Figure 1,** it is obtained that various challenges faced by students in the preparation of teaching materials, especially related to the use of technology and its integration with pedagogical aspects and content. Challenges in the use of technology are experienced by more than 40% of students, showing that although technology is an important element in education today, many students still find it difficult to use it optimally. In addition, around 40% of students also face obstacles in integrating technology with pedagogy, which shows a gap between their technological capabilities and how the technology can be used to support the pedagogical learning process. The biggest challenge is experienced in the integration of technology and content, where more than 50% of students find it difficult to align technology with the learning materials they create. This shows that although students are able to use technology, its application in the context of learning content or content is still a major challenge.

However, amid these obstacles, more than 50% of students report that they feel they have enough support and guidance. This support is very important in helping students overcome the various difficulties they face during the process of preparing teaching materials. In addition, about 40% of students also reported challenges in terms of confidence and experience, which contributed to their difficulty in structuring teaching materials well. However, what is interesting is that the majority of students, around 60%, stated that they have strategies to overcome the challenges they face. This shows the willingness and ability of students to find solutions and adapt to various obstacles that arise, both in terms of the use of technology, integration with pedagogy and content, and in building their confidence. These findings are in line with research conducted by Habibi et al., (2020) showing that the mastery of technology by prospective teacher students is often limited to the basic use of technology, without any deep integration with pedagogy or content. This is in line with the findings of the data that show that mastery of technology is still an obstacle, even though students already have a better understanding of how technology should be used in the learning process

Other research by Kurniawan et al., (2021) highlighting the importance of creativity in designing teaching materials and how students need to be supported with adequate resources to encourage innovation in learning. The data displayed confirms that creativity in designing teaching materials is one of the strengths of students, but challenges in time and resource management are still the main obstacles. This is reinforced by (Adipat, 2021; Maor, 2017) the findings that students often find it difficult to manage their workload in compiling teaching materials, especially when it comes to balancing academic assignments and the effective use of technology. Thus, although students have a fairly good understanding of the importance of TPACK integration and show creativity in designing teaching materials, they still face significant challenges in terms of technology mastery and time and resource management. Recent studies reinforce these findings and highlight the need for greater support in technology aspects as well as more effective management strategies to assist prospective teacher students in developing TPACK-based teaching materials.

3.2. Student Challenges in the Preparation of TPACK-Based Assessments

Next, data was presented regarding the challenges in the preparation of TPACK-based assessments experienced by students in designing assessments that integrate technology, pedagogy, and content.

Table 2. Challenges in the Preparation of TPACK-Based Assessments

Aspect/Statement	Answer (%)				
	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Understanding TPACK Integration	49,80	46,20	2,50	0,80	0,70
Mastery of Educational Technology	12,70	41,90	22,60	15,10	7,70
Creativity in Designing Assessments	32,50	60,20	5,70	0,70	0,90
Adaptation to the Curriculum	58,20	34,40	6,30	0,60	0,50
Time and Resource Management	18,50	40,90	23,60	14,00	6,00
Reflection and Feedback	30,60	57,30	6,70	0,20	5,20

Table 2, shows that there is a variation in the level of understanding and mastery of students. In terms of understanding the integration of TPACK, the majority of students, namely 49.80%, strongly agree that they have a good understanding, with an additional 46.20% agreeing. This reflects that the basic understanding related to TPACK integration is quite high among students. However, when it comes to mastering educational technology, only 12.70% of students strongly agree that they master technology, while 41.90% agree and 22.60% are neutral. This shows that although the understanding of TPACK is high, there are limitations in the practical application of the technology in the assessment.

Creativity in designing assessments appears to be a strength of students, with 32.50% strongly agreeing and 60.20% agreeing that they can design assessments creatively. This shows that the majority of students feel able to innovate in designing assessments. On the other hand, the adjustment of the assessment with the curriculum is one of the most mastered aspects, where 58.20% of students strongly agree that they are able to adjust the assessment to the curriculum, supported by another 34.40% who also agree. However, time and resource management is still a significant challenge. Only 18.50% strongly agree that they can manage their time and resources well, while 40.90% agree and 23.60% feel neutral. This shows that many students still have difficulty managing their time and utilizing resources effectively

during the assessment preparation process.

In addition, reflection and feedback also received important attention, with 30.60% strongly agreeing and 57.30% agreeing that they actively reflect and provide feedback. This shows that the majority of students are aware of the importance of reflection in the assessment preparation process and strive to actively involve this component. Overall, although students show a good understanding of TPACK integration and creativity in designing assessments, challenges are still seen in mastery of educational technology as well as time and resource management that requires further improvement.

To provide a clearer visual picture of the challenges faced by students in the preparation of TPACK-based assessments, the description of the data explanation above will be presented in the form of a bar chart. This diagram will show a comparison between aspects of understanding TPACK integration, mastery of educational technology, creativity in designing assessments, adjustments to the curriculum, time and resource management, as well as reflection and feedback based on the percentage of student responses. Thus, readers can more easily see how each aspect is assessed by students and identify areas that still need further attention.

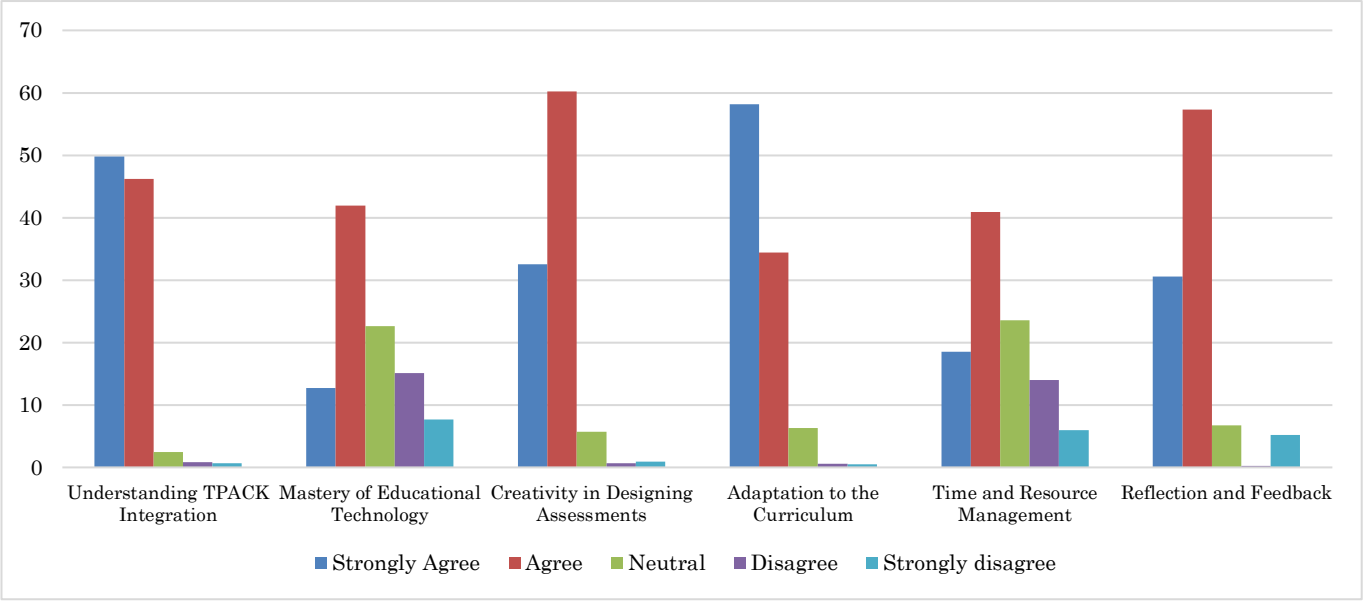

Figure 2. Diagram of the results of the analysis of student challenges to the assessment

Based on **Figure 2,** it emphasizes the results that have been explained previously regarding student challenges in the preparation of TPACK-based assessments. It is clear that the majority of students feel they have a good understanding of TPACK integration, with the percentage of "Strongly Agree" and "Agree" dominating compared to other answers. However, the challenges in mastering educational technology are still quite significant, with a relatively high percentage of "Neutral" and "Disagree", indicating that there are still practical obstacles in the use of technology. The creativity of students in designing assessments looks strong, where almost all students give positive answers. This shows that they tend to be able to innovate in the preparation of assessments.

Adjustment to the curriculum is one of the areas with the most positive results, showing that most students feel able to adjust the assessments they make to the existing curriculum standards. On the other hand, the challenges in time and resource management are still considerable, with many students being neutral or disagreeing that they can manage both aspects well. On the other hand, reflection and feedback are seen as quite important by students, as shown by the high percentage of agreeing and strongly agreeing. These findings are in line with research conducted by Atmojo et al., (2023); Aulia et al., (2023) those who emphasized the importance of technology integration in education and the challenges faced by teachers in applying TPACK in daily practice. This research also reveals that the lack of mastery of technology is still a major obstacle in technology-based education, especially in the assessment process. In addition, research by Dewi et al., (2022); Diamah et al., (2022); Thohir et al., (2023) found that creativity in designing assessments is one of the main competencies that must be developed by prospective teachers, although time and resource management is often an obstacle in the process.

4. CONCLUSION

The main conclusion of this study shows that prospective teacher students still face various challenges in the preparation of TPACK-based teaching materials, especially in technology mastery, pedagogical integration, and time management. Although most students have a good understanding of the TPACK concept, they need further support in terms of resources and training to increase creativity and effectiveness in designing teaching materials. This indicates the need for special attention from educational institutions to strengthen technological competence and student pedagogy.

RECOMMENDATIONS

Based on the findings of this study, the researcher recommends to relevant educational institutions to strengthen training and assistance in mastering technology for prospective teacher students. This can be done by providing wider access to technological devices and integrating technology more deeply in the learning process. For future researchers, it is recommended to further explore effective strategies that students can apply in overcoming the challenges of TPACK, as well as conduct a more in-depth study related to the use of new technology in education in order to provide innovative solutions to the challenges faced.

CONFESSION

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AUTHOR CONTRIBUTIONS

All authors actively contribute to every stage of the research, from planning, data collection, analysis of results, to the preparation of the final manuscript. Each author is also involved in the discussion of findings and revision of the manuscript to ensure the quality of the research.

CONFLICTS OF INTEREST

The authors state that there is no conflict of interest that could affect the results or interpretation of this study.

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