



Does Gender Matter? Gender Differences in Ecological Awareness among Students in an Adiwiyata Madrasah Implementing Green Theology

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ABSTRACT

The integration of Green Theology into Islamic education has increasingly been recognized as a strategic approach to fostering students' ecological awareness. However, empirical studies examining whether the implementation of Green Theology leads to differences in ecological awareness based on gender within Adiwiyata Madrasahs remain limited. This study aimed to examine gender differences in ecological awareness among students in an Adiwiyata Madrasah implementing Green Theology. A quantitative approach with a comparative research design was employed. The study involved all 147 fifth-grade students of MIN 1 Sukoharjo, Indonesia, using a total sampling technique. Data were collected through a validated and reliable ecological awareness questionnaire developed in a previous study. Data analysis included descriptive statistics, normality and homogeneity tests, followed by the Mann-Whitney U test to examine differences in ecological awareness between male and female students. The findings revealed that female students obtained a slightly higher mean ecological awareness score than male students; however, the difference was not statistically significant ($U = 2323.50$, $p = 0.153$). These results indicate that no significant gender differences exist in students' ecological awareness within the context of an Adiwiyata Madrasah implementing Green Theology. The findings provide empirical evidence that integrating Green Theology into classroom instruction, school culture, and the Adiwiyata Program can foster ecological awareness inclusively, regardless of gender. This study contributes to the growing body of knowledge by positioning Green Theology as a sustainable Islamic education paradigm that promotes equitable internalization of ecological values among students.

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INTRODUCTION

The escalating global environmental crisis, including climate change (Ali & Thakkar, 2023), biodiversity loss (Pfenning-Butterworth et al., 2024), environmental pollution (Awewomom et al., 2024), and the unsustainable exploitation of natural resources (Homer-Dixon et al., 2011), has become a critical challenge for education systems worldwide. International organizations, particularly UNESCO through its Education for Sustainable Development (ESD) framework, emphasize that educational institutions play a strategic role in preparing future generations who possess not only academic competence but also environmental awareness, responsible attitudes, and a strong commitment to sustainable development (Agbedahin, 2019). Consequently, twenty-first-century education is expected to move beyond knowledge and skill acquisition toward cultivating ecological character, enabling learners to become responsible global citizens committed to environmental sustainability (Hadjichambis & Reis, 2020).

Within this context, Islamic education offers a broader perspective on environmental education by integrating ecological responsibility with spiritual and moral values (Mohamed, 2014). Islam regards human beings as *khalifah fi al-ardh* (vicegerents on Earth), entrusted by Allah with the responsibility of preserving ecological balance and protecting the natural environment (Qomusuddin et al., 2025). Environmental conservation is therefore understood not merely as a social obligation but as an act of worship and religious accountability. Consequently, Islamic education should extend beyond transmitting environmental knowledge to fostering theological values that shape students' moral awareness, environmental ethics, and sustainable ecological behavior (Khoirurrijal et al., 2025).

One of the emerging approaches in Islamic education is Green Theology, a theological perspective that integrates the Islamic principles of *tawhid* (the oneness of God), *amanah* (trusteeship), *khalifah* (stewardship), and *mizan* (balance) (Abadi et al., 2022) as the foundation for environmental responsibility. The implementation of Green Theology becomes particularly meaningful when integrated with Indonesia's *Adiwiyata* Program, which promotes environmentally friendly school culture (Aqilah & Lathifah, 2023). The synergy between these two approaches transforms environmental education from a series of technical conservation activities into a comprehensive process of internalizing Islamic values that influence students' ways of thinking, attitudes, and environmental behaviors.

Previous studies have consistently demonstrated that environmental education implemented in schools and madrasahs enhances students' environmental knowledge (Trisnawati et al., 2026), attitudes (Maarif et al., 2026), and pro-environmental behaviors (Sa'edi et al., 2025). Likewise, several studies have reported that integrating Green Theology into Islamic education strengthens students' ecological awareness through Islamic Religious Education, school culture, and religious habituation oriented toward environmental stewardship (Mustofa et al., 2025). Nevertheless, most existing studies have primarily examined program effectiveness, implementation outcomes, or relationships among variables. As a result, students have generally been treated as a

homogeneous group, while potential differences in ecological awareness arising from individual characteristics have received limited scholarly attention.

Educational psychology suggests that the internalization of values, moral development, empathy, and prosocial behavior may vary according to individual characteristics (Bashori, 2017), including gender (Rahmi, 2025). Several studies have reported that female students tend to demonstrate higher environmental sensitivity, ecological empathy, and conservation-oriented behavior than their male counterparts (Nkaizirwa et al., 2022). In contrast, other studies have found no significant gender differences, arguing that environmental awareness is more strongly influenced by contextual factors such as school culture (Gifford & Nilsson, 2014), learning experiences (Chawla & Cushing, 2007), and family environment (Grønhøj & Ölander, 2007). These inconsistent findings indicate that the relationship between gender and ecological awareness remains inconclusive, particularly within Islamic educational institutions that integrate Green Theology into both classroom instruction and school culture.

To date, research on Green Theology in madrasahs has predominantly focused on evaluating its effectiveness or examining its association with students' ecological awareness. Studies specifically investigating whether ecological awareness differs between male and female students within the context of Green Theology implementation in Adiwiyata Madrasahs remain scarce. Yet, such evidence is essential for developing learning strategies that are more inclusive, adaptive, and responsive to students' characteristics. Furthermore, understanding gender-based variations in ecological awareness may provide valuable insights for curriculum development, instructional design, and school culture aimed at strengthening the internalization of Islamic environmental values.

The novelty of this study lies in its comparative analysis of ecological awareness based on gender within the context of Green Theology implementation in an Adiwiyata Madrasah. Unlike previous studies that primarily focused on program effectiveness or the relationships among variables, this study examines whether gender is associated with differences in students' ecological awareness within an Islamic educational environment that systematically integrates Green Theology. Therefore, this study not only provides empirical evidence regarding gender differences in ecological awareness but also offers pedagogical insights for advancing more contextual, inclusive, and sustainable Islamic education.

Based on these considerations, this study aims to examine differences in ecological awareness between male and female students in an Adiwiyata Madrasah implementing Green Theology. The findings are expected to enrich the field of Islamic educational psychology while providing empirical evidence to support the development of instructional strategies, curriculum design, and school culture that more effectively cultivate students' ecological character as an integral component of sustainable Islamic education.

LITERATURE REVIEW

Green theology in islamic education

Green Theology is a theological approach that conceptualizes the relationship between humans and the environment as an integral component of religious teachings. From an Islamic perspective, this approach is grounded in the principles of tawhid (the oneness of God), khalifah (stewardship), amanah (trusteeship), and mizan (balance) (Trisnawati et al., 2026), which collectively emphasize that environmental conservation constitutes both an act of worship and a moral responsibility for every Muslim. Consequently, Islamic education serves not only to transmit religious knowledge but also to cultivate ecological values as a manifestation of faith in everyday life (Rohman et al., 2024).

The growing body of scholarship on eco-theology reflects a shift from a predominantly normative perspective toward a more transformative educational approach. Green Theology is no longer viewed merely as a theological discourse; rather, it has been increasingly integrated into curricula, instructional practices, school culture (Trisnawati, 2025), and institutional policies as a strategic framework for fostering students' ecological character (Febrianingsih et al., 2025). Such integration enables Islamic education to make meaningful contributions to the realization of Education for Sustainable Development (ESD) by strengthening learners' spiritual awareness, ethical responsibility, and environmental stewardship.

In educational practice, particularly within schools and madrasahs, Green Theology is implemented by integrating Qur'anic verses and Prophetic traditions related to environmental stewardship into classroom instruction, promoting environmentally responsible habits, encouraging teachers to model sustainable behaviors, and cultivating a school culture that supports sustainability (Trisnawati et al., 2026). This educational approach demonstrates that religious values can foster deeper and more enduring ecological behavior than conventional environmental education, which often emphasizes cognitive understanding without adequately addressing moral and spiritual dimensions.

Ecological awareness as an outcome of sustainable islamic education

Ecological awareness refers to an individual's knowledge, attitudes, values, and commitment to preserving the environment through responsible and sustainable actions (Perea et al., 2025). From an educational perspective, ecological awareness is regarded as a learning outcome that integrates cognitive, affective, and behavioral dimensions (Littledyke, 2008). Accordingly, the effectiveness of environmental education should not be assessed solely by students' acquisition of environmental knowledge but also by the development of enduring environmental responsibility and sustainable pro-environmental behaviors (Perea et al., 2025).

Within Islamic educational institutions, the development of ecological awareness possesses distinctive characteristics because it is closely linked to the internalization of religious values (Mohamed, 2014). In Indonesia, the Adiwiyata Program has become

an effective framework for cultivating environmentally responsible school culture through the integration of environmental policies, curriculum implementation, active participation of the school community, and sustainable management of school facilities (Trisnawati et al., 2026). When the Adiwiyata Program is integrated with Green Theology, students are encouraged not only to understand environmental conservation from a scientific perspective but also to perceive it as a religious obligation and a manifestation of their responsibility as khalifah (stewards of the Earth) (Maarif et al., 2026).

Recent empirical studies have demonstrated that the implementation of Green Theology in Adiwiyata Madrasahs is positively associated with students' ecological awareness. These findings reinforce the argument that integrating Islamic values into environmental education enriches students' ecological learning by incorporating moral and spiritual dimensions alongside scientific understanding (Trisnawati et al., 2026). Nevertheless, previous studies have generally treated students as a homogeneous population and have paid limited attention to potential variations in ecological awareness arising from individual characteristics, particularly gender. This gap highlights the need for further investigation into whether ecological awareness differs across student groups within the context of Green Theology-based Islamic education.

Gender and ecological awareness, an educational psychology perspective

From the perspective of educational psychology, gender is recognized as one of the individual factors that may influence the development of attitudes, empathy, moral reasoning, and students' social behavior (Eisenberg et al., 1996). Differences in socialization, parenting practices, and cultural expectations may lead male and female students to perceive and respond to environmental issues differently (Momsen, 2000). Consequently, examining ecological awareness through a gender perspective is essential for obtaining a more comprehensive understanding of the effectiveness of environmental education programs.

Previous studies have generally reported that female students tend to demonstrate higher levels of environmental concern than male students, primarily because they exhibit stronger empathy, greater social responsibility, and more pronounced prosocial orientations (Eisenberg et al., 1996). However, other empirical studies have found that these gender differences are not always statistically significant and are often shaped by contextual factors, including educational settings, school culture, learning experiences, and instructional strategies (Legewie & DiPrete, 2012). These inconsistent findings suggest that the relationship between gender and ecological awareness remains inconclusive and warrants further empirical investigation across diverse educational contexts, particularly in Islamic educational institutions implementing Green Theology.

Within the context of Islamic education, research on gender has predominantly focused on academic achievement (Hadjar et al., 2014), learning motivation (Butler, 2014), and the development of religious character (Woodhead, 2012). In contrast, studies examining gender differences in ecological awareness remain relatively scarce.

Understanding whether ecological awareness differs between male and female students is important because such evidence may inform educators and school leaders in designing instructional strategies, character education programs, and environmental initiatives that are more responsive to students' diverse characteristics and learning needs.

Building upon the theoretical framework and previous empirical findings, this study positions gender as the grouping variable and ecological awareness as the outcome variable within the context of an Adiwiyata Madrasah implementing Green Theology. Unlike previous studies that primarily investigated the effectiveness of Green Theology or its relationship with ecological awareness, this study adopts a comparative perspective by examining whether ecological awareness differs between male and female students. Accordingly, this research is expected to provide a new perspective on how students respond to Green Theology-based environmental education and to contribute to the advancement of sustainable Islamic education.

METHOD

This study employed a quantitative approach using a comparative research design to examine whether ecological awareness differs between male and female students in an Adiwiyata Madrasah implementing Green Theology. Unlike correlational research, which seeks to examine relationships among variables, comparative research is designed to identify differences between groups based on a specific outcome variable. The study was conducted at MIN 1 Sukoharjo, Indonesia, an Islamic primary school that has implemented the Adiwiyata Program while integrating Green Theology into classroom instruction, school culture, and various environmental activities. The study population comprised all 147 fifth-grade students enrolled in the 2025/2026 academic year. A total sampling technique was employed, whereby all members of the population were included as research participants.

Data were collected using an ecological awareness questionnaire that had been validated and demonstrated satisfactory reliability in a previous study. The instrument consisted of a four-point Likert scale ranging from strongly agree, agree, disagree, to strongly disagree. Each participant's total score was calculated to compare ecological awareness between male and female students. Prior to hypothesis testing, descriptive statistics were performed to summarize participants' characteristics and the distribution of ecological awareness scores. Assumption testing included normality and homogeneity tests. If the data satisfied the assumptions for parametric analysis, group differences were examined using an independent-samples t-test. Otherwise, the Mann-Whitney U test was employed as the non-parametric alternative. All statistical analyses were conducted using a significance level of $\alpha = 0.05$. The research hypotheses were formulated as follows:

H_0 : There is no significant difference in ecological awareness between male and female students in an Adiwiyata Madrasah implementing Green Theology.

H_1 : There is a significant difference in ecological awareness between male and female students in an Adiwiyata Madrasah implementing Green Theology.

FINDINGS

Respondents' characteristics by gender

The initial descriptive analysis was conducted to describe the demographic characteristics of the research participants at MIN 1 Sukoharjo based on gender. The study involved the entire population of 147 fifth-grade students, all of whom participated in the study through a total sampling technique. The distribution of respondents by gender is presented in Table 1.

Table 1. Respondents' characteristics by gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	69	46.9	46.9	46.9
Female	78	53.1	53.1	100.0
Total	147	100.0	100.0	-----

As presented in Table 1, the study included 147 fifth-grade students, comprising 69 male students (46.9%) and 78 female students (53.1%). The distribution indicates a relatively balanced representation of both gender groups, providing an appropriate basis for comparative analysis of ecological awareness. Since the study employed a total sampling technique, the gender distribution accurately reflects the actual composition of the fifth-grade student population at the participating Adiwiyata Madrasah.

Descriptive statistics of ecological awareness by gender

Descriptive statistics were computed to provide an initial overview of the distribution of ecological awareness scores among male and female students before hypothesis testing. The analysis summarizes the central tendency and variability of ecological awareness scores for each gender group. The results are presented in Table 2.

Table 2. Descriptive statistics of ecological awareness by gender

Gender	<i>n</i>	Mean	SD	Minimum	Maximum
Male	69	67.62	6.85	39	78
Female	78	69.58	6.15	50	80

As shown in Table 2, female students obtained a higher mean ecological awareness score ($M = 69.58$, $SD = 6.15$) than male students ($M = 67.62$, $SD = 6.85$). This descriptive finding suggests that female students tended to demonstrate slightly higher ecological awareness than their male counterparts. Furthermore, the larger standard deviation observed among male students indicates greater variability in ecological awareness scores within this group. However, these descriptive differences alone do not indicate whether the observed variation between the two groups is statistically significant. Therefore, inferential statistical analysis was subsequently conducted to test the research hypothesis.

Assumption testing

Prior to hypothesis testing, assumption tests were conducted to determine the appropriate statistical procedure. Data normality was assessed using the Shapiro–Wilk test, while homogeneity of variances was evaluated using Levene's test. The results of both tests are presented in Table 3.

Table 3. Results of normality and homogeneity tests

Test	Group	Statistic	p-value	Interpretation
Shapiro–Wilk	Male	0.913	<0.001	Not normally distributed
	Female	0.973	0.102	Normally distributed
Levene's Test	Both groups	0.385	0.536	Homogeneous variances

As shown in Table 3, the Shapiro–Wilk test indicated that ecological awareness scores for male students were not normally distributed ($p < 0.001$), whereas the female group met the assumption of normality ($p = 0.102$) (Sugiyono, 2013). Therefore, the normality assumption was not satisfied because one of the comparison groups exhibited a non-normal distribution. The Levene's test yielded a non-significant result ($p = 0.536$), indicating that the variances between the two groups were homogeneous (Sugiyono, 2013). Since the normality assumption was violated, differences in ecological awareness between male and female students were analyzed using the Mann–Whitney U test, which is appropriate for comparing two independent groups when the assumption of normality is not met.

Hypothesis testing

To address the research objective of examining gender differences in ecological awareness, a comparative analysis was conducted between male and female students. Based on the results of the assumption tests, the Mann–Whitney U test was selected as the appropriate statistical procedure. The results are presented in Table 4.

Table 4. Mann–Whitney U Test results for ecological awareness by gender

Variable	Male Mean Rank	Female Mean Rank	Mann–Whitney U	Z	p-value
Ecological Awareness	68,67	78,71	2323,50	-1,429	0,153

As presented in Table 4, female students obtained a higher mean rank (78.71) than male students (68.67), indicating a tendency toward higher ecological awareness among female students. However, the Mann–Whitney U test revealed that the difference was not statistically significant ($U = 2323.50$, $Z = -1.429$, $p = 0.153$). Since the p-value exceeded the significance level of 0.05, the null hypothesis was not rejected (Sugiyono, 2013), indicating that no significant difference in ecological awareness was found between male and female students.

DISCUSSION

The findings revealed no statistically significant difference in ecological awareness between male and female students in the Adiwiyata Madrasah implementing Green Theology ($p = 0.153$). Although descriptive statistics indicated that female students achieved slightly higher mean scores ($M = 69.58$) and mean ranks (78.71) than male students ($M = 67.62$; mean rank = 68.67), the observed difference did not reach statistical significance. These findings suggest that gender is unlikely to be a primary determinant of ecological awareness within an Islamic educational environment that systematically integrates Green Theology into classroom instruction, school culture, and students' daily activities.

One possible explanation is that the development of ecological awareness is influenced more by the quality of the educational environment than by students' biological or social characteristics. At MIN 1 Sukoharjo, Green Theology is implemented not only through environmental learning materials but also through religious habituation, teachers' role modeling, environmentally oriented school culture, the Adiwiyata Program, and the active participation of the entire school community in environmental stewardship (Trisnawati et al., 2026). Such learning experiences provide male and female students with relatively similar opportunities to internalize ecological values. Consequently, Green Theology may function as a pedagogical framework that nurtures ecological character through shared educational experiences rather than through gender-specific learning processes.

From the perspective of educational psychology, these findings support the view that character development emerges from continuous interactions between individuals and their learning environments (Eisenberg et al., 1996; Momsen, 2000). Educational settings that consistently promote role modeling, value reinforcement, habitual practice, and authentic learning experiences are more likely to shape students' character than individual demographic characteristics alone. This finding suggests that when schools successfully establish a strong ecological culture, the influence of educational experiences may outweigh gender-related differences in shaping students' ecological awareness. Therefore, ecological character appears to be constructed primarily through systematic educational processes rather than as a consequence of inherent psychological differences between male and female students.

The present findings both complement and extend previous research on gender and environmental education. Several earlier studies have reported that female students generally demonstrate higher levels of environmental concern because of stronger empathy, social responsibility, and prosocial orientations (Eisenberg et al., 1996). In contrast, the findings of this study are more consistent with research indicating that gender differences become less pronounced when students experience comparable learning environments, supportive school cultures, and consistent value internalization (Aelenei et al., 2017). This inconsistency across studies suggests that the influence of gender on ecological awareness is likely to be context-dependent (Chan et al., 2019). In educational settings where environmental education has not been systematically integrated, gender differences may still be observable. However, in

schools implementing Green Theology through comprehensive environmental policies and school-wide practices, these differences appear to diminish because all students receive similar educational experiences and opportunities for ecological value internalization.

Conceptually, this study contributes to the growing literature on Green Theology in Islamic education. Existing studies have primarily emphasized its effectiveness in enhancing students' ecological awareness (Cetin & Nisanci, 2010). The present findings extend this perspective by suggesting that Green Theology also facilitates an inclusive process of value internalization, enabling students from different gender groups to develop comparable levels of ecological awareness. Rather than functioning solely as a theological foundation for environmental education, Green Theology may also serve as a pedagogical paradigm that promotes equitable learning experiences, strengthens environmentally oriented school culture, and supports the collective development of ecological character within Islamic educational institutions.

The findings also have important practical implications for the development of sustainable Islamic education. Teachers of Islamic Religious Education and school leaders should focus less on designing gender-specific environmental learning strategies and more on strengthening learning environments that consistently internalize the Islamic values of *tawhid*, *khalifah*, *amanah*, and *mizan*. Integrating Green Theology into the curriculum, classroom instruction, co-curricular activities, environmental projects, and school culture may provide a more effective approach to cultivating ecological character among all students. For educational policymakers, the findings indicate that the success of environmental education in madrasahs may depend more on the consistency of ecological school culture than on instructional differentiation based on gender.

Despite these contributions, this study has several limitations. First, the research was conducted in a single Adiwiyata Madrasah, limiting the generalizability of the findings to other educational contexts. Second, the comparative quantitative design was unable to capture the psychological and educational processes underlying the absence of significant gender differences. Future research is therefore encouraged to employ mixed-methods or qualitative approaches to explore how Green Theology is internalized in students' daily learning experiences. Expanding the study across diverse madrasahs and examining additional variables such as religiosity, school culture, family support, teacher engagement, and the intensity of Green Theology implementation would contribute to a more comprehensive understanding of the factors shaping ecological awareness within Islamic education.

CONCLUSION

This study concludes that no statistically significant difference was found in ecological awareness between male and female students in an Adiwiyata Madrasah implementing Green Theology. Although female students demonstrated slightly higher mean ecological awareness scores and mean ranks than male students, these differences were not statistically significant. The findings indicate that the integration

of Green Theology through classroom instruction, school culture, and the Adiwiyata Program is associated with relatively comparable levels of ecological awareness among students, regardless of gender.

Conceptually, this study extends the existing literature on Green Theology in Islamic education by suggesting that the development of ecological character may depend more on the quality of value internalization than on students' gender. These findings position Green Theology not only as a theological foundation for environmental education but also as a pedagogical framework that supports inclusive learning environments, strengthens environmentally oriented school culture, and promotes the equitable development of ecological character. Consequently, this study contributes to the advancement of sustainable Islamic education by highlighting the potential role of school-wide ecological culture in fostering students' ecological awareness.

From a practical perspective, the findings suggest that madrasahs and Islamic Religious Education teachers should continue strengthening the integration of Green Theology into the curriculum, classroom instruction, religious habituation, and school culture without differentiating environmental learning strategies based on gender. Creating contextual, collaborative, and value-based learning experiences may provide a more effective approach to cultivating ecological awareness among all students. Given that this study was conducted in a single Adiwiyata Madrasah using a comparative quantitative design, future research is encouraged to include a broader range of madrasahs, employ mixed-methods or longitudinal designs, and examine additional factors such as religiosity, school culture, family support, teacher leadership, and the intensity of Green Theology implementation. Such studies would contribute to the development of a more comprehensive model explaining the factors that shape ecological awareness within the context of Islamic education.

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