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Students' Perceptions of Environment-Based Biology Learning in the School Surroundings among Students at SMA Swasta HAS Sepakat Negeri Lama, Labuhanbatu

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Abstract: This study aimed to analyze students' perceptions of biology learning based on the school surrounding environment at HAS Sepakat Negeri Lama Private Senior High School, Labuhanbatu. This study employed a quantitative approach with a descriptive survey design. The participants were 60 Grade X students from two classes, selected using total sampling. Data were collected using a closed-ended questionnaire consisting of 15 items covering cognitive, affective, and conative dimensions. The data were analyzed using descriptive statistics and the Mann–Whitney U test. The results showed that students' perception scores ranged from 3.63 to 4.28, falling within the high to very high categories. These findings indicate that students perceived environment-based biology learning as beneficial, relevant, and engaging. The Mann–Whitney U test showed no significant difference in students' perceptions between the two classes ($p = 0.382$), suggesting relatively similar learning experiences across groups. Overall, environment-based biology learning can support contextual and meaningful learning by connecting biological concepts with real environmental phenomena. These findings provide practical implications for biology teachers in designing learning strategies that utilize the surrounding environment as an authentic learning resource and contribute to the development of contextual learning in biology education.
Keywords: Student perceptions; biology learning; school environment

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INTRODUCTION

Biology education plays a strategic role in developing students' understanding of natural phenomena while fostering ecological awareness and responsible attitudes toward sustainability. In the context of 21st-century education, science learning is expected not only to promote conceptual understanding but also to prepare students to respond critically and responsibly to environmental issues in their daily lives (UNESCO, 2020; Ardoin et al., 2020). Therefore, learning approaches that connect scientific concepts with real-life contexts have become increasingly important, particularly through environment-based learning and education outside the classroom. These approaches are theoretically aligned with constructivist theory, contextual learning, and experiential learning, which emphasize that knowledge is actively constructed through meaningful experiences, social interaction, and direct engagement with the surrounding environment (Vygotsky, 1978; Dewey, 1938; Kolb, 1984). By positioning the environment as an authentic learning resource, environment-based biology learning can enhance students' conceptual understanding while also promoting scientific attitudes, environmental literacy, and ecological responsibility (Yusup et al., 2021; Ardoin et al., 2020; O'Neill et al., 2024). Activities such as direct observation, field experimentation, and the exploration of biological phenomena further support meaningful knowledge construction, consistent with the principles of contextual and experiential learning (Laksmi et al., 2021; Mann et al., 2022).

Despite its pedagogical potential, the implementation of environment-based biology learning in schools remains limited. Biology instruction is still frequently dominated by theoretical, textbook-oriented, and teacher-centered approaches, which restrict students' opportunities to engage directly with environmental phenomena. As a result, students often have limited contextual learning experiences, low active participation, and few opportunities to conduct exploratory activities beyond the classroom. This condition indicates a gap between the ideal principles of environment-based learning and actual instructional practices in schools. Previous systematic reviews also suggest that outdoor and environment-based learning can support students' knowledge, motivation, enjoyment, social interaction, and environmental attitudes; however, its implementation often depends on explicit pedagogical design, teacher readiness, and the integration of local environmental contexts into the curriculum (Mann et al., 2022; O'Neill et al., 2024; Yemini et al., 2023).

Students' perceptions of environment-based learning represent an important yet often underexamined factor in understanding the effectiveness of such instructional practices. Perception is not limited to students' cognitive recognition of learning activities but also includes affective responses and conative tendencies, such as interest, motivation, intention, and willingness to participate in learning. These dimensions are closely associated with students' learning behavior, self-regulation, and motivation (El-Sabagh, 2021; Schunk & DiBenedetto, 2020). From the perspective of the theory of planned behavior, students' intentions and learning-related actions are shaped by their attitudes, perceived control, and beliefs regarding the learning experience (Ajzen, 1991). Similarly, research in science education indicates that students' awareness of environmental issues is positively related to science self-efficacy, interest, enjoyment, and epistemological beliefs, highlighting the importance of affective and cognitive dimensions in science learning (Xie et al., 2023). Previous studies have also shown that outdoor learning can significantly improve students' social interaction and participation (Nadya & Santoso, 2022), while project-based learning involving real environmental contexts can enhance conceptual understanding and collaboration among students (O'Connor et al., 2024). However, most existing studies have primarily emphasized learning outcomes and the effectiveness of instructional methods, whereas students' perceptions of environment-based learning experiences have received less systematic attention.

Previous research on environment-based biology learning has demonstrated its positive contribution to students' environmental literacy and academic achievement (Panjaitan et al., 2021). Nevertheless, these studies have largely focused on measurable learning outcomes rather than examining students' perceptions as an important indicator of instructional success. In particular, limited attention has been given to the integrated analysis of students' cognitive, affective, and conative perceptions in the context of biology learning (Kurniawati et al., 2022; Schunk & DiBenedetto, 2020). This gap is theoretically significant because, from the perspectives of constructivism, contextual learning, and social cognitive theory, students' perceptions influence how they interpret learning experiences, which in turn may shape motivation, engagement, and learning outcomes (Vygotsky, 1978; Schunk & DiBenedetto, 2020). Moreover, environmental education research emphasizes that cognitive and affective outcomes are essential foundations for developing environmental attitudes, values, and action-oriented behavior (Littledyke, 2008; Ardoin et al., 2020).

The use of the school surrounding environment as a contextual learning resource is especially relevant in biology education because it enables students to connect

biological concepts with phenomena that they encounter in their daily lives. This approach is also consistent with place-based education, which emphasizes the relationship between learning processes and the physical, ecological, and social contexts in which students live and learn (Yemini et al., 2023). However, this potential has not been fully utilized in many school contexts. Learning practices that remain predominantly theoretical may weaken the relationship between biology content and students' immediate environmental realities. In contrast, integrating the school surrounding environment into biology instruction can provide authentic learning experiences that promote engagement, scientific inquiry, environmental awareness, and students' sense of connection to their local environment (Putri & Aznam, 2024; Mann et al., 2022; O'Neill et al., 2024).

This study differs from previous research by integrating biology learning based on the school surrounding environment with a structured analysis of students' perceptions across cognitive, affective, and conative dimensions. The novelty of this study lies in its comprehensive focus on how students understand, experience, and respond to environment-based biology learning within their local school context, rather than merely evaluating learning outcomes (Kurniawati et al., 2022). Therefore, this study aims to comprehensively analyze students' perceptions of biology learning based on the school surrounding environment through cognitive, affective, and conative dimensions. The findings are expected to provide contextual empirical evidence that can inform the development of more innovative, relevant, and locally grounded biology learning strategies, while strengthening the role of the environment as an authentic learning resource in science education.

METHOD

Research Design

This study employed a quantitative approach using a descriptive survey design. The design was selected to examine students' perceptions of environment-based biology learning objectively through questionnaire data analyzed using descriptive and inferential statistics. This study was non-experimental because no treatment or intervention was administered. Instead, it focused on describing students' perceptions based on their prior experiences in biology learning activities that used the school environment as a learning resource.

Population and Sample

The study involved Grade X students who had participated in environment-based biology learning activities, including field observations, practical activities in the school environment, and other contextual learning experiences. The population consisted of 60 students from two classes, namely Class X-1 and Class X-2.

Because the population was relatively small, all students were included as respondents. Therefore, this study used saturated sampling, also known as total sampling, which is categorized as a non-probability sampling technique. For comparative analysis, Class X-1 was treated as the first group, whereas Class X-2 was treated as the second group.

Research Variable

The variable examined in this study was students' perceptions of environment-based biology learning. Operationally, this variable was measured through three dimensions: cognitive, affective, and conative. The cognitive dimension refers to students' understanding of the concepts, benefits, and relevance of environment-based learning. The affective dimension refers to students' attitudes, interests, and

emotional responses toward the learning process. The conative dimension refers to students' behavioral tendencies to participate in learning activities and use the environment as a learning resource.

Table 1. Operational definition of students' perception variable

Variable	Dimension	Indicator	Number of Items	Scale
Students' perceptions of environment-based biology learning	Cognitive	Understanding of concepts, benefits, and relevance of environment-based learning	5	Likert scale (1–5)
	Affective	Attitudes, interests, and emotional responses toward environment-based learning	5	Likert scale (1–5)
	Conative	Tendencies toward action, participation, and environmental awareness in using the environment as a learning resource	5	Likert scale (1–5)

Research Instrument

Data were collected using a closed-ended questionnaire developed based on the cognitive, affective, and conative dimensions of students' perceptions. The questionnaire consisted of 15 items and used a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5) (Likert, 1932). The instrument was developed through several stages: preparing the questionnaire blueprint based on the research indicators, formulating the statement items, conducting expert judgment to examine content validity, and testing the instrument outside the research sample. Empirical validity was analyzed using the product-moment correlation, while instrument reliability was tested using Cronbach's alpha coefficient to determine the internal consistency of the items.

Data Collection Procedure

Data were collected by distributing the questionnaire directly to students at the school. Before completing the questionnaire, respondents were informed about the purpose of the study and were asked to answer each item based on their actual experiences in environment-based biology learning. Students completed the questionnaire independently to minimize external influence and ensure that the responses reflected their own perceptions.

Data Analysis

The collected data were coded, tabulated, and analyzed using SPSS version 25.0. Descriptive statistics were used to calculate the mean score of each indicator and dimension of students' perceptions. The mean score was calculated using the following formula:

$$\bar{x} = \frac{\sum x}{N}$$

Where $\bar{x}$ represents the mean score, $\sum x$ represents the total score, and N represents the number of respondents. The mean scores were interpreted using score interval categories to determine the level of students' perceptions toward environment-based biology learning.

Table 1. Categories of students' perceptions

Score Range	Category
4.21–5.00	Very High
3.41–4.20	High
2.61–3.40	Moderate
1.81–2.60	Low
1.00–1.80	Very Low

In addition to descriptive analysis, inferential analysis was conducted using the Mann–Whitney U test to determine whether there was a significant difference in students' perceptions between Class X-1 and Class X-2. This non-parametric test was used because the data did not meet the assumption of normal distribution. The significance level used in this study was 0.05.

RESULTS AND DISCUSSION

Descriptive statistical analysis was conducted to identify the general tendency of students' perceptions of environment-based biology learning. The analysis covered 15 questionnaire items completed by 60 students. The descriptive results and item-based categorization are presented in Table 2.

Table 2. Descriptive statistics and categorization of students' perceptions

Item	N	Minimum	Maximum	Mean	Std. Deviation	Category
P01	60	1.00	5.00	4.28	0.74	Very High
P02	60	2.00	5.00	4.17	0.72	High
P03	60	2.00	5.00	4.17	0.83	High
P04	60	1.00	5.00	3.78	0.98	High
P05	60	2.00	5.00	4.28	0.67	Very High
P06	60	1.00	5.00	4.02	1.08	High
P07	60	1.00	5.00	3.85	1.02	High
P08	60	1.00	5.00	3.93	1.10	High
P09	60	1.00	5.00	4.02	1.08	High
P10	60	1.00	5.00	3.97	0.82	High
P11	60	1.00	5.00	3.85	1.01	High
P12	60	1.00	5.00	3.63	1.01	High
P13	60	1.00	5.00	4.13	1.05	High
P14	60	1.00	5.00	3.83	1.08	High
P15	60	1.00	5.00	4.10	1.10	High

Note: P = Questionnaire items

Table 2 shows that the mean scores of students' perceptions ranged from 3.63 to 4.28. Most items were categorized as high, while two items, namely P01 and P05, were categorized as very high. No item was categorized as moderate, low, or very low. These findings indicate that students generally had positive perceptions of environment-based biology learning. The highest mean scores suggest that students strongly recognized the benefits and relevance of using the surrounding environment as a learning resource. Meanwhile, the lowest mean score, although still categorized

as high, indicates that certain aspects of student engagement may require further improvement.

The students' Perceptions of Environment-Based Biology Learning at SMA Swasta HAS Sepakat Negeri Lama are presented more clearly in Figure 1.

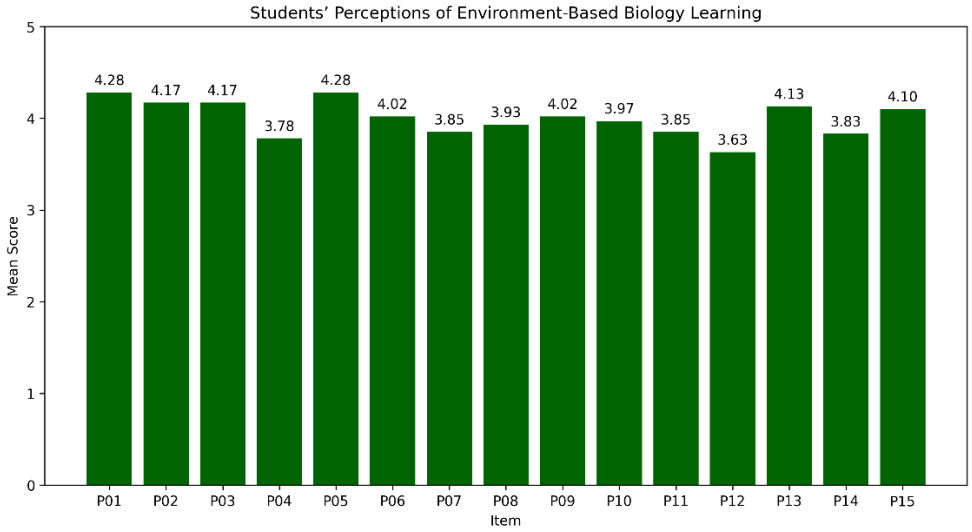

Figure 1. Students' Perceptions of Environment-Based Biology Learning at SMA Swasta HAS Sepakat Negeri Lama

Before conducting comparative analysis, a normality test was performed to determine whether the data met the assumptions required for parametric testing. The results are presented in Table 3.

Table 3. Normality test results

Analysis	Sig.
Kolmogorov–Smirnov	0.001
Shapiro–Wilk	0.001

Table 3 shows that both the Kolmogorov–Smirnov and Shapiro–Wilk tests produced significance values below 0.05. This indicates that the data were not normally distributed. Therefore, a non-parametric test was used for further analysis.

The Mann–Whitney U test was conducted to determine whether there was a significant difference in students' perceptions between the two classes. The results are presented in Table 4.

Table 4. Mann–Whitney U test results for students' perceptions

Variable	Sig.	Interpretation
Students' perceptions	0.382	Not significant

Table 4 shows that the significance value was 0.382, which is greater than 0.05. This result indicates that there was no significant difference in students' perceptions between Class X-1 and Class X-2. Thus, students from both groups tended to have similar perceptions of environment-based biology learning.

Overall, the findings demonstrate that students' perceptions of environment-based biology learning were high to very high. This suggests that learning activities using the school environment can provide meaningful, contextual, and relevant learning experiences. By engaging directly with environmental objects and

phenomena, students are able to connect biological concepts with real conditions in their surroundings. This supports previous studies showing that environment-based and outdoor learning can improve students' conceptual understanding, motivation, and engagement in science learning (Hermawan et al., 2022; Putri & Aznam, 2024).

The positive perception found in this study may also be explained by the contextual nature of environment-based learning. Biology concepts are often easier to understand when students observe organisms, ecosystems, or environmental problems directly. Such learning experiences help reduce the abstract nature of scientific concepts and make learning more concrete. Similar findings have been reported in previous studies indicating that contextual and environment-based learning can strengthen students' scientific attitudes, active participation, and environmental awareness (Panjaitan et al., 2021; O'Connor et al., 2024).

Across the cognitive, affective, and conative dimensions, students' responses were generally positive. Cognitively, students perceived that environment-based learning helped them understand biological concepts more effectively. Affectively, students showed interest and positive attitudes toward learning activities conducted in the surrounding environment. Conatively, students demonstrated a tendency to participate more actively and develop environmental awareness. This indicates that environment-based biology learning does not only support knowledge acquisition but also encourages students' attitudes and behavioral intentions related to environmental responsibility (Schunk & DiBenedetto, 2020; Wulandari & M, 2025).

The absence of a significant difference between the two classes indicates that students' perceptions were relatively similar across groups. This may suggest that environment-based biology learning was implemented consistently and provided comparable learning experiences for both classes. Therefore, the school environment can be considered a practical and accessible learning resource that can be applied across different classroom groups. This finding is in line with previous research showing that similar instructional strategies in comparable learning contexts tend to produce relatively consistent student responses (Supriadi et al., 2023).

Nevertheless, this study has several limitations. The sample was limited to 60 students from two classes, and the data were collected only through a quantitative questionnaire. Future studies should involve larger samples and include qualitative data, such as interviews, classroom observations, or student reflections, to obtain a deeper understanding of students' learning experiences. A mixed-methods approach would provide richer evidence regarding how environment-based biology learning shapes students' perceptions, engagement, and environmental awareness.

In conclusion, environment-based biology learning was perceived positively by students and has strong potential to improve the quality of biology instruction. By connecting scientific concepts with students' immediate surroundings, this approach can support conceptual understanding, increase learning engagement, and foster environmental awareness. Therefore, environment-based learning should be further developed as an effective and contextually relevant instructional strategy in biology education.

CONCLUSION

This study concluded that students had positive perceptions of environment-based biology learning. The mean scores of the questionnaire items ranged from high to very high, indicating that students generally perceived the use of the school environment as beneficial, relevant, and engaging for biology learning. Environment-based learning helped students connect biological concepts with real environmental

phenomena, supported their interest in learning, and encouraged active participation and environmental awareness. The Mann–Whitney U test showed no significant difference in students' perceptions between the two classes, suggesting that both groups had relatively similar learning experiences and responses to environment-based biology learning. Overall, this approach has strong potential to improve the quality of biology instruction by making learning more contextual, meaningful, and closely related to students' daily lives.

RECOMMENDATION

Based on the findings, biology teachers are encouraged to integrate the surrounding school environment more frequently as a learning resource, particularly for topics that require observation, investigation, and contextual understanding. Learning activities should be designed to involve students actively through field observations, practical work, group discussion, and reflection so that cognitive, affective, and conative aspects of learning can be developed more comprehensively. Schools are also expected to support environment-based learning by providing adequate facilities, flexible learning spaces, and policies that encourage outdoor and contextual learning activities. Future researchers are recommended to involve larger samples, different school contexts, and qualitative data such as interviews, observations, or student reflections to obtain a deeper understanding of students' experiences in environment-based biology learning.

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