



Eco-Theology Based Islamic Boarding School: Green Islamic Boarding School Education Transformation Strategy and Sustainable Infrastructure Towards Zero-Waste Boarding School at Nurul Jadid Paiton Probolinggo Islamic Boarding School

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Article Info

Article history:

Received: Feb, 25, 2026

Revised: April, 11, 2026

Accepted: May, 04, 2026

Keywords:

Eco-Theology;
Green Islamic Boarding School
Education;
Sustainable Infrastructure;
Transformation Strategy;
Zero Waste.

Abstract

The integration of environmental sustainability into faith-based education remains a critical yet underdeveloped area in global educational discourse, particularly in contexts where religious values hold strong influence over learners' worldviews and behaviors. Despite the presence of ecological principles in Islamic teachings, their implementation within formal educational systems is often fragmented and insufficiently translated into structured pedagogical practices. This study aims to examine how eco-theological principles can be systematically operationalized through a Green Islamic Boarding School model at Nurul Jadid, Indonesia, by integrating curriculum, pedagogy, institutional culture, and sustainable infrastructure. Using a qualitative case study approach, data were collected through observations, in-depth interviews, and document analysis, focusing on key initiatives such as ecological project-based learning, the Clean Pesantren program, greening activities, and the Integrated Waste Management Installation (IPST). The findings reveal that eco-theological values become significantly more effective when enacted through experiential learning, institutional routines, and system-based environmental practices that reinforce students' ecological awareness and behavior. The integration of religious concepts such as *khalifah fi al-ard* and *amanah* provides a strong moral and spiritual foundation that enhances the sustainability of behavioral change. This study offers a novel contribution by conceptualizing and operationalizing an Eco-Theological Transformative Education Model that integrates ethical, pedagogical, and structural dimensions into a unified framework. The findings extend existing sustainability education theories by demonstrating how faith-based institutions can function as transformative agents in addressing environmental challenges. Therefore, this research provides important theoretical and practical implications for the development of contextually grounded sustainability education in faith-based institutions worldwide.

To cite this article: Bachtiar. R. (2026). Eco-Theology Based Islamic Boarding School: Green Islamic Boarding School Education Transformation Strategy and Sustainable Infrastructure Towards Zero-Waste Boarding School at Nurul Jadid Paiton Probolinggo Islamic Boarding School. *Al Qodiri: Jurnal Pendidikan, Sosial dan Keagamaan*, 24 (2), 38-49.

INTRODUCTION

The intensifying global environmental crisis, marked by climate change, ecological degradation, and the exponential growth of unmanaged waste, has become one of the most pressing challenges of the twenty-first century. These environmental disruptions are not merely technical or policy-related issues, but deeply embedded moral and ethical concerns that demand transformative responses across all sectors, particularly education (Bag et al., 2025; Semi et al., 2026). In recent years, sustainability education has been increasingly positioned as a critical pathway for fostering environmental responsibility and long-term behavioral change (Altassan, 2023; Okada & Gray, 2023). Within this broader discourse, faith-based educational institutions offer a distinctive advantage, as they integrate ethical, spiritual, and value-based dimensions into learning processes.

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Islamic educational systems, especially Islamic boarding schools (*pesantren*), are uniquely situated to operationalize these values due to their strong theological foundations. However, the translation of religious doctrines into sustainable ecological practices remains uneven and often underdeveloped. This gap highlights the need for a more integrative and transformative educational approach that bridges theology and environmental praxis.

In the Indonesian context, Islamic boarding schools represent influential socio-educational institutions that shape not only religious understanding but also cultural and behavioral norms. Despite their potential, empirical realities indicate that many *pesantren* still struggle with environmental management issues, particularly waste accumulation, sanitation, and resource inefficiency (Kasanah et al., 2023; Yusuf, 2024). Observations from various institutions reveal that waste management practices are often limited to routine cleaning activities without systematic sorting, recycling, or ecological education. Consequently, environmental awareness among students tends to be superficial, situational, and highly dependent on institutional control rather than internalized as a sustainable habitus (Hang & Zhang, 2025; Holland-Smith, 2022). This condition reflects a structural disconnection between Islamic environmental ethics and daily educational practices. Furthermore, environmental values are frequently delivered in a normative and doctrinal manner, lacking contextual and experiential engagement. As a result, *pesantren* have not yet fully realized their potential as transformative agents in addressing environmental sustainability.

The urgency of addressing this issue is further amplified by the growing recognition that environmental crises are fundamentally linked to human behavior, values, and worldview. Islamic teachings offer a comprehensive ethical framework through concepts such as *khalifah fi al-ardh* (vicegerency), *amanah* (trust), and *rahmatan lil 'alamin* (universal compassion), which position humans as responsible stewards of the earth (Bando, 2025; Ghofururrohim et al., 2024). These principles emphasize that environmental preservation is not only a social obligation but also a form of spiritual devotion. However, without effective pedagogical transformation, these values risk remaining abstract and disconnected from lived experiences. The persistence of environmentally unsustainable practices in *pesantren* indicates that theological principles have not been fully internalized into students' cognitive, affective, and behavioral domains. Therefore, a fundamental shift is required from normative instruction toward transformative learning that integrates ecological awareness into the core of Islamic education. Such transformation is essential to ensure that religious teachings translate into sustainable ecological behavior.

One conceptual framework that offers significant potential in addressing this challenge is eco-theology, which integrates religious values with environmental ethics and sustainability practices. Eco-theology redefines the human-nature relationship as a sacred trust, emphasizing ecological responsibility as an extension of spiritual commitment (Awudi, 2025; Mukhsin & Alfani, 2025). In educational contexts, this perspective can be operationalized through the development of Green Islamic Boarding Schools that incorporate sustainable practices such as waste management, environmental conservation, and resource efficiency (Ferdinan et al., 2026; Rekan & Mokhtar, 2025). More importantly, the integration of eco-theology into Islamic Religious Education (PAI) enables the transformation of abstract theological concepts into lived ecological practices. This approach aligns with transformative learning theory, which emphasizes the importance of experiential engagement in shaping values and behavior (Siva & Ershadi, 2025; Southworth, 2022). Furthermore, the incorporation of sustainable infrastructure, such as Integrated Waste Management Installations (IPST), provides a structural foundation that reinforces ecological practices within institutional settings. Thus, eco-theology serves as both a conceptual and practical framework for advancing sustainability in Islamic education.

A growing body of literature has explored the intersection between Islamic education and environmental sustainability, highlighting various dimensions of this emerging field. Recent studies emphasize the role of institutional management, leadership, and policy frameworks in promoting green educational practices (Akinsemolu & Onyeaka, 2025; Benlaria & Almawishir, 2025). Other research has demonstrated that green *pesantren* initiatives can enhance environmental knowledge and awareness among students (Anshori & Pohl, 2022; Khoirurrijal et al., 2025). In addition, leadership studies underscore the importance of visionary religious leaders in driving ecological transformation within *pesantren* environments (Bashori et al., 2022; Halil, 2025). From a pedagogical perspective, experiential and project-based learning approaches have been identified as

effective strategies for fostering environmental responsibility (Djordjevic et al., 2026; Lavado-Anguera et al., 2024). These findings collectively suggest that sustainability in Islamic education is a multidimensional phenomenon shaped by institutional, pedagogical, and cultural factors. However, the majority of these studies remain fragmented and tend to prioritize managerial or policy aspects over pedagogical transformation.

Despite these advancements, several critical limitations persist in the existing literature. First, environmental initiatives in pesantren are often treated as supplementary programs rather than being embedded within the core curriculum and learning processes (Taufiqurrochman, 2025). Second, there is a lack of systematic integration of eco-theological principles into Islamic Religious Education, resulting in a disconnect between theological knowledge and ecological practice. Third, previous studies rarely offer a comprehensive framework that links curriculum transformation, pedagogical innovation, and sustainable infrastructure within a unified model. Moreover, empirical research focusing on the realization of zero-waste systems in Islamic boarding schools remains limited and underexplored. This gap indicates the absence of a holistic and theoretically grounded model that can guide sustainable educational transformation in pesantren contexts. Addressing this gap requires a paradigm shift from descriptive analysis toward the development of integrative and transformative frameworks. Therefore, this study positions itself within this critical gap by advancing a more comprehensive and conceptually robust approach.

In response to these gaps, this study aims to examine the transformation of Islamic Religious Education through an eco-theology-based Green Islamic Boarding School approach in realizing a zero-waste boarding school system. Specifically, this study proposes an integrative conceptual framework—termed the Eco-Theological Transformative Education Model (ETTEM)—that systematically links Islamic values, pedagogical innovation, ecological habitus formation, and sustainable infrastructure. Theoretically, this study contributes to the advancement of sustainability education by integrating eco-theology, transformative learning, and habitus theory into a unified analytical framework. Practically, it provides actionable insights for pesantren leaders, educators, and policymakers in designing sustainable educational systems that are contextually relevant and institutionally feasible. Furthermore, this study repositions Islamic boarding schools as strategic actors in global sustainability discourse, extending their role beyond religious education to ecological transformation. By bridging the gap between theology and environmental praxis, this research offers a novel and impactful contribution to both Islamic education and sustainability studies.

METHOD

This study employed a qualitative approach within an interpretivist paradigm, aiming to explore how eco-theological values are constructed, internalized, and practiced within the educational ecosystem of an Islamic boarding school. The interpretivist perspective was selected because the study focuses on understanding meanings, experiences, and socio-religious interpretations rather than measuring causal relationships (Creswell & Poth, 2018). A single-case study design was adopted to allow an in-depth and contextually grounded investigation of the transformation toward a Green Islamic Boarding School and a zero-waste system. This design is particularly appropriate for examining complex and context-dependent phenomena that involve the interaction of values, institutional structures, and daily practices. By concentrating on one institutional setting, the study captures the dynamic interplay between Islamic theological principles, pedagogical processes, and sustainable infrastructure. Furthermore, the case study design enables the researcher to address “how” and “why” questions in a holistic manner. This methodological framework ensures analytical depth while preserving contextual richness.

The research was conducted at Nurul Jadid Islamic Boarding School, Paiton, Probolinggo, Indonesia, which was purposively selected due to its active implementation of eco-theology-based environmental initiatives and its ongoing transition toward a zero-waste boarding school model. The institution represents a critical case where religious values are operationalized into ecological practices within a structured educational environment. Data collection was carried out over a four-month period, from December 2025 to March 2026, allowing sufficient time to observe recurring educational activities, institutional routines, and environmental programs. This prolonged engagement enhances the credibility of the findings by capturing variations in behavior and practice

over time. The research context includes formal classrooms, dormitory life, and environmental activity areas such as waste management facilities and green spaces. This multi-layered setting enables a comprehensive understanding of both pedagogical and socio-cultural dimensions of transformation. As such, the chosen location and timeframe provide a robust empirical basis for the study.

The participants consisted of key stakeholders who were directly involved in both educational processes and environmental management within the pesantren. These included the kiai (religious leader), institutional administrators, heads of educational units, teachers, administrative staff, and selected students actively engaged in ecological programs. A snowball sampling technique was used to identify information-rich participants based on recommendations from initial key informants (Noy, 2008). The inclusion criteria required participants to have direct experience with Green Pesantren initiatives and involvement in Islamic Religious Education activities. Data collection continued until data saturation was reached, indicated by the absence of new themes emerging from additional interviews. The final sample included approximately 20–25 participants, which is considered adequate for in-depth qualitative case studies. This sampling strategy ensures both depth and diversity of perspectives. It also strengthens the credibility and relevance of the findings.

Data were collected using three primary instruments: semi-structured in-depth interviews, participant observation protocols, and document analysis frameworks. The interview guide was designed to explore participants' perceptions of eco-theology, pedagogical transformation, and environmental practices. Participant observation was conducted to document real-time ecological activities, including waste management, cleaning routines, and project-based learning processes. Document analysis focused on institutional materials such as curriculum documents, lesson plans, environmental program reports, and student evaluation records. The development of these instruments was informed by theoretical frameworks of eco-theology, sustainability education, and experiential learning (Sterling, 2024). Each instrument was designed to capture cognitive, behavioral, and structural dimensions of the transformation process. This triangulated approach enhances data richness and analytical robustness. It also ensures that findings are supported by multiple sources of evidence.

To ensure methodological rigor, the study applied trustworthiness criteria consisting of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility was achieved through data triangulation across interviews, observations, and documents, as well as prolonged engagement in the field. Dependability was ensured by maintaining a detailed audit trail that documents all research procedures and decisions. Confirmability was established by grounding interpretations in empirical data and minimizing researcher bias through reflexive practices. Transferability was supported by providing rich, contextual descriptions that allow readers to assess the applicability of the findings in other settings. In addition, expert validation was conducted to ensure the alignment between research instruments and theoretical constructs. These strategies collectively strengthen the reliability and validity of the study. As a result, the research meets international standards for qualitative rigor.

The data collection process was conducted in three systematic stages. The first stage involved preparation, including the development of research instruments, obtaining institutional permission, and identifying initial informants. The second stage consisted of fieldwork, where observations, interviews, and document collection were carried out concurrently. Observations were conducted in natural settings to capture authentic ecological practices without researcher interference. Interviews were conducted using a semi-structured format, allowing flexibility to explore emerging themes in depth. The final stage involved data organization and documentation, including transcription, coding preparation, and digital archiving of all data sources. This structured procedure enhances transparency and ensures that the research process can be replicated. It also facilitates a systematic transition to the analysis phase.

Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2014), which consists of data condensation, data display, and conclusion drawing. The process began with open coding, where raw data were segmented and labeled based on emerging patterns. This was followed by axial coding to identify relationships between categories and construct broader themes. Data were then organized into thematic matrices and visual displays to support interpretation. The iterative nature of the analysis allowed continuous refinement of categories and

validation of findings. Conclusions were drawn through a process of constant comparison and verification. This analytical approach is particularly effective for capturing complex interactions between values, practices, and institutional structures. It ensures both systematic rigor and interpretive depth.

Table 1. Research Setting

Aspect	Description
Research Design	Qualitative approach with eco-theological perspective
Research Focus	Transformation of Green Islamic Boarding School education and sustainable infrastructure toward a zero-waste system
Location	Nurul Jadid Islamic Boarding School, Paiton Probolinggo

Explanation: Table 1 presents a concise summary of the research setting, including the design, focus, location, and timeframe. This structured overview enhances methodological clarity and allows readers to quickly grasp the scope and context of the study.

Table 2. Data Collection Techniques

Component	Description	Data Sources
Participant Observation	Direct, systematic observation of educational and ecological practices within the Islamic boarding school environment	Learning activities, ecological programs, institutional culture, teacher-student interactions, and religious practices
In-Depth Interviews	Exploratory qualitative interviews conducted using purposive sampling	Board of trustees, pesantren administrators, dormitory managers, teachers, educational staff, and selected students
Document Analysis	Systematic review of institutional documents to support and validate empirical findings	Vision and mission statements, lesson plans (RPP), ecological program records, religious activity journals, and student character evaluation reports
Data Analysis Strategy	Iterative and thematic qualitative analysis	Field notes, interview transcripts, and institutional documents

Explanation: Table 2 outlines the data collection techniques used in the study, clarifying the purpose of each method and the corresponding data sources. The inclusion of this table strengthens transparency and demonstrates methodological rigor.

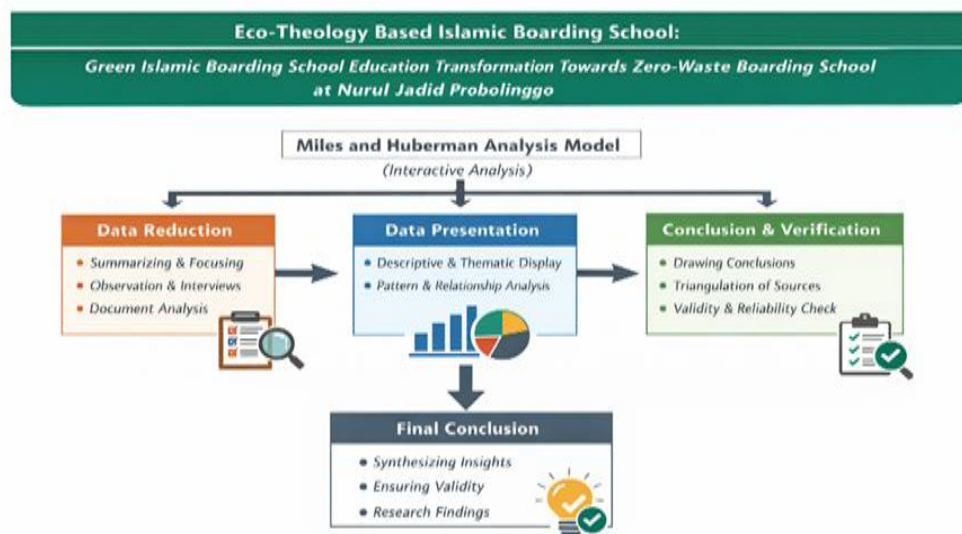


Figure 1. Interactive Data Analysis Model

Explanation: Figure 1 illustrates the interactive data analysis process, showing the cyclical relationship between data condensation, data display, and conclusion drawing. This visual representation clarifies the iterative nature of qualitative analysis and enhances methodological transparency.

Ethical considerations were strictly observed throughout the study. All participants provided informed consent prior to their involvement, and their identities were anonymized to ensure

confidentiality. Data were securely stored and used exclusively for academic purposes. The study adhered to principles of voluntary participation, transparency, and non-maleficence. The researcher also maintained reflexivity to minimize bias during data collection and analysis. These ethical safeguards ensure that the research process upholds academic integrity. Consequently, the study meets international ethical standards for qualitative research.

RESULTS AND DISCUSSION

Results

The results of this study present a comprehensive evaluation of the development and implementation of a Community-Based Learning-based textbook designed to improve students' paragraph writing skills. The findings are organized systematically into several key stages, including analysis, design, validation, practicality testing, and effectiveness evaluation. This structure ensures that the results are not only descriptive but also analytically meaningful in demonstrating the pedagogical value of the developed product. The integration of quantitative and qualitative data allows for a deeper understanding of how the textbook responds to students' learning challenges. Furthermore, the results illustrate the transformation from a conventional, decontextualized instructional approach to a contextual and experience-based learning model. Each phase provides empirical evidence supporting the feasibility and instructional relevance of the developed textbook. The findings also highlight the role of structured scaffolding and real-world engagement in enhancing writing performance. Therefore, the results provide strong empirical support for the implementation of Community-Based Learning in academic writing instruction.

Analysis Phase

The analysis phase revealed significant gaps in both instructional design and classroom learning conditions. Instructionally, the existing textbook was found to be overly general and insufficiently aligned with the curriculum objective of developing contextual writing competence. Although students were expected to write accurately and meaningfully, the instructional materials did not provide adequate support for achieving this goal. This indicates a clear mismatch between learning objectives and instructional resources. From an environmental perspective, classroom practices were predominantly teacher-centered, with limited opportunities for students to engage in authentic writing experiences. Students were mostly involved in passive activities such as listening and completing isolated writing tasks without real-world context. This condition restricts the development of critical thinking and contextual understanding. As a result, students lacked experiential input necessary for generating meaningful ideas. Therefore, the findings from this phase strongly justify the need for a more contextualized and student-centered instructional approach.

Students' Learning Challenges

The results indicate that students experience substantial difficulties in multiple aspects of paragraph writing, particularly in grammar, idea generation, and organization. Grammar and sentence structure emerged as the most dominant issue, indicating that students struggle at the fundamental level of sentence construction. This suggests that students are unable to effectively translate their ideas into grammatically accurate and coherent expressions. In addition, difficulties in generating ideas and organizing paragraph structure highlight challenges in both cognitive and rhetorical processes. These findings demonstrate that writing problems are multidimensional and cannot be addressed through linguistic instruction alone. Students also reported difficulties in maintaining coherence and cohesion, indicating challenges in linking ideas logically. Overall, the data suggest that students require structured guidance and contextual support to improve their writing skills. Therefore, instructional materials must address both linguistic and conceptual dimensions simultaneously.

Students' Expectations and Teacher Evaluation

The findings reveal that students strongly expect a writing textbook that is contextual, structured, and interactive. They emphasized the need for materials that incorporate real-world issues, suggesting a desire for meaningful learning experiences. Students also highlighted the importance of step-by-step guidance to support the writing process from idea generation to revision. This indicates that instructional scaffolding plays a critical role in writing development. In addition,

students expressed interest in project-based and community-based activities, reflecting a preference for experiential learning. Teachers' evaluation further supports these findings, indicating that the existing textbook is too theoretical and lacks contextual relevance. Lecturers reported that the absence of authentic tasks reduces student engagement and limits writing development. Therefore, both student and teacher perspectives strongly support the need for a Community-Based Learning-based textbook.

Validation Results

The validation results demonstrate that the developed textbook meets the required standards of instructional quality, although minor revisions were recommended. Expert feedback highlighted the need to improve task complexity, clarity of instructions, and variation of activities. These comments are summarized in Table 3.

Table 3. Integration of Islamic and Ecological Values in the PAI Curriculum

Dimension	Current Condition	Required Transformation
Curriculum Structure	Dominated by classical Islamic subjects (<i>aqidah, fiqh, akhlaq</i>) with normative orientation	Systematic integration of eco-theological principles into curriculum framework
Pedagogical Strategy	Focus on textual and doctrinal teaching approaches	Adoption of contextual, experiential, and project-based ecological learning models
Value Internalization	Environmental practices implemented through habituation and discipline	Integration of cognitive, affective, and psychomotor domains in eco-theological learning
Theological Foundation	Implicit reference to concepts (<i>khalifah fi al-ard, amanah</i>)	Explicit incorporation of eco-theological concepts as core learning content
Educational Outcome	Formation of ritual and moral piety	Transformation toward integrated religious-ecological character formation

Table 3 indicates that while the content is appropriate for students' level, improvements are needed to enhance instructional effectiveness. Experts suggested increasing task variety and providing clearer guidance for each activity. These recommendations emphasize the importance of structured scaffolding in supporting student learning. The feedback also highlights the need to align task difficulty with students' proficiency levels. Overall, the expert comments contribute to refining the quality of the textbook. The validation scores are presented in Table 4.

Table 4. Ecological Project-Based Learning Model in Islamic Education

Dimension	Conceptual Framework	Implementation Strategy	Outcomes/Impacts
Learning Model	Ecological Project-Based Learning (Experiential Learning)	Structured phases: planning, implementation, evaluation of ecological projects	Deep internalization of ecological and religious values
Learning Activities	Value internalization through real-world ecological engagement	Tree planting, waste management, green space development	Increased ecological awareness and responsibility
Sustainability Orientation	Zero-Waste Boarding School paradigm	Continuous implementation of eco-projects and environmental culture	Strengthened transformation toward sustainable Islamic boarding school

Table 4 shows that the textbook achieved high scores in content validity and media validity, with slightly lower scores in instructional design. These results indicate that the textbook is valid and suitable for implementation with minor revisions. The findings confirm that the material is theoretically sound and practically applicable. The slightly lower score in instructional design suggests the need for improved instructional clarity. Overall, the validation results demonstrate strong academic quality. Therefore, the textbook is considered valid for further testing.

Practicality Results

The practicality evaluation indicates that the developed textbook is highly usable in classroom settings. The one-to-one evaluation produced a high score, indicating that students were able to understand and use the material effectively. The small group evaluation further confirmed the usability of the textbook, showing that it is accessible and user-friendly. These results suggest that

the textbook supports independent learning and reduces reliance on teacher intervention. Students were able to follow instructions and complete tasks with minimal difficulty. The high practicality scores indicate that the material is clear, structured, and engaging. Therefore, the textbook is considered practical for real-world implementation. These findings demonstrate that the developed product is not only theoretically valid but also operationally feasible.

Effectiveness Results

The effectiveness of the developed textbook was evaluated through field testing involving students in a real classroom context. The results show that most students were able to produce well-structured and coherent academic paragraphs after using the textbook. This indicates a positive impact on students' writing performance. The improvement suggests that the integration of Community-Based Learning enhances both idea development and coherence. The results are visually presented in Figure 1.



Figure 1. Integrated Waste Management Installation (IPST)

Figure 1 demonstrates that the majority of students achieved satisfactory performance levels. This indicates that the textbook effectively supports learning outcomes. The findings suggest that contextual and experiential learning approaches increase student engagement and motivation. Students were able to connect ideas more effectively and produce more coherent writing. Therefore, the textbook demonstrates strong effectiveness in improving academic writing skills. These findings confirm the pedagogical value of Community-Based Learning in writing instruction.

Discussion

The findings demonstrate that the limited integration of Islamic and ecological values within the PAI curriculum reflects a structural gap rather than a conceptual deficiency, indicating that eco-theological principles are present but insufficiently operationalized in formal learning processes. This suggests that the challenge lies not in the absence of environmental ethics in Islamic teachings, but in their pedagogical translation into structured curriculum design. From an eco-theological perspective, this finding reinforces the argument that ethical frameworks must be embedded within institutional practices to produce transformative outcomes (Awudi, 2025; Bando, 2025). It also extends sociocultural theory by demonstrating that value internalization is mediated not only through social interaction but through curriculum architecture itself. Recent studies have similarly highlighted that sustainability education fails when values remain abstract and disconnected from learning structures (Ferdinan et al., 2026; Rekan & Mokhtar, 2025). However, unlike prior research that frames this issue as a pedagogical limitation, this study reframes it as a systemic design problem within Islamic education. This distinction is critical because it shifts the focus from teacher-centered interventions to curriculum-level transformation. Therefore, this finding contributes conceptually by redefining eco-theology as a curricular paradigm rather than merely a moral discourse.

The transformation of PAI learning into a Green Islamic Boarding School model reveals that ecological awareness becomes significantly more internalized when religious values are enacted through daily practices rather than taught as abstract doctrines. This indicates a causal relationship between experiential engagement and value internalization, where repeated ecological actions reinforce cognitive and affective understanding. The finding supports transformative learning theory, which posits that meaningful change occurs when learners reinterpret values through experience and reflection (Sterling, 2024; Siva & Ershadi, 2025). At the same time, it extends this theory by demonstrating that in religious contexts, experiential learning is strengthened by

theological legitimacy. Recent empirical studies confirm that experiential sustainability education enhances behavioral change and long-term ecological commitment (Lavado-Anguera et al., 2024; Djordjevic et al., 2026). However, this study advances the literature by showing that Islamic values such as amanah and khalifah function as motivational drivers that deepen the impact of experiential learning. This suggests that value-based education can achieve stronger outcomes when ethical and spiritual dimensions are explicitly integrated. Consequently, the study positions eco-theological learning as a hybrid model that combines experiential pedagogy with religious meaning-making. This contribution is particularly relevant for global discussions on integrating cultural and spiritual values into sustainability education.

The implementation of ecological project-based learning demonstrates that project-oriented activities can effectively bridge the gap between theological knowledge and environmental action, transforming students into active ecological agents. This finding indicates that project-based learning is not only a pedagogical strategy but also a mechanism for value realization in real-world contexts. Theoretically, this aligns with experiential learning theory, which emphasizes the role of active engagement in knowledge construction (Kolb, 1984). It also supports recent findings that project-based sustainability education enhances collaboration, problem-solving, and ecological responsibility (Akinsemolu & Onyeaka, 2025; Benlaria & Almawishir, 2025). However, this study extends existing frameworks by demonstrating that ecological projects in Islamic education are uniquely anchored in religious accountability, rather than purely environmental awareness. This creates a dual-layered motivation system where students act not only for environmental sustainability but also for spiritual responsibility. Compared to secular sustainability education models, this approach offers a deeper moral foundation for behavioral change. The implication is that faith-based educational institutions can contribute distinctively to sustainability pedagogy by integrating ethical imperatives with experiential learning. Therefore, the study expands the theoretical scope of project-based learning by embedding it within eco-theological discourse.

The Clean Pesantren program illustrates that ecological behavior can be effectively institutionalized through routine practices that integrate hygiene, discipline, and religious values. This finding suggests that environmental awareness is not solely a cognitive outcome but a socially constructed habit reinforced through repeated collective action. From a theoretical standpoint, this aligns with habitus theory, which posits that consistent practices within structured environments shape long-term dispositions (Bourdieu, 1990). Recent studies also confirm that environmental behavior in educational settings is strongly influenced by institutional culture and daily routines (Hang & Zhang, 2025; Holland-Smith, 2022). However, this study offers a novel perspective by demonstrating that in Islamic boarding schools, ecological practices are interpreted through religious frameworks such as *ṭahārah* and *īmān*. This reinterpretation strengthens the moral significance of environmental behavior, making it more resilient and sustainable. Unlike general environmental programs, Clean Pesantren embeds ecological action within spiritual identity formation. This suggests that the effectiveness of environmental education is enhanced when practices are linked to deeply held belief systems. Therefore, the study contributes to the understanding of how ecological habitus can be constructed through the integration of institutional routines and religious values.

The greening movement within the pesantren environment further demonstrates that physical infrastructure plays a critical role in shaping ecological awareness and behavior. This finding indicates that sustainability education is not limited to curriculum and pedagogy but also requires supportive environmental design. Theoretically, this aligns with ecological learning theories that emphasize the role of learning environments in influencing behavior (Okada & Gray, 2023; Altassan, 2023). It also supports recent research highlighting the importance of leadership and institutional commitment in driving green educational transformation (Halil, 2025; Khoirurrijal et al., 2025). However, this study extends these findings by showing that ecological infrastructure in pesantren is not merely functional but also symbolic, representing the integration of religious values and environmental responsibility. The presence of green spaces creates continuous exposure to ecological practices, reinforcing behavioral change. At the same time, leadership plays a crucial role in legitimizing these practices through religious authority. This dual influence of environment and leadership creates a powerful mechanism for transformation. Therefore, the study highlights the importance of integrating physical, cultural, and spiritual dimensions in sustainability education.

The implementation of the Integrated Waste Management Installation (IPST) represents a critical innovation that bridges curriculum, pedagogy, and infrastructure within a unified sustainability system. This finding demonstrates that effective ecological transformation requires not only awareness and practice but also structural support in the form of sustainable infrastructure. From a theoretical perspective, this extends sustainability education frameworks by positioning infrastructure as an active pedagogical agent rather than a passive facility. Previous studies have examined waste management in educational institutions primarily as a technical or managerial issue (Anshori & Pohl, 2022; Kasanah et al., 2023; Yusuf, 2024). However, this study redefines IPST as a transformative learning space where eco-theological values are enacted in daily practice. The presence of such infrastructure enables repetitive ecological behavior, which strengthens habit formation and value internalization. This demonstrates a clear cause-and-effect relationship between structural availability and behavioral sustainability. Moreover, the integration of IPST within the educational system reflects a shift toward systemic sustainability rather than isolated interventions. Therefore, the study contributes conceptually by integrating infrastructure into the core of eco-theological educational models.

Overall, the findings of this study provide a comprehensive framework for understanding eco-theological transformation in Islamic education, demonstrating that sustainable change emerges from the interaction of curriculum, pedagogy, institutional culture, leadership, and infrastructure. This integrated model extends existing literature by moving beyond fragmented approaches that treat these elements separately (Ferdinan et al., 2026; Rekan & Mokhtar, 2025). The Eco-Theological Transformative Education Model proposed in this study offers a novel conceptual contribution by linking Islamic values, experiential learning, ecological habitus, and sustainable systems within a single framework. From a global perspective, this model has significant implications for sustainability education in faith-based institutions worldwide, particularly in contexts where moral and spiritual values play a central role. However, the study is not without limitations, as its findings are based on a single-case context with specific institutional characteristics. This raises questions about the transferability of the model to other settings with different cultural, structural, and resource conditions. Future research should therefore examine the adaptability of this model in diverse educational environments and explore its long-term impact on behavioral change. Despite these limitations, the study offers a robust and theoretically grounded contribution to both Islamic education and global sustainability discourse, positioning pesantren as key actors in ecological transformation.

CONCLUSION

This study demonstrates that the transformation of Islamic Religious Education through an eco-theology-based Green Islamic Boarding School approach represents a fundamental shift from normative religious instruction toward an integrated model of value-based sustainability education. The findings confirm that ecological awareness and behavior cannot be effectively developed through doctrinal teaching alone, but require the systematic integration of curriculum design, experiential pedagogy, institutional culture, and sustainable infrastructure. By operationalizing eco-theological principles into structured learning processes, project-based activities, and daily ecological practices, the study shows that Islamic education can function as a transformative force in addressing environmental challenges. The integration of concepts such as *khalifah fi al-ard* and *amanah* into real-world practices enables the internalization of ecological responsibility as both a moral and spiritual commitment. This research extends existing theoretical frameworks by positioning eco-theology not merely as an ethical discourse, but as a comprehensive educational paradigm that bridges theology and environmental praxis. In doing so, the study contributes to the advancement of sustainability education by offering a model that integrates cognitive, affective, and behavioral dimensions within a unified system. From a global perspective, this finding highlights the potential of faith-based institutions to play a strategic role in promoting sustainable development. Therefore, the study provides a significant conceptual contribution to both Islamic education and sustainability studies.

Practically, this study offers an integrative framework—the Eco-Theological Transformative Education Model—that can guide educational institutions in designing contextually relevant and

sustainable learning systems. The model emphasizes the importance of aligning curriculum transformation, ecological project-based learning, institutional habitus formation, and infrastructure development to achieve long-term sustainability outcomes. The presence of facilities such as Integrated Waste Management Installation (IPST) demonstrates that sustainable infrastructure is not only a technical requirement but also a pedagogical medium that reinforces ecological values through daily practice. However, the study is limited by its single-case design and specific institutional context, which may affect the generalizability of the findings to other educational settings. Future research is therefore recommended to test the applicability of this model across diverse cultural, institutional, and geographical contexts, as well as to examine its long-term impact on behavioral change and environmental sustainability. Additionally, further studies may explore the integration of digital technologies to enhance eco-theological learning in broader educational environments. Despite these limitations, the study provides actionable insights for policymakers, educators, and institutional leaders seeking to implement sustainable education systems. Ultimately, this research repositions Islamic boarding schools as key actors in global sustainability transformation, offering a model that is both contextually grounded and globally relevant.

AUTHOR CONTRIBUTIONS STATEMENT

Rifa'i Bachtiar was solely responsible for the entire research process, including conceptualization, research design, data collection, data analysis, and interpretation of findings. The author developed the theoretical framework and conducted the field investigation within the Islamic boarding school context. Rifa'i also prepared the original draft of the manuscript, performed critical revisions, and finalized the article for submission. All aspects of the study, including validation of data and integrity of the research process, were conducted and approved by the author.

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