
Implementation of Natural and Social Sciences Learning Media Based on Ecopedagogy to Improve Environmental Awareness

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Abstract

Human life and the environment are interconnected, but global environmental challenges such as climate change, deforestation, pollution, and biodiversity loss have damaged the earth's ecosystem. Therefore, increasing environmental awareness and attitudes among the younger generation is very important. Natural and Social Sciences (IPAS) learning has a key role in achieving this goal. This study aims to determine the effect of the ecopedagogy approach in IPAS learning on improving the environmental attitudes of elementary school students. This study uses a quasi-experimental type with a Pretest-Posttest Nonequivalent Control Group design. The subjects of the study consisted of two classes, namely class IV Sina as the experimental class and IV Kahldun as the control class. This study was conducted at SD Islam Al Azhar 31 Yogyakarta. This study develops ecopedagogy-based learning media to improve students' environmental attitudes. Ecopedagogy emphasizes a balanced relationship between humans and nature. This learning media combines the concept of ecopedagogy in IPAS material, creating an immersive learning environment about the relationship between humans and nature. The research includes the development, testing, and evaluation of learning media, including videos, simulations, interactive games, and additional resources. Data analysis using paired sample t-test showed that ecopedagogy approach can improve students' environmental awareness. The posttest results showed that the experimental class had higher scores compared to the control class, with an average N Gain value of 0.5207 indicating that the increase in environmental awareness of fourth grade students after using ecopedagogy-based media was in the "Quite Effective" category.

KEYWORDS: Learning Media, Natural and Social Sciences, Ecopedagogy, Environmental Care Attitude.

Introduction

In this era of globalization, the biggest challenge facing humans is how to maintain a balance between technological development and environmental sustainability. To achieve this goal, education has an important role in forming an attitude of environmental concern in the younger generation [1]. One innovative approach is through the application of Natural Sciences and Social Sciences (IPAS) Learning Media based on Ecopedagogy [2].

Natural and Social Sciences (IPAS) is a field of study that integrates Natural Sciences and Social Sciences as one unit, thus enabling students to understand the complexity of interactions between humans and their environment [3]. Ecopedagogy, on the other hand, is an educational concept that emphasizes the harmonious relationship between individuals and nature, encouraging awareness of the impact of human activities on ecosystems [4]. The application of Science and Technology Learning Media based on Ecopedagogy offers a holistic approach in the learning process. By

using technology, such as interactive animation, simulation and multimedia, students can understand science concepts more deeply and relate them to the real context of their surroundings.

One of the main advantages of this approach is its ability to increase students' active participation in learning [5]. By combining game elements and educational challenges, students are directly involved in the learning process, thereby increasing motivation and interest in the subject matter [6]. It should be noted that the main objective of implementing Ecopedagogy-based Science Learning Media is not only to understand scientific concepts, but also to develop an attitude of caring for the environment [7]. Through deep and immersive learning experiences, students are expected to understand the connection between their actions and environmental sustainability.

This article will further explore the concept and benefits of implementing Ecopedagogy-based Science Learning Media and provide an overview of how this approach is an effective medium in increasing caring attitudes and forming a generation that is responsible for the environment. Ecological intelligence is often referred to as ecological literacy [8]. Ecological intelligence is the ability to sense, understand, and act on an awareness of the relationship between humans and their environment. This ability is to see the long-term impacts on the ecosystem of human actions and make resolutions that support ecological sustainability. Ecopedagogy is also often associated with experiential education, where learning occurs through direct engagement with the surrounding environment. This can include activities such as community projects, environmental stewardship, organic farming, or the study of local ecosystems. Overall, ecopedagogy aims to build collective awareness of the importance of maintaining the balance of nature for the sustainability of life on earth. Therefore, to develop ecological intelligence must be guided by an awareness of how nature supports life and its benefits for all living things, including humans [9].

In accordance with the explanation above, a person's ecological intelligence is based on awareness, understanding and the ability to live a harmonious life by caring for and preserving the environment [10]. Furthermore, according to Supriatna, individuals who have ecological intelligence are those who understand the impact of their actions on the ecosystem and take active steps to reduce ecological impacts, such as utilizing natural resources in a sustainable manner, reducing waste, and strengthening environmentally friendly initiatives. Their environmental awareness is driven by concern for the current state of the environment and the threats it faces. They also hold values and ethics that encourage respect for and protection of nature and understand the importance of environmental justice and responsibility towards future generations. Personal experiences, such as interacting directly with nature through outdoor activities, strengthen their understanding. In addition, formal and informal education on environmental issues and access to information from various sources play an important role. Practical skills in sustainable living, such as the use of renewable energy, recycling, and cultural and community influences that support environmentally friendly principles, also contribute to ecological intelligence.

This shows that ecological intelligence focuses on developing knowledge about environmental issues and its practical application to address existing environmental problems [11]. Ecological intelligence is proven to be an ability that involves understanding ecological aspects in education, which students need to master throughout the learning process [12]. Furthermore, Hines identified four main elements that make up ecological intelligence. First, environmental knowledge, which is an understanding of the basic principles of ecology, ecological systems, and the relationship between humans and the environment. Second, environmental awareness, which includes an understanding of the current state of the environment, the challenges faced, and the impact of human activities on ecosystems. Third, values and attitudes, which include values and attitudes that support environmental protection and ecological justice. Fourth, action skills, which are the practical ability to implement environmentally friendly and sustainable actions in daily routines.

Learning achievement related to ecological competence requires a learning model that can implement it effectively. Ecopedagogy learning can be one option to improve ecological competence [13]. In the implementation of ecopedagogy learning at SD Islam Al Azhar 31 Yogyakarta, both students and teachers often face various problems. Students have difficulty understanding complex ecological concepts and lack of practical involvement, such as field activities or nature-based projects, which can reduce their understanding and motivation. In addition, social and cultural barriers in certain communities can also affect students' attitudes and interests towards environmental conservation. On the other hand, teachers often face challenges such as lack of specific training on ecopedagogy, limited resources such as teaching materials and teaching aids, and limited time due to a dense curriculum. Classroom management for outdoor activities and environment-based projects can also be a logistical problem as well as learning focuses on the role of the teacher. The learning process that makes the teacher the center has a disadvantage, namely that it tends to make students passive. In this model, students are merely recipients of information and have less control over their own learning process [14]. Addressing this problem requires a comprehensive approach, including improving teacher training, providing adequate resources, and developing a curriculum that is relevant and interesting to students. Based on the background explanation

that has been presented, the purpose of this study is to determine the increase in environmental awareness through science learning in grade IV students of SD Islam Al Azhar 31 Yogyakarta.

Methods and Methodology:

Learning media for science and social sciences

Learning Natural and Social Sciences (IPAS) that includes environmental issues such as waste or flooding is very important to deepen students' understanding of environmental issues and prepare them to face sustainable challenges. Environmental education with an ecopedagogical approach that includes issues such as waste and flooding can help students develop environmental awareness and an understanding of human impacts on ecosystems. It can also motivate them to take sustainable action. Learning with an ecopedagogical approach in instilling an attitude of caring for the environment is an effort to prepare the next generation to become individuals who understand and care about the importance of protecting the environment [15]. In accordance with the understanding of ecopedagogy, namely environmental education that can trigger awareness of the importance of preserving nature and encourage change [16]. Based on the results of observations, several problems were found in the field related to the implementation of science and natural science learning. Related to the preparation of teaching materials, learning media, and methods delivered by teachers are not in line with the needs of science and natural science learning [17]. The implementation of science and natural science learning in the Emancipated curriculum really requires optimal readiness from teachers, in addition to using textbooks, teachers must also be able to develop additional tools to support learning, especially in learning activities. Teachers are expected to be able to independently develop their creativity in the learning process [18]. Emancipated curriculum is an educational approach that emphasizes freedom and independence in the teaching and learning process. This curriculum provides freedom for teachers and students to adjust the learning methods that best suit the needs and interests of students and are contextual to the surrounding environment. In the context of the Emancipated curriculum, the integration of Natural Sciences and Social Sciences into Natural and Social Sciences is a strategic step to produce more holistic and integrative learning. By combining these two disciplines, students can understand the relationship between natural phenomena and social dynamics more comprehensively. The IPAS approach in the Emancipated curriculum also motivates students to improve their critical thinking skills, problem solving, and environmental awareness, which are very important to face global challenges in the modern era. In addition, this approach allows students to see the relationship between natural sciences and social sciences in everyday activities, so that they can become individuals who are more concerned and responsive to environmental and social problems.

The lack of traditional game-based science learning media regarding ecopedagogy and flood issues is an innovative step that combines elements of education, culture, and the environment. The combination of traditional games with an understanding of ecopedagogy and flood issues can be an effective means of teaching knowledge and awareness about the relationship between humans and the natural environment. Traditional games have been proven to develop children's character such as patience, honesty, sportsmanship, discipline, perseverance, independence, self-confidence, and cooperation [19]. Therefore, it is important to develop learning media that combine traditional games with ecopedagogy concepts and flood-related issues. This can include creating dakon games, applications, videos, or books involving traditional games. Types of folk games (children's games) can improve multiple intelligence abilities, such as linguistic intelligence, personal intelligence, special visual intelligence, kinesthetic intelligence, musical intelligence, interpersonal intelligence [20].

Ecopedagogy

The application of the ecopedagogy approach in learning is expected to form a generation that is more aware and cares about the environment. By integrating the principles of sustainability and ecological responsibility into the curriculum, students will not only learn about environmental issues but also how they can actively contribute to protecting and preserving nature. Ecopedagogy encourages interactive and participatory learning methods, where students are invited to think critically about the impact of human actions on ecosystems and seek innovative solutions to environmental problems. Thus, they will grow into individuals who have strong ecological values, are able to make wise decisions regarding the environment, and are ready to become agents of change in society towards a more sustainable future. Ecopedagogy is an initiative that focuses on life, with the aim of creating a new civilization that is sustainable and environmentally friendly. With the support of educators and the people around them, the younger generation and children are expected to be able to realize this goal [21].

Ecological intelligence is important for fourth graders because at this age, they are at a critical stage of cognitive development where an understanding of the environment and responsibility for nature can be firmly established. Teaching ecological intelligence to fourth graders helps them understand the interplay between humans and the environment, as well as the consequences of human actions on nature. With this knowledge, children will learn the importance of preserving the environment through everyday actions such as recycling, saving energy, and conserving natural resources. In addition, ecological intelligence also encourages a sense of caring and empathy for other living things, strengthening the values of sustainability that they will carry into adulthood. Ultimately, equipping fourth graders with ecological intelligence will create a generation that is more environmentally aware and ready to play an active role in protecting the earth. Therefore, developing ecological intelligence must be based on an understanding of how nature supports life, as well as the positive impacts it has on all living things, including humans [22].

Method

This research approach uses a quantitative method with the Quasi Experimental Design type, especially with the Nonequivalent Control Group Design. The purpose of this study was to determine whether the ecopedagogy approach in science learning can improve the environmental awareness of elementary school students. The design used was a quasi-experimental design with a pretest and posttest nonequivalent control group design. The sampling technique used was Purposive or Judgmental Sampling, which was selected based on certain considerations. The collection of research data was carried out through tests identified with pretests and posttests, as well as non-tests including observation, interviews, and documentation studies. Data validation analysis techniques include validity tests, normality tests, homogeneity tests, hypothesis tests, and normalized gain tests. In this study, the ecopedagogy approach acts as an independent variable, while environmental awareness is the dependent variable. Before conducting the analysis to test the hypothesis, two preliminary tests were carried out, namely the normality and homogeneity tests, which are prerequisites for hypothesis testing. The normality test was carried out using the Shapiro-Wilk test to determine whether the data was normally distributed. The homogeneity test used the Levene test to ensure that the data had homogeneous variance. Data analysis was performed using Paired Samples T-Test with a significance level of 5%.

Results

Based on the findings of the research conducted by researchers on the influence of the application of ecopedagogy-based learning on increasing students' environmental awareness, this can be seen in the table below:

Table 1. Normality Test of Environmental Concern Attitudes

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Environmental Care Attitude	Pre-Test Experiment	.102	30	.200*	.963	30	.372
	Post-Test Experiment	.113	30	.200*	.943	30	.108
	Pre-Test Control	.088	30	.200*	.968	30	.486
	Post-Test Control	.100	30	.200*	.969	30	.505
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on table 1, the significance value (Sig.) for all data, both the Kolmogorov-Smirnov and Shapiro-Wilk tests, is > 0.05, so it can be concluded that the research data on environmental concern attitudes are normally distributed.

Table 2. Homogeneity Test of Environmental Concern Attitudes

		Levene Statistic	df1	df2	Sig.
Environmental Care Attitude	Based on Mean	.166	1	58	.685
	Based on Median	.112	1	58	.739
	Based on Median and with adjusted df	.112	1	56.361	.739

	Based on trimmed mean	.140	1	58	.709
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Based on table 2, it is known that the significance value (Sig.) Based on Mean is $0.685 > 0.05$, so it can be concluded that the variance of the Post-test data of the experimental and control classes on the environmental care attitude variable is the same or homogeneous.

After conducting the normality and homogeneity test of the data, which shows that the data is normally distributed and homogeneous, the prerequisites for using the Independent-Samples T Test are met. This test will compare the average between the experimental and control groups to assess the effectiveness of ecopedagogy-based media in improving students' environmental awareness. The results of the analysis of this test will provide a deeper understanding of the positive or negative impact of using the media in the context of science learning in the fourth grade of elementary school.

Table 3. Independent-Samples T Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Environmental Care Attitude	Equal variances assumed	.166	.685	13.873	58	.000	16.900	1.218	14.461	19.339
	Equal variances not assumed			13.873	57.586	.000	16.900	1.218	14.461	19.339

Based on table 3, the Sig. (2-tailed) value is $0.00 < 0.05$, so it can be concluded that there is a significant difference between the environmental care attitudes of the experimental class and the control class.

Table 4. Test N-Gain Score

	N	Minimum	Maximum	Mean	Std. Deviation
N Gain Score	30	.04	.80	.5207	.21082
N Gain Persen	30	4.00	80.00	52.0664	21.08165
Valid N (listwise)	30				

The table above shows 30 respondents with a minimum N-Gain score of 0.04 and a maximum of 0.80, which means that the increase in environmental awareness ranges from 0.04 to 0.80. The average N-Gain score is 0.5207, with a standard deviation of 0.21082 indicating that the average increase in environmental awareness is around 52.07. The N-Gain percentage (Ngain_Persen) has a minimum value of 4% and a maximum of 80%, with an average of 52.07% and a standard deviation of 21.08165, indicating that the increase in environmental awareness of fourth grade students after using ecopedagogy-based media is in the category of "Quite Effective"

Discussion

Ecopedagogy learning can improve environmental awareness in Natural and Social Sciences (IPAS) lessons by integrating ecological concepts and environmental awareness into the curriculum. This method emphasizes the importance of a holistic understanding of the relationship between humans and the environment and the impact of our actions on the ecosystem. Research shows that the ecopedagogy approach can improve students' environmental awareness [23]. This intelligence is based on cognitive aspects or understanding of how nature supports the lives of all living things [24]. Through this approach, students are encouraged to be more critical in viewing environmental issues, such as climate change, pollution, and natural resource conservation. With interactive and contextual learning, students not only gain theoretical knowledge, but are also involved in practical activities that foster a sense of responsibility towards the environment. As a result, students become more aware and concerned about environmental issues, and are motivated to

take real action in preserving nature. Ecological intelligence, or ecological literacy, is very relevant in this context because it involves the ability to understand and respond wisely to ecosystem dynamics [25].

By enhancing ecological intelligence through ecopedagogy, students can develop critical thinking skills and empathy towards nature, which in turn strengthens their environmental awareness. As a result, students become more aware and concerned about environmental issues, and are motivated to take real action in preserving nature [26]. Teaching environmental awareness with an ecopedagogy approach in the fourth-grade science subject can begin by integrating basic ecological concepts and environmental awareness into the curriculum. For example, teachers can introduce topics such as recycling, water conservation, and biodiversity through stories, videos, and hands-on activities outside the classroom. By conducting field trips to parks, gardens, or urban forests, students can observe firsthand how ecosystems work and the importance of protecting the environment. Through discussion and reflection, students are invited to understand the impact of human behavior on nature and seek practical solutions to environmental problems around them [27]. In addition, the ecopedagogy approach involves practical projects that actively involve students in environmental activities. For example, students are involved in tree planting projects at school, composting organic waste, or energy saving campaigns at home and school. With this approach, students not only learn theory but also apply their knowledge in real action. These projects can be linked to other subjects such as mathematics (calculating the amount of water saved), Indonesian (making campaign posters), and art (making works from recycled materials). Thus, environmental awareness is not only taught as knowledge, but also as skills and habits that are applied in everyday life.

Conclusion

Based on the results of the research that has been conducted on ecopedagogy-based science learning in improving the environmental awareness of fourth grade students, it can be concluded that there is an increase in students' environmental awareness after participating in ecopedagogy-based science learning. This is evidenced by the Sig. (2-tailed) value of $0.000 < 0.05$, so H_0 is rejected, and H_a is accepted. In the experimental class, namely the class that received treatment in the form of an ecopedagogy approach in science learning, the average N-Gain score was 0.5207, with a standard deviation of 0.21082 indicating that the average increase in learning outcomes was around 52.07. The N-Gain percentage (Ngain_Persen) has a minimum value of 4% and a maximum of 80%, with an average of 52.07% and a standard deviation of 21.08165, indicating that the increase in the environmental awareness of fourth grade students after using ecopedagogy-based media is in the "Quite Effective" category.

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Conflict of interest

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