TPACK Competency Analysis of Prospective Mathematics Teacher in Micro Teaching Subjects

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Abstract

In education, the integration of technology is becoming increasingly important. This is especially true for mathematics teachers, who must use technology effectively to enhance the learning experience for their students. One method for assessing a mathematics teacher's ability to integrate technology into their teaching practice is through TPACK competency analysis. The purpose of this study was to analyze the TPACK abilities possessed by a future teacher candidate through the microteaching course he has attended. This study used a qualitative method in which data were obtained from interviews and questionnaires distributed via WhatsApp. The results of this study showed that prospective teachers who were the subjects of this study were capable and proficient enough in using and utilizing technology in learning but were still unable to match learning methods and models with the material to be taught to students in the learning tools they compiled. Through this research, it is hoped that students who are prospective teachers of mathematics will deepen their mastery of learning methods and models which will be applied when they teach. The implications of these findings highlight the importance of increased training in developing the TPACK competency of prospective mathematics teachers.

Keywords: TPACK ability; Prospective Mathematics Teachers; Microteaching.

Abstrak

Di bidang pendidikan, integrasi teknologi menjadi semakin penting. Hal ini terutama berlaku untuk guru matematika, yang harus memanfaatkan teknologi secara efektif untuk meningkatkan pengalaman belajar bagi siswanya. Salah satu metode untuk menilai kemampuan guru matematika dalam mengintegrasikan teknologi ke dalam praktik mengajarnya adalah melalui analisis kompetensi TPACK. Tujuan dari penelitian ini untuk menganalisis kemampuan TPACK yang dimiliki oleh seorang calon guru masa depan melalui mata kuliah microteaching yang telah diikutinya. Penelitian ini menggunakan metode kualitatif yang mana data diperoleh dari hasil wawancara dan pengisian kuisioner yang sebar melalui WhatsApp. Hasil penelitian ini diperoleh bahwa calon guru yang menjadi subjek penelitian ini telah mampu dan cukup mahir dalam penggunaan dan pemanfaatan teknologi dalam pembelajaran, namun masih belum mampu dalam mencocokkan metode dan model pembelajaran dengan materi yang akan diajarkan kepada siswa dalam perangkat pembelajaran yang mereka susun. Melalui penelitian ini diharapkan mahasiswa calon guru matematika dapat memperdalam penguasaannya terhadap metode dan model pembelajaran yang akan diterapkan pada saat mereka mengajar. Implikasi dari temuan ini menyoroti pentingnya peningkatan pelatihan dalam pengembangan kompetensi TPACK calon guru matematika.

INTRODUCTION

Education according to Putri D.S and Suyitno (Sartika, N.S., 2021) is something that is universal activity in human life, which is essentially a process in developing everyone for life and their survival and conscious efforts to shape them into independent adults. that make changes for the better in knowledge, behavior, and attitudes. Teachers are a very important part of organizing education to achieve the expected learning objectives and can create conducive learning conditions (Yurinda & Widyasari, 2022). The teacher is an important component in the learning process. In Law No. 14 of 2005 concerning Teachers and Lecturers (Turmudzi & Kurniawan, 2021) teachers are defined as professional educators whose main task is to educate, teach, train, and evaluate early childhood through formal education, basic education, and secondary education. Therefore, teachers are required to have certain competencies to carry out the learning process properly. Teacher professionalism is closely related to teacher welfare and the level of teacher education, both formal and non-formal. The professionalism of a teacher can look from two aspects, namely from the level of education he has taken and from the aspects of teacher mastery of the material, class mastery, and managing the learning process (Hafinda, 2022).

According to Ashifa S (2022), a professional teacher must also have several competencies within himself. Teachers can be categorized as professional teachers if they have pedagogic competence, personal competence, social competence, and professional competence as stated in Law Number 14 of 2005 concerning Teachers and Lecturers Article 10 paragraph (1).

According to Ismail et al., (2020) In addition, candidate of mathematics teachers should master educational competencies, technology commercialization competencies, globalization competencies, future strategy competencies, and counselor competencies, in addition to mastering the four core competencies of the law. With the rapid development of technology, teachers are expected to be able to integrate technology into teaching well. Efforts can be made by the teacher of them by using learning media such as visual aids in the learning process. This is done so that students can absorb and understand exactly what is conveyed by the teacher so that learning objectives can be achieved as they should (Murtiyasa & Atikah, 2021).

According to Nurdiana (2016) integrating technology, pedagogical, and content in the learning process can create a new framework for teachers to be able to create a learning process called TPACK.

TPACK is a framework that can collaborate between aspects of technological knowledge and content so that TPACK raises a new paradigm, of how to teach or provide stimulus in learning.

The Faculty of Teacher Training and Education at UNMA-Banten prepares mathematics students to become competent teachers in their field, with mastery of pedagogics and mastery of technology that is increasingly developing in the world of education. With a better technological pedagogical content knowledge (TPACK) concept, it is hoped that prospective mathematics teachers will be able to develop their abilities well too. The relationship between TPACK components is described as follows:
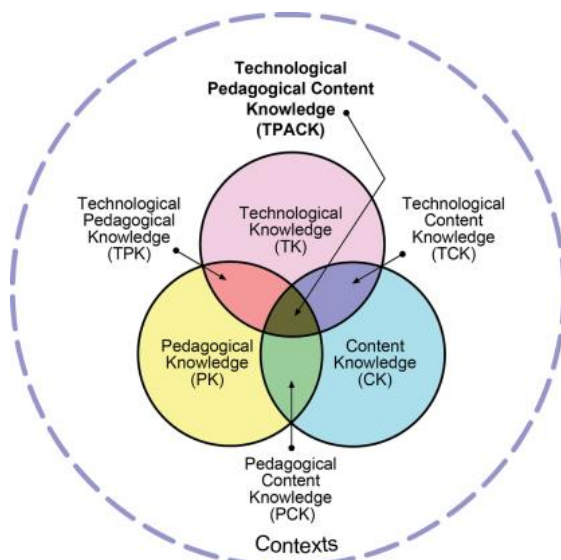

Figure 1. The TPACK framework according to Koehler et al., (Zulhazlinda W. et al., 2023).

Annisa F, et al., (2023) says that the function of microteaching learning is divided into several types, the first is a function instructional which explains that microteaching is useful for developing competence and teaching skills. Then there is a coaching function that is useful for debriefing prospective educators before carrying out the actual teaching process. Next is integralistic function because mi-

croteaching is included in the Field Experience Program and the last is the experimental function, namely this course is used as experimental material for prospective educators. So, it can be concluded that microteaching is indeed very important for students who will become teachers in the future.

According to Herawati (2021), teacher competency standards are a parameter that must be owned by a teacher both knowledge, skills, and values as a reference for improving teacher quality in improving the learning process. knowledge insight needs to be mastered by teachers as the main capital in teaching in the classroom is called Content Knowledge or content knowledge. Science and technology progress supports the delivery of learning materials. Teachers can utilize technology in classroom learning ranging from simple technology to modern technology. Another factor that is an important part of learning is the teacher's ability to convey learning material in the class called the ability of Pedagogical Content Knowledge (PCK), Putranti (2020).

Amrizal stated that a professional teacher is a teacher who can adapt and develop himself with the development of increasingly sophisticated science and technology. Competent teachers must also be able to apply learning models and methods based on time demands and the needs of students (Herawati, 2021). The TPACK capability of professional teachers in Indonesia is still faced with various problems, this must be the center of serious attention from related parties. Especially professional teachers so that they do not hinder the implementation of education in the use of TPACK in learning Mathematics (Yurinda, B & Widyasari, N, 2022).

Satriawati et al., (2022) revealed

that to achieve the competence of prospective mathematics teachers in microteaching courses, students must understand mathematical material (content), the ability to convey or teach (pedagogy) mathematics material properly and correctly, and the ability to create or compile indicators learning or achievement indicators based on basic competencies in the 2013 curriculum. A prospective mathematics teacher must have a deep understanding of the subject matter he will teach. They must be able to accurately explain mathematical concepts and provide real-world examples to aid student understanding. Without a strong content knowledge base, it is difficult for a teacher to integrate technology effectively into their lessons.

Implications for Future Classrooms The development of TPACK competencies through the micro teaching subject has significant implications for future classrooms of future mathematics teachers. By integrating technology, pedagogy, and content knowledge, these teachers are better equipped to create engaging learning environments that promote deep understanding of mathematics and facilitate student-centered learning experiences. In their future classrooms, aspiring mathematics teachers with strong TPACK competencies can leverage technology to differentiate instruction and personalize the learning experience. They can leverage online resources, educational software, and virtual manipulatives to provide additional support for struggling students and challenging advanced students. Additionally, they can encourage collaborative problem solving, facilitate discussion, and provide timely feedback using digital platforms. So that it is hoped that the prospective mathematics teachers who will be produced will not only be professional teachers who master pedagogic competencies, personality competencies, social competencies, and professional competencies but also be able to master technology and utilize it in learning.

METHOD

The type of research used is descriptive with a quantitative approach, while the research method uses a survey with mathematics university student Mathla'ul Anwar as the subject of this research. The research was carried out in the even semester of the 2021/2022 on Mei-June 2022, with 4 (four) students in the mathematics education study program as subjects. This study aims to analyze and describe the TPACK Competence of Prospective Mathematics Students in Micro Teaching Subjects. The research object is seven aspects of TPACK's abilities including technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). Researchers as the main instrument in this study and supporting instruments are in the form of questionnaires and interviews. Each statement on the questionnaire has the following answer options: Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS). With a weighted score, if the research subject answers Strongly Agree, you get a score of 4, if you answer Agree, you get a score of 3, if you answer Disagree, you get a score of 2, and if you answer strongly disagree, you get a score of 1.

The stages in this study were that mathematics students who had attended the microteaching class were given a questionnaire regarding their knowledge of TPACK and what things they had learned while attending the microteaching class. After the subject filled out the

questionnaire, the subject was then given interview questions about matters related to the microteaching course and regarding the knowledge and importance of TPCK abilities for prospective teachers. In this study, the subjects studied were mathematics students at Mathla'ul Anwar University-Banten semester seven who had taken microteaching courses so that they could answer each of the questions available in the questionnaire that had been distributed via the Google form.

The research data obtained will be analyzed with descriptive statistics and document analysis. The data analysis procedure was produced from research instruments that used a Likert scale according to table 1. The Likert scale is a scale used to measure the perceptions, attitudes, or opinions of a person or group regarding an event or social phenomenon (Pranatawijaya, V. H et al., 2019).

Table 1. Category Likert Scale

Interval s	Information
3,25 < Score ≤ 4,00	Very Good
2,50 < Score ≤ 3,25	Good
1,75 < Score ≤ 2,50	Not Enough
1,00 < Score ≤ 1,75	Very Less

The formula used to convert the scores obtained into percentages is as follows:

$$Value = \frac{obtained\ score}{maximum\ score} \ X\ 100\%$$

The data obtained is then changed in the criteria in table 2.

Table 2. Percentage Range and Qualitative Criteria

Score	Range	Qualitative Criteria
1	0-20	Very Poor
2	21-40	Less
3	41-60	Enough
4	61-80	Good
5	81-100	Very Good

RESULTS AND DICUSSION

Results

Koehler M. J, et al., (Herizal et al., 2022) stated that the TPACK model consists of three main components and four combined components. The main components are technological knowledge (Technological Knowledge-TK), pedagogic knowledge (Pedagogical Knowledge-PK), and content knowledge (Content Knowledge-CK). The four components which are a combination/integration of these main components are Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK).

TPCK is a dynamic framework for describing knowledge that teachers can rely on in designing and implementing curriculum and learning, as well as guiding students to think and learn using technology. Technology can be custom-made to address the pedagogical need to teach appropriate content in each context. Nur Atikah (Yohana R, 2020) added that the TPCK framework describes the various types of knowledge that teachers and prospective teachers need to teach effectively with the help of technology and various complex procedures in the field of knowledge interaction.

The results of the assessment were obtained from questionnaire answers and interviews conducted with students who were the subjects of this study. Of the seven TPACK components with each indicator accompanying them, they were compiled into questionnaire items which were distributed to students who had taken the microteaching course to find out how far they had studied classroom management in mega-teaching learning activities, developing learning strategies, making learning media, and understand

the material that will be taught to students in class. The questionnaire and interview sheet were distributed using the Google form via WhatsApp, then the results of the questionnaire and interview sheet were analyzed to get the results of this study.

From the results of the questionnaire, it was found that the research subjects (mathematics students) in this study were able and strongly agreed with the use of technology in the teaching and learning process in the classroom. Especially in 21st-century learning, learning already uses a HOTS level of thinking which really needs and dependence on technology is growing rapidly. Learning is not only centered on the teacher but uses learning media that utilize current technological sophistication, for example through the media of powerpoint presentations, learning videos, and so on which cannot be separated from the use of technology. Therefore, teachers in this era must be able to use computer/laptop technology properly, especially smartphones.

In the following, tables and graphs are presented from the results of the questionnaire that was distributed to the seventh-semester students who were the subject of this study. The research subjects used were students taking microteaching courses.

Table 3. TPACK Aspect Average Value

Subject code	TPACK Score (%)	Criteria
S1	2,95	Good
S2	3,35	Very Good
S3	3	Good
S4	3,25	Good

From the results of the questionnaire, it was found that the subjects in the study were obtained if the prospective teacher mathematics students were good at understanding and using technology as a support for teaching and learning activities in class. Subject 1 (S1) has an average score of 2.95 with good criteria so he is considered capable of preparing himself to be a future teacher candidate. Likewise, the other three subjects had scores above subject 1 (S1) with good criteria. Especially S2 who got a score of 3.35 with very good criteria.

The following results from the average value of the TPACK aspect are presented in the form of a pie chart.
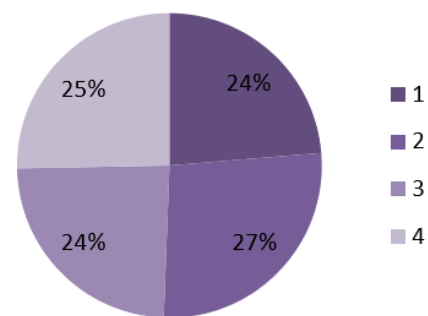

Figure 2. Percentage of the average value of the TACK aspect

According to Sahidin (Sahidin, et al., 2022), the technology referred to here is the technology that can assist teachers in representing concepts, principles, and procedures. To carry out online learning, students need to search the internet (library sites and databases) and use e-mail or short messages to communicate with peers for learning activities. On the other hand, Rahayu, et al added that teachers need competence which includes content knowledge, pedagogic knowledge, and Technological Pedagogical and Content Knowledge (TPACK) in accommodating online learning activities. Mishra & Koehler (Sahidin L et al., 2022) said TPACK is a framework that introduces the relationship and complexity between the three basic components of knowledge (technology, pedagogy, and content).

Students who are the subject of this study are all capable of using and operat-

ing both laptops and computers well, especially smartphones which are addictive in their daily activities. The research subjects were able to operate Microsoft Word, PowerPoint, and Excel applications well, by using these applications they could make learning tools including making interesting learning media through attractive PowerPoint presentations for the students they teach in class.

Based on the results of this study, the subject is considered capable of using technology in the teaching and learning process in the classroom. Such things are also taught in microteaching courses. Microteaching is a compulsory subject that must be taken by all prospective teachers. According to Fatwanto et al., (Novianti & Khaulah S, 2022) Microteaching is a course that is theoretical and applicable to all the learning experiences that have been experienced by students so far to become a preparatory training program in mastering various teacher competencies so that they can be responsible and Trust professionally. In practice, students or prospective teachers act as teachers practicing giving material to their students, whereas those who act as students are their classmates who are formed in small groups so that their application is also limited by a predetermined time and is monitored and assessed by the supervising lecturer. Those courses. With the microteaching course, prospective teacher students can learn how to prepare themselves as prospective teachers to go directly to school properly. Learn how to be a good teacher, prepare learning methods and models, learn class control, and so on that are needed in the process of teaching and learning activities in class.

The teaching and learning process in the classroom is supported by various learning tools and teaching aids to assist teaching and learning activities so that the learning process takes place effectively and conductively. The learning device used as a reference in learning activities is the RPP (Learning Implementation Plan) whose contents include school identity, learning time allocation, learning steps, as well as learning methods and materials that will be given to students.

In the Ministry of Education and Culture (2016) based on the 2013 curriculum process standards, lesson plans must contain school identity, subjects, class/semester, subject matter, time allocation, learning objectives, learning competencies, learning materials, learning methods/models, learning media, learning resources, learning steps, and assessment (Hasanah, R.u & Siregar, T.J, 2022).

In microteaching courses, students are taught and guided in making learning tools such as lesson plans, syllabus, semester program, and annual program, determining effective weeks in the educational calendar, and adjusting learning methods and models according to the material to be taught to students. Paying attention to TPACK which is mastered by prospective mathematics teachers will make it easier to develop effective and efficient learning tools during the learning process in class. The emergence of technology in learning mathematics is one of the strategies that can be used to make abstract mathematical concepts more concrete. Aija and Inga (2012) describe the various benefits of technology in the learning process, namely increasing student learning motivation because the mathematical content presented is by developments in the digital era, helping students associate concepts with students' initial abilities, helping teachers create different learning atmosphere, the learning process is more visual, concrete, fun, and interesting.

Sumarni et al., (2019) argued that

teaching knowledge in the field of mathematics education usually called mathematics content knowledge (MKT), is an important thing that prospective teachers must have. Teachers need to teach math material by the applicable curriculum and carry out creative learning to build students' thinking skills. Especially in improving higher-order thinking skills (HOTS), and associating abstract material with concrete things in everyday life. To be able to do this, prospective teachers must be able to determine learning methods and models that are appropriate to the material to be taught so that students easily understand and grasp the meaning of what the teacher teaches so that the learning objectives desired by the teacher can be achieved properly.

The pedagogical competence of prospective mathematics teachers is influenced by their self-confidence in the form of teaching skills and conveying mathematical concepts to improve student achievement (Nugroho W, 2022). Isnaniah and Imamuddin M (2022) argue that prospective mathematics teachers are students of mathematics education who are practicing having basic teaching skills in order to convey mathematics material to students. Mathematical material is material that is full of concepts, facts, principles, and procedures. Imamuddin added that the relationship between mathematical concepts is very tight so in studying mathematics, students must start from simple concepts and then move on to complex mathematical concepts. Mathematics is one of the subjects that studies abstract material so it requires teachers to have good skills in relating material to everyday life so that abstract material can be digested and understood well by their students. For this reason, the ability of Content Knowledge (CK) must be owned by a teacher.

Discussion

The world of education is required to always adapt to the times, especially in terms of technology. Prospective teachers as an important element in education are expected to be able to have three knowledge namely pedagogy, content, technology, and a combination of the three which is commonly called Technological Pedagogical and Content Knowledge (TPACK) so that they are ready to become professional teachers in the 21st century. In the following, some research results from previous researchers are presented regarding the TPACK ability of prospective mathematics teachers both in microteaching courses and so on. Based on the results of the research (Hafinda T, 2022) the data findings and analysis results obtained outline the teaching abilities of prospective Madrasah Ibtidaiyah teacher candidates for the Madrasah Ibtidaiyah Teacher Education Study Program STAIN Teungku Dirundeng Meulaoh in terms of Technological Pedagogical and Content Knowledge (TPACK) in the Learning subject MI/SD Mathematics is in a low category. It can be seen from the six aspects of the review that the average is in a low category.

Based on research (Novianti and Khaulah S, 2022), the research results obtained were that the microteaching learning activities carried out by students of the Mathematics Education Study Program, Faculty of Teaching and Education, Almuslim University were very good, but there were two criteria that there were still frequent exercises. and must be more focused, including on the criteria for speaking skills and closing activities. From these two criteria, it is expected that students can learn from experience can improve their speaking skills and improve their ability to close lessons.

Based on the research results of Turmuzi M and Kurniawan E (2021), it was found that the ability to teach prospective mathematics teachers in terms of Technological Pedagogical and Content Knowledge (TPACK) in the Micro Teaching course is described as follows: has an average standard deviation of 0.75, average -an average percentage of 77.80% and an average mean of 3.89 in the medium category.

The results of Muhtadi D. et al., (2022) show that a technology-based learning approach can play an effective role in preparing and improving TPACK competencies for mathematics teachers. Research according to Murtiyasa B and Atikah M.D (2021), shows that the TPACK abilities of prospective mathematics teacher students in the Practicum course for Making Mathematics Teaching Aids are in a good category. Each aspect of TPACK is also in the good category. Prospective math teacher students already understand aspects of TPACK abilities well and must still be honed and developed so that their current understanding does not stop here because technology will continue to develop over time.

From the research results of previous researchers, it can be concluded that TPACK abilities are very necessary for prospective teachers, especially math teachers, in carrying out their duties. Having good mastery of technology will make learning easier and more interesting for students, because in the 21st century, learning is technology-based. For teachers who are unable to use increasingly developing technology, it will be difficult for teachers to catch up with increasingly advanced and sophisticated technological developments. Everything can be accessed through certain websites, even the internet has become an inseparable need in educational life at this time.

From the results of this study, it was found that these prospective mathematics teacher students who were the subjects of this study had been well prepared by the faculty of Mathematics Education FKIP to welcome them into becoming qualified future teachers, although there were still many shortcomings and inadequacies for some students in several ways, for example in compiling good learning tools by the applicable provisions in a pre-determined curriculum.

21st-century learning prioritizes the ability of teachers to access and manage learning by utilizing technology and the internet which are increasingly well-developed. Because learning in the 21st era has applied HOT learning or high-level critical thinking, teachers in this century must be even smarter. The material is easily accessible through websites or other sources using free and wide internet access. So that not only teachers can access it but students can easily access it.

The teacher's ability in classroom management must be more advanced because if the teacher still uses conventional methods or lecture methods then learning will remain stagnant or not develop. In fact, it will be very far from being advanced if there are no changes in learning methods and models. In practice, it will indeed be a little difficult to apply creative, innovative learning using increasingly advanced technology, but that doesn't mean it can't be applied. Young teachers and prospective teachers must be able to become creative teachers in class management during the process of teaching and learning activities in class.

From the results of this study, it was found that the students who were the sample in this study had prepared themselves as well as possible to become creative, innovative, and sporty young teachers in carrying out their duties as facilitators to educate this nation's generation. Students have learned a lot about learning

tools, changing or matching methods with the material to be taught to students, and preparing by studying and following technological developments that are increasingly advancing rapidly.

Technological Pedagogical and Content Knowledge (TPACK) skills must be possessed by all future teacher candidates so that education in Indonesia is more advanced and not out of date. Moreover, learning in the 21st-century era emphasizes technology with high-order thinking skills which must be balanced with qualified teachers to produce quality products (students) as well. The following describes some of the results of interviews with prospective teacher students in responding and preparing themselves to become good teachers while attending the microteaching course, with the description P being Researcher and S1 being Subject one, and so on.

Q : What do you need to prepare in your process of becoming a teacher?

S1 : *Mental, knowledge, experience, and good intentions*

S2 : *Of course, good education, broad insight, teaching skills, good attitude to be role models for students as well as personal competence, pedagogic competence, social competence, and professional competence.*

S3 : *Teaching modules and media for learning*

S4 : *Studying/finalizing the material that we will teach to students.*

Q : Do you think a teacher is obligated to use technology that is increasingly developing in the teaching and learning process? Why?

S1 : *Yes, it is mandatory. Because technology is very important for teachers.*

S2 : *Mandatory. Because teachers must be literate about technology.*

S3 : *Mandatory, to adapt learning in today's world.*

S4 : *Mandatory. Because education is increasingly advanced with rapidly developing technology.*

Q : Are microteaching courses required in the lecture process? Why?

S1 : *Very necessary, as a training ground for how we teach and get involved in the real world of education.*

S2 : *Very necessary. Because micro-teaching learning aims to foster prospective teachers to have knowledge and skills about the learning process. In addition, another goal to be obtained from micro-teaching learning is to grow the self-confidence of prospective teachers so that they can teach and manage real classes.*

S3 : *It is necessary to train students in conveying a lesson.*

S4 : *Very necessary. Because prospective teachers can practice first in college.*

Q : What did you learn while teaching microteaching courses?

S1 : *Method, pedagogic competence, and so on.*

S2 : *Preparing good learning tools, skills in teaching, how to manage classes well, and so on.*

S3 : *Make Rpp, porta promissory note, and train to get used to appearing in front of many people.*

S4 : *Method of delivery, assessment, materials, and so on.*

Q : What impact did you feel after teaching the microteaching course?

S1 : *It has had a big impact on me personally, especially since I don't have much experience teaching at the high school level.*

S2 : *Lots of them, with the microteaching course, I know how to manage classes well, how to deliver interesting lessons and the teaching skills that prospective educators must master.*

S3 : *More confident.*

S4 : *There are pictures of when you are going to teach at school.*

Based on the results of these interviews which has been carried out on june 20 2022, for prospective 21st-century teachers, the ability to operate technology is indeed very important. The TPACK ability possessed by a teacher will determine the quality of learning that occurs in class, the better the quality of the TPACK ability possessed by the teacher, the better the learning will be carried out and will produce good-quality students.

Implication

In conducting this research, the researcher tried to do everything best to obtain satisfactory results. This study aims to analyze the ability of TPACK student

teacher candidates in attending micro-teaching lectures, and whether they can carry out their duties as good future teachers in preparing a highly competitive nation's generation. The research findings show that the TPACK Competency Analysis (Technological Pedagogical Content Knowledge) of prospective mathematics teachers in micro-subjects is very important for their development and effectiveness in the classroom. This means that teacher education programs need to prioritize the integration of technology, pedagogy, and content knowledge in their curricula to enhance the TPACK competencies of future mathematics teachers.

Limitation

One of the limitations of the TPACK competency analysis research for prospective mathematics teachers in the micro teaching subject is the potential for bias in the assessment of their competence. Ratings can be influenced by the subjective opinion of the rater, leading to potential inconsistencies and inaccuracies in the analysis. In addition, the sample size of prospective mathematics teachers involved in this study may be relatively small, which may limit the generalizability of the findings to the wider population. In addition, the duration of the micro-teaching sessions may not be sufficient to fully assess and capture the complexities of the prospective mathematics teacher's TPACK competencies.

CONCLUSSION

From the results of this study, it was found that the subjects in this study were able to use and apply technology well as a source of learning in learning. From the results of the study, it was found that the TPACK capabilities of prospective teacher students were quite good because all of them were able to operate Microsoft well, they could use it in learning, both as a learning resource or as a learning support application.

Included a tool to create learning tools that support teaching and learning activities in the classroom. Nevertheless, there are still some difficulties for prospective teacher students in making lesson plans, especially in determining the method or model that is appropriate to the material to be used during learning. For this reason, it is necessary to increase the material for preparing learning tools so that they are even better at preparing good learning tools. In preparing learning tools, it must be further deepened so that there are no mistakes in determining between the material and the learning method or model used.

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