TEACHERS AND STUDENTS' PERCEPTIONS OF TECHNOLOGY-BASED BIOLOGY LEARNING IN PUBLIC HIGH SCHOOL 2 SOUTH REGION

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ABSTRAK

The utilization of technology in learning has been an important part of the transformation of education, particularly in the subject of Biology which demands conceptual understanding and visualization of the material. The post-pandemic learning paradigm change encourages the use of digital media, Learning Management System (LMS), and various other technological applications as a means of supporting teaching-learning activities. However, the effectiveness of technology-based learning implementation is highly dependent on the perception of teachers and students as the main actors in the learning process. This study aimed to describe and analyze teachers' and students' perceptions towards technology-based Biology learning at Senior Secondary School 2 Southern Region. This study used a quantitative descriptive approach with a survey method. The respondents consisted of all Biology teachers and grade XI science students who were selected by total sampling for teachers and proportional random sampling for students. The research instrument was in the form of a Likert-scale questionnaire that had been validated by experts and tested for reliability. Data were collected through face-to-face questionnaire distribution, then quantitatively analyzed descriptively with percentage categories. The results of this study are expected to provide a preliminary picture towards the readiness and response of teachers as well as students in adopting technology-based learning in upper secondary schools.

Keywords: perception, Biology learning, technology, teachers, students, high school

INTRODUCTION

The development of information and communication technology (ICT) has had a significant influence on various aspects of life, including in the world of education. The integration of technology in the learning process is an attempt to answer the challenges of the 21st century that demand critical thinking, collaborative, creative skills, as well as digital literacy skills. In the context of Biology learning, the utilization of technology allows students to access information extensively, follow virtual practicum simulations, as well as interact actively through various digital platforms such as Learning Management Systems (LMS), interactive learning videos, as well as online quiz applications (Mellisa & Sari, 2022).

Teachers as facilitators of learning are required to be capable of designing and implementing effective technology-based learning strategies, in accordance with the characteristics of Biology subject matter which is complex and dynamic. Meanwhile, students are expected to be able to adapt to new learning models that foreground learning independence as well as proficiency in managing digital information (Hizhwati et al., 2022). However, the reality on the ground shows that the application of technology-based learning does not always go smoothly. Some of the barriers encountered include teachers' lack of digital competence, limited infrastructure facilities, as well as students' low motivation to learn in the online environment (Haruna et al., 2022).

In Senior High School 2 Southern Region, the application of technology-based Biology learning has been pursued through the use of various digital learning media, especially since the COVID-19 pandemic forced a transition to distance learning. However, not all teachers and students have the same perception of the usefulness as well as the effectiveness of such learning models. These perceptions are important because they will influence acceptance, engagement, and learning success (Aseptianova et al., 2022). Teachers who have a positive perception of technology use tend to be more adaptive in developing digital learning media and methods. Conversely, negative perceptions can be a significant barrier in creating a meaningful and interactive teaching learning process (Faitunnisa et al., 2023).

Therefore, it is important to study in depth how teachers and students perceive technology-based Biology learning in Senior High School 2 Southern Region. This study not only aims to describe the attitudes and views of educational actors but also to identify the supporting factors as well as the constraints faced in its implementation. The results of this study are expected to contribute in formulating Biology learning strategies that are more effective, innovative, and in accordance with current technological developments.

RESEARCH METHODOLOGY

This study used a quantitative descriptive approach with a survey method. This approach was chosen to describe and analyze teachers' and students' perceptions of technology-based Biology learning in a systematic, factual, and accurate manner. The study was conducted at SMA Negeri 2 Rantau Selatan, Labuhanbatu Regency, North Sumatra Province, in the full semester of

the 2024/2025 academic year, namely in May 2025. The population in this study consisted of all Biology subject teachers and grade XI students of the science program in the school. The number of Biology teachers is two people, while the number of students in grade XI IPA is 120 people. The sampling technique was conducted by total sampling for teachers and proportional random sampling for students, so that the total sample of students under study was 60 people or 50% of the population.

The instrument used in this study was a Likert-scale-shaped questionnaire or questionnaire with five answer options, namely strongly agree, agree, neutral, disagree, and strongly disagree. The questionnaire was structured in two parts, namely for teachers and for students, each consisting of 20 statement items. Before use, the instrument was validated by two Biology education experts and one learning media expert. Furthermore, the reliability test of the instrument was conducted using Cronbach's Alpha formula with the help of SPSS software. The data were collected by distributing the questionnaires directly to the respondents for convenience. The data obtained were quantitatively analyzed descriptively, by calculating the mean score and percentage of each statement in the questionnaire. The results were then categorized based on percentage ranges, namely 81–100% for very positive perception, 61–80% for positive, 41–60% for fair, 21–40% for negative, and 0–20% for very negative. The final data were presented in the form of frequency distribution tables, diagrams, and interpretive descriptions.

RESULTS AND DISCUSSION

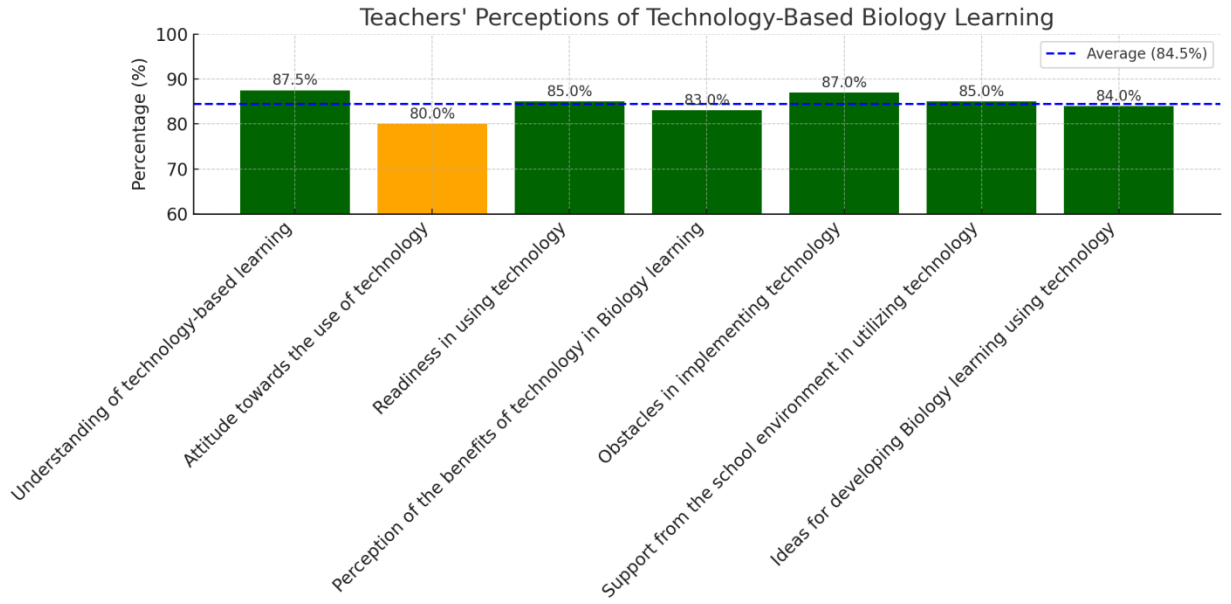
This study aims to describe teachers' and students' perceptions towards technology-based Biology learning at Senior Secondary School 2 Rantau South. Data were obtained through the distribution of questionnaires to 2 Biology teachers and 30 students of class XI science.

1. Results of Teachers' Perceptions of Technology-Based Biology Learning

Based on the results of the analysis of the questionnaire consisting of 20 statements, a total mean score of 84.5% of the maximum possible score was obtained. These results were categorized as very positive. In detail, teachers' perceptions can be seen in the following Table 1:

Table 1. Recapitulation of Teachers' Perceptions of Technology-Based Biology Learning

No	Indicators	Persentase	Categories
1	Understanding technology-based learning	87,5%	Very Positive
2	Attitudes toward technology use	80,0%	Positive
3	Readiness in using technology	85,0%	Very Positive
4	Perceptions of the benefits of technology in biology learning	83,0%	Very Positive
5	Constraints in technology implementation	87,0%	Very Positive
6	School environment support	81,5 %	Very Positive
7	Expectations towards the development of technology-based biology learning	**84,0%**	Very Positive
Avg.		**84,5%**	Very Positive



Teachers stated that the use of technology in Biology learning facilitates the process of material delivery, increases student participation, and provides space for learning media innovation. However, perceived challenges included limitations of internet networks and students' skills in optimally utilizing technology.

2. Results of Student Perceptions of Technology-Based Biology Learning

From the results of the analysis of the students' questionnaires, a total mean score of 76.3% was obtained, which belongs to the positive category. Table 2 presents a recapitulation of the results of student perceptions.

Table 2. Recapitulation of Students' Perceptions of Technology-Based Biology Learning

No	Indicators	Persentase	Kategori
1	Students' understanding of technology-based biology learning	78,0%	Positive
2	Interest in and attitudes toward technology use	74,5%	Positive
3	Perceptions of technology effectiveness	72,0%	Positive
4	Students' experiences in attending technology-based learning	76,0%	Positive
5	Barriers in technology-based learning	71,0%	Positive
6	Expectations towards the use of technology in learning	86,3%	Very positive
Avg		**76,3%**	Positive

Most of the students felt that technology-based Biology learning made the learning process more interesting and flexible. However, they also revealed that signal interference, device limitations, and lack of hands-on mentoring were major obstacles in following technology-based learning

Based on the results of the study showed that teachers' perception towards technology-based Biology learning is very positive, with an average percentage of 84.5%. This suggests that the teachers have understood and accepted the integration of technology in the learning process. According to Wulandari et al. (2021), teachers who have a positive understanding of technology-

based learning tend to be more prepared and motivated to implement it in the classroom. The percentage of teachers' understanding of technology-based learning which reached 87.5% indicates the existence of high awareness and understanding of the importance of technology in supporting the learning process. This is in line with the findings of Sari & Prasetyo (2022) who stated that teachers' understanding of learning technologies has a direct impact on the effectiveness of applying digital learning strategies.

Teachers' attitude towards technology use of 80% also reveals openness towards learning innovations. Putri & Haryanto (2023) stated that teachers' positive attitude became a key factor in the successful transition from conventional to digital learning. The preparedness of teachers in using technology at 85% indicates that teachers' training and experience in using technology is quite good. Kurniawan et al. (2021) put forward that teacher preparedness is influenced by systematic ICT training as well as support from school management. The teachers' perception towards the benefits of technology in Biology learning by 83% indicated that they realize that the use of technology is able to increase student engagement. Astuti & Nugroho (2022) asserted that digital-based Biology learning is able to improve the understanding of abstract concepts through visual simulations.

Nevertheless, teachers also conveyed the presence of constraints in technology implementation (87%), such as infrastructural or network limitations. Fadillah & Ramadhani (2023) explained that technical limitations are still a major challenge in the equalization of the application of digital learning, especially in non-urban areas. The school environment support of 85% indicates that the school climate has been supportive of technological innovation in learning. Handayani & Yuliana (2020) mentioned that principal support, colleagues, and adequate facilities greatly influence teachers' success in integrating technology. Teachers' expectations towards the development of technology-based Biology learning which reached 84% reflects the desire to continuously improve the quality of learning through digital innovation. According to Saputro & Lestari (2021), teachers who have high expectations for technology will typically actively seek opportunities for competency enhancement and utilization of digital learning media.

From the students' side, the perception towards technology-based Biology learning was in the positive category (76.3%). This showed reasonably good acceptance, although some barriers were still found. Rahmawati & Fitria (2022) stated that although students welcome technology-based learning, their digital literacy skills are uneven. However, constraints such as internet networks and devices are still a challenge, especially in the implementation of distance learning. Setiawan & Hasanah (2023) put forward that technical issues and limited means are still barriers in the optimization of technology-based learning at the high school level.

CONCLUSION AND SUGGESTIONS

Based on the results of research conducted on 2 Biology teachers and 30 grade XI IPA students at SMA Negeri 2 Rantau Selatan, it can be concluded that:

1. Teachers' perceptions of technology-based Biology learning are very positive, with an average percentage of 84.5%. Teachers showed good understanding, high readiness, and positive attitudes towards the use of technology. They also recognized the benefits of technology in supporting Biology learning and had high hopes for the development of technology-based learning in the future.
2. Students' perceptions of technology-based Biology learning are relatively positive, with an average percentage of 76.3%. Students expressed interest and fairly good experience in using technology to learn Biology. Although there are still obstacles, such as difficulty in access and lack of motivation in online learning, most students still have good expectations for the use of technology in the teaching and learning process.
3. In general, both teachers and students showed enthusiasm and good acceptance of technology-based Biology learning, although there are still several challenges that need to be overcome, especially in terms of infrastructure, digital competence, and more interactive learning strategies.

Suggestion

1. For schools: It is hoped that support for the development of technology-based learning can be increased, both in terms of providing infrastructure (such as internet connections and learning devices), teacher training, and policies that encourage digital learning innovation.

2. For teachers: It is recommended to continue developing digital and pedagogical competencies in designing technology-based Biology learning that is interesting, interactive, and in accordance with students' needs. Teachers also need to evaluate and adjust learning methods periodically based on student feedback.
3. For students: Expected to be more active and independent in participating in technology-based learning. Students also need to improve digital literacy in order to be able to utilize learning resources optimally and adapt to the dynamics of modern learning.
4. For further researchers: Further studies need to be conducted with a broader scope and a mixed-method approach in order to obtain a more in-depth picture of the factors that influence the success of technology-based Biology learning.

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