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The Impact of Environmental Education on Students' At-titudes Towards Climate Change at state Senior High School 1 Gondang Sragen

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Abstract

Purpose: This study investigates how environmental education influences students' behavior in responding to climate change at State Senior High School 1 Gondang. By examining this relationship, the research seeks to demonstrate the strategic role that integrated environmental education can play in fostering adaptive attitudes and actions among adolescents facing increasingly frequent flooding disasters in Indonesia.
Methodology: Employing a quantitative design, the study surveyed 289 students selected via stratified random sampling to ensure representation across grade levels. Data collection combined structured questionnaires—measuring both exposure to environmental education and self-reported climate-response behaviors—with school documentation on program implementation. Analyses comprised descriptive statistics to categorize variable levels and a Pearson product–moment correlation test to assess the strength and significance of the relationship between environmental education and climate-responsive behavior.
Results: The descriptive analysis placed the environmental education variable in the moderate category (46%) and the climate-response behavior variable in the sufficient category (34%). The correlation test yielded a significance value of 0.00 ($p < 0.05$) and a correlation coefficient of 0.527, reflecting a moderately strong positive relationship. These findings confirm that higher levels of environmental education are associated with more proactive student attitudes toward climate change.
Applications/Originality/Value: By providing empirical evidence of the positive impact of environmental education on students' climate-responsive behaviors, this study underscores the importance of curriculum designers and school administrators embedding targeted environmental modules into secondary education. The results offer a practical framework for schools seeking to enhance resilience education and inform policymakers on the value of scaling up environmental programs to mitigate the human and economic costs of climate-induced disasters.

Introduction

The Earth is a complex form of life, and over time, life on Earth will change as a response to human activities, with humans becoming the central component in it. One of the changes that has already occurred and is increasingly felt is climate change. Indicators of climate change include the rise in Earth's temperature, accompanied by a rise in ocean temperatures, the large-scale melting of ice at the Earth's poles, and the occurrence of extreme weather (Nugraheni, 2024).

According to a report from the Intergovernmental Panel on Climate Change (IPCC), it is explained that the Earth's temperature from 2011 to 2020 has increased by 1.1°C compared to the period from 1850 to 1900 (IPCC, 2023). This temperature rise is the largest in the past 2,000 years. The IPCC states that the primary cause of global warming is human activities that produce greenhouse gas emissions. Greenhouse gas emissions (GHG emissions) on a global scale continued to increase from 2010 to 2019 (IPCC, 2023). This increase is a lasting impact resulting from the use of unsustainable energy, changes in land use, and massive land use conversions. The IPCC emphasizes that this climate change is causing increasingly widespread negative impacts on various aspects such as food security, water availability, public health, the economy, and biodiversity. If these conditions are not addressed immediately, the IPCC predicts that by 2030, the temperature increase will exceed 1.5°C, making it difficult to limit global warming to below 2°C (IPCC, 2023).

The essence of environmental education, according to Zuhriyah (2021), is that environmental education is a crucial component for enhancing students' knowledge and competence in how to behave towards the environment. The development of learning outside the classroom can also determine the success of environmental education. Learning with nature will support the improvement of students' behavior changes. The character developed in this concept is environmental care character education and its implementation in schools. The outcome achieved is that environmental education reflects human behavior towards the environment in the form of actions in daily life, such as preventing environmental degradation and repairing environmental damage, and it can be implemented in schools through integration into subject lessons (Miftah & Syamsurijal, 2023).

Environmental education is a tool to enhance and develop behaviors or attitudes, values, and knowledge, as well as to build skills for carrying out positive actions. Environmental education will encourage the sustainability of interactions between humans and nature over time (Al-Washliyah & Al-Washliyah, 2019). Environmental education is viewed as the foundation of the educational process and a new lifestyle that can be developed according to the surrounding environment, while also being able to adapt to various social, economic, cultural structures, and local environmental conditions (Sukma et al., 2020).

In Sragen Regency, the impact of climate change has caused extreme weather and heavy rainfall. This has led to an increase in flood disasters in several areas of Sragen Regency (Nuriasari et al., 2013). These flood disasters are caused by human activities such as dumping waste into rivers, the construction of settlements in riverbank areas, and improper land use (Andriani et al., 2017). One of the impacts of these floods is the overflowing of the Garuda River, which causes residents' homes to be submerged in water, reaching a height of 50-100 cm. Flood disasters also lead to environmental problems, such as river pollution, poor air quality, and the emergence of diseases. These issues can lead to an increase in public awareness of environmental sustainability. One of the efforts to improve this is through education (Priyananda, 2019).

The challenges of environmental education are cultural challenges in today's era. In this digital age, the way we learn, interact, and receive information is changing. The challenge lies in ensuring that the information provided is consistent, accurate, and aligned with its objectives. To address this, collaboration with the government, educational institutions, and other organizations is necessary to help solve these issues. Providing appropriate strategies and methods to engage students is essential, so that they actively participate (Aisa et al., 2024). Students are the key actors in driving change, and education plays a crucial role in raising environmental awareness. This can change the way people perceive, act, and feel responsible for their surrounding environment (Nugraheni, 2024).

One of the subjects used to integrate environmental education in schools is geography education. Geography education is a subject aimed at solving problems related to human life and the environment. The goal of geography education is to raise awareness about the importance of the environment for life (Sugandi, 2015). Additionally, geography education related to the environment also aims to develop students' understanding of knowledge and skills, as well as to foster attitudes of awareness and concern for the environment (Hariyadi et al., 2021). One school that has already implemented environmental education is SMA Negeri 1 Gondang, through the "Clean Friday" program. Examples of its implementation include cleaning up waste around the school environment, sorting and recycling waste, and reprocessing or recycling waste into useful products. These examples include disaster mitigation education related to preparedness (AO Syahputra, 2023). The knowledge and experience regarding disaster risk management provided through environmental education hold great value and are essential to be taught to students (Fitriana, 2021).

Method

Sragen Regency is an area that frequently experiences flooding due to the overflow of the Bengawan Solo River almost every year. Flood disas-ters occur due to heavy rainfall and the topography being lower than the outlet of the Bengawan Solo River. Floods in Sragen Regency cause dam-age to infrastructure and result in many casualties, both in terms of lives and property. One of the affected subdistricts is Gondang Subdistrict. This research was conducted at SMA Negeri 1 Gondang, Sragen. SMA Negeri 1 Gondang is located in an area with characteristics that make it prone to flooding, such as flat slope (topography), dense drainage systems, residen-tial land use, and high rainfall intensity. The location of the research can be seen on the administrative map presented in Figure 1.

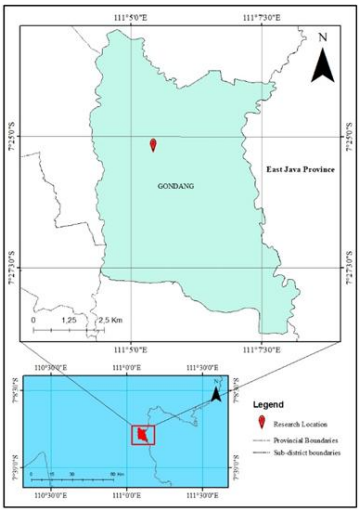

Figure 1. Research location.

The type of research conducted by the researcher is quantitative re-search using a correlational design, which correlates environmental edu-cation variables with climate change behaviour. The population in this study consists of all students of SMA Negeri 1 Gondang. The sample tak-en in this study was 289 respondents, including students from grades X to XII, using the method of dividing the population into strata and ran-domly selecting from each stratum, or the stratified random sampling technique. The instrument used was a test questionnaire in the form of a Rating Scale, where respondents could select one of the provided an-swers on the questionnaire. The data collection techniques in this study were questionnaires and documentation. The questionnaire is presented in Table 1.

Tabel 1. Environmental education variable.

No	Variable	Indicator
1	*Environmental education*	1. Interest in environmental issues 2. Concern for the environment 3. Responsibility to protect the environment 4. Intention to overcome environmental problems

Source: A Ch. Hadjichambis, 2020.

Tabel 2. Climate change variable.

No	Variable	Indicator
2	Climate Change	**1.** Adapt to climate change **2.** Mitigation of climate change

Source: Wiratama, 2016

The method of data employed in this research is descriptive statistics, with categorization using the mean and standard deviation. This tech-nique is used to answer research questions 1 and 2. The data analysis technique to answer research question number 3 is the Pearson product-moment correlation analysis, which aims to find the correlation coeffi-cient denoted by the symbol r. The largest value of r is +1, and the small-est value of r is -1. If r = +1, it indicates a perfect positive correlation, while r = -1 indicates a negative correlation (Asiva Noor Rachmayani, 2015).

Results and Discussion

Environmental education

Environmental education is an educational program aimed at foster-ing students' awareness, attitudes, and responsibilities towards the en-vironment. Environmental education is expected to change thinking patterns, behaviors, and knowledge about the state of the environment. It is crucial to apply environmental education within teaching methods so that environmental issues can be addressed wisely, as well as to en-hance knowledge, awareness, and a positive attitude towards the envi-ronment (Nugroho, 2022). The results of the categories are presented in Table 3 and Figure 2.

Table 3. Environmental education variables.

Criteria	Intervals	Frequency	Presentation
Low	< 32	215	74%
Currently	32-49	72	25%
Tall	>49	2	1%
	Total	289	100%

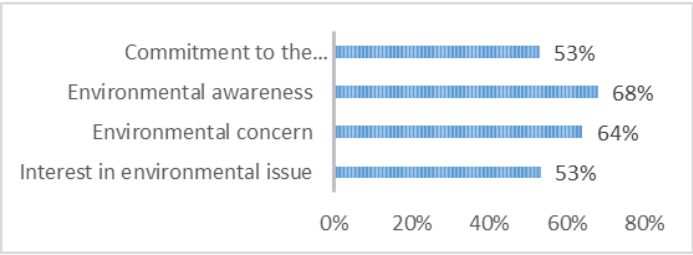

Figure 2. Environmental education level.

Based on the results in Figure 2, the environmental education varia-ble has four indicators: commitment to the environment, environmental awareness, environmental concern, and interest in environmental is-sues. For indicator (1) Commitment to the environment, the average score is 53%, falling into the high category; (2) Environmental aware-ness has an average score of 68%, also in the high category; (3) Envi-ronmental concern has an average score of 64%, placing it in the high category; and (4) Interest in environmental issues has an average per-centage score of 53%, also in the high category.

Environmental education is a tool to enhance and develop behav-iors or attitudes, values, and knowledge, as well as to build skills for taking positive actions. Environmental education is the best way to ap-ply sustainable principles to the environment (Sari, 2023). The pres-ence of environmental education is expected to instill in the younger generation the importance of protecting the environment (Armini, 2024). In the research by Supadmini (2020), it is explained that envi-ronmental education has become something urgent to implement in schools, especially in elementary schools. This is due to the worsening environmental damage every day, and the survival of life is highly de-pendent on the condition of the environment. Based on the research, it shows that environmental education at SMA Negeri 1 Gondang has been well integrated. This has had a positive impact on protecting the environment from extreme climate change.

Climate Change Behavior

Climate change is a phenomenon of weather changes, such as extreme rainfall, prolonged droughts, and unpredictable temperatures. Climate change can erode the capacity of the environment, leading to a continuous decline, which in turn threatens the sustainability of development (Education, 2022). Therefore, adaptation and mitigation of climate change are necessary. Research findings on the variable of climate change behavior fall into the "moderate" category, with an average of 34% based on the responses of 289 students from Senior High School 1 Gondang. The results of this category are presented in Table 4 and Figure 3.

Table 4. Climate change behavioral variables.

Criteria	Intervals	Frequency	Presentation
Not Good	< 32	285	99%
Enough	32-46	4	1%
Good	>46	0	0%
	Total	289	100%

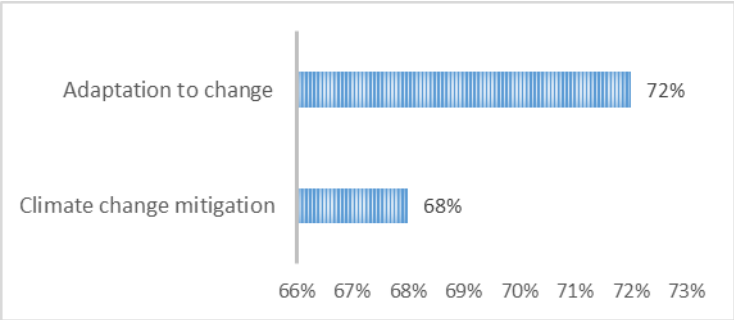

Figure 3. Climate change behavior level.

Based on the results in Figure 3, the climate change behavior variable has two indicators: the climate change mitigation indicator and the cli-mate change adaptation indicator. In indicator (1) Climate Change Miti-gation, the average score is 72%, which falls into the "good" category, and in indicator (2) Climate Change Adaptation, the average score is 68%, also placing it in the "good" category.

Climate change refers to changes in temperature, rainfall, humidity, and evaporation, and is a direct result of global warming (SA Susilawati, 2017). This calls for actions in climate change adaptation and mitigation. Adaptation actions are efforts to cope with climate change, thereby re-ducing its negative impacts, such as utilizing schoolyards to create health gardens. Meanwhile, climate change mitigation involves efforts to reduce environmental risks, such as recycling waste to facilitate waste manage-ment in the next stages. If climate change adaptation and mitigation are carried out properly, they can help reduce the impacts and risks of cli-mate change.

In the study by Susilawati (2021), it is explained that climate change can affect life, especially human health. It impacts human health directly through exposure to changing weather patterns (temperature, rainfall, in-creased frequency of extreme weather events). Extreme weather events can threaten human health, even leading to death. Climate change also leads to disasters and has negative consequences for future life. Based on the research on climate change behavior at Senior

High School 1 Gondang, the results show that the adaptation and mitigation behaviors towards climate change have been well integrated. As a result, students' understanding of preparedness, knowledge, and experience regarding disasters has improved.

The Influence of Environmental Education on Climate Change Behavior

Based on the results of the research, this study consists of two varia-bles: the environmental education variable and the climate change be-havior variable. These variables are used to determine the influence be-tween the two variables using inferential statistics. Prior to conducting inferential statistical tests, normality testing, homogeneity testing, and product moment correlation testing were performed. A description of the inferential statistical data results is presented in Table 3.

Table 5. Normality Test Results Using One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		289
Normal Parameters[a,b]	Mean	0E-7
	Std. Deviation	6.01925997
Most Extreme Differences	Absolute	.072
	Positive	.072
	Negative	-.049
Kolmogorov-Smirnov Z		1.226
Asymp. Sig. (2-tailed)		.099

a. Test distribution is Normal.

b. Calculated from data.

Based on Table 5, the results of testing the two research variables in-dicate that the environmental education variable and the climate change behavior variable are normally distributed, as both have a significance value greater than 0.05, which is 0.99. This shows that the data on envi-ronmental education and behavior in response to climate change are normally distributed.

The importance of environmental awareness is crucial and needs to be instilled in students through environmental education. It is hoped that, through environmental education, students will develop a sense of love and care for the environment, leading to an increase in knowledge and understanding of the importance of protecting the environment. This, in turn, affects individual behavior in responding to climate change, which has resulted in an increase in natural disasters. Strategies for dealing with climate change can be developed in schools so that students will receive guidance and experience change in a systematic and planned manner. The key to addressing climate change today is adaptation. Adaptation is a planned approach to coping with climate change(M.Intan Sari, 2021).

Next, the homogeneity test in this study was conducted with the help of computer software, specifically SPSS Statistics, as a prerequisite for the independent sample t-test and Anova analysis. The criterion for the test is that if the p-value is greater than 0.05, the data are considered ho-mogeneous (Pokhrel, 2024). The results of the homogeneity test can be seen in Table 6.

Table 6. Homogeneity test result.

Levene Statistic	df1	df2	Sig.
.062	1	287	.804

Based on Table 4, the homogeneity test for both variables shows that they are homogeneous, meaning they have a significant value greater than 0.05, which is 0.804. This significance value indicates homogeneity, allowing for the next step, which is the correlation test. The correlation test data is presented in Table 7.

Tabel 7. Correlation Test Results

		Environmental Education	Climate Change
Environmental Education	Pearson Correlation	1	.527**
	Sig. (2-tailed)		.000
	N	289	289
Climate change	Pearson Correlation	.527**	1
	Sig. (2-tailed)	.000	
	N	289	289

**. Correlation is significant at the 0.01 level (2-tailed).

Based on Table 5, it can be stated that environmental education has an influence or relationship with climate change behavior. This is indi-cated by the significance value greater than 0.05, which is 0.527. The re-sults of this study show that environmental education is related to stu-dents' attitudes in facing climate change, aiming to develop students' un-derstanding, knowledge, skills, and foster awareness and concern for the environment.

Environmental education is a strategic step in reducing disaster risks. It is essential for preventing climate change as part of adaptation and mitigation efforts. Environmental education provides knowledge and ed-ucation based on environmental issues regarding climate change, in line with the concept of sustainable living. The research indicates that cli-mate change can have harmful effects on humans, such as natural disas-ters. One of the most frequent disasters in Indonesia is flooding, which poses significant risks, potentially leading to material losses or loss of life. Disaster prevention and preparedness must be improved, one of which can be achieved through environmental education.

Environmental education aims to enhance knowledge and awareness in adapting to climate change. The education should be delivered in local languages or through teaching methods that are easy for students to un-derstand. This education is intended to anticipate disasters, both before and after they occur, through disaster adaptation and mitigation strate-gies to minimize casualties during such events.

Conclusion

Based on the results and discussion of the research, the correlation analysis shows that the environmental education variable on the indicators: (1) Commitment to the environment scored an average of 53%, which falls into the high category; (2) Environmental awareness scored an average of 68%, also in the high category; (3) Environmental care scored an average of 64%, which is categorized as high; and (4) Interest in environmental issues scored an average of 53%, again in the high category. Meanwhile, the climate change behavior variable on the indicators: (1) Climate change mitigation scored an average of 72%, categorized as good; and (2) Climate change adaptation scored an average of 68%, categorized as good. There is an influence of environmental education on students' attitudes toward climate change in SMA N 1 Gondang, as shown by a significant value of <0.05 and a Pearson correlation of 0.527, which indicates a positive relationship. This condition suggests that environmental education is related to students' attitudes in addressing climate change, helping to develop their understanding, skills, and fostering awareness and concern for the environment.

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