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Comparative analysis of environmental awareness among students in senior high schools, vocational schools, and islamic schools: Implications for enhancing naturalistic intelligence

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Abstract: Environmental awareness is crucial for fostering responsible behaviors towards the environment, and understanding the variations among different educational settings can inform targeted educational strategies. This study aims to examine differences in environmental awareness among students from three types of secondary educational institutions—Senior High Schools (SMA), Vocational Schools (SMK), and Islamic Senior High Schools (Madrasah Aliyah)—using a descriptive-comparative quantitative approach. Furthermore, it seeks to explore the implications of students' environmental awareness on the development of their naturalistic intelligence, particularly through experiential learning activities that address real-world ecological challenges. Data had been collected using a structured questionnaire that had been compiled and analyzed using the RASCH program. Based on the results of the analysis using the Ministeps (RASCH) program, 25 items of the environmental awareness rating scale instrument were obtained from 240 subjects from senior high schools, vocational schools, and Madrasah Aliyah. The data analysis technique in this research applied Kruskal-Wallis. The result of this research showed that the level of environmental awareness of students in the public senior high school was higher than Madrasah Aliyah, followed by the vocational school. Increased environmental awareness has the potential to stimulate students' naturalistic intelligence, fostering a deeper understanding of ecological systems and promoting sustainable behaviours through experiential learning activities that address real-world environmental issues.
Keywords: Environmental Awareness, Comparative, Naturalistic Intelligence

INTRODUCTION

The correlation between students' environmental awareness and their naturalistic intelligence is a significant area of research that highlights the interplay between cognitive abilities related to nature and the understanding of environmental issues. Naturalistic intelligence, as defined by Gardner's theory of multiple intelligences, encompasses the ability to recognize, categorize, and draw upon certain features of the environment, including flora and fauna. This intelligence is closely linked to environmental awareness, which refers to the understanding and concern for environmental issues such as pollution, climate change, and biodiversity loss.

Research indicates a strong positive correlation between naturalistic intelligence and environmental awareness among students. For instance, a study by Ningrum et al., (2018) found a correlation coefficient of 0.754, suggesting that students with higher naturalistic intelligence tend to exhibit greater environmental. This finding is supported by other studies that emphasize the role of naturalistic intelligence in fostering a deeper understanding of ecological issues. For example Rakhmawati et al., (2023) discusses how a lack of naturalistic intelligence can lead to diminished awareness of environmental problems, indicating that enhancing this form of intelligence could improve students' environmental consciousness. Furthermore, Djumat et al., (2023) highlights that students with well-developed naturalistic intelligence demonstrate a greater sensitivity to their natural surroundings, which translates into a proactive approach to environmental stewardship.

This is echoed by Aydin, (2021) who note that individuals with strong naturalistic intelligence often engage in ecocentric behaviors, prioritizing the protection of nature over personal gain. Such behaviors are crucial for fostering a sustainable future, as they encourage students to act responsibly towards their environment. Moreover, the educational context plays a vital role in developing both naturalistic intelligence and environmental awareness. The implications for enhancing naturalistic intelligence through environmental education are profound. As Liao and Li (2019) emphasize, effective environmental education should not only impart knowledge but also foster environmentally-friendly attitudes and behaviors. Ningtyas, (2019) points out that while naturalistic intelligence may not significantly influence environmental sensitivity, it remains a critical factor in developing a comprehensive understanding of ecological issues.

Regardless of the national emphasis on environmental education, gaps in students' environmental understanding are often seen across different types of schools, which may be due to variations in curriculum focus, pedagogical approaches, and institutional values. Research indicates that students in senior high schools generally exhibit higher levels of environmental awareness compared to their counterparts in vocational and Islamic schools. For instance, a study by Sahidullah, (2022) found that 26% of secondary students have low levels of environmental awareness, while 48% have moderate levels and 26% have high levels of awareness. This aligns with findings from Darmawan & Dagamac, (2021), who reported that environmental education in senior high schools is often more structured and comprehensive, leading to better awareness among students. In contrast, vocational schools may focus more on practical skills, which can sometimes overshadow environmental education, resulting in lower awareness levels Punzalan, (2020). On the other hand, In Islamic schools, where religious teachings often emphasize stewardship of the earth, there is potential to leverage these values to enhance environmental awareness and naturalistic intelligence. Hidayati et al., (2020) suggest that integrating ecological principles with Islamic teachings can create a strong foundation for environmental care among students. This approach can be particularly effective in fostering a sense of responsibility and connection to the environment, which is essential for developing naturalistic intelligence.

Previous studies have primarily focused on assessing environmental awareness in a single educational context, leaving a gap in understanding how this awareness varies across different school types within the Indonesian education system. Thus, a comparative analysis is needed in order to highlight the different levels of environmental awareness among students in high schools, vocational schools, and Islamic schools. Environmental awareness, as a person's understanding of and concern for environmental issues,

as well as individual and collective responsibility for the protection and preservation of the environment, is critical to addressing environmental issues protection and preservation of the environment, is very important for students to have in overcoming contemporary environmental challenges (Avalos et al., 2023). By recognizing these differences, it is hoped that educators can implement targeted educational strategies, educators can enhance students' naturalistic intelligence and foster a generation that is more aware and proactive in addressing environmental challenges. This multifaceted approach will not only increase environmental awareness, but also contribute to the development of responsible citizens who are prepared to address ecological issues.

METHOD

This study employed a comparative cross-sectional research design to assess the levels of environmental awareness among students from three different educational settings: senior high schools, vocational schools, and Islamic schools. This design is appropriate as it allows for the simultaneous collection of data from various groups, facilitating a comparison of their environmental awareness levels. A random sampling technique utilized to select the 240 participants from each educational setting. The sample was selected, with 80 students from each school type, allowing for a fair comparison and generalization of findings across the broader population of senior secondary education institutions. Data had been collected using a structured questionnaire designed to measure environmental awareness and has been analysed for validity and reliability using the RASCH model. The questionnaire included demographic Information: Age, gender, school type, and grade level. A validated Likert-type scale (1-4) assessing various dimensions of environmental awareness, including knowledge of environmental issues, attitudes towards environmental protection, behaviours, and critical issues related to environmental conservation. Data will be analyzed using statistical software (SPSS) 2.9, include Descriptive Statistics and Inferential Statistics ANOVA (Analysis of Variance)**: To compare the mean environmental awareness scores among the three groups (senior high school, vocational, and Islamic high schools (Madrasah Aliyah).

RESULT AND DISCUSSION

Result

Student’s Environmental Awareness Profile

Research data obtained from online questionnaires to students who have been select using the convenience sampling method, which is a sample obtained because individuals are willing to become research participants. The data was processed then analyzed using descriptive statistical analysis methods. The environmental awareness test consists of indicators of knowledge, attitudes, behavior and critical. Environmental awareness indicators were tested by students then the results were explained descriptively, the data was transformed according to the environmental awareness categories described in Table 1.

The analysis results from 240 respondents across three school types—public senior high schools, vocational high schools, and state Madrasah Aliyah—revealed differences in the average scores for four variables of environmental awareness. Despite these differences, all three schools fell into the same category, with students' environmental awareness still classified as moderate. Among the three types of schools, public senior high school students demonstrated the highest environmental awareness, followed

closely by Madrasah Aliyah students, while vocational school students showed lower environmental awareness compared to the other two. Additionally, significant differences were observed among the environmental awareness variables—knowledge, attitudes, behavior, and critical aspects—as illustrated in Figure 1.

Table 1. Data analysis results on students' environmental awareness across three types of schools

Variabel	Student Environmental Awareness Scores			Average	EA Criteria
	Senior High School	Vocation School	MA		
Knowledge	3,205	2,85	3,17	3,08	Moderate
Attitudes	3,024	2,93	3,03	2,99	Moderate
Behavior	2,96	2,83	2,87	2,89	Moderate
Critical	2,91	2,74	2,94	2,86	Moderate
Average	3,02	2,83	3,00	2,95	Moderate
Total average:		2,95			Moderate

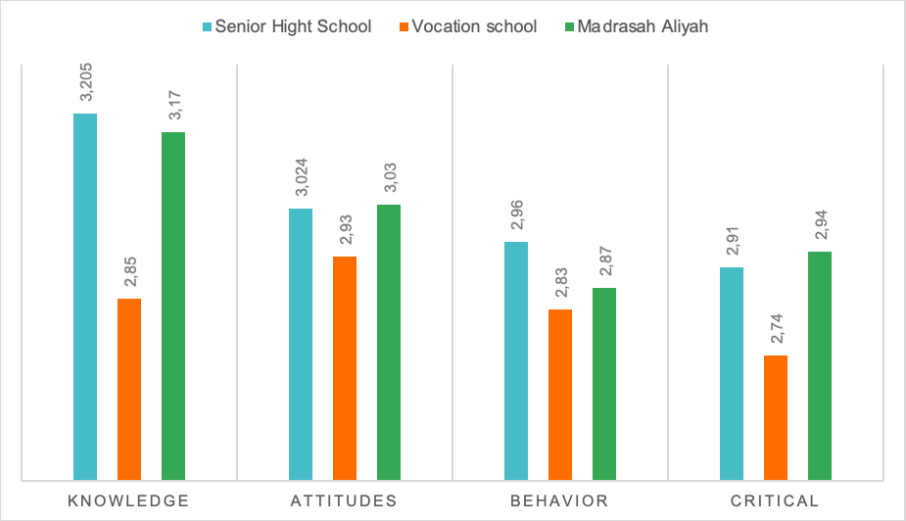

Figure 1. The differences in the levels of four variables on environmental awareness among students

The graph in Figure 1 illustrates the differences in the levels of environmental awareness among students from three types of schools based on four assessment criteria. The first criterion, the knowledge variable, shows a notable difference between vocational students and students from senior high schools and Madrasah Aliyah (MA), while the difference between senior high school students and MA students is minimal. For the attitude and critical variables, there are differences in scores among the three schools, but they are not substantial. Meanwhile, in the behavior and critical variables, the scores across all three schools are relatively low, with vocational students consistently obtaining the lowest scores compared to the others.

Table 2. Homogeneity analysis results using SPSS 2.9

		Lavene statistic	df1	df2	Sig.
Environmental awareness value	Based on Mean	3.333	2	237	.037
	Based on Median	2.222	2	237	.111
	Based on Median and with adjusted df	2.222	2	222.432	.111
	Based on trimmed mean	3.022	2	237	.051

Statistically using SPSS 2.9, the results of data analysis turned out to show that the data were distributed inhomogeneously and not normally (Table 2 and 3), if seen in Table 2 which displays a significance value of 0.037 which means that the scores are not normally distributed because <0.05. Table 4 also shows that the data is not normally

distributed because it is also <0.05. The data is only normally distributed for the results in MAN.

Table 3. Student environmental awareness test normality test results using SPSS 2.9

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Sekolah	Statistic	df	Sig.	Statistic	df	Sig.
Environmental Awareness	SMA	.164	50	.002	.906	50	<.001
	SMK	.117	171	<.001	.928	171	<.001
	MAN	.093	19	.200*	.972	19	.815

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Nonparametric Test: Independent-Samples Kruskal-Wallis Test

Non-parametric tests were conducted because the data from the homogeneity test showed inhomogeneous data. Furthermore, data on students' environmental awareness was analyzed using the Kruskal-Wallis Test. Through Table 4, it displays that there is a significant difference between the level of environmental awareness between high school students and vocational high school students and Madrasah Aliyah students because the results of the Kruskal and Wallis test show a significance value <0.050.

Table 4. Kruskal Wallis test results Student environmental awareness test

Hypothesis test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1.	The distribution of Enviromental Awareness is the same across categories of Sekolah	Independent-Samples Kruskal-Wallis test	.006	Reject the null hypothesis

a. The significant level is .050
b. Asymptotic significance is displayed

Figure 2 shown box-and whisker plot illustrate the value of students' environmental awareness (ordinate), and the respondents who are students from three different school types (abscissa). Three black horizontal lines at the top, bottom, and between the top and the bottom of each blue box indicates the data's first quartile, third quartile, and mean, respectively. The two horizontal lines that are perpendicular above and below each box, indicates the maximal and minimal values, respectively.

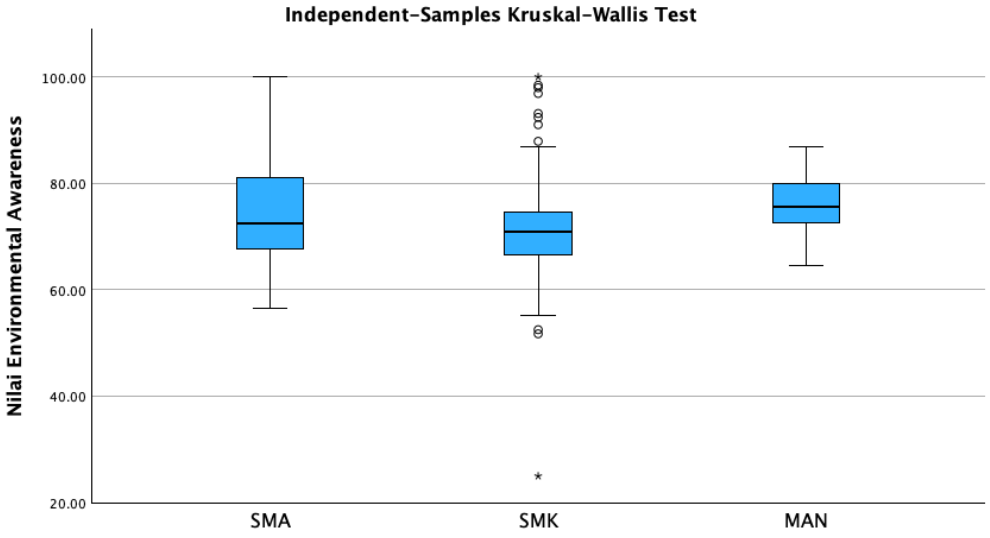

Figure 2. Box plot representing the difference in students' environmental awareness from three senior high schools (public senior, vocational, and Madrasah Aliyah high school)

Discussion

The differences in environmental awareness among high school, vocational school, and Madrasah Aliyah students

Through a questionnaire distributed to 240 students from SMA, SMK, and MAN, it was revealed that there is a difference in the level of students' environmental awareness among the three school types. The environmental awareness of SMA and MAN students is similar, while that of SMK students is comparatively lower. This difference is assumed to result from the general curriculum similarities between SMA and MAN, where core subjects are emphasized, whereas the SMK curriculum is more focused on vocational expertise specific to each major (Anam & Maimun, 2024; Nurhadi, 2021). In SMK, science or integrated science is only taught as a single subject in either Phase E or Phase F, but not both. In contrast, SMA and MAN students in science tracks study separate subjects such as Biology, Physics, and Chemistry across Phases E, F, and G. For non-science SMA and MAN students, science is an elective subject. This study involved SMA and MAN students from various majors, including science, social studies, and general tracks without specific specialization.

Research conducted by Sattar, (2021) shows that pro-environmental attitudes in religious schools are higher than in public schools. The science students have more awareness of biodiversity and its conservation than other students in other disciplines. Kiraz & Firat, (2016) in their research revealed that the most dominant subject students were taught about the environment were through science and biology subjects. Schools are essential in promoting environmental education. This involves creating policies that ensure clean and healthy school environments, providing training for educators, and incorporating environmental education into the curriculum to cultivate a culture of environmental awareness (Djirong et al., 2024).

Comparing environmental awareness among different educational levels, the research suggests that there are some notable differences. High school students have been found to exhibit increased environmental awareness and pro-environmental behaviours when exposed to effective teaching methods, such as the science learning model. This model has been shown to positively impact students' knowledge, attitudes, behaviors, and skills in addressing environmental problems (Aliman et al., 2019; Berame et al., 2022; Yli-Panula et al., 2020). Regarding Madrasah Aliyah (Islamic high schools) students, limited research is available on their environmental awareness compared to their counterparts in general high schools and vocational schools. However, some studies suggest that environmental literacy, which encompasses environmental knowledge, attitudes, and behaviors, can be effectively developed in Islamic educational settings through the integration of environmental awareness and sustainability concepts (Hermawan et al., 2022; Septiara et al., 2021)

The students may have a high knowledge of environmental education awareness issues, but they lack the necessary action to overcome environmental problems (Astuti et al., 2024). Fauzi et al., (2024) mention that the students' awareness of environmental problems caused by waste not only positively influences their behavior but also contributes to environmental sustainability. This awareness can ultimately shape the community's understanding of the importance of strengthening health systems and preventing the spread of diseases through effective waste management. So, there are positive correlation between public understanding and waste management knowledge, suggesting that educational interventions can significantly enhance environmental behaviors.

Factors that can influence environmental awareness among students include teaching methods, curriculum design, and educational background (Bernaciak et al., 2021; Septiara et al., 2021). Effective environmental education approaches, such as inquiry-based learning, experiential learning, and collaborative learning, have been shown to enhance students' understanding and engagement with environmental issues (Azevedo et al., 2022; Berame et al., 2022; Habibi, 2023).

The Interplay Between Environmental Awareness and Naturalistic Intelligence in Science Educational Contexts

Environmental awareness and naturalistic intelligence are closely interconnected constructs, particularly in science education, where understanding and appreciation of nature are critical components. Environmental care is influenced by several factors, one of which is Natural intelligence (Sahabuddin et al., 2022). Their interplay holds significant implications for promoting sustainable behavior, fostering ecological literacy, and enhancing science learning outcomes. Environmental awareness refers to the recognition and understanding of environmental issues, coupled with attitudes and behaviors aimed at mitigating environmental degradation. It encompasses knowledge about ecosystems, sustainable practices, and the impact of human actions on the environment (Ardoin & Heimlich, 2013). The individuals who have environmental awareness and who worry about the self-effects of the environmental issues are supposed to behave with care towards the environment in every activity while leading their lives (Kiraz & Firat, 2016).

Naturalistic intelligence often serves as a cognitive and emotional foundation for developing environmental awareness. The studies show that Natural intelligence is significantly related to environmental care; the individuals with high naturalistic intelligence are more attuned to environmental phenomena and exhibit greater motivation to engage in sustainable practices (Liu & Lin, 2014; Sahabuddin et al., 2022). This connection is grounded in experiential learning theories, where direct interaction with nature fosters both cognitive and affective development. Introduced by Howard Gardner in his theory of Multiple Intelligences, naturalistic intelligence describes an individual's ability to identify, categorize, and interact effectively with elements of the natural world. It reflects a cognitive and affective connection to nature, including sensitivity to biodiversity, ecological patterns, and environmental dynamics (Fithian, 2001).

In science education, fostering environmental awareness involves engaging students in activities that stimulate their naturalistic intelligence, such as observing ecosystems, conducting experiments, and solving environmental problems. This approach aligns with constructivist learning theories, emphasizing active, hands-on experiences as a pathway to deeper understanding. Research indicates that students with heightened environmental awareness and naturalistic intelligence are more likely to adopt sustainable lifestyles (Chawla, 2007). Science education programs that emphasize experiential learning and real-world environmental issues can instill a sense of responsibility and agency among students. it is necessary to make efforts so that students awareness of the environment and students' naturalistic intelligence can also develop well, especially in vocational schools. Such as environmental lessons or lessons about the environment should be added to the curriculum. If environmental lessons are included at primary, middle, and high schools, students' environmental knowledge and correspondingly their environmental perception and sensitiveness will increase, and their positive attitude development will be provided (Kiraz & Firat, 2016). Increased environmental awareness

has the potential to stimulate students' naturalistic intelligence, fostering a deeper understanding of ecological systems and promoting sustainable behaviors. By engaging students in experiential learning activities that address real-world environmental issues, educators can enhance both cognitive and affective aspects of environmental consciousness, ultimately cultivating a more responsible and informed generation.

CONCLUSION

Based on the statistical analysis that has been conducted, it is concluded that high school and Madrasah Aliyah students generally show a higher level of environmental awareness compared to vocational students. This difference in environmental awareness can be caused by several factors, such as teaching methods, curriculum design, and educational background. Increasing students' environmental awareness can stimulate naturalistic intelligence in students by incorporating hands-on and real-world activities, and fostering this awareness can start early, starting from elementary school to high school.

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