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Comparative Analysis of Students' Environmental Awareness Attitudes in Learning at Adiwiyata and Non-Adiwiyata Schools

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ABSTRACT

The environment is a space inhabited by living things along with biotic and abiotic elements that interact to maintain ecological balance. This study aims to compare the environmental awareness attitudes of Adiwiyata and non-Adiwiyata high school students in Boyolali Regency. This study is motivated by the important role of education in fostering environmental awareness to prevent ecosystem degradation. The sample consisted of two schools, namely SMA Negeri 1 Ampel (Adiwiyata) and SMA Negeri 1 Cepogo (non-Adiwiyata) which were selected randomly. Data were collected using a questionnaire and analyzed using the Independent Samples t-test and the Mann-Whitney U-test. The results showed a significant difference in students' environmental awareness attitudes between the two schools. Students in Adiwiyata schools showed more positive attitudes towards cleanliness, energy conservation, waste management, and maintaining the quality of the school environment compared to students in non-Adiwiyata schools. This difference is caused by the integration of the Adiwiyata program into school policies, curriculum, and environmentally friendly activities that involve the active participation of school residents. The Adiwiyata program makes a positive contribution in shaping environmental awareness among students, by emphasizing the importance of implementing environmental education systematically in Adiwiyata and non-Adiwiyata schools to support sustainable development.

Keywords: environmental care attitude, high school students, adiwiyata school

INTRODUCTION

The environment is a space inhabited by living organisms together with both living and non-living elements. It consists of reciprocal interactions among various components, including plants, animals, humans, and microorganisms as biotic elements, as well as various factors, organic materials, and inorganic substances as abiotic elements [1]. Human life is highly dependent on the environment in which they live [2], [3]. The mutual interactions among these components create a dynamic balance that continually changes and evolves, thereby supporting life within the ecosystem. Therefore, these reciprocal relationships among environmental components must be maintained to ensure ecological stability. In line with this, human activities play a major role in determining environmental quality. Various forms of environmental degradation caused by anthropogenic activities have driven the emergence of numerous efforts to restore and improve environmental conditions [4].

The existence of the environment is vital for human life; therefore, the government has issued various policies related to environmental management. In addition, public participation in protecting and preserving the environment is essential, as communities are directly connected to and affected by environmental issues. The balance between fulfilling human needs and preserving the environment must become a shared goal to ensure the continuity of life in the future, in line with the principles outlined in the Sustainable Development Goals (SDGs) [5]. The success of development and economic growth achieved through the exploitation of natural resources inevitably has negative impacts on the environment. From an environmental perspective, the success of development should not only be measured by the rate of economic growth and the achievement of equality but also by environmental sustainability. If the environment is damaged, the very resources needed for development will diminish and eventually become scarce. Environmental issues are increasingly being discussed today, as signs of environmental pollution caused by human activities have become evident [6]. The alarming consequences include global warming and climate change related to the greenhouse effect, damage to plants and forests, extinction of species, depletion of fishery resources, reduction of agricultural land, air pollution, and the scarcity of clean water supplies [7].

The current environmental crisis has reached a serious stage that threatens the very existence of planet Earth and all its inhabitants [8]. Gradually but

inevitably, the environmental systems that sustain human life are deteriorating at an alarming rate. Indicators of this degradation can generally be categorized into two forms: environmental pollution and environmental destruction. Floods, erosion, landslides, water scarcity, air and water pollution, global warming, biodiversity loss, the extinction of plant and animal species, as well as the outbreaks of pests and diseases such as avian influenza, dengue fever, HIV, and even COVID-19, are among the consequences and indirect impacts resulting from the disruption of ecological balance and the degradation of both physical and non-physical environments on Earth.

Environmental degradation, both on a global and national scale, fundamentally stems from irresponsible human behavior toward the environment. Humans are the primary cause of damage occurring on the Earth's surface. Most disasters are the result of human actions, while the rest are caused by natural phenomena [9]. Whether consciously or not, such damage arises from humans' failure to live in harmony with nature and their exploitation of natural resources without consideration. Only by changing human behavior can these environmental problems be mitigated [10].

Environmental conservation efforts are the responsibility of all members of society who interact with their surroundings, including students. The Ministry of Environment (KLH), in collaboration with the Ministry of Education and Culture, launched the Adiwiyata program in 2006 as an implementation of environmental education. This program aims to encourage and develop environmentally conscious and cultured schools that are capable of participating in and carrying out environmental preservation efforts within the framework of sustainable development [11]. The cleanliness and beauty of the school environment are shared responsibilities among all school members. A healthy school environment promotes the development of intelligent, high-quality students who possess environmental awareness and demonstrate love and concern for the environment, both within the school and in the wider community [12]. Conversely, a poorly maintained school environment, inadequate sanitation, and pollution around the school can have negative impacts on all school members, especially students who engage in daily learning activities within that environment [13]. To address environmental issues, the government has implemented various efforts to manage the environment and natural resources.

One of the programs implemented by the Ministry of Environment is the development of environmental preservation initiatives through the Adiwiyata program. The Adiwiyata program is an environmentally conscious and cultured school initiative aimed at fostering responsible school communities through good school governance in support of sustainable development [14], [15], [16]. Cultivating habits and awareness of environmental care can be achieved through environmental education [17]. The main motivation behind the Adiwiyata program is to serve as a preventive effort against environmental degradation, beginning at the school level. The government has gradually implemented the program across various levels, including district, provincial, national, and independent Adiwiyata schools. The success of the Adiwiyata program largely depends on the active participation of students. Student involvement in Adiwiyata activities includes complying with all school environmental regulations such as maintaining a smoke-free environment, properly sorting waste into organic and inorganic categories, keeping the school clean, engaging in greening activities, and bringing reusable water bottles and food containers to reduce plastic waste [18]. Schools play a crucial role in instilling environmental awareness as part of character education that must be nurtured from an early age. Continuous habituation is necessary so that values of environmental care become an integral part of children's culture from an early stage. Considering the current condition in which many children exhibit a decline in social and environmental concern, fostering environmental awareness deserves serious attention from the education sector [19]. In line with this, environmental education serves as a medium for character formation, particularly in shaping attitudes and behaviors that reflect love and respect for nature [20]. The integration of environmental education into school programs is expected to create a continuous process of habituation that cultivates students' behaviors and attitudes toward appreciating, loving, and preserving the environment [21].

In an effort to contribute to national education and foster noble character and moral values, there are 81 secondary schools in Boyolali Regency, consisting of public and private senior high schools (SMA), Islamic senior high schools (MA), and vocational high schools (SMK). Each of these schools has its own flagship programs that serve as sources of pride, one of which is the Adiwiyata school program. Adiwiyata schools are expected to demonstrate better environmental management compared to schools without the program. However, it is still common to find schools that have received the Adiwiyata designation but have yet to fully internalize a culture of environmental awareness. Plastic waste is still easily found, vegetation intended to green the school area remains limited and poorly organized, indicating that the environmental attitudes of school members have not yet reflected the true spirit of an Adiwiyata school.

In order to identify students' environmental awareness in both Adiwiyata and non-Adiwiyata schools, an initial observation was conducted as a preliminary study to examine students' behavior in implementing the Adiwiyata school program. The results of the initial observation indicated that some students were already aware of the importance of maintaining their surrounding environment, while others still showed a lack of concern for cleanliness. This was evident from the condition of the classrooms, surrounding areas, and waste bins at the schools. The presence of plastic waste was primarily generated by

students who had not yet fully understood the essence of the Adiwiyata program.

This study was conducted to determine the extent to which there are differences in environmental awareness attitudes between students in Adiwiyata and non-Adiwiyata high schools in Boyolali Regency. To date, there has been limited research specifically examining the effectiveness of the Adiwiyata program in shaping students' environmental awareness, making its contribution to ecological behavior change not yet clearly measurable. The main issue addressed in this study is whether a school's Adiwiyata status truly has a significant influence on improving students' environmental awareness compared to schools that have not implemented the program. The novelty of this research lies in its comparative analysis, which highlights the impact of Adiwiyata program implementation on various dimensions of environmental awareness, such as cleanliness, energy conservation, and waste management. The findings of this study are expected to serve as a foundation for developing more effective and sustainable environmental education strategies across different types of schools.

RESEARCH METHODS

This study employed a quantitative causal-comparative design (ex post facto) aimed at identifying differences in students' environmental care attitudes between Adiwiyata and non-Adiwiyata senior high schools in Boyolali Regency, Indonesia. The ex post facto approach was chosen because the data were collected after the events under investigation had occurred, focusing on the variation in environmental care attitudes among students.

The population comprised all students from Adiwiyata and non-Adiwiyata senior high schools in Boyolali. The sample consisted of SMA Negeri 1 Ampel (representing Adiwiyata schools) and SMA Negeri 1 Cepogo (representing non-Adiwiyata schools). The participants were Grade X students, selected purposively based on the consideration that they receive geography and biology lessons containing environmental topics.

The variable of environmental care attitude was measured through several dimensions, including maintaining school cleanliness and environmental sustainability, managing waste disposal, separating organic and inorganic waste, practicing composting, providing adequate cleaning equipment, and participating in environmental awareness programs.

Data were collected through questionnaires, observations, interviews, and documentation. Data analysis employed inferential statistics using a comparative analysis model to determine differences between the two groups. The Independent Sample t-test was used when the data met the assumptions of parametric statistics; otherwise, the Mann–Whitney U test was applied as a non-parametric alternative.

RESULT AND DISCUSSION

This study was conducted to compare environmental awareness attitudes between Adiwiyata and non-Adiwiyata schools. The research subjects were senior high school students who had received environmental education materials in Biology (Grade X) and Geography (Grade XI). The participants were drawn from Adiwiyata and non-Adiwiyata schools, namely SMA Negeri 1 Ampel (as the Adiwiyata school) and SMA Negeri 1 Cepogo (as the non-Adiwiyata school). The sample consisted of 267 respondents from all grade levels at SMA Negeri 1 Ampel and 228 respondents from all grade levels at SMA Negeri 1 Cepogo. The measurement instrument used was a questionnaire comprising 60 items related to environmental awareness attitudes and 40 items regarding the Adiwiyata school program, utilizing a five-point Likert scale (1–5). The indicators assessed included habits of maintaining classroom and school cleanliness, awareness of waste management, and participation in environmental conservation activities.

The instrument validity test was conducted to determine the level of validity for each questionnaire item. The researcher employed the product-moment correlation test to assess the validity of each statement item. The results of the validity test for the environmental awareness and Adiwiyata school questionnaires are presented in Table 8. According to the product-moment correlation criteria, an item is considered valid if the correlation coefficient (r) is greater than 0.30. Based on the results, the percentage criteria for item validity were obtained as follows.

Table 1. Percentage of Questionnaire Validity

Criteria	Question Items	Number of items	Percentage (%)
Valid	1 – 77	77	97
Invalid	78 & 79	2	3
Total		79	100

The table indicates that 97% of the questionnaire items were proven valid and therefore suitable for use in the study. Meanwhile, the reliability test was conducted to determine whether the questionnaire items were reliable and appropriate for further analysis. The reliability test was performed using Cronbach's Alpha with the aid of Microsoft Excel. The instrument reliability test, conducted on 200 respondents using the Cronbach's Alpha method, yielded a coefficient value of 0.979. With an Alpha value of 0.979, the instrument was determined to have a very high level of reliability and was deemed appropriate for further research use. In this study, in addition to conducting validity and reliability tests on the instrument, the researcher also performed prerequisite tests and hypothesis testing on the collected data.

The prerequisite test is a preliminary test step as a prerequisite for parametric or non-parametric statistics and is used to test whether the data distribution is normal or not. Based on research to

determine whether or not there are differences in the environmental care attitudes of students in Adiwiyata and non-Adiwiyata schools, the normality of the data distribution of the two schools must first be ensured using a normality test. After knowing the normality distribution of data from the two schools, a homogeneity test can then be carried out. The normality test is carried out before comparing the average data of Adiwiyata and Non-Adiwiyata schools regarding environmental care attitudes, a normality test is carried out to determine whether the data distribution from the two groups is normal or not. The normality test for Adiwiyata school data uses the Kolmogorov-Smirnov test with the interpretation that if the p-value ≥ 0.05 then the data is considered normal. Based on the normality test for data at SMA Negeri 1 Ampel, it shows a p-value <0.05, namely 0.000281, so H_0 is rejected with the conclusion that the data is not normally distributed. The normality test for non-Adiwiyata schools uses the Shapiro-Wilk statistical test method with the interpretation that if the p-value ≥ 0.05 then the data is normally distributed. Based on the normality test for SMA Negeri 1 Cepogo data, the p-value < 0.05 is 0.0000099, so H_0 is rejected with the conclusion that the data is not normally distributed.

The homogeneity test was conducted after determining the normality distribution of data from both Adiwiyata and non-Adiwiyata schools. Levene's test was used to assess the homogeneity of variances between the two groups of data from each school. According to the Levene test criteria, the data variances are considered homogeneous if the p-value > 0.005, and non-homogeneous if the p-value ≤ 0.005. The results of the homogeneity test indicated that, with a significance level of α = 0.05 and a p-value of 0.0598 > 0.05, there was no significant difference in variance between the groups from SMA Negeri 1 Ampel and SMA Negeri 1 Cepogo. In other words, the data exhibited homogeneous variance, meaning the assumption of homogeneity was fulfilled.

The hypothesis testing in this study employed the Mann–Whitney U test, as the normality test results indicated that the data were not normally distributed. The Mann–Whitney U test, a non-parametric statistical method, was therefore used to analyze the difference in environmental awareness attitude scores between students of SMA Negeri 1 Ampel (as an Adiwiyata school) and SMA Negeri 1 Cepogo (as a non-Adiwiyata school). The results of the Mann–Whitney U test analysis are presented in the following table.

Table 2. Results of Mann Whitney U Test Calculation

Description	Value
Number of Samples at SMAN 1 Ampel (n_1)	150
Number of Samples at SMAN 1 Cepogo (n_2)	151
Total Ranks at SMAN 1 Ampel (R1)	25718.5
Total Ranks at SMAN 1 Cepogo (R2)	19732.5
U1 Value	8256.5
U2 Value	14393.5
Smallest U Value (U)	8256.5
Mean U (μ)	11325.0
Standard Deviation of U (σ)	755.0
Z-Score	-4.06
Decision	Reject H0

Based on the results presented in the calculation table, it can be interpreted that the smallest U value is 8256.5, and the Z value is -4.06. The Z value lies far beyond the critical range of ±1.96 (for α = 0.05). Since |Z| > 1.96, the null hypothesis (H_0) is rejected. Based on the findings from the Mann–Whitney U test, it can be concluded that there is a statistically significant difference in environmental awareness attitude scores between students of SMA Negeri 1 Ampel, an Adiwiyata school, and SMA Negeri 1 Cepogo, a non-Adiwiyata school. Based on previous relevant studies, there are varying perspectives regarding environmental awareness attitudes and their relationship with the Adiwiyata school program. Environmental awareness is influenced by the extent of students' own environmental knowledge. As environmental knowledge increases, environmentally conscious behavior tends to develop, thereby contributing to reducing the potential for environmental damage in the future [22], [23]. In this study, students' environmental awareness was measured using a questionnaire consisting of statement items divided into three indicators such as habits of maintaining classroom and school cleanliness, concern for waste management, and participation in environmental conservation activities. The following table presents the environmental awareness attitudes of students from Adiwiyata and non-Adiwiyata schools in Boyolali Regency.

Table 3. Average Score of Students' Environmental Awareness Attitudes

Indicators	Adiwiyata School		Non-Adiwiyata School	
	Percentage (%)	Category	Percentage (%)	Category
Habit of maintaining classroom and school cleanliness	3.36	Good Enough	3.19	Good Enough
Concern for waste management	3.31	Good Enough	3.23	Good Enough

Indicators	Adiwiyata School		Non-Adiwiyata School	
	Percentage (%)	Category	Percentage (%)	Category
Participation in environmental conservation	3.26	Good Enough	3.20	Good Enough
Average	3.31		3.22	

The results of the environmental care attitude questionnaire in Adiwiyata schools averaged 3.31, meeting the fairly good standard, while in non-Adiwiyata schools the average score was 3.22, slightly lower than Adiwiyata schools but also meeting the fairly good standard. In line with this, the embedded environmental values have significant benefits in shaping students' character and creating a positive learning environment [24]. In addition to the average score results from the environmental care attitude questionnaire, information can be presented in the form of a comparison table of students' environmental care attitude scores as follows.

Table 4. Comparison of Environmental Attitude Scores

Statistics	Adiwiyata School	Non-Adiwiyata School
Number of statements	79	79
Number of respondents	150	151
Maximum score	316	316
Minimum score	225	225
Mean	260.97	260.97
Median	254	225
Mode	237	237
Standard deviation	22.18	22.25

Based on the above data, in Adiwiyata schools obtained a maximum score of 316, a minimum score of 225 from 150 respondents, while in non-Adiwiyata schools obtained a maximum score of 316, a minimum score of 225 from 151 respondents. The highest score of students' environmental care attitudes was found in the indicator of the habit of maintaining classroom and school cleanliness, namely 3.36 for SMA Negeri 1 Ampel as an Adiwiyata school, while in non-Adiwiyata schools based on the same questionnaire obtained the lowest score compared to other environmental care attitude indicators, namely 3.19. Those who have a high level of environmental knowledge influence environmental care attitudes and behaviors that will also improve. One effort to increase environmental care knowledge and attitudes is through environmental education. In line with this, the Adiwiyata program has proven effective in increasing school community understanding of the environment, while simultaneously encouraging changes in attitudes and behaviors toward more environmentally friendly behaviors. The program's effectiveness is further enhanced by the active involvement of the entire school community, as this participation contributes to increased environmental awareness within the school community [25]. The importance of environmental literacy and the environmental awareness that students need as members of society is key to addressing various global environmental issues. The implementation of environmental education in schools can be seen in students' levels of environmental literacy and environmental awareness [26].

The gap in achievement scores on these indicators in Adiwiyata and non-Adiwiyata schools is caused by the fact that in Adiwiyata schools environmental education is the focus of attention so that it is integrated into every activity at school, whereas in non-Adiwiyata schools environmental education is not the focus of the program and is only found in certain subjects so that the intensity of environmental education acquisition is different between Adiwiyata and non-Adiwiyata schools.

he lowest average score in Adiwiyata schools is found in the indicator of participation in environmental preservation. This may occur because the understanding of the sense of ownership of the school environment is still lacking so that the environment is not directly related to themselves they feel they have no responsibility to maintain it. In non-Adiwiyata schools, the highest average score is found in the indicator of concern for waste management. This is influenced by the role of craft and entrepreneurship subjects which are quite concerned with utilizing waste to be processed into more useful objects. Meanwhile, the lowest score is on the indicator of habituation to maintaining classroom and school cleanliness. This shows that the Adiwiyata program in schools is able to foster an attitude of caring for the environment. In line with that, the attitude of caring for the environment developed through the Adiwiyata school program shows that the program of loving environmental cleanliness has a higher

effectiveness. When teachers consistently instill values of caring for the environment and provide examples through real actions, students tend to imitate and apply these environmental care behaviors in their daily lives [27]. The Adiwiyata program has a positive effect on environmental care attitudes, this is seen from the increase in students' environmental care attitudes [28]. Most individuals in Adiwiyata schools have a spirit of love and concern for the environment, because the school has implemented an environmentally aware organizational culture and instilled ecological values in various school activities [29]. Students' environmental knowledge, attitudes, and behaviors each influence their level of environmental awareness. Overall, environmental attitudes have been shown to be a significant contributing factor to environmental awareness in Adiwiyata-awarded schools [30].

CONCLUSION

The results of the data analysis indicate that students' environmental care attitudes in both Adiwiyata and non-Adiwiyata schools fall within the "fairly good" category. At SMA Negeri 1 Ampel (Adiwiyata school), the mean score for environmental care attitude was 3.31, while the mean score for understanding of the Adiwiyata school concept was 3.26. Similarly, at SMA Negeri 1 Cepogo (non-Adiwiyata school), the mean score for environmental care attitude was 3.22, and the mean score for understanding of the Adiwiyata concept was 3.14, both categorized as fairly good. A comparative analysis using the Mann–Whitney U test revealed a statistically significant difference in environmental care attitudes between students in Adiwiyata and non-Adiwiyata schools, with a test value of $Z = -4.06$, exceeding the critical value of ± 1.96 ($\alpha = 0.05$). This finding indicates that students from Adiwiyata schools demonstrate a significantly higher level of environmental care attitude compared to those from non-Adiwiyata schools.

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