

**INTEGRATION OF ECOLOGICAL PRINCIPLES IN THE PESANTREN
SYSTEM: A STUDY OF SUSTAINABILITY AND ENVIRONMENTAL
CONSERVATION PRACTICES IN ISLAMIC EDUCATION**

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ABSTRACT

While pesantren education in Indonesia has great potential in implementing ecological principles, challenges in integrating environmental values often hinder its effectiveness. This study explores how ecological principles are incorporated into the pesantren education system and their impact on environmental conservation practices and awareness of santri. Data were collected through in-depth interviews, participatory observation, and document analysis using a qualitative approach with a descriptive-analytical method. The findings show that ecological principles can be effectively implemented through a holistic approach combining Islamic values with conservation practices. The results reveal that this integration increases environmental awareness among santri and strengthens their Islamic identity as khalifahs responsible for the ecosystem. This research enriches the theory of ecological integration in Islamic education and provides a model that can be applied in other pesantren. Practical implications include guidance for pesantren managers in designing effective environmental curricula and activities. This research also opens pathways for further studies with quantitative or mixed-methods approaches and exploring digital technology in pesantren ecological education.

Keywords: Pesantren Education; Ecological Principles; Environmental Conservation; Santri Awareness



INTRODUCTION

Pesantren, the oldest and most influential Islamic educational institution in Indonesia, plays an important role in the character, moral, and spiritual formation of santri. (Zakki & Hazinah, 2023) As centers of Islamic education, pesantren educate students in religious knowledge, shaping their behavior and mindset, influencing their lives in society. However, with the increasing global awareness of environmental and sustainability issues, there is an urgent need to expand the scope of education in pesantren and include aspects of environmental conservation and ecological sustainability. (Nashihin, Aziz, Adibah, Triana, & Robbaniyah, 2022)

The world faces major challenges related to climate change, pollution, and increasingly severe environmental degradation. This situation demands a paradigm shift in various sectors, including education, to create a more concerned and responsible generation for the environment. Pesantren has great potential to contribute to this global effort by integrating ecological principles into its education system. (Hakim, 2013).

Integrating ecological principles in pesantren is a strategic step to instill environmental awareness in santri from an early age, considering that pesantren have a strong community structure and allow the implementation of sustainable collective practices. (Mangunjaya, 2014) This approach not only increases environmental awareness among santri but also contributes to environmental conservation at the local and national levels. Education that combines spiritual and ecological aspects will equip santri with in-depth religious knowledge and an understanding of the importance of protecting nature as a mandate from God. (Parma, Singgih, & Amin, 2023) However, studies on applying ecological principles in the Pesantren education system are still limited. The main focus of education in Pesantren tends to be on religious aspects, such as the study of the Quran, hadith, and fiqh, with minimal attention to environmental and sustainability issues. (Zahid, Bakhri, Ikeyanti, & Hijazi, 2023). This creates a gap between the urgent need for ecological awareness and the current pesantren curriculum.

The lack of studies on ecological principles in pesantren contributes to the low environmental awareness among santri and pesantren managers, considering that without adequate education on ecological conservation, santri tend not to understand the impact of human activities on nature as well as their responsibility as Muslims to preserve the earth. As a result, there is a lack of real initiatives or practices in protecting the environment, both in pesantren and in the lives of santri after graduating. (Mesran, Suginam, & Assrani, 2024).

The main challenge is to integrate ecological principles into the curriculum and activities of pesantren without compromising the essence of religious education. (Ahyani, Permana, & Abduloh, 2020) Given Pesantren's established traditions and teaching methods, changes or adjustments to new approaches are often difficult. (Wulandari, 2024) Therefore, a comprehensive strategy is needed to ensure the application of ecological principles in harmony with the religious values of pesantren. This research aims to develop an approach that effectively integrates religious education and environmental education in pesantren.

This research aims to develop an effective model of integrating ecological principles in the pesantren education system to increase awareness and sustainable environmental conservation practices among santri. By focusing on the daily activities of pesantren, this research identifies sustainable ecological management practices. It formulates practical strategies for integrating environmental education into the curriculum, including developing materials, teaching methods, and extracurricular activities that support santri involvement in ecological conservation.

The results of this study are expected to provide recommendations for an integration model of ecological principles that pesantren can adopt throughout Indonesia, enabling their active contribution to maintaining environmental sustainability globally while enriching religious education with relevant values. However, research on integrating ecological principles in pesantren education is still limited, with most literature focusing on spiritual aspects and morality. At the same time, insufficient attention is paid to environmental sustainability. As a result, the practice of conservation and sustainable environmental management is still minimal in pesantren, so in-depth and empirically-based research is needed to fill this gap.

This research offers an innovative approach to integrating ecological principles into the pesantren education system. This area has not been widely explored in the current literature. By integrating sustainability principles with the pesantren curriculum, this research not only fills the existing gap in knowledge regarding pesantren education and the environment but also significantly contributes to developing an educational model responsive to environmental issues.

The urgency of this research lies in the importance of increasing environmental awareness in educational institutions, which greatly influence the morals and ethics of santri. With the integration of ecological principles, pesantren can play an important role in shaping a more concerned generation of people concerned about environmental sustainability. In

addition, this research is expected to have a broad social and ecological impact by producing an applicable model for various pesantren in Indonesia. The practical recommendations from this research will include effective implementation strategies, necessary tools, and solutions to challenges that may be faced to facilitate the wider adoption of ecological principles in Islamic educational institutions.

RESEARCH METHODOLOGY

This research adopts a qualitative approach with a descriptive-analytical research type. (Sugiyono, 2019). A qualitative approach was chosen to enable an in-depth understanding of how ecological principles are integrated into the pesantren education system and the environmental conservation practices implemented. With this approach, researchers can dive into the meanings, values, and experiences from the perspectives of pesantren managers, students, and staff involved in environmental activities. Descriptive-analytical research aims to describe existing phenomena and analyze the processes and factors that influence the implementation of ecological principles in the context of pesantren.

Data was collected through three main techniques: in-depth interviews And interviews with pesantren managers, teachers, and santri. Observation was conducted by the researcher, who was directly involved in activities at the pesantren for several months. The researcher participated in environmental programs, such as greening and waste management. Participatory, and document analysis Document analysis includes examining relevant documents such as curriculum, learning modules, environmental activity reports, and pesantren policies related to ecology.

The collected data were analyzed using the thematic analysis method. This process begins with data familiarization, where researchers read and understand the data to recognize emerging patterns and themes. Next, the data was coded with keywords or phrases that reflected the themes or patterns. After coding, key themes were identified and analyzed to see how they interconnected and supported the initial research hypothesis. The identified themes were then reviewed to ensure clear linkages and relevance to the data. These themes were defined and given names corresponding to the core of the analyzed data. Findings from the theme analysis were then reported in detail, emphasizing how they supported the research conclusions.

Data validity was assured through several techniques. Triangulation uses various data sources, such as interviews, observations, and documents, to get a comprehensive and

objective picture of integrating ecological principles in pesantren. Member check was conducted by confirming the findings with key respondents to ensure the accuracy of the researcher's interpretation. An audit trail includes keeping detailed records of the entire research process, including data collection, coding, and thematic analysis. This allows for review and verification by other researchers or interested readers.

RESULTS & DISCUSSION

Contribution to the Development of Theory and Practice of Ecological Education in Islamic Boarding Schools

This study reveals that integrating ecological principles in the pesantren education system can be effective through a holistic and contextual approach. The results show that environmental conservation practices that have been implemented in several pesantren, such as community-based waste management and greening of the pesantren environment, not only increase ecological awareness among santri but also strengthen Islamic identity rooted in teachings about the harmonious relationship between humans and nature. This finding aligns with Islamic ecological theory that teaches the concept of *Khalifah* (human leadership on earth) and *amanah* (responsibility for protecting nature), where humans are expected to maintain the ecosystem balance as part of worship. (Bashori, Novebri, & Salabi, 2022).

Previous studies have also shown that ecology-based education integrated into the curriculum can encourage the formation of environmentally friendly attitudes and behaviors among students. For example, research by (Aulia, Mardhiah, Bagus, Gunawan, & Sari, 2018) Indicates that introducing ecological materials in Islamic education can foster a deeper understanding of social and environmental responsibility. In this context, our research strengthens the argument. Albar, Hamami, & Sukiman, (2024) With its traditional approach deeply rooted in Islamic teachings, Pesantren education has great potential to develop a sustainable environmental education model.

Furthermore, the results of this study corroborate the research. Ubab, (2022) The importance of a contextual approach in applying ecological principles in pesantren. It is not enough to adopt general conservation practices; adjustments must be made to align with Islamic values and local wisdom embraced by the pesantren community. The findings significantly contribute to the development of ecological integration theory in Islamic education and offer practical insights for pesantren managers in designing effective and sustainable environmental education programs.

Theoretical Contribution: Ecological Integration in Islamic Education

The results of this study make an important contribution to the development of ecological integration theory in Islamic education, especially in the context of pesantren. This research shows that an educational approach that combines ecological principles with Islamic teachings can produce a more holistic and effective educational model. Theoretically, this finding strengthens the view that values-based education that integrates spiritual and environmental aspects can produce deeper and more sustainable behavioral changes, in line with the theory of educational transformation. (Mezirow, 1997) In the context of pesantren, this approach strengthens ecological awareness and supports the development of santri characters, such as khalifas, who are responsible for environmental sustainability. (Pardi, 2020).

From a practical perspective, this study offers direct implications for developing curriculum and educational programs in pesantren. The findings show that integrating ecological principles into the daily activities of pesantren, such as through environment-based extracurricular activities, can increase the involvement and active participation of santri in environmental conservation. Previous research by Al Hamid, (2024) It has been identified that learners' direct engagement in practical activities, such as greening and recycling, contributes significantly to forming pro-environmental attitudes and behaviors. Our research reinforces the findings. Pratama, Sari, & Handoko, (2024) Adding a spiritual and religious dimension acts as an additional motivation for students to engage in sustainable practices.

In addition, this research also impacts practice in the field by offering an environmental education model that other pesantren can adopt. This model includes developing contextualized learning materials, interactive teaching methods that combine theory and practice, and extracurricular activities relevant to local environmental conditions. Implementing this model not only has the potential to increase ecological awareness among santri but can also encourage pesantren to take a more active role in environmental issues in the surrounding community. Thus, the results of this study make a real contribution to the development of relevant and applicable ecological education in Islamic educational institutions.

Like any other research, this study does not escape the limitations that must be considered in interpreting the results. Another limitation lies in the number of pesantren that are the object of research, which may not be representative enough to reflect the diversity of practices and views in all pesantren. As expressed in another study by Muntaha (2021),

Cultural and geographical variations in Indonesia may influence how people adopt and implement ecological principles. In this context, the limited sample size and research locations require that these results be seen as a representation of a particular case study rather than an overview of all people.

Theoretical limitations should also be noted, especially concerning the framework that integrates ecological principles with Islamic values. Although relevant and suitable in the study context, this framework may not fully cover the complex dynamics in the educational practices of various pesantren. Theories of ecological integration in education used in this study, such as the theory of eco pedagogy (Gadotti, 2008), still require further testing to ensure that these concepts apply in various religious and cultural contexts in pesantren.

Finally, limitations in terms of resources and time also affected the scope of this study. Given these limitations, some important aspects, such as the long-term analysis of the impact of environmental education on the behavior of santri after they graduate from pesantren, could not be explored in depth. As a result, the interpretations and implications of this study should be seen in the context of these limitations, with the recognition that there is still much room for further research that can expand and deepen the findings that have been obtained.

Based on the results and limitations of this study, several suggestions can be proposed for future research. First, it is necessary to conduct a follow-up study with a quantitative or mixed-methods approach to measure in more detail the long-term impact of integrating ecological principles in pesantren education. This research could include surveys involving more pesantren in different regions to increase the generalizability of the findings. In addition, longitudinal studies that track changes in santri behavior after they leave the pesantren can provide deeper insights into the effectiveness of ecological education in forming sustainable habits. This approach is in line with recommendations. (Tashakkori & Teddlie, 2010) On the importance of using mixed methods to gain a more comprehensive understanding of social research.

Furthermore, developing a more inclusive ecological education model needs to be considered, considering the diversity of pesantren cultures and traditions in Indonesia. Previous research (Khitam, 2016) suggests that local adaptation of educational models is crucial for successful implementation, especially in heterogeneous environments such as pesantren. Therefore, future research could explore how ecological principles can be adapted to various pesantren contexts, including areas with limited resource access. (Lubis, 2015).

This will help ensure the approach developed is adaptive and relevant to local needs and capabilities.

Another suggestion is to test the application of more innovative interactive and participatory teaching methods in integrating environmental education into the pesantren curriculum. For example, applying project-based learning techniques or environmental simulations can give students a more in-depth and meaningful learning experience. As proposed by (Barron, 2006) This method improves conceptual understanding, practical skills, and students' engagement in environmental issues. Future research could evaluate its effectiveness in different contexts and how it can be adapted to Islamic values and local contexts.

Finally, future research should further explore how digital technologies can support environmental education in pesantren. Although digital technology offers great opportunities, such as access to wider learning resources and tools for remote collaboration, challenges must be addressed, including infrastructure limitations and potential conflicts with traditional values. Study by Dinarti, Salsabila, & Herlambang, (2024) It emphasizes the importance of a critical approach to adopting technology in education, considering social and cultural factors. Therefore, further research is needed to develop strategies that utilize technology effectively without compromising the core values of pesantren education.

Holistic Approach in the Development of Environmental Education in Islamic Boarding Schools

This research has significant social and ethical implications, particularly in using digital technology to support environmental education in pesantren. The application of digital technologies, such as online learning platforms and applications for environmental management, opens up great opportunities to expand the reach and effectiveness of environmental education. However, as expressed by (Selwyn, 2011), The adoption of technology in education is not free from social and ethical challenges, including issues of equal access, privacy, and cultural impact. In the context of pesantren, where traditional and religious values are strongly held, the use of technology should be designed in such a way as to respect and reinforce these values.

Socially, integrating ecological principles in pesantren can strengthen their role as agents of change in society. Pesantren, who can educate students with high environmental awareness, will not only produce a generation that cares about environmental sustainability

but also contribute directly to conservation efforts at the community level. This is by social responsibility theory, which emphasizes the role of educational institutions in shaping responsible attitudes and behaviors toward society and the environment. (Cheng, 2022). The findings of this study support the idea that pesantren, as value-based learning centers, can play a key role in social transformation towards a more sustainable society.

From an ethical perspective, this research emphasizes the importance of considering ethical responsibilities in educating the younger generation about environmental sustainability. As stated by Sterling & Orr, (2001), Sustainability education is not only about knowledge transfer but also about forming a strong moral ethos regarding responsibility for the planet. In the context of pesantren, environmental education should be integrated with religious teachings that underline human responsibility as Khalifah on earth. By teaching these principles, pesantren educates santri to become good citizens and environmental stewards committed to sustainability.

Furthermore, this study underscores the need to maintain a balance between technological innovation and the preservation of traditional values in pesantren education. This is a complex ethical challenge, given that technology often brings changes that can disrupt long-established traditions. Therefore, this study proposes a cautious approach to adopting technology, where innovation is encouraged but remains within a framework that supports and does not conflict with pesantren values. Thus, the social and ethical implications of the findings emphasize the importance of a holistic and context-sensitive approach in developing sustainable environmental education in pesantren.

CONCLUSION

This research shows that integrating ecological principles in the pesantren education system can be effectively implemented through a holistic and contextual approach, combining Islamic values with environmental conservation practices. The results increase environmental awareness among santri and strengthen their Islamic identity as khalifahs responsible for maintaining the balance of the ecosystem. The findings significantly contribute to the development of the theory of ecological integration in Islamic education and offer a relevant and applicable model of environmental education, which other pesantren can adopt. Theoretically, this study strengthens the view that value-based education integrating spiritual and environmental aspects can produce deep and sustainable behavioral changes. Practically, the results of this study provide guidance for pesantren managers in

designing effective environmental education curricula and activities, as well as encouraging pesantren to play an active role in environmental issues in their communities.

However, this study has limitations that need to be considered, such as its qualitative nature and limited sample size, which limits the generalizability of the results. Future research should address these limitations using quantitative or mixed-methods approaches and explore how digital technology can be effectively utilized in permanent environmental education without compromising traditional values. The social and ethical implications of this study are also important, as pesantren have the potential to be agents of change in society, educating not only an environmentally conscious but also socially and ecologically responsible generation. Thus, this research enriches the literature on environmental education in Islamic educational institutions and offers practical and theoretical insights for developing sustainable and ethical education models in a broader context.

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