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THE ROLE OF SCHOOLS IN PROMOTING ENVIRONMENTAL AWARENESS AND GREEN LIVING

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Abstract

Climate change and environmental degradation demand a strategic role for education in fostering environmentally conscious and sustainable behaviors among young generations. This study examines the role of schools in cultivating environmental awareness and green lifestyles through a Systematic Literature Review (SLR) approach. A total of 43 academic publications from 2019 to 2024 were analyzed through structured database searches and thematic analysis. The findings reveal that schools play a significant role in building ecological awareness through sustainability-integrated curricula, green school programs, project-based environmental learning, teacher modeling, environmentally oriented school culture, and community involvement. However, challenges remain, including limited school facilities, inconsistent implementation quality, and low digital green literacy. This research emphasizes that fostering sustainable behavior requires a systemic and collaborative approach to ensure the internalization of environmental values and habits among students.
Keywords : *environmental awareness, environmental education, green lifestyle, sustainable schools*

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1. Introduction

The environmental crisis has become a fundamental issue in the 21st century, marked by rising global temperatures, declining biodiversity, air pollution, extreme weather patterns, and the destruction of natural ecosystems due to human exploitation. The Intergovernmental Panel on Climate Change (IPCC, 2022) report states that the Earth's surface temperature has increased by 1.1°C compared to the pre-industrial era and is predicted to reach 1.5°C in the next two decades if global mitigation efforts are slow. This condition is not only an ecological warning, but also a real threat to the sustainability of human life, including food availability, population health, economic stability, and the social resilience of a nation. The United Nations Environment Programme (UNEP, 2023) emphasizes that changing individual behavior based on environmental awareness is an important element in global efforts to reduce carbon footprints and support environmental sustainability.

Indonesia, as the country with the second-largest biodiversity in the world and a population of more than 275 million, is in a strategic position but also vulnerable to the threat of environmental crisis. Data from the Ministry of Environment and Forestry (KLHK, 2023) shows that forest loss reaches around 104 thousand hectares per year, while 60% of major rivers in Indonesia experience heavy and moderate pollution due to industrial waste and domestic waste. Air quality is also a concern, with the Air Quality Index (2023) report showing that DKI Jakarta has repeatedly been listed among the cities with the highest air pollution in the world. This phenomenon calls for systematic steps to build awareness and pro-environmental behavior from an early age, because environmental sustainability depends not only on government regulations and technological innovation, but also on the active involvement of the community in applying a green lifestyle in their daily lives.

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In the context of shaping pro-environmental behavior, schools have a strategic role as formal educational institutions tasked with shaping the intellectual capacity, moral character, and social awareness of students. Environmental education in schools aims not only to increase knowledge, but also to foster attitudes, values, and skills so that students are able to behave in an environmentally friendly manner, understand the relationship between humans and nature, and contribute to climate change mitigation and adaptation (Tilbury, 2021). UNESCO (2023) emphasizes that environmental education in schools is an important pillar of education for sustainable development (ESD), which encourages the younger generation to become agents of change in realizing ecological, economic, and social sustainability.

Indonesia has implemented environmental education policies and programs through national initiatives such as the Adiwiyata Program, which aims to create environmentally conscious schools through the cultivation of environmentally friendly behaviors, the development of green curricula, ecology-based school management, and the provision of environmental support facilities (KLHK, 2022). This program has shown positive impacts, with schools implementing Adiwiyata demonstrating an increase in pro-environmental behavior among students, better waste management, and increased participation of the school community in environmental activities (Fawehinmi et al., 2020). However, its implementation has not been uniform and still faces various obstacles, such as limited facilities, low environmental literacy among some educators, and minimal family involvement in reinforcing green practices at home.

The role of schools in building environmental awareness is not only related to the formal curriculum but also to school culture, teacher role modeling, school operational practices, and the participation of the entire school community. Research by Al-Naqbi & Alshannag (2018) in South Korea shows that environment-based project learning, cross-disciplinary curriculum integration, and community involvement are effective strategies for shaping students' environmentally friendly behavior. Meanwhile, according to Uralovich et al., (2023) in Indonesia, ecology-based thematic learning at the elementary school level can significantly improve students' critical thinking skills and environmental awareness. A similar finding was reported by Al-Naqbi & Alshannag (2018), who found that student involvement in school waste management practices, urban farming programs, and energy-saving campaigns effectively fostered long-term ecological habits.

The challenges of the digital era also bring new dynamics to environmental education. On the one hand, digital technology can expand information and accelerate the dissemination of environmental campaigns, raise public awareness, and provide interactive learning resources such as virtual learning, ecological simulations, and social media-based educational content. However, on the other hand, digital technology also contributes to increased energy consumption, electronic waste production, and consumptive lifestyles, especially among teenagers. According to the Global E-Waste Monitor (2023), Indonesia produces more than 1.8 million tons of electronic waste each year and is one of the largest contributors to e-waste in Southeast Asia. This shows that environmental education must involve green digital literacy, which is the ability to use technology responsibly and support ecological sustainability (Rahman & Setiawan, 2022).

Schools, as spaces for social interaction among children and teenagers, play a key role in shaping the understanding that simple actions such as reducing the use of single-use plastics, managing waste, conserving energy, planting trees, and using environmentally friendly transportation are real contributions to protecting the environment. These attitudes and habits are proven to be more effective if instilled at an early age, because moral values and social responsibility are being formed and are easier to direct (Bronfenbrenner, 2020). In addition, the involvement of parents and the community is very important because the sustainability of green practices requires consistency at school and at home (Hernandez, 2021).

The urgency of fostering environmental awareness in students is even clearer when linked to changes in modern lifestyles, which tend to be consumptive and less reflective of

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the ecological impact of daily actions. The development of the digital economy and instant culture has contributed to an increase in the consumption of disposable goods, the exploitation of energy resources, and the accumulation of packaging and electronic waste, especially in urban areas. Research by Purwanto & Andayana (2022) reveals that more than 60% of students in major Indonesian cities have high digital consumption patterns, including the use of gadgets and online shopping activities that generate significant plastic packaging waste. This habit shows that ecological awareness cannot be assumed to grow along with technological advances, but must be formed through systematic and consistent educational interventions.

Psychologically, schools have an advantage in instilling environmental values because interactions between students and educators and peers can shape ecological behavioral norms through social modeling mechanisms (Bandura, 2021). Teachers who adopt a green lifestyle and implement environmentally friendly practices in the classroom, such as efficient use of paper, waste sorting, or utilization of local resources, can be effective role models. Research by Ramukumba (2024) in elementary schools shows that teachers' exemplary environmental behavior has a positive correlation with students' environmentally friendly habits, such as not littering and bringing their own water bottles. This confirms that environmental education strategies cannot be based solely on theory but must be part of school culture and institutional policy.

In addition to exemplary practices, pedagogical approaches oriented towards direct experience and authentic learning have also shown high effectiveness. The concept of experiential learning allows students to connect environmental realities with scientific knowledge and ideas of sustainability (Maurer et al.,, 2020). For example, activities such as composting, school gardens, school energy audits, and water quality observations in the surrounding environment can increase students' understanding of ecological principles while fostering a sense of responsibility for the environment (Wahyuni et al., 2023). Not only that, environmental project activities encourage the development of 21st-century skills such as critical thinking, collaboration, creativity, and problem solving—concepts that are in line with the Merdeka Curriculum (Kemendikbudristek, 2023).

However, the challenges of implementing environmental education in schools are still significant. Research by Al-Naqbi & Alshannag (2018) found that some schools still view environmental programs only as extracurricular activities or thematic celebrations such as Earth Day, rather than as an integral part of the curriculum and school culture. Another obstacle is the limited ability of teachers to design contextual learning that integrates environmental issues with other subjects, as well as the lack of support facilities such as green spaces, waste management facilities, and access to environmental teaching materials. In addition, the lack of coordination between schools and families means that the environmental values instilled at school are not always continued at home (Hernandez, 2021).

The next challenge arises from the dynamics of education digitalization. On the one hand, digital platforms provide rich environmental learning resources, including educational videos, climate change simulations, and popular science articles. However, on the other hand, exposure to consumption- and entertainment-oriented digital content can reduce students' ecological sensitivity. A study by Rahman & Setiawan (2022) shows that exposure to lifestyle consumerism content on social media influences an increase in consumptive behavior among students. This reinforces the argument that environmental education must be accompanied by critical digital literacy so that students are able to sort through content and assess the ecological consequences of modern digital lifestyles. The concept of green digital literacy is relevant here, namely the ability to use technology efficiently, ethically, and in an environmentally friendly manner.

Furthermore, the success of schools in fostering environmental awareness is greatly influenced by institutional policies and support. Schools that implement environmentally friendly operational standards—such as reducing electricity consumption, waste management, and low-plastic policies—tend to be more successful in forming a strong

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environmental culture than schools that only implement a curricular approach without structural changes (KLHK, 2022; Fawehinmi et al., 2020). At the international level, green school models in Japan and Finland show that the sustainability of environmental education is strongly supported by the integration of curriculum, school governance, community participation, and local government support (Purcell et al., 2019). Lessons from these countries emphasize the importance of systemic integration, rather than just temporary program interventions.

Beyond institutional aspects, multi-stakeholder collaboration is a crucial factor in strengthening school-based environmental movements. Engaging communities, local governments, environmental organizations, and the private sector can enhance the quality of school environmental programs while amplifying their social impact (Tilbury, 2021). For instance, an eco-school partnership program with local NGOs or universities can provide conservation education, waste management training, and joint environmental research with students. This collaborative approach is in line with UNESCO's (2023) principles of sustainable education, which require cross-sector involvement to drive ecological transformation on a broader scale.

Thus, instilling environmental awareness and a green lifestyle through school education is a strategic effort to build a generation that is responsive to sustainability issues. However, the success of this effort requires a comprehensive approach that includes cognitive, affective, and psychomotor dimensions; teacher role modeling; school managerial support; synergy with families and communities; and critical and sustainable use of technology. Environmental education is not only about information, but also about shaping values, habits, and a culture of living that is internalized in concrete actions.

Research on environmental education in Indonesia has shown positive contributions, but some are still limited in scope and depth of analysis. A study by O'Flaherty (2018) entitled "Evaluation of the Implementation of the Adiwiyata Program in Secondary Schools in West Java" confirms the success of the Adiwiyata Program in strengthening school environmental management, but its main focus is on administrative aspects and fulfillment of program indicators, rather than on the formation of a sustainable internal ecological culture among students. In addition, research by Al-Naqbi & Alshannag (2018) in the article "Implementation of Environmental Learning at the Elementary School Level" identified that environmental learning is still simple and thematic and has not been strongly integrated into the cross-subject curriculum and has not made optimal use of experience-based pedagogical approaches. Furthermore, the study by Uralovich et al., (2023) entitled "The Effect of Project-Based Learning on the Environmental Awareness of Junior High School Students" shows the effectiveness of project-based learning in increasing student participation, but the study does not highlight the role of digital literacy, family involvement, or teacher role models in influencing the consistency of students' environmental behavior.

From these three studies, it is evident that environmental education studies in Indonesia still focus on programmatic aspects and specific learning methods, without comprehensively addressing the interaction between school culture, teacher role models, green digital literacy, and family-community support in shaping students' long-term ecological habits. Therefore, this study aims to fill this gap with a systemic approach that views schools as sustainable learning ecosystems that integrate pedagogical, digital, social, and cultural dimensions in fostering environmental awareness from an early age.

This study offers a new contribution by positioning schools as green learning ecosystems that integrate curriculum, school cultural practices, green digital literacy, and community collaboration in shaping students' ecological awareness. This approach moves beyond an administrative perspective and places the formation of ecological character at the core of modern environmental education strategies. The purpose of this study is to analyze the role of schools in fostering environmental awareness and green lifestyles among students in Indonesia through the integration of learning, school culture, educator role modeling, and the use of technology and sustainable community collaboration.

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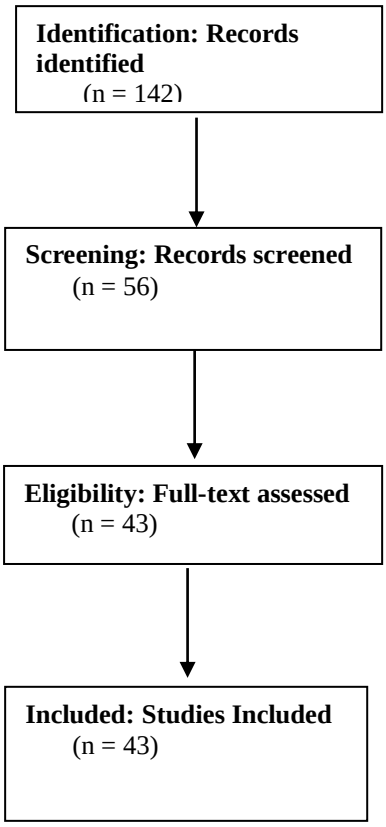
2. Method

This study uses the Systematic Literature Review (SLR) method to identify, evaluate, and synthesize scientific findings related to the role of schools in fostering environmental awareness and green lifestyles among students in Indonesia. The SLR approach was chosen because it allows researchers to systematically examine empirical evidence and reduce subjective bias through a rigorous literature selection process, resulting in comprehensive and validated conclusions (Snyder, 2019; Amoah & Addoah 2021). The review process was conducted on SINTA-indexed national journal articles and reputable Scopus international journals published between 2019 and 2024 to ensure temporal relevance and academic validity on the issue of modern educational sustainability.

Data collection was conducted through systematic searches of the Scopus, Web of Science, Google Scholar, and SINTA databases using the keywords: environmental education, green school, environmental awareness, ESD, school sustainability, student green behavior, Adiwiyata, and eco-school program. The inclusion criteria included studies that analyzed the implementation of environmental education in schools, green school programs, pro-environmental student behavior, the role of teachers and curriculum in environmental education, and policy studies related to sustainable education. Meanwhile, non-empirical articles, opinions, media reports, and sources without peer review were excluded from the analysis. From a total of 164 identified articles, the selection process based on title, abstract, and content resulted in 43 studies worthy of further analysis.

The data analysis technique used a thematic analysis approach, which allowed for the grouping of key themes based on conceptual patterns and empirical findings that emerged from various studies (Miles, Huberman, & Saldaña, 2020). The validity of the data was strengthened through source triangulation, namely by comparing the findings of academic journals with official reports from international agencies such as UNESCO (2023) and KLHK (2022), as well as Indonesia's environmental education policies. The results of this SLR are then presented in the form of a systematic narrative that explores the dimensions of curriculum, school culture, educator role models, community participation, and the integration of green digital literacy in efforts to foster environmental awareness among students



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3. Results and Discussion

Integration of Environmental Education into School Curricula in Indonesia

The integration of environmental education into school curricula is a key foundation in systematic efforts to foster ecological awareness among students. In Indonesia, the commitment to incorporating sustainability issues into the curriculum has actually undergone progressive development through various policies such as the 2013 Curriculum, the Adiwiyata Program, and the Merdeka Curriculum, which provides more space for schools to implement contextual learning based on real issues (Kemendikbudristek, 2023). However, the effectiveness of this integration is largely determined by how educational units understand the concept of environmental education, not merely as additional material, but as a framework of thinking that must be embedded in every subject and learning activity. UNESCO (2023) emphasizes that adaptive environmental education is education that encourages students to understand the relationship between humans and nature holistically, develop critical thinking skills, and take concrete actions for ecosystem sustainability.

In practice, the integration of environmental education into the primary and secondary school curricula still faces variations in the quality of implementation between schools. A study by Al-Naqbi & Alshannag (2018) shows that some elementary schools still position the environment as a simple thematic topic in science or civics and citizenship classes, resulting in students' understanding being more declarative and not yet leading to analytical skills or critical attitudes towards environmental phenomena around them. In contrast, research by Uralovich et al., (2023) on junior high schools shows that systematically designed project-based learning such as school waste audit projects, composting, and water quality monitoring can significantly improve students' ecological literacy. This difference indicates that the effectiveness of curriculum integration is influenced by school readiness, teacher support, and pedagogical understanding in designing ecosystem-based learning.

The implementation of the Merdeka Curriculum brings new opportunities for strengthening environmental education. The project approach to strengthening the Pancasila student profile allows schools to explore sustainability themes in a local context, including waste management, water conservation, emission reduction, and food security through school urban farming (Kemendikbudristek, 2023). This approach is in line with the UNESCO (2023) recommended Education for Sustainable Development (ESD) framework, which emphasizes transformative learning based on real action. By understanding local environmental issues, students not only receive information but are also trained to make ecological decisions that directly impact their daily lives. However, the implementation of the Merdeka Curriculum requires the support of teachers' pedagogical literacy, the readiness of school facilities, and the support of school management so that the implementation of the project does not stop as a symbolic or ceremonial activity.

In addition to the curriculum structure, the learning approach plays an important role. Effective environmental education does not only convey theory but also develops three domains: cognitive, affective, and psychomotor. Maurer et al., (2020) asserts that the experiential learning approach creates a deeper understanding because students directly experience the process of knowledge, reflection, concepts, and experimentation. The implementation of this approach can take the form of observing the school's surroundings, creating ecological journals, simulating global warming, or conducting fieldwork with local communities. Designing such experiences can foster a sense of connection between students and the environment, cultivate ecological empathy, and increase a sense of responsibility for resource sustainability.

The role of teachers as facilitators is crucial to the success of this process. Teachers who have environmental knowledge, pedagogical skills, and motivation to implement sustainability-oriented learning tend to be able to create a learning environment conducive to the formation of students' environmental awareness (Varela-Candamio et al., 2018). Conversely, research by Jorgenson et al., (2019) found that teachers' limited competence in developing environment-based lesson plans and lack of training are major obstacles to the integration of green curricula. Therefore, strengthening teachers' capacity through ESD

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training, environmental learning workshops, and collaboration with the community are crucial components in strengthening environmental education in Indonesian schools.

However, the success of green curricula does not only depend on teachers, but also on school leadership and educational governance. O'Flaherty (2018) show that Adiwiyata schools that successfully implement an environmental culture have leadership that is capable of building an ecological vision, allocating resources, establishing environmentally friendly operational policies, and encouraging the participation of the entire school community. Transformative leadership in the context of environmental education is tasked with creating an organizational culture that prioritizes sustainability, including energy-saving habits, banning single-use plastics, integrated waste management, and student involvement in school environmental planning.

At the international level, several countries with high achievements in environmental literacy provide examples of strong curriculum practices. For example, schools in Finland integrate environmental education into all subjects and school activities, placing sustainability issues at the core of the educational culture (OECD, 2022). Meanwhile, in Japan, environmental education is implemented through the tokkatsu approach, which is the habit of clean culture and student discipline through daily activities, where students are responsible for the cleanliness of the classroom and school environment (Purcell et al., 2019). Both examples show that an effective green curriculum places learning experiences, school culture, and role models as the main pillars, not just adding teaching materials in textbooks.

In the Indonesian context, collaboration between schools, families, and communities is also crucial to the success of environmental education. Meherali (2025) found that strengthening environmental values in schools alone is not effective without the support of families, as children's habits are greatly influenced by their home environment. Therefore, schools need to establish active communication, provide environmental behavior guidelines for parents, and involve the community in environmental education programs, so that the formation of a green lifestyle becomes a collective movement, not limited to the school environment.

Thus, the integration of environmental education into the Indonesian school curriculum has made progress through strategic policies and programs such as the Merdeka Curriculum and Adiwiyata, but its implementation requires strengthening teacher capacity, school management support, family participation, and adequate facilities. Furthermore, environmental education needs to be designed not only as knowledge but also as a cultural practice of education that fosters ecological awareness, critical literacy, and the ability to act in the face of the climate crisis. This makes the school curriculum an instrument of social transformation to produce a generation capable of maintaining a balance between technological progress and environmental sustainability.

The Role of Teachers, School Culture, and Community in Shaping Students' Green Behavior

Teachers are key agents in shaping students' environmental awareness and behavior because their role is not only as conveyors of knowledge but also as role models, facilitators of learning experiences, and guides of environmental moral values.

Otto & Pensini (2017) social learning theory emphasizes that children tend to imitate significant behaviors around them, so that teachers' exemplary behavior in implementing green practices such as saving energy, bringing environmentally friendly food containers, and managing waste will have a stronger influence than verbal instructions alone. Research by Ramukumba (2024) shows that in elementary schools in Central Java, there is a significant correlation between teacher role modeling and the intensity of students' pro-environmental behaviors, such as sorting waste, reducing the use of single-use plastics, and maintaining classroom cleanliness. These findings underscore that environmental education is most effective when the role models presented are consistent, integrated into daily routines, and not merely formalities.

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In addition to the role of individual teachers, school culture also plays a strategic role in shaping ecological habits. School culture includes values, rituals, rules, and practices that influence the mindset and behavior of the entire school community in the long term (Gao, 2018). Schools that prioritize sustainability usually have explicit policies such as banning single-use plastics, requiring students to bring their own drinking cups, waste sorting programs, school gardens, and the integration of environmental issues into flag ceremony activities and thematic classes (KLHK, 2022). A study by O'Flaherty (2018) revealed that Adiwiyata schools that have successfully built an environmental culture not only implement administrative standards but also create collective participation, where students, teachers, school staff, and school leaders share responsibility for the cleanliness and sustainability of school facilities. Conversely, schools that only follow formal Adiwiyata procedures without internalizing ecological values show temporary changes in student attitudes that do not carry over into life outside of school.

The social environment also plays an important role in strengthening a sustainable school culture. Within Inoue et al., (2019) ecological framework of development, children's behavior is influenced by various layers of the social system, including family, school, and community. Schools that successfully foster ecological character are those that build active partnerships with parents and the surrounding community. Hernandez's (2021) research shows that parent involvement programs in school environmental activitiessuch as family composting training, zero-waste parenting classes, and campaigns for environmentally friendly transportation can increase the consistency of students' green behavior at home. This is important because the reinforcement of ecological values cannot stop at school; behavioral sustainability requires a supportive social environment.

In addition to family involvement, collaboration with environmental communities, local governments, and the private sector is an important strategy in expanding the reach of environmental learning in schools. Agbedahin (2019) emphasizes that the success of global sustainable education is greatly influenced by cross-sector partnership networks, including universities, non-governmental organizations, and the business world. In Indonesia, school collaborations with environmental organizations such as Waste4Change, Greeneration Foundation, and waste bank communities have been proven to improve students' practical skills in waste management, organic processing, and responsible consumption education (Wahyuni et al., 2023). These collaborative activities not only expand learning resources but also strengthen students' sense of ownership of environmental issues at the local level.

The strengthening of students' green behavior is also influenced by the school's leadership structure. Visionary principals with a sustainability perspective tend to encourage systematic change through environmental policies, budget allocation for green facilities, and supervision of environmental program implementation (Fawehinmi et al., 2020). A transformative leadership model that involves teachers, students, and the community in decision-making also increases collective responsibility for the school environment (Gao, 2018). Thus, the success of environmental programs cannot be viewed as an individual responsibility but rather as a collaborative effort based on school governance.

To clarify the contribution of school elements to the formation of student environmental behavior, the following table presents strategic components found in international and national literature:

Table 1. Key School-Based Components Supporting Green Lifestyle Formation

Component	Description	Expected Behavioral Outcomes	Literature Support
Teacher Modelling	Teachers demonstrate eco friendly habits	Students imitate sustainable behavior	Denan et al., (2017); Ramukumba (2024)
School Green Policies	Rules on waste, energy, and resource	Habit information and environmental	KLHK (2022); O'Flaherty (2018)

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	use	responsibility	
Experiental Green Learning	Hands-on ecological projects	Increased engagement and environmental literacy	Maurer et al., (2020); Al-Naqbi & Alshannag (2018)
Family Participation	Parents adopt green practices at home	Continuity of green behavior beyond school	Meherali (2025)
Community Collaboration	Partnership with environmental orgs	Practical exposure and community engagement	Agbedahin (2019)
Student Leadership	Eco-ambassadors & student committees	Empowered and responsible student citizenship	Uralovich et al., (2023)

In addition to the socio-cultural dimension of schools, the digital era demands the integration of green digital literacy as part of interventions to shape ecological behavior. Rahman & Setiawan (2022) state that today's students are in an information ecosystem that is vulnerable to a culture of excessive digital consumption and instant lifestyle trends. Therefore, schools need to teach how to use digital platforms for environmental advocacy, select science-based content, and use technology in an energy-efficient manner. This approach is also in line with the concept of green digital citizenship, which emphasizes that digital ethics must include ecological responsibility in the use of technology (UNESCO, 2023).

Thus, it can be understood that shaping students' environmental awareness requires a holistic approach that combines teacher role modeling, school culture, family and community collaboration, and green digital literacy. Ecological behavioral change is not only a cognitive transformation but also a change in habits that is built sustainably through harmony between educational structures, daily practices, and social support.

Green School Implementation Model and Case Studies in Indonesia

The implementation of green schools in Indonesia emphasizes a comprehensive approach that combines institutional policies, environment-based project learning, student and community participation, and the habit formation of ecological behaviors through daily activities. This model is in line with the whole-school approach framework developed by UNESCO (2023), which places sustainability at the core of school governance, curriculum, culture, and community partnerships. In the national context, the Adiwiyata Program is a concrete example of the application of this approach, with the aim of creating environmentally conscious and cultured schools through the implementation of sustainable policies and the involvement of the entire school community in ecological practices (KLHK, 2022). This approach reflects the understanding that environmental education cannot stand alone as a single component of the curriculum, but must be instilled as a value of life that is realized continuously.

The Adiwiyata Program has proven to have a positive impact on improving students' ecological literacy and behavior. O'Flaherty (2018) noted that schools that successfully implemented this program showed real changes in school environmental management, including waste reduction, optimization of green spaces, 3R practices (reduce, reuse, recycle), and student involvement in environmental audits. Al-Naqbi & Alshannag (2018) found similar results, showing that urban farming, waste sorting, and composting successfully increased students' ecological awareness, practical skills, and love for the environment. However, disparities in implementation are still evident between urban and rural schools, often influenced by the availability of facilities, local government support, and community participation.

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Apart from Adiwiyata, a number of schools in Indonesia have also implemented independent innovations in environmental education. In several secondary schools in East Java, for example, students are assigned to conduct personal carbon audits and develop plans to reduce their families' carbon footprint (Uralovich et al.,, 2023). This program not only strengthens students' understanding of the impact of daily activities on carbon emissions, but also encourages family involvement in green living practices. Similarly, an environmentally-based private school in Yogyakarta has developed eco-project labs that integrate science, technology, and art to produce environmentally-friendly innovations such as bioplastics and simple hydroponic systems (Astuti & Wibowo, 2022). These findings confirm that effective environmental programs are those that allow students to be creative and solve real problems through project-based learning.

The implementation of green schools also requires strong policy support and internal governance. KLHK (2022) emphasizes that the success of green schools depends on the transformative leadership of school principals who are able to mobilize resources, establish ecological rules, and facilitate teacher training. Effective green school models include plastic reduction policies, the implementation of no-littering zones, energy conservation, and policy implementation monitoring systems.

In addition, periodic evaluation mechanisms such as environmental audits, student green practice reports, and environmental award systems can increase the internal motivation of school members to maintain a green culture. Schein's (2020) research supports this view by stating that a strong organizational culture can only be created through a combination of formal policies and consistent informal practices. International literature provides a comparative perspective that enriches the understanding of green school implementation in Indonesia.

Schools in Finland implement place-based environmental education, where students learn about environmental issues based on the local geographical and cultural context, such as boreal forest ecosystems and traditional conservation practices (OECD, 2022). Japan emphasizes environmental discipline practices through the tokkatsu system, with students routinely cleaning classrooms and school grounds as part of the moral curriculum (Purcell et al., 2019). These practices create a sense of collective responsibility and ecological discipline that becomes ingrained in students' habits. Both approaches are relevant to Indonesia, especially in combining local values such as gotong royong (mutual cooperation) and the ecological wisdom of the archipelago in environmental education practices.

To map the implementation model of green schools in Indonesia and its success indicators, the following conceptual table has been compiled based on literature and empirical findings:

Table 2. Key Green School Implementation Models and Indicators in Indonesia

Model Approach	Key Strategies	Success Indicators	Supporting Studies
Policy-driven Green School	Environmental rules, waste policies, energy management	Plastic-free campus, reduced waste, energy efficiency	KLHK (2022); O'Flaherty (2018)
Project-Based Eco Learning	Hands-on environmental projects, student research	Student eco-projects, improved scientific literacy	Uralovich et al., (2023); Al-Naqbi & Alshannag (2018)
Community-Engaged Green School	Collaboration with parents, NGOs, local gov	Family involvement, community programs	Meherali (2025); Agbedahin (2019)
Digital-supported Eco Learning	Use of digital tools for environmental learning	Eco-campaigns, digital green literacy	Rahman & Setiawan (2022); UNESCO (2023)
Local-culture Integrated Model	Integrating local wisdom & culture	Context-based sustainable habits	Al-Naqbi & Alshannag (2018);

			OECD (2022)

The table above shows that the implementation of green schools is not singular, but rather adaptive to the local context and school resources. Environmental policy models; project-based learning; partnerships with the community; the use of digital technology; and the integration of local cultural values can run simultaneously to strengthen students' ecological awareness. The key principle of these various models is authentic, collaborative, and sustainable learning, where students are not only given information about the environment but are also involved as agents of change.

Even so, challenges in implementing green schools remain, including budget constraints, lack of teacher training, and low commitment from certain stakeholders (Kurniasari & Darmawan, 2021). In addition, modern digital consumption culture can hinder the internalization of green values if not balanced with critical digital literacy (Rahman & Setiawan, 2022). Therefore, an emphasis on experience-based learning, family participation, and consistent school policies is key to the success of long-term implementation.

Thus, green schools in Indonesia can be catalysts for change towards a sustainable society if they are supported by institutional commitment, pedagogical capacity, community partnerships, and the integration of local culture. This systemic approach ensures that ecological awareness is not just knowledge, but a way of life that shapes the identity of future generations.

4. Conclusions and Suggestions

Schools play a central role in shaping students' environmental awareness and green lifestyles through learning mechanisms, habituation, and internalization of ecological values. Environmental education is not only about imparting knowledge, but also instilling sustainable pro-environmental attitudes, skills, and habits. The findings of this study show that the integration of environmental education into the curriculum, the implementation of an environmentally friendly school culture, teacher role modeling, family participation, and community support are important elements in creating an effective green learning ecosystem. The success of green school programs such as Adiwiyata proves that a school-based systemic approach can improve students' ecological literacy and sustainable behavior.

However, implementation challenges remain, particularly regarding variations in facilities between regions, teacher competence in sustainable pedagogy, and consistent support from parents and the community. To address these challenges, schools need to strengthen the integration of environmental education into all aspects of school operations, expand collaboration with environmental communities, develop green digital literacy, and empower students as agents of ecological change. These efforts are not only relevant to the context of education, but also have a strategic impact in addressing the global climate crisis, building an environmentally friendly culture, and preparing a young generation that is empowered, responsible, and has a vision of sustainability.

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