The effectiveness of the Adiwiyata program in enhancing environmental problem-solving skills

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Abstract

This research examined the effectiveness of the Adiwiyata Program in fostering an environmentally conscious school culture in Magelang. The study utilized quantitative research employing survey techniques. It was con-ducted in twelve primary schools in the Magelang District, involving 316 participants, including school principals/vice principals, Adiwiyata coordinators, administrative staff, and students. Data collection was carried out through questionnaires and observations. The research findings indicated that overall, the implementation of the Adiwiyata Program falls under the effective category. This suggests that, in general, all four Adiwiyata components were effective. However, the environmentally aware school policy only accounted for an 11% influence, while the environmentally friendly school culture held a 20% influence on environmental problem-solving skills. This was due to various factors, including the school policy related to vision and mission not being adequately socialized and understood by the entire school community, and the lack of habitual attitudes and behaviors regarding environmental concerns within the school culture. In connection with this, Adiwiyata schools in the Magelang District need to intensify the dissemination and publication of environmental vision policies to the entire school community. Additionally, they should consistently foster environmental consciousness within the school and engage in environmental competitions.

Keywords

Adiwiyata program, Problem-solving skills, School culture

Introduction

The development of population growth rates and living standards has increased the demand for natural resources, which are interrelated [1][2]. This interconnection, if unbalanced, can result in various disasters due to excessive human activities that are not in line with religious values, lifestyles, and cultures [3-5]. In response to this, sustainable education is seen as a solution to address the environmental crisis [6-9]. This sustainable education aims to change the education system to be more balanced. This change affects the curriculum, learning outcomes, and school infrastructure through

environmental-friendly school certifications. This certification system helps facilitate change [10][11], including curriculum adjustments and lifestyle changes to encourage pro-environmental behavior [12].

Sustainable education becomes the key to promoting values, attitudes, and behaviors that support sustainability among the general public, including children and adolescents [13][14] that can be implemented through eco-schools' programs. Eco-schools encourage active participation of young people in environmental conservation. The goals of eco-schools include enhancing biodiversity at schools, [10][11] reducing waste through recycling, conserving energy, strengthening environmental concern attitudes, decision-making skills, environmental preservation, and motivating innovation [15-17].

Studies note that about 50 countries have implemented eco-schools with varying approaches to building problem-solving skills. Research on eco-schools' programs in various countries highlights nine main topics, including energy, water, biodiversity, healthy lifestyles in schools, transportation, waste, global citizenship, environmental aspects (problem-solving skills), environmental pedagogy, ESD approach, energy conservation, resource management, and student involvement in sustainable projects contributing to environmental awareness in society.

Eco-schools' programs in various countries integrate ecological environmental aspects to create sustainable school environments, focusing on nature conservation, energy, and resources, as well as recycling principles. Additionally, the educational aspect aims to create a stimulating learning environment, making schools a resource for environmental education and connected with environmental institutions in that country [18][19].

The implementation of eco-schools in various countries such as the UK, China, and the United States has proven to enhance sustainable development when supported by the government [20][21]. In Indonesia, the implementation of environmental education through eco-schools aims to increase awareness and concern for the environment both in formal and non-formal education [22][23].

Environmental education aims to enhance responsible environmental behavior to equip students with problem-solving skills (UNESCO, 2013). This aligns with the commitment of Agenda 21 to achieve sustainable development (Education for Sustainable Development). In this context, it is important for teachers to develop problem-solving skills in students because of their role in protecting the environment [24]. Research indicates that eco-schools' programs with environmentally friendly policies, environmentally based curricula, active participation in the environment, and environmentally friendly facility management effectively enhance problem-solving skills [25]. Furthermore, the development of eco-schools can increase student awareness through parental support, better collaboration, and increased knowledge and attitudes of students towards the environment [2].

Eco-schools' programs have widespread impacts, both in cognitive, affective, and psychomotor aspects. It allows students to understand environmental education aspects, exhibit attitudes and behaviors supporting environmental concern culture, and develop student skills, creativity, and productivity [26].

Global studies show that eco-schools' programs are effective in improving students' knowledge, attitudes, and concern for the environment. However, there are also studies stating that these programs are less effective in achieving their goals. This is understandable because each school and region has different characteristics, strengths, and weaknesses [27].

Education for sustainable development needs to be embedded in the education curriculum at all levels, starting early, because teachers play a key role in developing positive attitudes of students towards the environment [28]. Ecological knowledge, attention, and positive attitudes of teachers towards the environment influence students' environmental awareness levels [29][30].

Despite teachers having a positive attitude towards the environment, many of them have limited knowledge about ecological issues. This emphasizes the importance of evaluating teachers' ecological literacy to make changes in the education curriculum. Studies on environmental problem-solving skills of teachers highlight misunderstandings about ecological issues such as the greenhouse effect, acid rain, and ozone layer depletion. Continuous evaluation and changes in teachers' ecological literacy are required to ensure the success of eco-schools' programs.

Research Purpose

In this research, the aim/objective are: (1) Understanding the effectiveness of implementing an environment-based curriculum in building environmental problem-solving skills among elementary school students in Magelang; (2) Understanding the effectiveness of building an environmentally friendly school culture in developing environmental problem-solving skills among elementary school students in Magelang; (3) Understanding the effectiveness of managing environmentally friendly facilities and infrastructure in developing environmental problem-solving skills among elementary school students in Magelang; (4) Understanding the effectiveness of environmentally conscious school policies in developing environmental problem-solving skills among elementary school students in Magelang; (5) Understanding the simultaneous effectiveness of the four Adiwiyata programs in developing environmental problem-solving skills among elementary school students in Magelang.

Method

Every research has a philosophical paradigm that serves as the foundation for conducting the research. This study employs a quantitative research paradigm. According to [31]. quantitative research is based on the philosophy of post-positivism,

which holds that a phenomenon can be categorized, observed, measured, follows cause and effect, is relatively constant, and is value-free. The technique utilized in this research is explanatory survey, aimed at explaining causal relationships and hypothesis testing. Survey research, as noted by [32], is more appropriately categorized as one of the descriptive research types. The term "survey," is often used to refer to the activity of observation and examination with the intent of gathering information. The research sample is as following Table 1.

Table 1. Respondents based on school origin and respondent status

School Name	Status					Total	%
	Head of School	Coordinator Adiwiyata	Teachers	Administrative Staff	Students		
SDN Borobudur 1	2	1	4	1	41	49	15.51
SDN Jumoyo 2	1	1	4	1	41	48	15.19
SDN Sidomulyo 2	1	1	4	1	11	18	5.70
SDN Salaman 1	1	1	3	1	38	44	13.92
SDN Gunungpring 2	2	1	3	1	21	28	8.86
SDN Tamanagung 4	1	1	3	1	17	23	7.28
SDN Muntilan 3	1	1	3	1	10	16	5.06
SDIT Alam Al Hikmah	1	1	3	1	19	25	7.91
SDN Blondo 3	2	1	4	1	33	41	12.97
SDN Progowati	1	1	4	1	17	24	7.59
Total	**13**	**10**	**35**	**10**	**248**	**316**	**100**

Results and Discussion

The relationship between environmentally conscious school policies (X1) and students' environmental problem-solving skills (Y)

The relationship between environmentally conscious school policies (X_1) and students' environmental problem-solving skills (Y) is demonstrated through a correlation coefficient of 0.333 with a significance of 0.000, as seen in the correlation Table 2. Similarly, the non-parametric Kendall Tau analysis displays a correlation coefficient of 0.333 with a significance of 0.000. With a significance level below 0.05, it indicates a connection between environmentally conscious school policies and students' environmental problem-solving skills.

The test results also reveal the value of 0.333 for the association between environmentally conscious school policies and students' environmental problem-solving skills. This value indicates a moderately strong correlation, falling within the range of coefficients between 0.26 and 0.5. It suggests that higher levels of environmentally conscious school policies correspond to elevated levels of students' environmental problem-solving skills. Therefore, supporting the initial hypothesis that posits a reasonably strong relationship between environmentally conscious school policies and ecological literacy tendencies. The coefficient of determination of 0.333 signifies an influence of 11%. Thus, environmentally conscious school policies contribute to an 11% impact on students' environmental problem-solving skills, while the remaining 89% is influenced by other factors.

Table 2. Analysis of Kendall's Tau Non-Parametric

Correlations			School policy	environmental problem-solving skills
Kendall 's tau_b	School policy	Correlation Coefficient	1.000	.333**
		Sig. (2-tailed)	.	0.000
		N	246	246
	environmental problem-solving skills	Correlation Coefficient	.333**	1.000
		Sig. (2-tailed)	0.000	.
		N	246	246

The relationship between environment-based curriculum implementation (X_2) and students' environmental problem-solving skills (Y)

In the correlation Table 3, a correlation coefficient of 0.779 was obtained with a significance of 0.000. The results of the Kendall Tau Non-Parametric test show a correlation coefficient of 0.779 with a significance of 0.000, indicating a relationship between Environment-Based Curriculum Implementation and students' environmental problem-solving skills because the significance is < 0.05.

The testing results also indicate the value of 0.779 for the relationship between Environment-Based Curriculum Implementation and students' environmental problem-solving skills. This value demonstrates a very strong correlation as the coefficient falls between 0.76 and 1. It suggests that a higher level of Environment-Based Curriculum Implementation corresponds to increased proficiency in students' environmental problem-solving skills. Therefore, supporting the initial hypothesis that posits a very strong relationship between Environment-Based Curriculum Implementation and ecological literacy tendencies.

The coefficient of determination of 0.779 implies an influence of 60%. This signifies that Environment-Based Curriculum Implementation contributes to a 60% impact on students' environmental problem-solving skills, while the remaining 40% is influenced by other factors.

Table 3. Analysis of Kendall's Tau Non-Parametric

Correlations			Environment-Based Curriculum Implementation	environmental problem-solving skills
Kendall 's tau_b	Environment-Based Curriculum Implementation	Correlation Coefficient	1.000	.779**
		Sig. (2-tailed)	.	0.000
		N	213	246
	environmental problem-solving skills	Correlation Coefficient	.779**	1.000
		Sig. (2-tailed)	0.000	.
		N	246	246

The correlation between environmentally friendly school culture (X_3) and students' environmental problem-solving skills (Y)

The correlation coefficient obtained from the correlation Table 4 was 0.451, significant at 0.000. The Kendall Tau Non-Parametric analysis also showed a correlation coefficient of 0.451 with a significance of 0.000. Since the significance is < 0.05, it indicates a

relationship between Environmentally Friendly School Culture and students' environmental problem-solving skills. The coefficient of determination of 0.779 (20%) implies that Environmentally Friendly School Culture influences 20% of the variance in students' problem-solving skills, while 80% is influenced by other factors.

Table 4. Analysis of Kendall's Tau Non-Parametric

	Correlations		Environmentally Friendly School Culture	environmental problem-solving skills
Kendall 's tau_b	Environmentally Friendly School Culture	Correlation Coefficient	1.000	.451**
		Sig. (2-tailed)	.	0.000
		N	246	246
	environmental problem-solving skills	Correlation Coefficient	.451**	1.000
		Sig. (2-tailed)	0.000	.
		N	246	246

The relationship between environmentally friendly facilities management (X_4) and students' environmental problem-solving skills (Y)

The correlation coefficient obtained was 0.641, significant at 0.000 (Table 5). The Kendall Tau Non-Parametric analysis also indicated a correlation coefficient of 0.641 with a significance of 0.000, denoting a strong correlation. The coefficient of determination of 0.641 (41%) suggests that Environmentally Friendly Facilities Management impacts 41% of the variation in students' problem-solving skills, leaving 59% influenced by other factors.

Table 5. Analysis of Kendall's Tau Non-Parametric

	Correlations		Environmentally Friendly Facilities Management	environmental problem-solving skills
Kendall 's tau_b	Environmentally Friendly Facilities Management	Correlation Coefficient	1.000	.641**
		Sig. (2-tailed)	.	0.000
		N	246	246
	environmental problem-solving skills	Correlation Coefficient	.641**	1.000
		Sig. (2-tailed)	0.000	.
		N	246	246

The simultaneous relationship between environmental policy visionary schools, implementation of environment-based curriculum, environmentally friendly school culture, environmentally friendly facilities management, and students' environmental problem-solving skills

A Kendall concordance test was conducted (Table 6). The analysis showed a Kendall's Wa value of 0.908, a Chi-Square of 893.600 with 4 degrees of freedom, and an Asymptotic Significance of 0.000. These results indicate a very strong collective relationship between the independent variables and the dependent variable. The significance level being below 0.05 rejects Ho and accepts H1, suggesting a robust relationship between the Implementation of Environment-based Curriculum,

Environmentally Friendly School Culture, Environmentally Friendly Facilities Management, and students' environmental problem-solving skills.

Table 6. Kendall concordance test

N	246
Kendall's Wa	0.908
Chi-Square	893,600
df	4
Asymp. Sig.	0.000

By conducting a non-parametric statistical test, namely the Kendall concordance test, regarding the variables Environmental Policy Visionary Schools, Implementation of Environment-based Curriculum, Environmentally Friendly School Culture, and Environmentally Friendly Facilities Management with students' environmental problem-solving skills, it was found that the collective relationship among the independent variables and the dependent variable is indicated by a Kendall's Wa value of 0.908.

The significance level of the relationship among the independent variables and the dependent variable is denoted by an Asymptotic Significance (Asymp. Sig) of 0.000. As the Asymp. Sig value is below 0.05, the null hypothesis (Ho) is rejected, and the alternative hypothesis (H1) is accepted. In other words, the relationship between the Implementation of Environment-based Curriculum, Environmentally Friendly School Culture, Environmentally Friendly Facilities Management (X4), and students' environmental problem-solving skills (Y) is very strong.

Conclusion and Implication

There is a positive and significant relationship between school policies, curriculum implementation, school culture, and school infrastructure management together toward students' environmental problem-solving skills. This indicates that to achieve maximum results, all four components of the Adiwiyata program must be implemented integrally and cannot be partially executed. There is a positive and significant relationship between school policies and students' ecological literacy. This can be accepted because school policies are the primary foundation for schools to implement other components. There is a positive and significant relationship between curriculum implementation and students' ecological literacy. This can be accepted because curriculum implementation is the operation of curriculum documents into learning, and learning is a key component of every educational unit. There is a positive and significant relationship between school culture and students' environmental problem-solving skills. This shows that building ecological literacy is not merely through classroom learning but also requires a school culture ingrained in all members of the school community. There is a positive and significant relationship between school infrastructure management and students' ecological literacy. This is understandable as infrastructure is a key component that supports learning in schools.

In a detailed analysis, the environmentally conscious school policy only influences 11%, while the environmentally friendly school culture has a 20% impact on ecological literacy. This is because various factors, including school policies related to vision, mission, and goals, have not been socialized and understood by the entire school community, and habitual practices in the form of attitudes and behaviors in school have not yet been ingrained.

In connection with this, Adiwiyata schools in Magelang district need to intensify and publicize environmental awareness policies to the entire school community and consistently promote environmental consciousness in schools while competing in environmental fields. Furthermore, a deeper qualitative exploration related to environmental problem-solving skills needs further investigation. Other indicators in ecological literacy such as knowledge, attitudes of responsibility, and environmental concern should be recommended for further research.

Acknowledgement

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