JPPIPA 10(11) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Utilization of the Surrounding Environment as a Science Learning Resource in Gorontalo Province

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Received: August 06, 2024
Revised: September 20, 2024
Accepted: November 25, 2024
Published: November 30, 2024

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DOI: 10.29303/jppipa.v10i11.8754

Abstract: Environment-based learning is an approach that is gaining increasing attention in science education due to its potential to improve students' understanding of scientific concepts as well as practical skills. This research aims to examine in depth the utilisation of the surrounding environment of Gorontalo Province as a science learning resource, identify specific potentials that can be integrated into the curriculum and evaluate its impact on students' conceptual understanding, learning interest and practical skills. This study adopted a mixed method approach by combining experimental and interview methods to explore the utilisation of the surrounding environment as a science learning resource in Gorontalo. The population in this study were primary school students and science teachers in Gorontalo. The sample for the experimental method consisted of several elementary school classes selected by purposive sampling, quantitative data were collected through pre-test and post-test to measure changes in students' science understanding and skills before and after the intervention. Qualitative data, the sample consisted of science teachers selected through purposive sampling were interviewed. The results showed that students who participated in learning activities outside the classroom had a deeper understanding of concepts and better science skills compared to the control group. They also showed significant improvements in observation, problem-solving and co-operation skills. The out-of-class activities provided a more interactive and contextualised experience, which had a positive impact on students' motivation and interest in learning. The findings indicate that a neighbourhood-based learning approach, particularly through out-of-class learning activities, can be an effective method in improving the quality of education.

Keywords: Contextual learning; Environmental utilization; Science learning resources

Introduction

Science education in primary school is a learning process that aims to introduce students to the basics of science through a simple and fun approach (Bukit et al., 2023). At this level, science education focuses on introducing basic scientific concepts such as the nature of objects, weather changes, plant and animal life, and energy and its materials. Through interactive and experiential methods, students are introduced to scientific principles in a way that is easy to understand, such as through simple experiments, observations and discussions (Ozturk & Forsythe, 2024). Science education in primary schools also aims to develop students' critical thinking skills and practical skills early on, including the ability to make observations, formulate questions, and make conclusions based on data collected (Ma et al., 2023). In addition, science education at the primary level endeavours to relate learning to students' daily lives, so that students can see the relevance of

How to Cite:
Abdullah, G. (2024). Utilization of the Surrounding Environment as a Science Learning Resource in Gorontalo Province. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 8482–8489. https://doi.org/10.29303/jppipa.v10i11.8754

science in contexts that students are familiar with and experience firsthand.

Conventional approaches to science teaching are often limited to theory and practice in the classroom (Doğan et al., 2023). These methods, while basic, are often insufficient to spark students' interest or provide a deep understanding of scientific concepts. These limitations can reduce the effectiveness of science learning, especially in terms of making students feel the relevance and real application of what they are learning. Utilising the surrounding environment as a science learning resource offers a more holistic and integrative approach. The surrounding environment provides a variety of natural phenomena that can be observed and studied directly, thus providing a real context for scientific concepts taught in the classroom (Li & Liu, 2023). These contextualised and applied learning experiences not only enrich students' understanding, but also arouse natural curiosity. Students involved in direct observation and field experiments tend to be more motivated and engaged in the learning process (Rokhmawan et al., 2023). Students can see for themselves how scientific principles work in everyday life, which in turn increases student interest and engagement in science lessons. Utilisation of the surrounding environment as a learning resource also supports interdisciplinary learning (Merritt et al., 2022). For example, when students study local ecosystems, they learn not only about biology but also about geography, ecology and even social sciences. This approach creates a more integrated understanding of the world and helps students see the connections between different disciplines.

Effective science education helps students develop essential critical thinking, analytical and problem solving skills (Zulyusri et al., 2023). However, the main challenge faced is how to make science learning interesting and relevant for students. In Gorontalo, a region known for its unique biodiversity and natural phenomena, there is great potential to integrate the local environment as a science learning resource. Gorontalo has various ecosystems, ranging from forests, mountains, to the sea, all of which provide natural laboratories for science learning. Utilizing this local environment can be an effective way to overcome the limitations of conventional learning that is often too theoretical and lacking contextualization (Nguyen & Tull, 2022). By utilizing local natural resources, the science learning process can be made more interesting and meaningful for students. When students learn science by directly observing natural phenomena in their environment, learning becomes more concrete and easy to understand (Yanti et al., 2022). Environment-based learning can stimulate student interest and engagement (Hikmawati et al., 2020). Hands-on experiences in nature, such as conducting simple experiments or collecting field data, provide opportunities for students to become active and engaged little researchers. Students can experience how science works in unravelling the mysteries of nature, which can spark curiosity and a love for science. When students are actively involved in the learning process, they are more likely to remember and understand the material taught.

Many studies have discussed the importance of neighbourhood-based education (Hamid et al., 2021; Sarkowi et al., 2023). There is a research gap regarding the specific application of this approach in areas of high biodiversity such as Gorontalo. Previous research tends to be more general and less explores the specific potential of the local environment in improving students' understanding and interest in science. Most studies are also still limited to short-term observations without evaluating the long-term impact of environment-based learning on students' academic achievement and skills. This research is unique and novel in several aspects. Firstly, this research will deeply examine the utilization of Gorontalo's surrounding environment as a science learning resource, identifying specific potentials that can be integrated into the science curriculum. Secondly, this research will systematically and sustainably apply the environment-based learning method and evaluate its impact on students' conceptual understanding, learning interest and practical skills. Thus, this research not only aims to overcome the limitations of conventional approaches in science education, but also to prove the effectiveness of environment-based learning in a local context rich in biodiversity. The results of this study are expected to contribute significantly to the development of a more contextualised, relevant and sustainable science education model, as well as inspire other regions with similar conditions to implement a similar approach.

Method

This study adopted a mixed method approach by combining experimental and interview methods to explore the utilisation of the surrounding environment as a science learning resource in Gorontalo. The population in this study were primary school students and science teachers in Gorontalo. The sample for the experimental method consisted of several primary school classes selected by purposive sampling, where students from these classes followed an environment-based learning intervention. During the experimental period, students were given the opportunity to use elements of the surrounding environment as part of science learning activities. Quantitative data was collected through pre-test and post-test to measure changes in students' science understanding and skills

before and after the intervention. For qualitative data, the sample consisted of science teachers selected through purposive sampling to obtain in-depth interviews regarding the implementation process, benefits, and challenges of using the neighbourhood as a learning resource. The purposive sampling technique ensured that the participants selected had knowledge and experience relevant to the study. Quantitative data was analysed using statistical methods to determine the effectiveness of the intervention, while qualitative data was analysed to identify key themes related to experiences and views on environment-based learning.

Result and Discussion

Pre-test and post-test were conducted to assess students' learning outcomes. Comparisons were made between students who had learned by applying learning that utilises the surrounding environment for science learning in the experimental class and students who used conventional learning methods in the control class. Table 1 lists the results of the descriptive analysis, which shows significant differences in the achievement of learning outcomes between the two groups. The pre-test results provide an initial picture of students' abilities before the learning intervention, while the post-test results show the changes that occurred after the application of the respective learning methods.Results should be clear and concise. The discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Table 1. Results of Descriptive Statistical Analysis of Student Learning Outcomes

Description	N	Minimum	Maximum	Mean
Experiment Pre Test	30	20	68	54.50
Experiment Post Test	30	60	90	86.60
Control Pre Test	30	27	67	50.89
Control Post Test	30	47	70	68.47

Table 1 shows that there were 30 students in the experimental class and 30 students in the control class. Based on table 1, it is known that there is a more significant mean increase in the experimental class with the use of the surrounding environment as a learning resource compared to the control class that uses conventional learning. Furthermore, the results of each test on the pretest and post-test were collected and summarized in the score distribution. Table 2 Frequency distribution of scores.

Based on Table 2, it shows that students in the control class get a pre-test score of good 10, medium 5 and bad 15. After the post test, the students get good 12, medium 10 and bad 8. For the experimental class, the pre-test value is good 15, medium 10, bad 5 while for the posttest value, the value is very good 5, good 20 and medium 5. This shows an increase in students' conceptual understanding by utilizing the surrounding environment as a learning resource. This is in accordance with the results of interviews with several elementary school teachers in Gorontalo province. Data collected through interviews showed a significant increase in students' conceptual understanding after the implementation of environment-based learning. The learning process by utilizing the environment has a positive impact on the way students understand and apply science concepts (Abidin et al., 2023); (Rahmadhea, 2024). Students engaged in environment-based learning showed better ability in explaining scientific principles and relating them to concrete examples from the neighbourhood.

Table 2. Frequency Distribution of Student Score Acquisition Related to Increasing Students' Conceptual Understanding

Score range	Description	Control Class		Experiment Class	
		Pre-test	Post-test	Pre-test	Post-test
0 – 20	Very Bad	0	0	0	0
21 – 40	Bad	15	8	5	0
41 – 60	Medium	5	10	10	5
61 – 80	Good	10	12	15	20
81 – 100	Very good	0	0	0	5

Based on Table 3, it shows that students in the control class get a pre-test score of good 5, medium 7 and bad 17. After the post test, the student score is good 5, medium 15 and bad 10. For the experimental class, the pre-test value is good 5, medium 15, bad 10 while for the posttest value, the value is very good 11, good 15 and medium 4. This shows an increase in students' science skills by utilising the surrounding environment as a learning resource. This is in accordance with the results of interviews with several primary school teachers in Gorontalo province.

Table 3. Frequency Distribution of Student Score Acquisition Related to Science Skills

Score range	Description	Control Class		Experiment Class	
		Pre-test	Post-test	Pre-test	Post-test
0 – 20	Very Bad	0	0	0	0
21 – 40	Bad	18	10	10	0
41 – 60	Medium	7	15	15	4
61 – 80	Good	5	5	5	15
81– 100	Very good	0	0	0	11

Data collected through interviews showed a significant improvement in students' science skills.

Learning activities outside the classroom provide valuable opportunities for students to develop practical science skills that are essential in science education (Ayotte-Beaudet et al., 2023). By directly engaging in activities such as observation and measurement, students can deepen their understanding of the scientific method and research techniques. For example, when students make direct observations of natural phenomena such as the water cycle or ecosystem interactions, they learn to accurately identify and record relevant variables. The use of measuring tools, such as thermometers or microscopes, in a field context allows students to understand how these tools practically work, as well as the importance of accuracy in collecting data.

In addition to these technical skills, out-of-class activities also enhance students' abilities in data analysis and problem solving (Kabalay & Gökdemir, 2023). After collecting data, students must analyses the results of their measurements, which involves the use of graphs, tables and statistical techniques to draw valid conclusions. out-of-class learning activities make a major contribution to the development of students' practical and social science skills. By giving students the opportunity to apply theoretical knowledge in a real context, they not only improve their technical skills but also develop the social abilities needed to work effectively in a team (Wang, 2023). The increased self-confidence and communication skills gained during these activities equip students with competencies essential for success in future science studies and careers.

In addition, based on the results of interviews with teachers revealed that teachers witnessed a noticeable change in students' interest and engagement after the implementation of environment-based learning. According to teachers, students show greater enthusiasm when students are involved in activities outside the classroom, such as observing local ecosystems or conducting simple experiments in the field. Teachers reported that students seemed more excited and motivated to learn, and this was reflected in increased student participation in class discussions and science projects. Teachers also noted that students often talked about their field experiences with great enthusiasm. Students expressed how directly observing natural phenomena made scientific concepts more tangible and easier to understand. For example, when students learn about the process of photosynthesis, they feel more connected to the material when they can see first-hand how algae and plants function in their natural environment. This not only deepens their understanding but also increases their interest in science lessons. And based on the in-depth Interview revealed that the implementation of environment-based learning has a significant impact in raising students' awareness of the importance of maintaining and preserving the environment. Students who engage in environment-based learning show a deeper understanding of local and global environmental issues, as well as how human activities can directly affect ecosystems. For example, they can identify specific environmental issues such as plastic waste pollution on beaches and deforestation, and understand the negative impacts on the flora and fauna around them.

Discussion

Environment-based learning has a significant positive impact on various aspects of students' education, including conceptual understanding, interest in learning, practical skills and environmental awareness. This research found that students who engage in environment-based learning tend to show a clear improvement in understanding of scientific concepts, which is in line with the research conducted in this study (Kadarisman et al., 2023; Krisdiana et al., 2023; Saputra et al., 2024). This is due to the approach that allows students to learn theory in the classroom while experiencing first-hand its application in the field. This experiential learning provides a real context for students, helping students to link theory with practical applications in the real world. Hands-on experience in the field enriches the learning process by providing concrete examples relevant to the material learnt (Aithal & Mishra, 2024; Resch & Schrittesser, 2023).

In the context of education, the neighborhood-based learning approach refers to a method that integrates direct experiences from students' neighborhoods into the learning process (Akmalia et al., 2023; Arjunnajata et al., 2024). The environment-based approach not only emphasizes the delivery of information verbally or through conventional media, but also focuses on student involvement in activities that allow students to observe and interact directly with the world around them, students can relate theoretical concepts to phenomena encountered daily, deepen understanding through a more real and relevant context (Hendriyanto et al., 2024). One tangible form of this approach is learning outside the classroom, which offers opportunities for students to make direct observations and simple experiments in nature (Sjöblom et al., 2023). Environment-based learning takes students out of the confines of the traditional classroom and into a more dynamic and varied environment (Ben-Rebah et al., 2023). Outside the classroom, students can observe natural processes, identify different species of plants and animals, and conduct experiments that may not be possible in a confined classroom (Kong & Chen, 2024).

Environment-based learning offers a comprehensive approach to science education by engaging students directly with elements of the

surrounding environment (Feng et al., 2024). One of the main benefits of using the environment as a learning resource is the enhancement of observation and analysis skills (Rubianti et al., 2024). When students conduct outdoor activities, they are exposed to a variety of real-world variables that are not always present in a laboratory setting. For example, when observing a local ecosystem, students must record factors such as weather conditions, soil types, and interactions between species. This process encourages students to be more thorough and accurate in recording data, which is the foundation of the scientific method and evidence-based decision-making. environment-based learning allows students to apply science theories in real practice. Scientific concepts such as photosynthesis, the water cycle, or ecology can be learnt first-hand through field experiments, such as measuring plant growth or analyzing water quality (Dikmenli et al., 2024). By seeing how scientific principles function in a real-life context, students can understand the relevance and application of science theories in the world around them. This deepens students' understanding and helps connect theory with practice (Zhou & Li, 2024).

Learning outside the classroom with activities that involve direct observation and practical experimentation provides a real context for students to understand the concepts being learnt (Warouw et al., 2023). This is in line with the theory of constructivism, which is one of the main theories in educational psychology. This theory states that meaningful learning occurs when students are actively involved in the learning process, not just as recipients of information but as active participants in creating their own knowledge (Djaguna et al., 2024). According to constructivism, students construct an understanding of the world through direct experience and interaction with the environment (Nasution et al., 2024). In the context of environment-based learning, students not only receive information about ecosystems in theory, but students also participate in observation and experimentation processes that help build a deeper understanding of the subject matter (Fore et al., 2024). Increased interest in learning as a result of an interactive learning approach can have a positive impact on students' academic achievement (Kalemkuş & Kalemkuş, 2023). When students are more motivated and engaged in the learning process, students tend to be more diligent in completing tasks and pursuing their academic goals. This high motivation can lead to better learning outcomes and improved overall academic performance (Mahdavi et al., 2023). In addition, active engagement in learning can also help students develop important social and teamwork skills, which are beneficial in many aspects of life (Kassab et al., 2023).

The increase in students' environmental awareness shows that environment-based learning has great potential in shaping positive attitudes and behaviors towards the environment (Cincera et al., 2023). Environment-based learning not only provides a theoretical understanding of environmental issues, but also involves hands-on experience with nature that deepens students' emotional and intellectual connection with the environment. Environment-based learning fosters positive attitudes towards the environment that are long-lasting. When students see the positive impacts of conservation efforts, such as improved habitat quality or successful rehabilitation programmers, they are likely to feel motivated to continue contributing to conservation efforts (Sunassee et al., 2021).

This creates a positive cycle where students not only learn about the importance of protecting the environment but also feel inspired to take concrete actions that support the cause. By experiencing first-hand the beauty and vulnerability of their natural surroundings, students become more concerned and committed to safeguarding and conserving the environment. This is important in the context of education for sustainable development, which aims to shape a generation that cares and is responsible for the environment (Ahada & Zuhri, 2020). Overall, this research shows that utilizing the surrounding environment as a science learning resource in Gorontalo is effective in improving the quality of learning. This approach not only enriches students' conceptual understanding, but also develops practical skills and forms an attitude of environmental care. Therefore, this learning model is worth considering and applying in other areas with similar conditions to improve the quality of science education.

Conclusion

The utilization of the surrounding environment as a source of science learning in Gorontalo offers an effective and contextual approach to education. By utilizing natural resources and local ecosystems as learning media, students can gain hands-on experience that enriches understanding of scientific concepts. Activities such as observation, observation, and field experiments allow students to link theory with practice, enhancing their conceptual understanding and practical skills. This approach not only deepens students' knowledge of science, but also increases their interest and motivation to learn. Environment-based learning that involves direct interaction with the natural surroundings creates a more interesting and relevant experience, encouraging students to be more active in the learning process. Awareness of the beauty and vulnerability of the environment also develops,

encouraging positive attitudes and behaviors towards environmental conservation.

Acknowledgments
We would like to thank all the authors and those involved in this research for their support so that this research can be completed properly.

Author Contributions
The authors listed in this article contributed to the development of the article, and have read, approved the published manuscript.

Funding
This research received no external funding.

Conflicts of Interest
The authors declare no conflict of interest.

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