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Evaluation of the Effectiveness of Technology-Based Learning Methods: A Case Study of Prospective Professional Teachers

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Abstract

This study aims to evaluate the implementation of technology-based learning methods among prospective professional teachers in North Aceh, focusing on understanding, application, challenges, and effectiveness. A descriptive qualitative approach was employed, involving 152 prospective teachers as research subjects. Data were collected through questionnaires, observations, and documentation, and analyzed using thematic analysis. Questionnaire results indicated that 98.56% of prospective teachers had a strong understanding of technology-based learning, 84.87% were able to effectively apply technology in teaching, 85.74% faced significant challenges in technology-based learning, and 70.61% had an effective understanding of the technology-based learning process. Observations revealed that 72.59% had planned technology-based learning, 81.58% used technology extensively, 65.79% students interacted with technology, 69.74% teachers could manage classes well using technology, 94.96% believed technology had a positive impact on learning outcomes, and 86.18% were able to provide feedback and adjust teaching based on data. Despite its challenges, technology-based learning was considered effective in enhancing participation, comprehension of materials, and independent learning. Although prospective teachers showed good competence in integrating technology, there is a need for improved training and infrastructure support to optimize its implementation in education. This study is expected to provide insights for curriculum development to better prepare prospective teachers for the challenges of digital-era education.

Keywords: *Effectiveness, Technologi-Based learning Methods, Case study, Prospective Professional Teachers.*

INTRODUCTION

In the current digital era, developments in information and communication technology have had a significant impact in various fields, including the world of education. This transformation not only changes the way we communicate and access information, but also influences learning methods and strategies in the classroom. Technology has become an integral part of the educational process, providing a variety of tools and resources that enable learning to be more interactive, flexible and personalized. The integration of technology in learning is not only a trend, but also a necessity to prepare future teachers who are able to adapt to the demands of 21st century education (Salomo Leuwol et al., 2023). In the 21st century, there have been huge changes both in society and the world of education which have made it possible for the learning process not to be limited only to space and time, but with technology influencing the way of learning and teaching (Wahyuni & Neni, 2023).

With the rapid dynamics of the times, the world of education needs to respond to developments in the 21st century, especially for teachers who are an important part of education and are responsible for helping students learn. This is considered important to respond to and apply technology in the world of education, especially in the learning process. If we do not change learning methods, we will face big challenges in the next 30 years (Abdul Mun'im Amaly et al., 2021).

In the midst of these changes, prospective professional teachers are required to not only master teaching materials but also be able to utilize technology as part of the learning process. Technology-based learning methods, which include the use of digital devices, learning applications, and online platforms, have been widely adopted in education as part of efforts to improve the quality and effectiveness of learning.

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Professional teachers are able to demonstrate their ability to teach. This ability can be seen from the mastery of academic educational skills and abilities in relevant fields of study (Zhumash, Z., Zhumabaeva, A., Nurgaliyeva, S., Saduakas, G., Lebedeva, L. A., & Zhoraeva, 2021). To maximize learning outcomes, professional teachers must be able to manage all stages of activities in the learning process well (Hanun, 2021).

Teachers need to improve their competency skills, so that they can not only use classical methods to teach, but they must also be able to create media, models and teaching methods that are appropriate to the current era, where technology is very important (Abdul Mun'im Amaly et al., 2021)(Selwyn, 2021)(Omar, M. K., Zahar, F. N., & Rashid, 2020).

Problems that often arise in technology-based learning in schools are often related to teachers' technical abilities in mastering the technology or applications used in learning, thereby hampering the effectiveness of the teaching and learning process. It is important to carry out this research to identify the extent to which prospective professional teachers are able to master and apply technology-based learning methods, what challenges they face, and how effective these methods are in improving the quality of learning. Thus, it is hope that this evaluation can provide input for developing the educational curriculum for prospective teachers so that they are better prepared to face the challenges of education in the digital era.

METHODOLOGY

This research uses a qualitative descriptive approach. This approach was chosen to evaluate the application of technology-based learning methods to prospective professional teachers by exploring their experiences, perceptions and challenges they face in this learning. The research subjects were prospective professional teachers who were currently studying in the Teacher Education study program at one of the universities, totaling 152 prospective professional teachers in the North Aceh region. Subject selection was carried out using a purposive sampling technique, where researchers will select students who have taken several technology-based courses. The research location is the Faculty of Teacher Training and Education at the specified university. Data collection techniques used in this research include: questionnaire, observation, and documentation. The collected data are analyzed using the thematic analysis method, all data obtained from questionnaires, observations and documentation will be collected and categorized.

RESULTS

Based on uestionnaire data given to 152 prospective professional teachers, the following results were obtained.

Understanding of Technology-Based Learning

From table 1, it can be seen that indicators of understanding of technology-based learning show information that 81.45% of prospective professional teachers have received training to master the technology used in learning, 78.82% of prospective teachers are able to utilize technology platforms for learning purposes, 78.82% prospective teachers are confident in integrating technology into the learning process, and 76.97% of prospective teachers have a good conceptual understanding of technology-based learning. Based on the statement above, the average percentage is 98.56%, so it can be concluded that prospective professional teachers have a very clear understanding of technology-based learning.

Table 1. Understanding of Technology-Based Learning

Indicator	Total score	Average score	Average score	%
Understanding of Technology-Based Learning				
I understand well the concept of technology-based learning.	585	3,85	76,97	98,56
I have received sufficient training to master the technology used in learning.	619	4,07	81,45	
I am able to utilize various technology platforms for learning purposes.	599	3,94	78,82	
I feel confident in integrating technology into the learning process.	594	3,91	78,16	

Application of Technology in Learning

Table 2 shows that the indicators for the application of technology in learning show information that 98.29% of the learning process becomes more interesting by using technology in learning, 85.13% of technology makes it easier for professional teacher candidates to collaborate with students, 82.37% of professional teacher candidates can easily access teaching materials through the technology platform used, 80.00% of prospective professional teachers feel that using technology can help them understand the material before teaching, and 78.55% of prospective professional teachers are able to use technology well, such as learning applications to deliver the material. Based on the statement above, the average percentage is 84.87%, so it can be concluded that prospective professional teachers are able to apply technology in learning well.

Table 2. Application of Technology in Learning

Indicator	Total score	Average score	Average score	%
Application of Technology in Learning				
The use of technology in learning makes the learning process more interesting.	747	4,91	98,29	84,87
I actively use technology, such as learning applications, to deliver material.	597	3,93	78,55	
I feel that the technology used during learning helps me understand the material before I teach.	608	4,00	80,00	
Technology makes it easier for me to collaborate with students.	647	4,26	85,13	
I can easily access teaching materials through the technology platform used.	626	4,12	82,37	

Challenges in Technology-Based Learning

Table 3 shows that the indicators of challenges in technology-based learning show information that 99.47% of internet access used by prospective professional teachers is unstable so that it becomes an obstacle in technology-based learning, 93.29% of prospective teachers feel that there is a lack of time to learn new technology which affects effectiveness in learning, 88.55% of prospective teachers often experience technical difficulties in using technology during learning, 76.97% of prospective teachers feel that there is a lack of technical support from the school to influence the quality of technology-based learning, and 70.39% of prospective teachers sometimes feel that Technology is more disruptive than helping the learning process. Based on the statement above, the average percentage is 85.74%, so it can be concluded that prospective professional teachers have very big challenges in facing technology-based learning.

Table 3. Challenges in Technology-Based Learning

Indicator	Total score	Average score	Average score	%
Challenges in Technology-Based Learning				
I often experience technical difficulties in using technology during learning.	673	4,43	88,55	85,74
Unstable internet access is an obstacle in technology-based learning.	756	4,97	99,47	
I feel the lack of time to learn new technology affects the effectiveness of learning.	709	4,66	93,29	
Sometimes I feel that technology is more distracting than helping the learning process.	535	3,52	70,39	
Lack of technical support from the school affects the quality of technology-based learning.	585	3,85	76,97	

Effectiveness of Technology-Based Learning Methods

From table 4, it can be seen that indicators of the effectiveness of technology-based learning methods show information that 89.21% of prospective professional teachers, technology-based learning is very influential in

increasing teaching participation in the classroom, 86.71% of technology-based learning is able to prepare me well to become professional teachers, 84.34% of prospective teachers feel that technology helps to more easily remember and understand the material being taught, 83.82% of prospective teachers feel that technology is able to facilitate better communication between students and teachers, 83.29% of prospective teachers feel Learning using technology is able to encourage me to be more independent in learning, and 81.05% of prospective teachers feel that technology is able to speed up the learning process and mastery of the material. Based on the statement above, the average percentage is 70.61%, so it can be concluded that prospective professional teachers have a fairly effective understanding of the technology-based learning process.

Table 4. Effectiveness of Technology-Based Learning Methods

Indicator	Total score	Average score	Average score	%
Effectiveness of Technology-Based Learning Methods				
Technology-based learning increases my participation in class.	678	4,46	89,21	
Technology helps me to more easily remember and understand the material being taught.	641	4,22	84,34	
Learning with technology encourages me to be more independent in learning.	633	4,16	83,29	
I feel technology accelerates the learning process and mastery of the material.	616	4,05	81,05	70,61
Technology facilitates better communication between students and teachers.	637	4,19	83,82	
Technology-based learning prepared me well to become a professional teacher.	659	4,34	86,71	

Based on the results of observations made by observers using observation sheets on 152 prospective professional teachers, the following results were obtained.

Table 5. Observation Results

No	Indicator	Yes (%)	No (%)
1	Technology Based Learning Planning	72,59	27,41
2	Use of Technology in the Learning Process	81,58	18,42
3	Student Interaction with Technology	65,79	34,21
4	Classroom Management with Technology	69,74	30,26
5	The Influence of Technology on Student Learning Outcomes	94,96	5,04
6	Feedback and Instructional Adaptation	86,18	13,82

Technology Based Learning Planning

As many as 72.59% of respondents stated that technology-based learning had been planned. This shows that there are efforts to integrate technology in the learning process.

Use of Technology in the Learning Process

As many as 81.58% of respondents stated that technology was widely used in the learning process.

Student Interaction with Technology

As many as 65.79% of respondents stated that students interact with technology. This indicates that there are efforts to actively involve students in the learning process.

Classroom Management with Technology

As many as 69.74% of respondents stated that they could manage the class well using technology. This shows that teachers are starting to get used to the use of technology in managing the classroom.

Influence on Student Learning Outcomes

As many as 94.96% of respondents believed that technology had a positive impact on student learning outcomes. This shows a strong belief that technology can improve learning outcomes.

Feedback and Instructional Adaptation

As many as 86.18% of respondents stated that they could provide feedback and adjust teaching based on data obtained from technology. This shows that teachers have started to utilize technology to improve the quality of learning.

Based on these six indicators, it can be concluded that the application of technology-based learning for prospective professional teachers has shown progress, but there are several things that are still obstacles in the learning process.

DISCUSSION

In the 21st century, technology has developed rapidly and is very useful in various fields, especially in the field of education. Teachers should be more able to utilize technology to help students learn because they can get information from various sources (Siegle, D., & Hook, 2023)(Rintaningrum, 2023)(Muhtarom & Kurniasih, 2020). Based on the results of questionnaires and observations, it can be concluded that technology-based learning methods have great potential to increase the competency of prospective teachers in using technology and increase student involvement in the learning process (Ignatius Septo Pramesworo et al., 2023)(Fazilla & Bukit, 2024). These findings are also in line with previous research showing that technology can increase participation and interaction in the classroom (Johnson et al., 2022)(Kilag et al., 2023).

Technical challenges such as limited internet access and digital devices are problems that prospective teachers often face. This challenge needs to be overcome to ensure technology can be used optimally in learning, as emphasized by Ertmer and Ottenbreit-Leftwich (2020), who emphasize the importance of infrastructure support and technical training in the successful implementation of technology in the classroom. Even though the challenge of internet limitations is one of the obstacles in developing internet mastery activities, currently many schools provide internet access, as well as other software such as computers, internet networks and others as well as training activities held by the school.

The increase in technology skills experienced by prospective teachers prove that technology-based training activities have helped them to develop skills and creativity that are important for teaching in the digital era. Once we become teachers and deserve to be called professional teachers, teacher professional development should ideally be carried out throughout the teacher's career as an educator. This was done to dispel the assumption that the quality of teacher professional development using learning methods is low (Nahdi et al., 2020). Technology-based learning methods are becoming increasingly relevant and important in the world of education due to increasingly rapid technological developments. Therefore, efforts are needed to improve teachers' abilities in using technology-based learning media so that they can provide more effective and efficient learning to their students (Sitorus et al., 2024).

CONCLUSION

Based on the results of this research, it can be concluded that technology-based learning methods are very effective in improving the competence of prospective professional teachers. The use of technology in learning activities can increase teaching participation, speed up understanding of material, facilitate better communication and encourage independence in learning. However, to optimize the potential of technology in education, there needs to be increased access to technological infrastructure as well as more intensive training for prospective teachers. In this way, prospective teachers will be better prepared to face the challenges of the world of education in the digital era.

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