



Pesantren and Environmental-based Educational Innovation: Building Environmentally Friendly Pesantren

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Received: 22-10-2024

Revised: 21-12-2024

Accepted: 25-12-2024

Abstract

This study explores the application of environmental-based educational innovation in Islamic boarding schools (pesantren) to build environmentally friendly pesantren. The main focus of this study is the involvement of pesantren in environmental conservation, which is still limited even though Islamic teachings firmly support the values of ecological sustainability. This study uses a qualitative literature study method to analyze literature related to Islamic boarding schools, environmental education, and sustainability strategies in the context of Islamic educational institutions. The main findings reveal that pesantren have significant potential to become agents of change in environmentally-based education. Several pesantren have begun implementing environmentally friendly programs, but various challenges must be faced, including limited resources, infrastructure, and resistance to innovation. This study has essential value because it provides a model of educational innovation that integrates Islamic teachings with sustainability principles and is relevant to increasingly pressing global environmental challenges. Thus, this study strengthens the environmentally friendly Islamic education paradigm, which aligns with international efforts to address climate change.

Keywords: Educational Innovation; Environmentally Friendly Pesantren; Pesantren Education.

Abstrak

Penelitian ini mengkaji penerapan inovasi pendidikan berbasis lingkungan hidup di pesantren untuk membangun pesantren yang ramah lingkungan. Fokus utama penelitian ini adalah keterlibatan pesantren dalam pelestarian lingkungan hidup yang masih terbatas meskipun ajaran Islam secara tegas mendukung nilai-nilai keberlanjutan ekologis. Penelitian ini menggunakan metode studi pustaka kualitatif untuk menganalisis literatur terkait pesantren, pendidikan lingkungan hidup, dan strategi keberlanjutan dalam konteks lembaga pendidikan Islam. Temuan utama penelitian ini mengungkapkan bahwa pesantren memiliki potensi yang signifikan untuk menjadi agen perubahan dalam pendidikan berbasis lingkungan hidup. Beberapa pesantren telah mulai menerapkan program ramah lingkungan, tetapi berbagai tantangan harus dihadapi, termasuk keterbatasan sumber daya, infrastruktur, dan resistensi terhadap inovasi. Penelitian ini memiliki nilai penting karena memberikan model inovasi pendidikan yang mengintegrasikan ajaran Islam dengan prinsip-prinsip keberlanjutan dan relevan dengan tantangan lingkungan global yang semakin mendesak. Dengan demikian, penelitian ini memperkuat paradigma pendidikan Islam yang ramah lingkungan, yang sejalan dengan upaya internasional untuk mengatasi perubahan iklim.

Kata Kunci: Inovasi Pendidikan; Pendidikan Pesantren; Pesantren Ramah Lingkungan.

INTRODUCTION

As an Islamic educational institution, Pesantren plays a significant role in shaping its students' character and religious understanding (santri).¹ However, in the face of increasingly pressing global environmental challenges, pesantren must adapt by implementing environment-based educational innovations.² In this context, pesantren is a center for religious education and an agent of change in environmental conservation efforts. According to Rarasati Mawftiq and Edo Segara Gustanto (2023), environmental education in pesantren can

¹Saihu and Baeti Rohman, "Pembentukan Karakter Melalui Model Pendidikan Transformative Learning Pada Santri Di Pondok Pesantren Nurul Ikhlas Bali," *Edukasi Islami: Jurnal Pendidikan Islam* 08, no. 02 (2019): 435–52.

²Musyaf Ali, "Adaptasi Dan Inovasi Pendidikan Masyarakat Berbasis Komunitas," in *Adaptasi Dan Inovasi Pendidikan Masyarakat Berbasis Komunitas*, vol. 1, 2023, 350–55.

help students (santri) understand the importance of sustainability and nature conservation as part of Islamic teachings.³

Several Islamic boarding schools in East Java, such as Pondok Pesantren Baitul Qur'an Al-Jahra Magetan, Pondok Pesantren Miftahul Muftadiin Krempyang Nganjuk, Pondok Pesantren Nurul Jadid Paiton Probolinggo, and Pondok Pesantren Assalafi Al-Fithrah Surabaya, have received the Eco Pesantren award from the East Java Provincial Government. This award was granted in recognition of their initiatives to integrate sustainability principles through waste management programs, tree planting activities, and the use of renewable energy. These examples highlight the potential of pesantren to serve as a model for environmentally friendly educational institutions.

Previous studies indicate that environmental education in pesantren is still in development. Research conducted by Herman Wicaksono (2022) found that only a few pesantren have integrated environmental education into their curricula. This finding highlights a gap in utilizing pesantren's potential as agents of ecological education. With a more integrated curriculum, pesantren can systematically deliver environmental education, making students more aware of sustainability issues.⁴

Another study by Sairin et al. (2024) revealed that implementing environmentally friendly programs in pesantren can increase students' awareness of environmental issues. This awareness is crucial as a first step in fostering attitudes and behaviors that support sustainability. In this context, environmentally friendly programs such as waste management, tree planting, and composting not only provide direct ecological benefits but also serve as practical educational tools that motivate students to actively participate in environmental conservation.⁵ as concluded by Anri Naldi et al. (2024), significant challenges persist in implementing environmental education in pesantren, including limited resources and inadequate infrastructure. These limitations can hinder integrating ecological education into pesantren's teaching and activities. Therefore, establishing partnerships with external organizations or leveraging available local resources are essential to address these challenges.⁶

In this study, environment-based education is an approach that integrates sustainability values into pesantren's teaching and learning process. This concept is rooted in environmental education theory, which emphasizes the importance of direct experience and community involvement in conservation efforts. Environmental education in pesantren can foster ecological awareness among students (santri) and encourage them to become pioneers in environmental preservation.⁷

The combined findings of Wicaksono (2022) and Sairin et al. (2024) strengthen the argument that pesantren have great potential to contribute to environmental education.

³Rarasati Mawftiq and Edo Segara Gustanto, "Green Economy Dalam Pesantren: Ekonomi Keberlanjutan Dan Maqashid Syariah (Studi Kasus Di Pesantren An Nur Ngrukem Bantul)," *Tamaddun Journal of Islamic Studies* 2, no. 1 (2023): 23–36.

⁴Herman Wicaksono, "Integrasi Pesantren Dan Sekolah (Kajian Atas Pemikiran Abdurrahman Wahid)," *Al-Anfa: Jurnal Pendidikan Dan Kajian Keislaman* 04, no. 1 (2022): 1–18.

⁵Sairin, Chotamul Fajri, and Susanto, "Pengembangan Kelembagaan Pendidikan Lingkungan Dan Kewirausahaan Berkelanjutan Di Pesantren Al Wafi Islamic Boarding Scool Depok," *Abdimas Awang Long* 7, no. 2 (2024): 101–10.

⁶A Naldi et al., "Ekspresi Ekologis: Kontribusi Pendidikan Agama Islam Dalam Mempertahankan Kelestarian Lingkungan Di Tengah Tantangan Masyarakat Modern Di Kota Medan," *At-Tazakki* 8, no. 2 (2024): 116–29.

⁷Hasan Ayatullah, "Konsep Ekologi Dalam Al-Qur'an Dan Implementasinya Di Pondok Pesantren Al Ashriyyah Nurul Iman, Bogor" (2024).

However, a well-planned and systematic approach is needed to fully harness this potential, encompassing curriculum design, infrastructure development, and resource support. By doing so, pesantren can transform into educational institutions that provide religious instruction and actively contribute to environmental preservation.

This study aims to broaden the understanding of implementing environment-based educational innovations in pesantren, emphasizing their potential as eco-friendly educational institutions. Unlike previous studies, which primarily focus on identifying challenges or documenting isolated success stories, this research provides a novel approach by systematically exploring actionable strategies for pesantren to integrate sustainability principles into their educational and operational frameworks. Specifically, this study addresses the gaps in the existing literature by offering a comprehensive analysis of how pesantren can overcome resource limitations and resistance to innovation through partnerships and curriculum development. By grounding its findings in recent research, this article contributes to the advancement of environmental education in pesantren. It creates a collaboration between Islamic teachings and global sustainability goals while offering practical solutions for broader adoption.

METHODS

This study employs the library research method to explore the implementation of environment-based educational innovations in pesantren. This method was chosen because it allows the researcher to gather and analyze information from relevant literature sources, including scholarly journals, books, and articles related to the research theme. The researcher can delve deeper into key concepts, educational policies, and best practices in eco-friendly pesantren through this approach.

Data collection involved identifying and gathering literature related to environmental education and pesantren. The referenced sources include articles published in accredited academic journals and books authored by Islamic education and environmental studies experts. The researcher utilized academic databases such as Google Scholar, Semantic Scholar, and other sources to locate the most recent and relevant articles. Additionally, previous studies were considered to provide context and supplementary perspectives on the discussed issue, offering a more comprehensive understanding of the current situation in pesantren.

Once the data were collected, the researcher analyzed the gathered information qualitatively. This analysis involved identifying key themes, emerging patterns, and the connections between educational innovation and sustainability practices in pesantren. The researcher evaluated the contributions of various sources to build a strong argument regarding the potential of pesantren to implement environment-based education. The findings from this analysis were then systematically organized to depict the current situation and offer recommendations for the further development of eco-friendly education in pesantren. Thus, this study aims to contribute to the existing literature and provide new insights into the integration of environmental education within the context of pesantren.

RESULTS AND DISCUSSION

Results

The results of this study were obtained through a library research investigation into the implementation of environment-based educational innovations in pesantren. Several

important aspects identified in this research include identifying eco-friendly programs, student involvement, challenges, and opportunities for improvement.

Identification of Eco-Friendly Programs in Pesantren

Through literature analysis, this study identified pesantren that have implemented eco-friendly programs. Several types of programs found include:

1. Waste Management

Waste management in pesantren has become one of the main focuses in creating a clean and healthy environment. Many pesantren have begun to adopt more environmentally friendly waste management practices by implementing recycling systems.⁸ This system allows for the effective separation of generated waste, both organic and inorganic. As a result, recyclable waste can be processed further, while non-recyclable waste can be managed more responsibly.⁹ This practice helps maintain the pesantren environment's cleanliness and provides valuable lessons to students (santri) about the importance of proper waste management.

In addition to recycling systems, several pesantren also implement the separation of organic and inorganic waste.¹⁰ This is achieved by providing separate bins for each type of waste. Through this initiative, students (santri) are trained to be more aware of the types of waste they generate and how to manage it. Waste separation also becomes part of a broader environmental education, where santri are taught about the impact of waste on the environment and the importance of reducing, reusing, and recycling.¹¹ Thus, waste management has become a routine activity and an integral part of the educational process for pesantren.

Furthermore, several pesantren have involved students (santri) in organic waste composting activities.¹² This activity not only helps reduce the waste being discarded but also provides an opportunity for students (santri) to learn about the composting process and its benefits for agriculture. Composting involves collecting food scraps, leaves, and other organic materials then processed into natural fertilizer. By involving Santri in this activity, pesantren contributes to environmental preservation and empowers students with valuable practical skills.¹³ This involvement fosters a sense of responsibility and care for the

⁸Setyo Widagdo, Soesiladi Esti Widodo, and Zulferiyenni Zulferiyenni, "Pendampingan Pengelolaan Sampah Terpadu Di Pondok Pesantren Ulul Albab Lampung Untuk Peningkatan Kualitas Lingkungan Sekitar Dan Nilai Tambah Ekonomi," *Jurnal Pengabdian Fakultas Pertanian Universitas Lampung* 1, no. 2 (2022): 411, <https://doi.org/10.23960/jpfp.v1i2.6446>.

⁹M Yusuf and Ahmad Saifudin, "Pengembangan Kreativitas Santri Dalam Pengelolaan Sampah Bernilai Ekonomis Di PP . Miftahul Muftadiin Krempyang Nganjuk," *Janaka, Jurnal Pengabdian Masyarakat* 3, no. 2 (2021): 47–56.

¹⁰Sri Anastasia Yudhistirani, Lailan Syaufina, and Sri Mulatsih, "Desain Sistem Pengelolaan Sampah Melalui Pemilahan Sampah Organik Dan Anorganik Berdasarkan Persepsi Ibu - Ibu Rumah Tangga," *Jurnal Konversi* 4, no. 2 (2015): 29–42, <https://doi.org/10.24853/konversi.4.2.29-42>.

¹¹Rina Dian Novianti, . Sudarti, and . Yushardi, "Mengenal Konsep Zero Waste: Mengurangi, Mendaur Ulang, Dan Mengelola Sampah Dengan Bijak," *Jurnal Pendidikan, Sains Dan Teknologi* 2, no. 4 (2023): 1026–30, <https://doi.org/10.47233/jpst.v2i4.1354>.

¹²Shinfi Wazna Auvaria, "Perencanaan Pengelolaan Sampah Di Pondok Pesantren Langitan Kecamatan Widang Tuban," *Al-Ard: Jurnal Teknik Lingkungan* 2, no. 1 (2016): 1–7, <https://doi.org/10.29080/alard.v2i1.126>.

¹³Muh. Mujaddidi Ainul Yakin, Usman Usman, and Salimul Jihad, "Peningkatan Karakter Peduli Lingkungan Di Pondok Pesantren Selaparang Kediri Lombok Barat," *Jurnal Ilmiah Profesi Pendidikan* 9, no. 3 (2024): 2016–27, <https://doi.org/10.29303/jipp.v9i3.2555>.

environment among students (santri), making them agents of change who can carry sustainability values within the community.

2. Environmental Education

Environmental education in pesantren has become important in fostering awareness and responsibility for environmental preservation.¹⁴ Some pesantren have actively developed curricula that include materials on the importance of environmental conservation, making environmental issues an integral part of students' (santri) education. With this approach, pesantren function as religious educational institutions and as agents of change contributing to ecological awareness. The materials integrated into the curriculum cover various aspects, ranging from natural resource management to the impacts of climate change, presented in engaging and relevant ways.

Environmental education programs often include seminars and discussions featuring speakers from various backgrounds, including environmental experts, activists, and practitioners with experience in sustainability.¹⁵ By inviting experts, pesantren provides students (santri) with the opportunity to learn directly from those with in-depth knowledge of environmental issues. These activities offer new insights for santri and encourage them to think critically and actively seek solutions to environmental problems. Open and interactive discussions allow santri to ask questions, engage in conversations, and share opinions, making the learning process more dynamic and participatory.

In addition to seminars, pesantren organizes field activities to provide santri with firsthand experience regarding environmental issues. These activities may include visits to conservation sites, waste processing facilities, or reforestation projects. Through these real-life experiences, santri can directly observe the impacts of human behavior on the environment and understand the importance of preserving ecosystems.¹⁶ These field activities also allow students (santri) to contribute directly to environmental preservation efforts and feel more involved and responsible for their surrounding environment.

A comprehensive curriculum on environmental education in pesantren includes practical skills training, such as compost production, plant cultivation, and water management techniques. Santri is taught how to process organic waste into compost that can be used for agriculture.¹⁷ Through these exercises, they learn about sustainability principles and acquire skills that can be applied in everyday life. This reinforces their understanding of natural cycles and maintaining ecosystem balance. This practice-based education ensures that santri can implement the knowledge they gain in real-world contexts.¹⁸

¹⁴Eka Denis Machfutra et al., "Perilaku Hidup Bersih Dan Sehat Santri Putri Pesantren X Yogyakarta," *Buletin Penelitian Sistem Kesehatan*, 2018.

¹⁵Resty Hudaidah and Romelah Romelah, "Program Pesantren Ramadhan Dalam Meningkatkan Pembelajaran Pendidikan Agama Islam Di SMK Muhammadiyah Pagatan," *Journal of Comprehensive Science (JCS)* 1, no. 1 (2022): 17–23, <https://doi.org/10.59188/jcs.v1i1.3>.

¹⁶Nailur Ridha and Abdul Wahid, "Ekopesantren Pondok Pesantren Annuqayah (Strategi Konservasi Lingkungan Dan Penguatan Agraria Pada Masyarakat Pedesaan Kabupaten Sumenep)," *JSP: Jurnal Studi Pesantren* Vol. 1 No., no. 1 (2022): 92–116.

¹⁷Fauzan Akmal Firdaus, "Membangun Kesadaran Lingkungan Melalui Kurikulum Pendidikan Islam Kontribusi Terhadap SDGs," *Jurnal TarbiyahMu* 4, no. 2 (2024): 13–21.

¹⁸Ahmad Nur Rohim, "Program Metroponik: Edukasi Hidroponik Berbasis Vokasional Dalam Pembentukan Jiwa Wirausaha Santri Pondok Madania Yogyakarta," *Warta LPM* 25, no. 2 (2022): 175–86, <https://doi.org/10.23917/warta.v25i2.643>.

By integrating environmental education into the curriculum, pesantren actively contributes to building an environmentally conscious and responsible generation. This initiative demonstrates that pesantren educate santri in spiritual and intellectual aspects as well as social and environmental dimensions. Through holistic education, santri are expected to become agents of change who can spread sustainability values and preserve the environment within their communities.

The contribution of pesantren to environmental education is highly significant, especially in addressing global challenges related to the ecological crisis, and it can serve as a model for other educational institutions in efforts to create a better world.

3. Tree Planting

Tree planting has become one of the significant activities in many pesantren as part of efforts to raise awareness about the importance of reforestation. This activity is focused on planting trees and serves as a broader campaign to create a healthier and more sustainable environment.¹⁹ By involving santri, pesantren provides direct education on the benefits of trees for the ecosystem, including reducing pollution, providing oxygen, and protecting the soil. This activity also teaches santri to appreciate nature and understand the importance of maintaining environmental balance.

Tree planting activities at pesantren often involve collaboration with local communities and environmental organizations. This cooperation broadens the reforestation campaign's scope and strengthens the relationship between the pesantren and the community.²⁰ Pesantren often invites residents to participate in tree-planting activities, fostering a shared sense of ownership over the environment. This collaboration also allows santri to learn from the local community's experiences regarding sustainable practices implemented over the years. Through this interaction, pesantren become more integrated with their surrounding environment, and the santri gain valuable insights into how local wisdom and modern environmental practices can work hand in hand for sustainability.

Tree planting activities are typically well-planned, starting with selecting the right locations and choosing appropriate tree species. Pesantren often assess the local environmental needs and select species that can thrive in the area. Some pesantren even conduct small research projects to identify tree species with more significant ecological and social benefits, such as trees that produce fruit or provide valuable timber. This approach ensures that tree planting contributes to environmental sustainability and the community's economic well-being, as the trees can offer long-term resources while improving local ecosystems.²¹ This approach demonstrates that pesantren are committed to planting trees and ensuring the sustainability and long-term benefits of these activities.

After planting, pesantren often implement maintenance programs to ensure the growth of the planted trees. Students are involved in the tree care process, from watering

¹⁹Mesran Mesran, Suginam Suginam, and Dwika Assrani, "Integrasi Teknologi Informasi Di Pesantren Dalam Upaya Meningkatkan Keterampilan Digital, Kualitas Pembelajaran Dan Kepedulian Penghijauan," *JPM: Jurnal Pengabdian Masyarakat* 4, no. 4 (2024): 402–7, <https://doi.org/10.47065/jpm.v4i4.1850>.

²⁰Tera Lesmana and Kuswarini Sulandjari, "Pemberdayaan Komunitas Lokal Dalam Pelestarian Lingkungan: Tinjauan Atas Proyek Kolaboratif, Keberlanjutan, Dan Pengambilan Keputusan," *Jurnal Multidisiplin West Science* 2, no. 09 (2023): 808–18, <https://doi.org/10.58812/jmws.v2i09.668>.

²¹Wahyudi Wahyudi, Muhamad Agus Mushodiq, and Dedi Wahyudi, "Implementasi Ayat Ekologis Melalui Teknologi Hidroponik Deep Flow Technique Pada Santri Pondok Pesantren Ma'arif Nahdlatul Ulama Metro Lampung," *Jurnal Pengabdian Multidisiplin* 2, no. 3 (2022): 131–47, <https://doi.org/10.51214/japamul.v2i3.333>.

and fertilizing to protecting the trees from pests. This activity allows students to learn about the life cycle of plants and their responsibility towards living beings.²² Through maintenance, students can also witness the results of their efforts, which can motivate them to continue participating in environmental activities in the future.

Through tree planting activities, pesantren contribute to reforestation and environmental preservation and shape students' character as individuals who care about nature. This activity instills values of social responsibility and environmental awareness in the students, making them agents of change who can spread environmental consciousness in their communities. Thus, tree planting in pesantren becomes a concrete example of the integration of religious education and ecological responsibility, creating a broad positive impact on both the environment and the surrounding society.

Level of Student Involvement

The research findings indicate that the level of student involvement in these environmental programs varies:

1. Pesantren with High Levels of Involvement

The research findings show that pesantren with structured waste management programs integrated into the educational curriculum exhibit very high levels of student involvement.²³ In this context, waste management is viewed as an obligation and an integral part of the environmental education provided to students. These pesantren design programs that allow students to be directly involved in every stage of the waste management process, from separating organic and inorganic waste to composting. This enhances the students' awareness of the importance of waste management and provides them with valuable practical experience.

The activities carried out by students in these programs often involve collaboration with various stakeholders, such as pesantren administrators, environmental organizations, and the surrounding community. For example, when conducting waste separation, students learn how to identify different types of waste and their environmental impacts. These activities can also include training sessions and workshops that teach effective waste management techniques, such as composting. By involving students in an active and collaborative learning process, pesantren successfully creates a dynamic learning environment where students gain knowledge and develop practical skills that can be applied in their daily lives.

The high student involvement positively impacts their attitudes and behaviors toward the environment. Students who actively participate in waste management programs become more aware of environmental issues and are likely to adopt environmentally friendly practices in their daily lives, both inside and outside the pesantren.²⁴ Additionally, they often become agents of change in their communities, educating their peers and families about the importance of environmental conservation and sustainability principles. Thus,

²²Wahyudi, Muhamad Agus Mushodiq, and Dedi Wahyudi.

²³Ridwan Syahputra and Sarwandi, "Penguatan Lingkungan Hidup Bersih Dan Pembinaan Santri Di Pondok Pesantren Saifullah An Nahdliyah," *Orabua: Jurnal Pengabdian Kepada Masyarakat* 02, no. 01 (2024): 21–28.

²⁴Hunaidah, "Analysis of Boarding School Education in Developing Autonomy of Attaqwa Religious Students," *Robbayana* 2, no. 2 (2023): 1–11.

pesantren with structured waste management programs nurture environmentally conscious individuals and create a broader positive impact within society.

2. Pesantren with Moderate Levels of Engagement

Pesantren that implement environmental education programs show a moderate level of student engagement. These programs often include materials on the importance of environmental conservation and the negative impacts of ecosystem degradation. While there is an increase in awareness among students about environmental issues, their active participation in organized activities remains limited. This may be due to various factors, including time constraints, a lack of supportive facilities, and insufficient motivation to engage in activities outside of the formal curriculum.

Despite the environmental education programs designed, the implementation in the field often does not meet expectations. For example, seminars and discussions may not always capture the students' interest, resulting in low participation levels in these activities. Some students may prefer to engage in other activities that they find more appealing or relevant to their interests. This highlights the need for a more innovative approach to designing environmental education programs to make them more engaging for the students.

This moderate level of involvement also reflects the potential to enhance students' participation in environmental activities if provided with the proper support. Some pesantren have begun to experiment with new approaches, such as organizing competitions or contests related to the environment, which are expected to boost student enthusiasm. For instance, a poster-making competition on the importance of environmental conservation or a campaign to reduce plastic usage can capture students' attention and encourage them to engage more actively.

In addition, collaboration with external parties, such as non-governmental organizations or local communities, can be an effective strategy to enhance students' involvement in environmental programs. Through these partnerships, pesantren can access additional resources, such as training, educational materials, and logistical support for field activities. By engaging students in real projects that impact the surrounding community, it is expected that they will feel more connected and responsible for environmental issues. With these steps, pesantren with moderate levels of involvement can transform into more proactive institutions that educate students about the importance of sustainability and environmental conservation.

3. Pesantren that demonstrate the low-level

Pesantren that demonstrate low levels of student involvement in environmental programs generally only engage in sporadic activities, such as tree planting, which takes place occasionally. Although these activities are beneficial, the lack of integration with the pesantren's routine programs and minimal continuity results in low student participation. Tree planting is often a ceremonial event without ongoing programs encouraging sustained student involvement. As a result, these programs are less effective in fostering deep environmental awareness among the students.

One of the reasons for the low level of student involvement in this pesantren is the lack of a deep understanding of the importance of environmental preservation. Because activities occur only occasionally and are not followed up with more in-depth educational initiatives, students tend to view these activities as formalities or obligations to be fulfilled

without a full awareness of their impact. Without structured and regular education on the importance of the environment, students struggle to connect tree-planting activities with long-term sustainability concepts.

In addition, limited resources in these pesantren also contribute to low student involvement. Many pesantren with low engagement do not have access to adequate support or funding to implement sustainable environmental programs. A lack of support from pesantren management also serves as a barrier to actively involving students. The pesantren may not prioritize activities such as tree planting, leading to these programs being conducted perfunctorily without thorough planning. This factor further affects the enthusiasm of students to participate in environmental stewardship.

The lack of follow-up after tree-planting activities is also one of the reasons for low student engagement. Once the planting is completed, there is often no effort to monitor or care for the trees that have been planted. Students are not empowered to maintain and nurture these trees, resulting in a lack of ownership or responsibility for the sustainability of the environment. Consequently, these activities are temporary and do not significantly impact the creation of a greener and more sustainable pesantren environment.

A more comprehensive and sustainable approach is necessary to increase student engagement with low participation levels in pesantren. One step that can be taken is to integrate environmental programs into the students' daily activities. For example, pesantren can establish a regular schedule for environmental care activities or utilize the trees planted as teaching materials in the environmental education curriculum. Students will feel more involved and responsible for maintaining the environment with a structured and consistent approach.

Finally, support from the pesantren leaders is crucial in encouraging student involvement. The pesantren leadership must set a tangible example by maintaining the environment and creating a learning environment that supports eco-friendly activities. By involving students in decision-making and designing programs relevant to their needs, it is hoped that pesantren with previously low engagement can enhance students' environmental awareness and create more significant changes.

Challenges Faced

This research also identifies various challenges faced by pesantren in implementing environmental-based education. Here are some common challenges encountered by pesantren. First, limited resources. Limited resources are one of the main obstacles pesantren faces in implementing environmentally friendly programs.²⁵ Many pesantren face budget constraints allocated for daily operations, making it challenging to allocate additional funds for environmental initiatives such as establishing recycling facilities, creating composting areas, or providing exceptional training for santri on environmental education. Often, the available funds only cover basic needs, such as educational infrastructure and religious facilities, causing environmental programs to be viewed as a lower priority.

In addition to financial constraints, pesantren faces a shortage of trained human resources in environmental studies. Not many teachers or staff members have specialized

²⁵Sairin, Fajri, and Susanto, "Pengembangan Kelembagaan Pendidikan Lingkungan Dan Kewirausahaan Berkelanjutan Di Pesantren Al Wafi Islamic Boarding School Depok."

knowledge or expertise in environmental sustainability or green technologies. As a result, despite the desire to implement eco-friendly programs, the lack of experts to guide and manage these initiatives becomes a significant obstacle. Pesantren often has to rely on individual initiatives or external support, which is not always available or consistent.

Swcond, inadequate infrastructure. Inadequate infrastructure poses one of the most significant challenges in implementing environmental programs in pesantren.²⁶ Many pesantren lack the essential facilities needed to support environmentally friendly activities, such as designated waste management areas for separating organic and inorganic waste, recycling facilities, or dedicated spaces for composting. This lack of infrastructure hinders practical waste management efforts, ultimately reducing the positive impact of planned environmental programs. Without the proper infrastructure, waste separation and recycling become challenging to carry out consistently and comprehensively.

In addition, most pesantren do not widely adopt environmentally friendly energy infrastructure.²⁷ The use of conventional energy sources such as electricity and fossil fuels still predominates, with little significant effort to transition to renewable energy sources like solar power or biogas. This is mainly due to financial constraints and a lack of technical knowledge, leading pesantren to maintain existing systems that are not environmentally friendly. The inability to provide sustainable energy facilities hinders the potential of pesantren to become model educational institutions that support environmental sustainability.

The lack of access to green technology and modern infrastructure also poses a significant barrier. For instance, many pesantren do not have access to technology for wastewater treatment or efficient clean water management. Furthermore, the often rural locations of pesantren, characterized by limited public infrastructure such as roads, electricity, and sanitation facilities, exacerbate this situation. Without adequate infrastructure, environmental education programs in pesantren tend to be suboptimal, and activities designed to raise awareness and participation among santri in environmental preservation are challenging to implement effectively.

Third, resistance to innovation. Resistance to innovation in some pesantren has become a significant obstacle in implementing environment-based education programs. Both the pesantren management and the santri often hold conservative views regarding change, especially if the innovations conflict with longstanding traditions or established practices. This resistance can hinder the adoption of new methods or technologies that are essential for promoting environmental sustainability. Additionally, there may be a lack of awareness or understanding about the benefits of such innovations, leading to skepticism among the community. As a result, even well-designed environmental programs may struggle to gain traction or achieve meaningful engagement from santri and staff alike.²⁸ For example, some pesantren prefer to stick with traditional methods and systems in managing their environment, unaware that transitioning to more environmentally friendly approaches supports Islamic teachings regarding the responsibility to care for nature. A lack of understanding about the urgency of environmental sustainability makes innovations such as waste segregation or using

²⁶Anasro Anasro and Muhammad Yusron Maulana El-Yunusi, "Leadership Style at the Contemporary Pesantren Al-Hilmi Prigen Pasuruan," *Ma'bad: Journal of Pesantren and Diniyah Studies* 1, no. 1 (2024): 15–24.

²⁷Siti Aminah, "Tinjauan Upaya Pengelolaan Limbah Dan Sanitasi Di Pondok Pesantren Miftahul Huda Kecamatan Kalianda, Kabupaten Lampung Selatan," *Skripsi* (2023).

²⁸Aminah.

renewable energy challenging to accept. This mindset not only hampers the implementation of effective environmental programs but also limits the potential for pesantren to play a leading role in fostering ecological awareness and practices aligned with religious values.

Moreover, the lack of adequate information regarding the long-term benefits of environmental innovations reinforces this resistance. The pesantren administrators, especially those who are older or have been involved in management for a long time, often feel hesitant to adopt new technologies or approaches that are perceived to require significant costs or specialized training. They may also worry that these innovations will only add to the administrative or operational burdens of the pesantren without yielding visible results in the short term. Ultimately, the lack of effective communication regarding the potential positive impacts of environmental innovations hinders the efforts of pesantren to transform into more environmentally friendly institutions.

Resistance to innovation also arises among the santri, especially those who have become accustomed to lifestyles that do not prioritize sustainability. They may not see the importance of proposed behavioral changes, such as waste segregation or energy conservation, due to a lack of understanding of the global environmental crisis. This situation is exacerbated by insufficient education on environmental issues within their curriculum. Therefore, pesantren need to find creative ways to address this resistance, such as integrating environmental education into religious teachings, so that santri can understand that caring for the environment is part of their worship and responsibility as Muslims.

Opportunities for Improvement

Despite the challenges, this research also identifies opportunities for the development of environmentally-based education in pesantren:

1. Training and Capacity Development

Training and capacity development serve as key strategies in enhancing pesantren administrators' and students' awareness and skills regarding environmentally friendly practices. Through structured training, both pesantren managers and students can gain a deeper understanding of environmental issues, such as the importance of waste management, energy conservation, and the efficient use of resources.²⁹ This training provides theoretical knowledge and includes hands-on practice, allowing participants to experience the positive impact of environmentally friendly actions in their daily lives. For instance, training on composting organic waste can serve as a concrete example for students on how they can transform waste into something beneficial.

In addition, capacity building is not limited to students; it is also crucial for managing the pesantren. Administrators must be equipped with the knowledge and managerial skills to implement environmentally friendly policies effectively within the pesantren environment.³⁰ This training could include environmental management, integrated waste management strategies, and using renewable energy in pesantren. By doing so, pesantren administrators can become role models for students and the surrounding community in implementing sustainable practices. Furthermore, this training can create a dialogue space

²⁹Harmathilda Harmathilda et al., "Transformasi Pendidikan Pesantren Di Era Modern : Antara Tradisi Dan Inovasi," *Karimiyah* 4, no. 1 (2024): 33–50, <https://doi.org/10.59623/karimiyah.v4i1.51>.

³⁰Siti Zaleha, "Pembelajaran Pendidikan Agama Islam Ramah Lingkungan," *Jurnal Komprehensif* 2, no. 1 (2024): 1–10.

among pesantren to share experiences and best strategies in implementing environmental programs.

Capacity building can also involve collaboration with external organizations, such as environmental NGOs or local government. By working together, pesantren can access resources, technology, and the latest knowledge about environmentally friendly practices that can be applied in the educational setting. This collaboration can also assist pesantren in designing training programs that are more relevant and tailored to their specific needs. Through targeted training and ongoing capacity development, pesantren have the potential to become pioneers in environmental education while making significant contributions to global efforts against climate change and environmental degradation.

2. Collaboration with External Organizations

Collaboration with external organizations is one of the strategic solutions that can assist pesantren in addressing various challenges related to implementing environmentally friendly programs.³¹ This partnership can involve collaboration with environmental organizations, government agencies, universities, or other institutions with sustainability experience and expertise. Through this collaboration, pesantren can access new knowledge, technical resources, and the financial support needed to implement environmental programs more effectively. For example, environmental organizations can provide training, workshops, or seminars related to waste management, water conservation, and the use of renewable energy.

This collaboration can also assist pesantren in obtaining the technology and equipment needed to implement environmental programs. Many pesantren face challenges related to infrastructure and a lack of adequate equipment, such as waste recycling facilities or energy-saving tools. Through partnerships with external organizations, pesantren can access environmentally friendly technologies that may have previously been out of reach, such as solar panels, wastewater management systems, or automatic composters. This will enhance the effectiveness and efficiency of the environmental programs they implement.

Partnerships with universities or other educational institutions also provide significant benefits for pesantren. Universities, for example, can act as partners in developing research and innovation related to environmental education in pesantren. Students or researchers can conduct studies within pesantren to identify challenges and opportunities in implementing environmentally friendly practices.³² Additionally, universities can assist in developing a more structured curriculum related to environmental education, ensuring that students gain theoretical knowledge and practical experience that can be applied in their daily lives.

Furthermore, collaboration with external organizations also opens up opportunities for pesantren to engage in broader environmental movements or campaigns, both nationally and internationally. Participation in global environmental networks can strengthen the position of pesantren as institutions committed to ecological sustainability while raising awareness among students and the surrounding community about the

³¹Moh. Hasan Afini Maulana, "Manajemen Hubungan Masyarakat Pada Lembaga Pendidikan Pesantren," *Itqan* 10, no. 1 (2019): 147–66.

³²Adam Diavano, "Program Eco-Pesantren Berbasis Kemitraan Sebagai Upaya Memasyarakatkan Isu-Isu Lingkungan Melalui Pendidikan," *Jurnal Litbang Sukowati: Media Penelitian Dan Pengembangan* 5, no. 2 (2022): 113–25, <https://doi.org/10.32630/sukowati.v5i2.312>.

importance of environmental stewardship. In the long run, pesantren can play a key role in promoting eco-friendly practices within their own communities and at the regional and global levels.

3. Integrating Curriculum

An integrated curriculum is an educational approach that connects different subject areas, allowing for a more holistic understanding of concepts. This method encourages students to see the interrelatedness of knowledge, fostering critical thinking and real-world problem-solving skills³³. Integrating environmental education into the pesantren curriculum is a strategic step to foster a more profound awareness among students about the importance of environmental issues. By linking religious values and Islamic teachings that promote environmental preservation, students can understand that caring for the environment is a social responsibility and a form of worship and concern for God's creations.³⁴ The curriculum integrating environmental education can encompass various subjects such as Fiqh, ethics, and natural sciences, providing a holistic view of the importance of ecological sustainability from both religious and scientific perspectives.

Moreover, this integration can be implemented through various practical approaches that enable students to learn theoretically and actively participate in activities that support environmental conservation. For instance, field practice activities such as waste management, reforestation, or using renewable energy can be incorporated into daily learning. Students can also be encouraged to study the local ecosystem through activities such as tree planting, caring for plants, or learning about recycling. Thus, environmental education becomes an integral part of the student's learning experience, providing beneficial knowledge and practical skills.

Furthermore, by integrating environmental education into the curriculum, pesantren can cultivate a generation of students with a high awareness and concern for the environment. This is crucial in facing global challenges such as climate change, pollution, and ecosystem degradation. Students trained with a curriculum based on sustainability principles will become agents of change in society. They will not only be individuals who care for the environment. Still, they will also inspire their communities to adopt more eco-friendly lifestyles, positioning pesantren as pioneers in the environmental movement.

Discussion

In environmental-based education in pesantren, applying the Transformative Learning theory proposed by Jack Mezirow (1991) becomes relevant.³⁵ This theory emphasizes that

³³ Susan M. Drake and Joanne Louise Reid, "Integrated curriculum as an effective way to teach 21st Century capabilities," *Asia Pacific Journal of Educational Research* 1, no. 1 (2018): 31–50, <https://doi.org/10.30777/APJER.2018.1.1.03>; Ihsan Ihsan, "Pesantren-Based Madrasah: Curriculum Implementation Model and Integrative Learning," *ADDIN* 13, no. 2 (August 1, 2019): 401–22, <https://doi.org/10.21043/addin.v13i2.8078>; Edi Nurhidin and Maimunatun Habibah, "Desain Pengembangan Kurikulum Pendidikan Islam Transdisiplin," *JALIE; Journal of Applied Linguistics and Islamic Education* 5, no. 1 (March 1, 2021): 170–91, <https://doi.org/10.33754/jalie.v5i1.339>; Sulhatul Habibah et al., "The Integration of Nationalism and Religious Education at Islamic Elementary School in Lamongan, East Java," *Indonesian Journal of Islamic Education Studies (IJIES)* 6, no. 2 (December 31, 2023): 148–69, <https://doi.org/10.33367/ijies.v6i2.4265>.

³⁴Sairin, Fajri, and Susanto, "Pengembangan Kelembagaan Pendidikan Lingkungan Dan Kewirausahaan Berkelanjutan Di Pesantren Al Wafi Islamic Boarding School Depok."

³⁵Colin Calleja, "Jack Mezirow's Conceptualisation of Adult Transformative Learning: A Review," *Journal of Adult and Continuing Education* 20, no. 1 (2014): 117–36.

transformative learning occurs when individuals experience profound changes in perspective, which can trigger awareness of social and environmental responsibilities. Environmental education in pesantren can serve as a medium to facilitate such change, encouraging students to understand the concepts of sustainability and internalize them as part of their identity as Muslim individuals. Thus, this approach supports the development of environmentally friendly pesantren that target not only educational aspects but also the students' character formation.

This study found that waste management in pesantren that implements a recycling system and separating organic and inorganic waste is a concrete step towards sustainability. Effective waste management in the educational environment can enhance students' awareness of the importance of sustainability. Involving students in this process provides practical knowledge and fosters a sense of collective responsibility towards the environment. This reflects the concept of collective efficacy described by Bandura, which states that individuals engaged in collective activities are more likely to perceive the positive impact of their actions.³⁶

Tree planting as part of a greening campaign that involves collaboration with the local community demonstrates the role of pesantren as agents of change. According to the book "Social Capital and Civic Engagement" by Putnam,³⁷ Community involvement in environmental activities can strengthen social bonds and improve quality of life. These activities support efforts for environmental preservation and foster positive relationships between pesantren and the surrounding community. By engaging Santri in tree planting, pesantren are provided with the opportunity to contribute directly to enhancing the quality of the environment while also developing their social skills and leadership abilities.

Lastly, the integration of environmental education into the pesantren curriculum has the potential to create a generation of santri who are sensitive to sustainability issues. According to the book "Education for Sustainable Development Goals" by UNESCO,³⁸ This integration can enhance awareness and collective action among learners. By combining religious education with sustainability principles, pesantren can cultivate a generation that is knowledgeable and responsible towards the environment.

While having great potential, environmental education in pesantren faces various complex challenges. This research indicates that although some pesantren have adopted waste management practices and tree planting activities, the success of implementing these programs is often hindered by resource limitations. This underscores the importance of financial support and adequate infrastructure to create a conducive student learning environment. Without strong support, efforts to develop environmentally friendly pesantren will be limited and unsustainable. This limitation aligns with Edwards' (2005) findings, which state that the success of sustainability initiatives requires holistic resource integration.

Despite the existence of environmental education programs developed in some pesantren, the involvement of students in these activities varies. With high levels of engagement, Pesantren demonstrates that students feel a sense of responsibility towards environmental programs when they are involved in decision-making and the execution of

³⁶Sri Muliati Abdullah, "Social Cognitive Theory: A Bandura Thought Review Published in 1982-2012," *Psikodimensia: Kajian Ilmiah Psikologi* 18, no. 1 (2019): 85–100.

³⁷Melissa D Dodd, John Brummette, and Vincent Hazleton, "A Social Capital Approach: An Examination of Putnam's Civic Engagement and Public Relations Roles," *Public Relations Review* 41, no. 4 (2015): 472–79.

³⁸Gerd Michelsen and Peter J Wells, *A Decade of Progress on Education for Sustainable Development: Reflections from the UNESCO Chairs Programme* (UNESCO Publishing, 2017).

activities. However, in pesantren that only offer passive environmental education, student participation tends to be low. This reflects the importance of an active learning approach emphasizing direct experience and involvement, which aligns with Mezirow's (1991) Transformative Learning theory. This indicates that environmental education programs must be designed so students feel engaged and can make tangible contributions.

The challenge of resistance to innovation also emerged in this study. Some pesantren experience a lack of understanding about the importance of environmental education and sustainability. This highlights the need for more effective training and socialization regarding the benefits of environmentally friendly practices. This lack of understanding can lead to stagnation in the implementation of programs that have been designed. The involvement of external institutions in providing training and resource support will be crucial to overcoming this challenge. The collaborative model proposed by Rittel and Webber (1973) suggests that inclusive decision-making can enhance the acceptance and engagement of all parties in environmental programs.

Analysis of the tree-planting program in pesantren shows that while this activity can raise environmental awareness, its long-term impact remains limited without strong integration into the curriculum and daily activities of the santri. Tree planting should be part of a broader educational strategy combining theoretical and practical aspects. It aligns with Putnam's (2000) view on the importance of community involvement in creating social change. Therefore, pesantren must establish partnerships with local communities to strengthen existing greening programs, resulting in a more significant impact.

Integrating environmental education into the pesantren curriculum must be encouraged to create a generation of santri sensitive to sustainability issues. As expressed in a UNESCO (2017) publication, education for sustainable development should be a primary focus in educational curricula at all levels. Pesantren has a unique opportunity to connect religious teachings with sustainability principles, but this requires a more strategic and planned approach. By adopting a holistic and action-oriented educational model, pesantren can prepare santri, who not only have knowledge about the environment but also can apply that knowledge in their daily lives and contribute to positive changes in their communities.

CONCLUSION

Based on the research findings regarding implementing environmental-based education in pesantren, it can be concluded that while there has been progress in integrating environmentally friendly practices, various challenges still hinder its optimal implementation. The research indicates that several pesantren have adopted effective waste management, environmental education programs, and tree planting activities; however, the level of student engagement varies. Pesantren with structured programs and high student involvement, demonstrate better outcomes in managing their environment. In contrast, pesantren with low engagement levels often conduct activities sporadically and fail to integrate them with the daily activities of the santri.

The main challenges pesantren face in implementing environmental-based education include resource limitations, inadequate infrastructure, and resistance to innovation. These limitations significantly affect pesantren's ability to develop and maintain sustainable, environmentally friendly programs. Additionally, the lack of understanding regarding the

importance of environmental education among administrators and students hinders the innovation process and active participation in these programs.

To enhance the effectiveness of environmental education in pesantren, strategic steps such as training and capacity development for administrators and students are necessary. Collaboration with external organizations is also highly recommended to provide access to broader resources and knowledge. Integrating environmental education into the pesantren curriculum is crucial in building awareness and involvement among students. In doing so, pesantren can significantly contribute to environmental sustainability efforts and cultivate a generation of students concerned about environmental issues.

Based on the findings of this research, it is suggested that pesantren actively develop partnerships with environmental organizations and other educational institutions to support environmentally friendly programs. Additionally, regular evaluations of implemented programs are essential to identify strengths and weaknesses in their execution. This approach will enable pesantren to continuously adapt and innovate to create a more sustainable and environmentally friendly educational environment.

REFERENCES

- Abdullah, Sri Muliati. "Social Cognitive Theory: A Bandura Thought Review Published in 1982-2012." *Psikodimensia: Kajian Ilmiah Psikologi* 18, no. 1 (2019): 85–100.
- Ali, Musyaf. "Adaptasi Dan Inovasi Pendidikan Masyarakat Berbasis Komunitas." In *Adaptasi Dan Inovasi Pendidikan Masyarakat Berbasis Komunitas*, 1:350–55, 2023.
- Aminah, Siti. "Tinjauan Upaya Pengelolaan Limbah Dan Sanitasi Di Pondok Pesantren Miftahul Huda Kecamatan Kalianda, Kabupaten Lampung Selatan." *Skripsi*, 2023.
- Anasro, Anasro, and Muhammad Yusron Maulana El-Yunusi. "Leadership Style at the Contemporary Pesantren Al-Hilmi Prigen Pasuruan." *Ma'had: Journal of Pesantren and Diniyah Studies* 1, no. 1 (2024): 15–24.
- Auvaria, Shinfy Wazna. "Perencanaan Pengelolaan Sampah Di Pondok Pesantren Langitan Kecamatan Widang Tuban." *Al-Ard: Jurnal Teknik Lingkungan* 2, no. 1 (2016): 1–7. <https://doi.org/10.29080/alard.v2i1.126>.
- Ayatullah, Hasan. "Konsep Ekologi Dalam Al-Qur'an Dan Implementasinya Di Pondok Pesantren Al Ashriyyah Nurul Iman, Bogor," 2024.
- Calleja, Colin. "Jack Mezirow's Conceptualisation of Adult Transformative Learning: A Review." *Journal of Adult and Continuing Education* 20, no. 1 (2014): 117–36.
- Diavano, Adam. "Program Eco-Pesantren Berbasis Kemitraan Sebagai Upaya Memasyarakatkan Isu-Isu Lingkungan Melalui Pendidikan." *Jurnal Litbang Sukowati: Media Penelitian Dan Pengembangan* 5, no. 2 (2022): 113–25. <https://doi.org/10.32630/sukowati.v5i2.312>.
- Dodd, Melissa D, John Brummette, and Vincent Hazleton. "A Social Capital Approach: An Examination of Putnam's Civic Engagement and Public Relations Roles." *Public Relations Review* 41, no. 4 (2015): 472–79.
- Drake, Susan M., and Joanne Louise Reid. "Integrated curriculum as an effective way to teach 21st Century capabilities." *Asia Pacific Journal of Educational Research* 1, no. 1 (2018): 31–50. <https://doi.org/10.30777/APJER.2018.1.1.03>.

- Firdaus, Fauzan Akmal. "Membangun Kesadaran Lingkungan Melalui Kurikulum Pendidikan Islam Kontribusi Terhadap SDGs." *Jurnal TarbiyahMu* 4, no. 2 (2024): 13–21.
- Habibah, Sulhatul, Hamidullah Marazi, Imam Wahyuddin, Mahbub Junaidi, and Khotimatus Sholikah. "The Integration of Nationalism and Religious Education at Islamic Elementary School in Lamongan, East Java." *Indonesian Journal of Islamic Education Studies (IJIES)* 6, no. 2 (December 31, 2023): 148–69. <https://doi.org/10.33367/ijies.v6i2.4265>.
- Harmathilda, Harmathilda, Yuli Yuli, Arief Rahman Hakim, and Cecep Supriyadi. "Transformasi Pendidikan Pesantren Di Era Modern : Antara Tradisi Dan Inovasi." *Karimiyah* 4, no. 1 (2024): 33–50. <https://doi.org/10.59623/karimiyah.v4i1.51>.
- Hudaidah, Resty, and Romelah Romelah. "Program Pesantren Ramadhan Dalam Meningkatkan Pembelajaran Pendidikan Agama Islam Di SMK Muhammadiyah Pagatan." *Journal of Comprehensive Science (JCS)* 1, no. 1 (2022): 17–23. <https://doi.org/10.59188/jcs.v1i1.3>.
- Hunaidah. "Analysis of Boarding School Education in Developing Authonomy of Attaqwa Religious Students." *Robbayana* 2, no. 2 (2023): 1–11.
- Ihsan, Ihsan. "Pesantren-Based Madrasah: Curriculum Implementation Model and Integrative Learning." *ADDIN* 13, no. 2 (August 1, 2019): 401–22. <https://doi.org/10.21043/addin.v13i2.8078>.
- Lesmana, Tera, and Kuswarini Sulandjari. "Pemberdayaan Komunitas Lokal Dalam Pelestarian Lingkungan: Tinjauan Atas Proyek Kolaboratif, Keberlanjutan, Dan Pengambilan Keputusan." *Jurnal Multidisiplin West Science* 2, no. 09 (2023): 808–18. <https://doi.org/10.58812/jmws.v2i09.668>.
- Machfutra, Eka Denis, Annita Noor, Riantina Luxiarti, and Nur Fatimah Mutmainah. "Perilaku Hidup Bersih Dan Sehat Santri Putri Pesantren X Yogyakarta." *Buletin Penelitian Sistem Kesehatan*, 2018.
- Maulana, Moh. Hasan Afini. "Manajemen Hubungan Masyarakat Pada Lembaga Pendidikan Pesantren." *Itqan* 10, no. 1 (2019): 147–66.
- Mawftiq, Rarasati, and Edo Segara Gustanto. "Green Economy Dalam Pesantren: Ekonomi Keberlanjutan Dan Maqashid Syariah (Studi Kasus Di Pesantren An Nur Ngrukem Bantul)." *Tamaddun Journal of Islamic Studies* 2, no. 1 (2023): 23–36.
- Mesran, Mesran, Suginam Suginam, and Dwika Assrani. "Integrasi Teknologi Informasi Di Pesantren Dalam Upaya Meningkatkan Keterampilan Digital, Kualitas Pembelajaran Dan Kepedulian Penghijauan." *JPM: Jurnal Pengabdian Masyarakat* 4, no. 4 (2024): 402–7. <https://doi.org/10.47065/jpm.v4i4.1850>.
- Michelsen, Gerd, and Peter J Wells. *A Decade of Progress on Education for Sustainable Development: Reflections from the UNESCO Chairs Programme*. UNESCO Publishing, 2017.
- Naldi, A, A Nisoh, F F Adami, and ... "Ekspresi Ekologis: Kontribusi Pendidikan Agama Islam Dalam Mempertahankan Kelestarian Lingkungan Di Tengah Tantangan Masyarakat Modern Di Kota Medan." *At-Tazakki* 8, no. 2 (2024): 116–29.
- Novianti, Rina Dian, . Sudarti, and . Yushardi. "Mengenal Konsep Zero Waste: Mengurangi, Mendaur Ulang, Dan Mengelola Sampah Dengan Bijak." *Jurnal Pendidikan, Sains Dan Teknologi* 2, no. 4 (2023): 1026–30. <https://doi.org/10.47233/jpst.v2i4.1354>.

- Nurhidin, Edi, and Maimunatun Habibah. "Desain Pengembangan Kurikulum Pendidikan Islam Transdisiplin." *JALIE; Journal of Applied Linguistics and Islamic Education* 5, no. 1 (March 1, 2021): 170–91. <https://doi.org/10.33754/jalie.v5i1.339>.
- Ridha, Nailur, and Abdul Wahid. "Ekopesantren Pondok Pesantren Annuqayah (Strategi Konservasi Lingkungan Dan Penguatan Agraria Pada Masyarakat Pedesaan Kabupaten Sumenep)." *JSP: Jurnal Studi Pesantren* Vol. 1 No., no. 1 (2022): 92–116.
- Rohim, Ahmad Nur. "Program Metroponik: Edukasi Hidroponik Berbasis Vokasional Dalam Pembentukan Jiwa Wirausaha Santri Pondok Madania Yogyakarta." *Warta LPM* 25, no. 2 (2022): 175–86. <https://doi.org/10.23917/warta.v25i2.643>.
- Saihu, and Baeti Rohman. "Pembentukan Karakter Melalui Model Pendidikan Transformative Learning Pada Santri Di Pondok Pesantren Nurul Ikhlas Bali." *Edukasi Islami: Jurnal Pendidikan Islam* 08, no. 02 (2019): 435–52.
- Sairin, Chotamul Fajri, and Susanto. "Pengembangan Kelembagaan Pendidikan Lingkungan Dan Kewirausahaan Berkelanjutan Di Pesantren Al Wafi Islamic Boarding School Depok." *Abdimas Awang Long* 7, no. 2 (2024): 101–10.
- Syahputra, Ridwan, and Sarwandi. "Penguatan Lingkungan Hidup Bersih Dan Pembinaan Santri Di Pondok Pesantren Saifullah An Nahdliyah." *Orabua: Jurnal Pengabdian Kepada Masyarakat* 02, no. 01 (2024): 21–28.
- Wahyudi, Wahyudi, Muhamad Agus Mushodiq, and Dedi Wahyudi. "Implementasi Ayat Ekologis Melalui Teknologi Hidroponik Deep Flow Technique Pada Santri Pondok Pesantren Ma'arif Nahdlatul Ulama Metro Lampung." *Jurnal Pengabdian Multidisiplin* 2, no. 3 (2022): 131–47. <https://doi.org/10.51214/japamul.v2i3.333>.
- Wicaksono, Herman. "Integrasi Pesantren Dan Sekolah (Kajian Atas Pemikiran Abdurrahman Wahid)." *Al-Anfa: Jurnal Pendidikan Dan Kajian Keislaman* 04, no. 1 (2022): 1–18.
- Widagdo, Setyo, Soesiladi Esti Widodo, and Zulferiyenni Zulferiyenni. "Pendampingan Pengelolaan Sampah Terpadu Di Pondok Pesantren Ulul Albab Lampung Untuk Peningkatan Kualitas Lingkungan Sekitar Dan Nilai Tambah Ekonomi." *Jurnal Pengabdian Fakultas Pertanian Universitas Lampung* 1, no. 2 (2022): 411. <https://doi.org/10.23960/jpfp.v1i2.6446>.
- Yakin, Muh. Mujaddidi Ainul, Usman Usman, and Salimul Jihad. "Peningkatan Karakter Peduli Lingkungan Di Pondok Pesantren Selaparang Kediri Lombok Barat." *Jurnal Ilmiah Profesi Pendidikan* 9, no. 3 (2024): 2016–27. <https://doi.org/10.29303/jipp.v9i3.2555>.
- Yudhistirani, Sri Anastasia, Lailan Syaufina, and Sri Mulatsih. "Desain Sistem Pengelolaan Sampah Melalui Pemilahan Sampah Organik Dan Anorganik Berdasarkan Persepsi Ibu - Ibu Rumah Tangga." *Jurnal Konversi* 4, no. 2 (2015): 29–42. <https://doi.org/10.24853/konversi.4.2.29-42>.
- Yusuf, M, and Ahmad Saifudin. "Pengembangan Kreativitas Santri Dalam Pengelolaan Sampah Bernilai Ekonomis Di PP . Miftahul Mubtadiin Krempyang Nganjuk." *Janaka, Jurnal Pengabdian Masyarakat* 3, no. 2 (2021): 47–56.
- Zaleha, Siti. "Pembelajaran Pendidikan Agama Islam Ramah Lingkungan." *Jurnal Komprehensif* 2, no. 1 (2024): 1–10.