

Profile of Environmental Knowledge and Attitudes Toward Environmental Care Among High School Students in Rural Areas

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Article Info	Abstract
Article history: Received: February 26, 2026 Accepted: April 8, 2026 Published: April 20, 2026 Keywords: Attitude Biology learning Caring for the environment Knowledge This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. © 2026 Vidya Karya	Environmental education is an important foundation for developing students' ecological awareness, yet evidence on how biology instruction shapes environmental knowledge and environmental attitudes, particularly in Madrasah Aliyah (Islamic Senior High School) settings in Indonesia, is limited. Previous studies have shown that environmental knowledge does not automatically translate into pro-environmental attitudes, making it important to assess both dimensions simultaneously. This study employed a quantitative descriptive design with a sample of 80 students drawn from a population of 120 students at MA Nurul Jamil, using a validated Likert-scale questionnaire to measure two constructs: environmental knowledge and environmental attitudes. Results indicated that environmental knowledge was distributed across the categories of very good (11%), good (36%), sufficient (33%), and less good (20%), while environmental attitudes were concentrated in the categories of fair (56.25%), very good (13.75%), good (30%), and less good (0%), descriptively suggesting that attitude expression was not fully aligned with knowledge acquisition, although no inferential statistical analysis was conducted to confirm this relationship. These findings suggest that biology learning at MA Nurul Jamil has made a positive contribution to environmental awareness while highlighting the need for experiential and project-oriented learning strategies to bridge the gap between knowledge and attitudes; future research should employ correlational or regression analysis to examine this relationship more thoroughly. To cite this article: Amrullah, F., Setiawan, A., Yustian, I., & Zulkifli, H. (2026). Profile of environmental knowledge and attitudes toward environmental care among high school students in rural areas . <i>Vidya Karya</i>, 41(1), 121-131.

INTRODUCTION

Environmental education is a crucial aspect in developing ecological awareness in the younger generation. This is especially true in biology, where environmental topics such as pollution and biodiversity and sustainable development should not only be theoretical knowledge but also shape students' attitudes and concrete actions (Setiawan et al., 2023). A sense of environmental responsibility is a person's behavior that reflects a sense of responsibility and concern for their environment. These are greatly influenced by daily desires and activities (Salsabila et al., 2021; Halek et al., 2021).

Various studies have shown that environmental knowledge is positively related to students' caring or pro-environmental attitudes, although the strength of this relationship varies across educational contexts. For example, research at SMA Negeri 1 Jatiagung found a positive and significant relationship between environmental knowledge and students'

caring attitudes (Herlina et al., 2023), and research at Muhammadiyah 23 High School, Jakarta, shows that environmental knowledge contributes directly and indirectly to students' environmental awareness character (Sya'ban et al., 2025). At a higher level, studies of college students show a positive relationship between environmental knowledge and pro-environmental attitudes and practices that contribute to behavioral change (Erwinsyah, 2022). Another example in West Sumatra also reported a correlation between knowledge and attitudes, although the strength varied (Sasea et al., 2023). However, this relationship is not always consistent: some studies found weak or even insignificant relationships, indicating that other factors such as direct experience, learning methods, school culture, and students' affective aspects also influence pro-environmental attitudes (e.g., environmental education studies that did not show a strong relationship between knowledge and attitudes/behavior).

Although Sasea et al. (2023) found a positive yet variable correlation between environmental knowledge and eco-friendly attitudes among students in West Sumatra, this relationship is not straightforward; mediating factors such as experiential learning and instructional methods play a significant role in determining its strength.

Efforts to overcome problems that occur in the environment by providing environmental education from an early age, which educators can provide to students to cover intellectual tasks of critical assessment of existing environmental situations and moral formulations regarding environmental problems, as well as developing commitments based on scientific values by providing opportunities to actively participate in environmental improvement (Aeni, 2021).

Schools, as a platform for environmental education, have significant potential to shape environmentally friendly attitudes and behaviors. Environmental education can improve students' knowledge, attitudes, and behaviors about caring for the environment in both Adiwiyata and non-Adiwiyata schools (Rushayati et al., 2023). In biology, approaches such as Project-Based Learning (PjBL) combined with Education for Sustainable Development (ESD) have been shown to increase environmental awareness and student engagement through concrete actions such as recycling campaigns or art (Setiawan et al., 2023). Environmentally based learning is an effective approach to fostering a sense of responsibility for the environment (Istiqomah et al., 2020).

MA Nurul Jamil, as a Madrasah Aliyah (Islamic senior high school) in a rural community, has the potential to make biology content more contextual by linking environmental material to local conditions and religious values. However, little empirical data measures how classroom knowledge connects to students' environmental attitudes and practices.

Studies such as those in 11th-grade Palembang show that despite adequate environmental literacy, indicators of knowledge and cognitive skills are still relatively low (Utami et al., 2023). These findings highlight the need for a local approach that assesses not only knowledge but also the attitudes and values formed through biology learning. According to behavior learning theory, knowledge combined with direct experience and contextual reinforcement, such as field practice or environment-based projects, is more effective in changing attitudes and encouraging real action (Adinugraha et al., 2021).

Previous studies have largely examined the relationship between knowledge and attitude in urban public schools using single-construct measures. This has left a gap in our understanding of how these dimensions coexist in rural Islamic educational institutions, where religious values and local ecological conditions may influence students' environmental attitudes. This study addresses this gap by profiling environmental knowledge and attitudes towards environmental concerns among Madrasah Aliyah students in rural settings simultaneously, using a dual-construct instrument that allows for descriptive mapping of the alignment and differences between the two. Rather than claiming novel causality or intervention, this study contributes to the field by generating a

context-based foundation that can serve as a reference for future correlational, experimental, or eco-pedagogical research in similar Islamic school settings.

METHODS

This study employed a descriptive quantitative evaluation design, combining survey questionnaires, observations, and interviews to assess students' environmental knowledge and care attitudes in biology learning. The research sample used was 80 of 120 grade XI students at MA Nurul Jamil. The students were selected using a random sampling method to determine the diversity of the data obtained in this study. Data collection was conducted from November 24 to December 7, 2024. Although the data collection period was relatively short, this study attempted to produce representative data on environmental knowledge and attitudes among students. However, this time constraint should be considered, as it could potentially limit the depth of the data or the findings obtained.

Data were collected using two validated questionnaires: an 11-item character questionnaire and a 14-item environmental knowledge questionnaire. Both were measured using a four-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree), with no neutral option to minimize response bias. The first instrument assessed environmental knowledge, including students' understanding of ecosystem functions, waste management, biodiversity conservation, and human impacts on the environment. The second instrument measured environmental awareness, including students' behavioral tendencies toward energy conservation, waste reduction, and participation in school greening activities. Each instrument was scored by summing all item responses. Scores were then converted to percentages and categorized into four proficiency levels: 81–100% = Very Good, 61–80% = Good, 41–60% = Sufficient, and $\leq 40\%$ = Less Good. Item Construction is listed in Table 1.

Table 1 Item constructs

Environmental knowledge	Environmental care attitude
Deforestation reduces biodiversity because it destroys animal and plant habitats.	I always dispose of waste in its designated bin according to its type.
Burning household waste contributes to air pollution and greenhouse gas emissions.	I turn off the lights and the fan when leaving the classroom.
Composting organic waste helps reduce landfill burden and enrich soil nutrients.	I actively participate in school gardening and greening programs.

Both instruments were validated through expert assessment by two biology education specialists and one environmental education expert. Items with a content validity index below 0.70 were revised or removed before full-scale data collection. The student character evaluation instruments are listed in Table 2.

Table 2 Student character evaluation instrument

No	Indicator	Statement	Scale			
			1	2	3	4
1	Maintaining the school and family environment	I imitate the teacher in saving water and electricity at school.				
		I invite family or friends to participate in environmental care activities.				
		I believe that protecting the environment is the responsibility of all school residents.				
2	Maintain plants and do not damage them	My friends and teachers always keep the environment clean.				
		I imitate the teacher's way of caring for plants or school cleanliness.				
		I enjoy being in the school garden or the school's natural environment.				
		I feel I have a close connection with the nature around the school.				

3	Support environmental care programs	I voluntarily participate in GPBLH activities at school. I believe that small everyday actions can have a big impact on the environment.
4	Environmentally friendly facilities and infrastructure	I always throw rubbish in its place. I don't use private/public transportation when I go to school.

The environmental awareness interview tools are listed in Table 3.

Table 3 Environmental awareness interview tool

No.	Question	Answer Description
1.	How does the school plan to increase environmental awareness in schools?	
2.	How do schools improve the habit of maintaining the cleanliness and sustainability of the school environment?	
3.	How do school residents maintain the classroom environment?	
4.	Does the school provide trash disposal and handwashing facilities in every room in the school?	
5.	Does the school provide cleaning equipment?	
6.	How to increase energy-saving habits among school residents?	
7.	Do school residents practice energy-saving habits?	
8.	Do school residents get into the habit of separating organic and inorganic waste?	
9.	Is there a trash can in the classroom?	
10.	Is there an assignment to make compost from organic waste?	
11.	Does the school provide bathrooms and clean water?	
12.	Does the school build a good wastewater drainage system?	
13.	Are there any efforts to collaborate with other parties to support environmentally conscious activities in schools?	
14.	Is there an evaluation carried out by the school to see the implementation of environmentally conscious schools?	

Both instruments, consisting of 14 items on environmental awareness and 11 items on environmental character on a four-point Likert scale, were validated manually using the Content Validity Index (CVI = 0.80) and demonstrated acceptable reliability (Cronbach's $\alpha = 0.70$), without the use of statistical software. Quantitative data were analyzed descriptively through manual frequency distributions and percentage assessments, categorizing students into four proficiency levels (excellent, good, fair, and poor). Observational data were analyzed using the Miles and Huberman (2014) triangulation model to corroborate questionnaire findings with classroom observations and teacher interviews. The short data collection period may have limited the depth of the findings, which should be considered when interpreting the results.

RESULTS AND DISCUSSION

Environmental care knowledge

Based on the results of the descriptive data analysis of students' environmental awareness knowledge at MA Nurul Jamil, which involved 120 Grade XI students with 80 students selected as the research sample, it was found that the level of students' environmental awareness knowledge was predominantly in the fairly good category, with a total of 11 students, making this category the highest compared to the others. This finding is consistent with empirical evidence from international studies indicating that environmental knowledge plays an important role in shaping students' environmental awareness and pro-

environmental behavior. Furthermore, a meta-analysis in the context of environmental education revealed that environmental education programs can significantly improve students' environmental knowledge, attitudes, and intentions to engage in environmentally friendly actions across various countries, demonstrating a positive relationship between environmental knowledge and the environmental awareness and behavior of children and adolescents (Van de Wetering et al., 2022). The results of the data analysis of environmental awareness knowledge of students can be seen in Table 4.

Table 4 Level of environmental knowledge

Categories	Assessment	
	Number of Students	Percentage
(80%-100%) Very Good	9	11%
(61%-79%) Good	26	33%
(41%-60%) Sufficient	29	36%
(<40%) Less Good	16	20%
	80	100%

The results of the study showed that students' environmental awareness knowledge at MA Nurul Jamil varied across categories. 11% of students were in the excellent category, 33% in the good category, 36% in the sufficient category, and 20% in the less good category. These data indicate that the majority of students have a relatively good level of environmental awareness knowledge, although some still fall into the poor category.

Environmental Care Attitude of Students

The research also found that schools utilize environmental awareness-based learning. The table below shows the extent to which students are cultivating environmental awareness as follows in Table 5.

Table 5 Environmental Concern Attitudes

Categories	Assessment	
	Number of Students	Percentage
(80%-100%) Very Good	11	13.75%
(61%-79%) Good	24	30%
(41%-60%) Sufficient	45	56.25%
(<40%) Less Good	0	0%
	80	100%

Table 5 shows that students at MA Nurul Jamil's environmental awareness is spread across several categories: 13.75% are very good, 30% are good, 56.25% are sufficient, and 0% are less good. This data indicates that the majority of students fall into the fairly good category, while no students fall into the poor environmental awareness category. The very good category (13.75%) reflects students who have a high level of environmental awareness. Students in this category not only understand the concept of environmental awareness but also apply it in their daily lives, such as properly disposing of waste,

conserving water, and participating in reforestation activities. Research by Yuliana & Hasanah (2021) shows that students with a high level of environmental awareness tend to be agents of change in the school community.

The concentration of students in the "sufficient" (36%) and "good" (33%) categories, with only 11% reaching "very good," suggests that biology learning at MA Nurul Jamil has achieved a functional but not transformative level of environmental knowledge transmission. This distribution is consistent with the cognitive plateau phenomenon described by Kollmuss and Agyeman (2002), wherein formal instruction effectively builds declarative environmental knowledge but rarely triggers deeper ecological reasoning or behavioral internalization. Critically, the relatively high proportion of students in the sufficient category may not reflect a failure of individual cognition but rather a structural limitation of curriculum delivery: when environmental topics are embedded as incidental content within broader biology units rather than treated as integrated thematic learning, students acquire fragmented rather than systemic ecological understanding.

The 20% of students in the "less good" category warrants particular analytical attention beyond simple attribution to low motivation or limited resources. In madrasah rural contexts, environmental knowledge acquisition is mediated not only by classroom instruction but also by students' lived ecological experiences and proximity to agricultural land, river systems, or community waste practices, which may either reinforce or contradict school-based environmental narratives (Gruenewald, 2008). The absence of contextually grounded learning materials that connect Islamic environmental ethics (*khalifah fil ardh*) with scientific ecological concepts may further explain why a portion of students fail to construct meaningful environmental knowledge frameworks, a gap that neither Adiwiyata programs nor standard biology curricula currently address systematically.

Taken together, these findings contribute to the growing body of evidence that environmental knowledge outcomes in Indonesian secondary schools are shaped by the interplay of pedagogical approach, institutional context, and sociocultural factors rather than cognitive capacity alone. This study extends prior work by Pradana and Wulandari (2021) and Anisa & Nurhasanah (2022) by demonstrating that even within an Islamic educational institution with explicit environmental program commitments (GPBLH/Adiwiyata), knowledge outcomes remain predominantly cognitive rather than applied, suggesting that program participation alone is insufficient without pedagogical redesign that centers experiential, place-based learning aligned with students' local environmental realities.

Overall, these findings indicate that biology instruction at MA Nurul Jamil has positively contributed to students' environmental awareness, although this study did not employ inferential analysis to measure the magnitude of that contribution, a limitation that future research should address using pre-post or correlational designs. Nevertheless, the descriptive profile generated here suggests meaningful room for pedagogical improvement: teachers are encouraged to supplement existing curriculum delivery with contextual, project-based learning approaches that anchor environmental concepts to real-world issues within students' immediate surroundings, enabling a more direct connection between ecological knowledge and everyday practice. To sustain these gains, environmental awareness education should be systematically integrated into the biology curriculum rather than treated as supplementary content, aligning with national environmental education policies such as GPBLH and the Adiwiyata program framework (Wuryandani et al., 2014; Setyowati et al., 2023).

The school environment has a significant influence on children's development, and school programs can even shape sustainable positive habits (Wibowo, 2016). Furthermore, it is also important for schools to collaborate with the Adiwiyata program or other activities. Environmentally-based extracurricular activities. According to research by Ningsih & Hidayati (2023), student involvement in school-based environmental awareness programs

can improve their understanding more comprehensively and encourage sustainable behavioral changes. (Purwanto et al., 2024), they stated that to improve students' environmental awareness, support from all parties is needed.

Thus, biology learning not only plays a role in improving cognitive knowledge but also serves as a strategic tool for fostering students' broader ecological awareness. The results of this study can serve as a basis for developing more integrative environmental learning strategies based on real-world experiences and capable of reaching all student groups. The school environment significantly influences children's development, and school programs can even foster sustainable positive habits (Wibowo, 2016).

Based on Table 5, the good category (30%) indicates that some students are able to demonstrate environmental awareness in their routine activities, although this awareness is not yet consistent across all aspects of environmental knowledge and behavior. This observation aligns with national findings, such as Widyastuti & Sari (2020), who emphasized the importance of reinforcing positive environmental habits through structured school programs, such as Adiwiyata activities, to encourage students to care for the environment. In addition, international research supports the idea that environmental education programs integrated into school curricula are significantly associated with improvements in students' environmental awareness and pro-environmental behaviors. For example, a study conducted in Adiwiyata high schools in Indonesia found that participation in environmental education programs was linked to moderate levels of environmental care attitudes among students, showing that curriculum implementation and student engagement in environmental activities positively influence environmental awareness and attitudes (Wibowo et al., 2023).

The sufficient category (56.25%) constitutes the largest proportion. This indicates that most students already have a basic awareness of the importance of environmental protection, but it has not yet fully formed into their daily habits. According to research by Pramesti & Rahayu (2022), students in the fairly good category typically have adequate cognitive understanding but are less motivated to internalize these attitudes into real behavior without encouragement from teachers or the school environment.

Interestingly, no students fell into the "less good" category. This indicates that all students demonstrate at least a minimal level of environmental awareness. This demonstrates the school's success in instilling core environmental values in its students, although further strategies are needed to increase the number of students in the "good" and "very good" categories.

When compared comprehensively, there is a clear difference between environmental knowledge and attitudes. While some students' knowledge ranged from good to very good (43.75%), many still had sufficient attitudes (56.25%). This finding aligns with research by Hermawan & Lestari (2021), which states that increasing environmental knowledge is not automatically followed by a high level of environmental concern, because attitudes are more influenced by habituation, direct experience, and a supportive environment.

Thus, schools need to strengthen experiential learning strategies, such as through environmental projects, habituation, and community collaboration, so that environmental awareness can be more consistently ingrained. Furthermore, strengthening programs such as the GPBLH (Environmental Care and Culture Movement in Schools) has been proven effective in increasing students' environmental awareness (Putri & Nurhayati, 2023).

CONCLUSION

This descriptive study shows that biology instruction at MA Nurul Jamil has contributed to building students' environmental knowledge, which falls within the good to very good range (good: 36%; very good: 11%), yet environmental concern attitudes only reached the good to very good range (good: 30%; very good: 13.75%), and none were categorized as less good (0%), indicating that knowledge acquisition has not yet been consistently

translated into attitudinal expression. This descriptive discrepancy, although not yet confirmed by inferential statistical analysis, highlights the importance of pedagogical strategies that go beyond cognitive transmission, particularly experiential and project-based learning approaches rooted in local environmental issues, to strengthen the alignment between what students know and how they behave toward the environment. Further research using pre-post experimental designs or correlational analyses is recommended to rigorously examine the relationship between biology instruction and environmental awareness outcomes in the madrasah context, thereby providing a stronger evidence base for curriculum development and environmental program evaluation.

CONFLICTS OF INTEREST

The authors declare no conflict of interest. This manuscript is original, has not been published previously, and is not under consideration for publication elsewhere.

AUTHOR CONTRIBUTIONS STATEMENT

All authors have read and approved the final version of the published manuscript and contributed substantially to the research on environmentally conscious schools at MA Nurul Jamil.

AI DISCLOSURE STATEMENT

The authors used AI-assisted tools during the preparation of this manuscript solely for the purpose of identifying and retrieving additional reference sources. No AI tools were used in the processes of data collection, data analysis, interpretation of findings, or manuscript writing. All content was critically reviewed, verified, and revised by the authors, who take full responsibility for the accuracy, integrity, and originality of the published work.

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