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Prospective elementary school teachers perceptions on the use of technology in natural science learning

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Abstract: Technology nowadays has undergone continuous innovation, and its use has grown considerably in society. One form of integration of technology into learning is through natural science learning. Studies on perception of prospective elementary school teachers on the use of technology in natural science learning is still under-research. Thus, this research aims to unravel perceptions and preparations of prospective elementary school teachers for the use of technology in natural science learning and how such perceptions and preparations can influence how natural science learning will be implemented in the future. This research used a descriptive method, and data collection was carried out via a questionnaire. The subjects of research were students of the 5th semester and higher during the odd semester of the academic year 2022/2023 of PGSD Study Program at Universitas Negeri as prospective elementary school teachers. It can be concluded that the prospective elementary school teachers have a good perception of the use of technology in natural science learning. The perceptions discussed include knowledge about technology, knowledge about learning science, experience using technology in learning, the factor of the necessity of using technology in learning science, the benefits of technology in learning science, and types of technology that are appropriate for learning science.
Keywords: technology; perception; prospective elementary school teachers; natural science learning

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Introduction

Today's technology has been continually developed and its application has spread significantly throughout society. In recent years, the evolution of technology has resulted in considerable shifts in the social and educational environment (Mollaei & Riasati, 2013). The integration of technology into education will ultimately result in various changes. One of them will allow for a change in learning orientation from formerly teacher-centered to student-centered (Setyawan et al., 2019 ; Parker et al., 2019). Technology integration is also carried out as an effort to increase the standard and quality of learning (Hudayati et al., 2021). Technology in education has the potential to assist, enhance and enrich opportunities and outcomes for all students, thereby contributing to future student achievement, especially in the workplace (Dogan et al., 2021). Technology can also assist in its successful integration into educational settings (A'mar & Eleyan, 2022). Technology increases access for teachers and students to more up-to-date learning resources and materials that can be accessed anytime and

anywhere. Technology has also enhanced access for students with exceptional circumstances and requirements. At locations employing reversed or mixed learning approaches, teachers found that access to current and broader materials offered their students a possibility to build a deeper and more engaged grasp of themes, as well as independence in choosing content. They no longer depend on teachers or textbooks for information (McKnight et al., 2016).

Science learning is one type of technology integration into learning. Science learning in elementary schools teaches pupils how to think critically, creatively, and autonomously in scientific activity (Bagania, 2019; Ningrum & Wulandari, 2020). One method of carrying out science learning is to integrate science ideas with students' real-life experiences, so that students can obtain direct experience with the goal of developing skills in receiving, storing, and applying the learning concepts learned (Arisman & Permanasari, 2016; Parker et al., 2019). An interest in technology will assist students become acquainted with the system, and as a result, they will have a thorough understanding of how these systems operate. Technology has greatly aided the educational industry. The use of technology can help students learn more (Fakherji, 2019).

Given technological improvements, teachers can promote and increase their students' talents. If technology is properly deployed and strategically employed, it has the potential to outweigh the benefits of traditional teaching approaches (Al-Labadi & Sant, 2021). Students will be able to solidify their comprehension of even the most commonly taught topics across many classes. Concrete instructional resources are required for students to receive direct experience, but they are difficult to obtain, especially for complex information. As a result, teachers must be creative in order to overcome these challenges.

Teachers play an essential part in accomplishing instructional objectives (Budiyono, 2020). In order to achieve learning objectives, teachers must be resourceful in their use of anything useful to assist learning, including the use of technology. As a result, it is critical for teachers and potential teachers to grasp the use of technology in learning as practitioners. Knowing the prospective teacher's point of view on the integration of technology in education is very important and necessary in this digital era because it can be used as a guide for teachers when planning and developing the use of technology in future learning so that it can improve the quality of learning, particularly learning science (Dinc, 2019; Rahmatih & Fauzi, 2020 ; Natalina et al., 2020).

Research on the views of science teachers on the use of technology has been carried out by (Ouahi et al., 2022). The research technology used was an interactive simulation technology in the form of a website called PhET (Physics Education Technology), which was developed by the University of Colorado at Boulder (Perkins et al., 2012). According to the findings of their study, teachers believed that the usage of these technologies can support a number of instructional aims and assist students in developing their comprehension and involvement in the scientific process. Minimal technical instruments and teachers who lack technological expertise are barriers to the use of technology in science learning (Ouahi et al., 2022).

The research that has been conducted by Natalina et al., (2020) showed that there is a positive perception of the use of teaching media (visual aids) in science learning through Project Based Learning (PJBL). Students in this PJBL can master a variety of 21st century skills. They also learn how to apply inquiry learning and contribute to research and design initiatives. There are numerous advantages to learning new things, practicing technical skills, establishing effective communication abilities, and learning to solve problems. Other research indicated that science and mathematics teacher candidates respond positively to learning that incorporates technology, such as STEM-oriented learning. Where learning has the ability to create abilities for the twenty-first century. They believe that applying STEM learning in the form of generating projects is beneficial for preparing students to meet globalization challenges, building problem-solving attitudes, and developing student soft skills (Afifah & Qomaria, 2018). Most teachers agree that STEM study will have a good impact, including on teacher vocational development. Meanwhile, it has a good impact on students in terms of achievement, original products, thinking abilities, application in daily life, direct or experiential learning, and professional growth (Siew et al., 2015; Firat , 2020).

Several studies have examined the use of technology in the learning process, but the bulk of the research participants were teachers (Risky, 2019; Boonmoh et al., 2021) which led to one learning media and approach(Natalina et al., 2020; Baysura et al., 2016). There are several studies that use prospective elementary school teachers to research subjects but not science subjects (Ciğerci, 2020; Bahng & Lee, 2017) and not science subject teachers in high schools (Hudayati et al., 2021; M, 2015; Bang & Luft, 2013). As a result, research on the use of technology in science instruction from the perspective of prospective elementary school teachers is still rare. As a result, the researchers would like to examine how future elementary school teachers perceive the use of technology in science learning, both in terms of the appropriate sort of technology, the benefits of using the technology, and mastery of technical skills.

The study will focus on the perceptions of prospective elementary school teachers, namely students from the elementary school teacher education study program at Faculty of Education, Universitas Negeri Yogyakarta. The selection of students from the elementary school teacher education study program as informants is the right choice for the research to be carried out because the students have been specialized to become prospective elementary school teachers compared to students from other study programs.

A survey of prospective teachers' attitudes on the use of technology in science education is urgently needed. Science in elementary schools plays an important role in providing students with initial knowledge, so science learning obtained in elementary schools affects students' interest in learning science; if students are no longer interested in learning science since elementary school, it can affect the next levels (Widiana, 2016). Science learning is a fundamental subject or learning that must be taught through the use of other objects that can aid in the learning process (Listyawati et al., 2013). Technology can be viewed as a supplementary object in the science learning process. The descriptive technique was used in this study, and data was collected via a questionnaire. The researchers in this present study tried to address three research questions, namely: 1) What are prospective elementary school teachers' perceptions about the use of technology in natural science learning? 2) What are prospective elementary school teachers' perceptions on the types of technology that can be used in natural science learning? 3) What are prospective elementary school teachers' perceptions on the benefits of using technology in natural science learning?

It is hoped that by conducting research on prospective elementary school teachers who will later become elementary school teachers, information about their perceptions and preparations for using technology in learning natural sciences can be obtained, and that these perceptions and preparations will influence how science learning is implemented in the future. The advantage of this research is that it may be used as a reference, guidance, and consideration for teachers and prospective teachers who want to include technology in learning science. The purpose of this study is to find out and investigate prospective elementary school teachers' perceptions of the use of technology in natural science learning, including perceptions of appropriate types of technology, benefits of using technology, and prospective teachers' mastery of using technology.

Method

Research Design

The descriptive method was employed in this study. Descriptive method is one that seeks to characterize situations that occur in a given condition based on the findings of data collected using instruments. This method was chosen because it allows for the employment of an instrument in the form of a questionnaire that can be transmitted asynchronously via digital media, making it easier to obtain accurate and frank information from respondents. Natalina et al., (2020)defined descriptive research as "the production of a description of a phenomenon or event that occurs at a specific moment in time." According to Tanjung et al., (2016), the descriptive approach is a research method that has been demonstrated to develop systematic, actual, and accurate descriptions or paintings using sample or population data as it is.

Population and Sample

The research subjects were 30 people. All of them were prospective elementary school teachers enrolled in *Pendidikan Guru Sekolah Dasar* (PGSD) or early childhood education program study in semesters 5 and above. All topics were taught at the same university, Universitas Negeri Yogyakarta (UNY). Some of the subjects had participated in community service activities in elementary school, while others had not.

Research Instrument

A questionnaire was used to collect data. The questionnaire was created using a Likert Scale, which included five possible responses: Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. The students can respond to 40 statements derived from instrument grid indications in the questionnaire. In November 2022, the statements were constructed. The questionnaire grid can be seen in Table 1.

Table 1. Questionnaire Grid

Variable	Indicator	Item Number
Prospective teachers perceptions on the use of technology in learning science	Knowledge of technology	1,2,3,4,5,6,7,8,9,10
	Knowledge of natural science learning	11,12,13,14,15
	Experience using technology in learning	16,17,18,19,20
	Factors that cause the need to use technology in natural science learning	21,22,23,14,15,16
	Advantages of using technology in natural science learning	27,28,29,30,31,32,33,34
	Type of technology suitable for natural science learning	35,36,37,38,39,40

Data Analysis

The data analysis used in this study was descriptive. Descriptive analysis is a method of processing and evaluating numerical data to offer a clear picture of a situation from which specific meanings can be inferred (Sholikhah, 2016). The descriptive data analysis in this study was presented as a percentage, which was then interpreted. The percentage calculation and score interpretation criteria used in this research was adopted from (Oktafiani & Haryanto, 2022) (Equation 1).

$$P = \frac{average\ actual\ score}{ideal\ score} \times 100\% \quad (1)$$

Results and Discussion

The data from the questionnaire, which was distributed to 30 participants was processed by completing computations to acquire the percentage number. The data is shown in table, with a percentage for each response (strongly agree, agree, undecided, disagree, and strongly disagree) indicating the respondent's assessment of the use of technology in learning science. Table 2 shows how the questionnaire findings were distributed.

Table 2. Distribution of questionnaire results that have been processed

No.	Indicator	Average Actual Score	Ideal Score	Percentage (%)	Information
1.	Knowledge of technology	125	150	83.3	Strongly Agree
2.	Knowledge of natural science learning	131	150	87.3	Strongly Agree
3.	Experience using technology in learning	124.2	150	82.8	Strongly Agree

No.	Indicator	Average Actual Score	Ideal Score	Percentage (%)	Information
4.	Factors that cause the need to use technology in natural science learning	123.7	150	82.45	Strongly Agree
5.	Advantages of using technology in natural science learning	124.2	150	82.8	Strongly Agree
6.	Type of technology suitable for natural science learning	119.7	150	79.8	Agree

Knowledge of Technology

It is seen from Table 2 and can be concluded that the majority of respondents strongly agree with the statements on indicators of knowledge about technology. According to these findings, the majority of respondents had a good understanding of technological expertise. Technology is a material or intangible tool that can be used to solve difficulties in life. Most of the respondents also stated that they understood the needs and types of relevant technology, allowing them to integrate technology into their daily lives.

Technology is regarded as significant in human life since it benefits human activity in a variety of disciplines, particularly education. The respondents believe that the integration of technology affects the quality of learning. This is consistent with Tae & Ngongo's study (2022) who believe that the use of technology in education attempts to improve the quality of learning through the process of optimally creating, using, and managing technology and resources. The move from traditional to digital learning has advantages, such as increasing student engagement in participating in learning activities (Asiba, 2021).

Knowledge of Natural Science Learning in Elementary School

Based on Table 2, it can be concluded that the respondents strongly agree with questions related to knowledge in natural science learning in elementary schools. Thus, natural science learning can train or develop critical thinking skills, increase awareness to respect nature, develop process skills to investigate the surrounding nature, develop curiosity, and develop knowledge as well as understanding of useful science concepts so that they can be applied in everyday life.

Attitude is one of the four components in science learning in which there is a curiosity in seeking knowledge (Wahyuningsih et al., n.d.). Natural science is a building of knowledge that can be formed through a process of observation and from natural phenomena so that from these observations it can add knowledge to the science learning process (Sulthon, 2017).

Experience of Using Technology in Learning

Based on Table 2, it can be concluded that respondents strongly agree with statements related to experience using technology in learning. Through these results, it is known that prospective elementary school teachers have excellent experience in the use of technology in learning. As far as the experience is concerned, the use of technology in learning is useful in helping learning activities, the usage of technology does not hinder the learning activities carried out, the utilization of technologies in the learning is easy to do, and does not find many barriers in using technologies in learning. This is relevant and consistent with the results of research conducted by Reginasari, Annisa & Annisa (2018) and Erwinsyah et al. (2020) which concluded that the use of technology in learning produces excellent experiences related to ease, flexibility, efficiency, and transforming the teaching process in a better direction. Nevertheless, it does not mean that the experience of using technology does not have any barriers at all. Barriers in the use of technology in learning can be overcome and solved well.

Factors that Cause the Need to Use Technology in Natural Science Learning in Elementary Schools

It can be interpreted from Table 2 that the respondents perceived strongly agree if there are several factors that cause the need to use technology in learning science. These factors include:

1. Science learning requires practical activities.
2. Technology has a close relationship with science learning.
3. There are demands of the times.
4. There is rapid development of technology for education.
5. There is development of science.
6. There is material that is difficult to explain with conventional methods in natural science learning.

Technology has a close relationship with science learning because technology is the result of the application of science and originates from science (Asry, 2020). One of the reasons teachers use technology for learning practices is because of current demands (Rodliyah, 2018). In the 21st century, technological developments have entered various aspects of life including in the field of education so that educators and students are required to have 21st century teaching and learning skills, one of which is mastering information and communication technology (Pratiwi et al., 2019). The implementation of science learning should carry out practical activities so that students can more easily understand learning material, by utilizing technology in a practicum-based laboratory, it can help realize the results of the scientific concept of science and components of the scientific process of science (Agustina, 2018). Technology assists teachers in explaining material that is difficult to explain using conventional methods in science learning because through information technology in the form of the internet, all knowledge and concepts that are difficult to solve can be easily accessed from various sources (Ayudha & Setyarsih, 2021). In addition to the supporting factors for the use of technology, there are factors that hinder the use of technology in learning, namely inadequate technological equipment facilities, limited internet access, and the competence and confidence of educators who lack technology (Fauzan & Pimada, 2018). Therefore, given the great need for technology in learning, the government's role in encouraging the development and provision of infrastructure and facilities and infrastructure to support the use of technology in every school, including in the 3T area, must be optimized immediately. In addition, teachers also need programs that can help improve their competence in the use of technology in learning.

Advantages of Using Technology in Natural Science Learning

From Table 2, it can be seen that respondents' the responses about the benefits of using technology in IPA learning are that they argue that they strongly agree with the offending statements about the advantages of using technologies in natural science learning. Thus, it can be inferred that the respondents have a good understanding of the benefits of using technology in natural science learning. Technologies in natural science learning help develop critical thinking, creative thinking, communicate, collaborate, technology, and help in improving student learning outcomes. Where such benefits have proven to be true through research conducted by Natalina et al., (2020), (Jannah & Atmojo, 2022), Suryaningsih et al. (2020, Tekega (2017), Fahmi et al, (2020) that the use of technology in learning will empower, develop, enhance critical thinking, creative, communication, collaborative, technological skills, and help improve student learning outcomes.

These benefits might be considered for prospective instructors and teachers to use technology into learning, especially in natural science learning. As is generally known that natural science learning at elementary school provides ways to think in scientific work, so students will be accustomed to thinking scientifically critically, creatively, and independently. (Bagania, 2019; Ningrum & Wulandari, 2020). Meanwhile, technology has benefits that can make learning natural science more successful. As indicated (Hudayati et al., 2021) that technology is integrated into learning as a form of effort to increase the quality and quality of learning. Therefore, the use of technology has the ability to help, enhance, and enrich the possibilities, comprehension, involvement and learning outcomes of students, especially in natural science learning (Dogan et al., 2021; Ouahi et al., 2022).

Type of Technology Suitable for Natural Science Learning in Elementary Schools

The respondents' response to the indicator of the type of technology suitable for natural science learning learning is that they agree with the statements about the kind of technology appropriate for natural science learning in elementary schools. The appropriate types of technologies are such as technology made by themselves or conventional, technology based on video games, educational websites such as virtual laboratories, and information technology. These techniques can be adapted according to the needs of teachers. If teachers want to enhance the development and engagement of students, they can use simple home-made or conventional technologies that leverage recycled materials Natalina et al., 2020. To develop student knowledge in natural science learning, especially in facilitating students to understand abstract and complex natural science learning concepts, can through educational websites such as virtual laboratories namely PhET and video games (Ouahi et al., 2022; Perkins et al., 2012; Ardiani & Ahmadi, 2019). In learning natural science learning requires information technology and by using natural science learning based ICT can make lessons more innovative (Nursamsu & Kusnafizal, 2017; Hudayati et al., 2021). In addition to the types of technologies mentioned, there are many other technologies that can be used in learning natural science learning. For example, the use of virtual reality and augmented reality technologies (Setyawan et al., 2019; M, 2015, video media (Risky, 2019; Yunita & Wijayanti, n.d.), and other types of technologies. Therefore, in choosing the appropriate type of technology, teachers need to adjust it to the learning objectives that they want to, the development and characteristics of the child, the local environmental conditions (Natalina et al., 2020; Abidin, 2016), dan perkembangan zaman (Oktafiani & Haryanto, 2022).

Conclusion

Based on the results of the above description, it can be concluded that the prospective elementary teachers perceived positively about the use of technology in natural science learning. They have a good understanding of technology and see technology as important in human life as well as in natural science learning. Meanwhile, for suitable technologies used in natural science learning are video game technology, educational websites in the form of virtual laboratories, information-based technologies, as well as ICT-based learning. For the advantages of the use of technology among other things that is technology in learning natural science can help to develop skills in critical thinking, creative thinking, communicate, collaborate, technology, so can improve the learning outcomes of students.

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