

The Green School Concept in Elementary Schools as an Effort to Form Sustainable Behavior and Environmental Awareness

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Abstract:

Green schools address "nature-deficit disorder" by creating an environment that supports children's interaction with nature. This concept should be implemented since elementary school to form a generation that cares about the environment, is healthy, and is ready to face sustainability challenges. The main objective of this study is to find an effective sustainability education strategy that supports environmental-based education practices in green schools and a learning environment that supports environmental awareness and sustainability. This study uses the Systematic Literature Review (SLR) method to identify, review, evaluate, and interpret relevant research. Researchers conducted a literature search in Pubmed, Garuda, Google Scholar, Scopus, and Springer Link with the keywords "sustainability education," "environmental education practices," and "green schools." Articles were selected based on inclusion criteria, namely focusing on sustainability education and environmental-based practices in green schools and having relevant empirical data. Articles that met the criteria were analyzed to identify trends, challenges, and practical strategies for implementing sustainability education. The results highlight that Green Schools significantly contribute to academic performance, environmental awareness, and the development of pro-environmental behaviors. Practical implementations, such as project-based learning activities like recycling projects and school gardening, enhance students' engagement with sustainability topics. This research underscores the importance of adopting Green School practices at the elementary level as a long-term investment in creating environmentally responsible future generations.

Keywords: Environmental Education; Green School; Project-Based Learning; Sustainability; Elementary Education

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Introduction

Children spend less time in nature, thus missing out on benefits such as improved concentration, reduced stress, and opportunities to build positive attitudes and connections with nature ([Luís et al., 2020](#)). This phenomenon is called "nature-deficit disorder," where children increasingly lose positive connections with nature. Lack of time outdoors can hinder motor skills development, limiting their creativity and imagination. To reduce "nature-deficit disorder," schools need to create a learning environment that supports and involves nature to help optimize children's potential ([Majdi, 2019](#)). So interactive and fun Learning in the outdoors supports academic development and strengthens their spiritual, emotional, and moral capacities ([Rahmad et al., 2024](#)).

The phenomenon of "nature-deficit disorder" has given rise to thoughts and awareness that have encouraged building green schools by considering that schools are ideal places to foster a love of nature and the surrounding environment ([Ramdhanía & Windarsih, 2020](#)). Children spend much time at school, so it is important to provide learning experiences that integrate sustainability values ([Hamdani & Wathoni, 2024](#)). Green schools allow children to do physical activity, develop creativity, and instill a caring attitude towards the environment ([Kumalasari et al., 2024](#)) while teaching sustainable behavior to form a generation responsible for preserving the earth ([Mahrus, 2024](#)). This is very important, especially since elementary school, to foster a caring attitude towards nature from an early age so that schools can help create a generation that is more responsible in maintaining the sustainability of the earth ([Handayani et al., 2024](#)), as well as preparing them to become agents of change who are supporting future sustainability ([Dinata et al., 2024](#)).

Green schools are garden-based programs proposed to increase children's contact with nature, especially since they spend a lot of time at school ([Maarif et al., 2024](#)). Green schools can be used as a place to foster and instill a sense of concern for the environment ([Basit & Sundawa, 2022](#)). Green schools implement environmentally friendly practices in all activities, including building design, Curriculum, and daily activities ([Baghdadi, 2022](#)). Green schools aim to form a generation that is more concerned and responsible for the environment by improving students' knowledge, attitudes, and behaviors on environmental issues ([Eslamieh et al., 2019](#)).

Green schools have great potential to improve energy efficiency ([Li et al., 2021](#)). Green schools can improve energy efficiency by retrofitting existing buildings, such as optimizing insulation and ventilation and using energy-efficient equipment. For new buildings, the design must consider energy efficiency from the start, including orientation, natural light, and environmentally friendly materials, to achieve sustainability and health according to green performance standards ([Liu & Ren, 2020](#)). Green schools are not only formal learning places but also provide direct experience in environmental conservation. Schools with green buildings can function as educational facilities by displaying five main themes of sustainability: recycling, water efficiency, energy saving, environmentally friendly materials, and ecological landscaping ([Cole et al., 2020](#)).

Previous studies have shown various benefits of implementing the green school concept on academic achievement, environmental understanding, and the formation of environmentally friendly student attitudes and behaviors. According to research by [Vakalis et al. \(2021\)](#), green schools contribute positively to students' academic achievement through environmentally friendly building features, such as natural lighting, good air quality, and noise control. This healthier learning environment supports students' concentration, speed, and accuracy in completing academic assignments.

[Cole and Hamilton \(2020\)](#) revealed that students in eco-friendly schools had higher knowledge of green building concepts than students in regular schools. However, this knowledge did not increase significantly over time, indicating that the presence of green buildings alone is insufficient to improve students' environmental understanding in depth; special programs focused on environmental education are needed. Another study by [Burns and Manouchehri \(2021\)](#) emphasized that green schools aim to provide environmentally based learning experiences for students, especially at the preschool and primary school levels. Green schools offer an alternative curriculum emphasizing outdoor Learning and direct interaction with nature. In addition [Verma & Grover's \(2022\)](#), study in Gujarat, India, showed that social media such as Facebook, Twitter, and YouTube support "Go Green" campaigns in green schools, raise public awareness, and support sustainable education.

[Lestari and Siskandar \(2021\); Cole, L. B. \(2019\)](#) showed that ecological literacy can be instilled in elementary school students through distance learning, supporting them in developing environmentally friendly habits that align with the Green School concept, even in online learning conditions. The positive effects of greener schoolyards are also supported by research by [Kelz et al. \(2015\)](#), which found that green schoolyards provide a more substantial recovery effect for students, especially those with less contact with nature outside of school. These results are supported by [Prasetyo \(2020\)](#), who emphasized the importance of including natural elements such as trees and ground vegetation in playgrounds to improve children's physical and mental recovery. This is also in line with the findings of [Puhakka et al. \(2019\)](#) in Finland, which stated that children more often exposed to natural diversity in daycare yards become more connected to nature, physically active, and feel healthier.

[Barrera-Hernández et al. \(2020\)](#) found that students in green courtyards had more positive attitudes and a stronger connection to nature, suggesting that green school design can increase awareness of sustainable environments. According to [Gericke et al. \(2020\)](#), the main objective of the Green School program in elementary schools is to instill environmental awareness and responsibility from an early age. [Kamil et al. \(2020\)](#) support this opinion by stating that green schools can function as agents of change that form environmentally conscious school citizens and create a healthy learning environment.

Previous studies have shown that green schools contribute to increased academic achievement and develop students' attitudes, knowledge, and connection to nature, making schools an environment that encourages positive change and sustainability. However, studies on implementing Green Schools at the elementary school level are still limited, even though this age is crucial for instilling sustainability values and environmental awareness early on.

This literature review will focus on implementing Green Schools in elementary schools, highlighting the importance of habituating students to sustainable behavior. Amid the increasing urgency of environmental education, this study aims to expand the study of Green Schools by analyzing the optimal implementation model for elementary schools. Thus, this study is expected to be the basis for developing a more integrated Green School at the elementary level, strengthening students' environmental understanding, and forming a sustainable mindset for the future.

Research Method

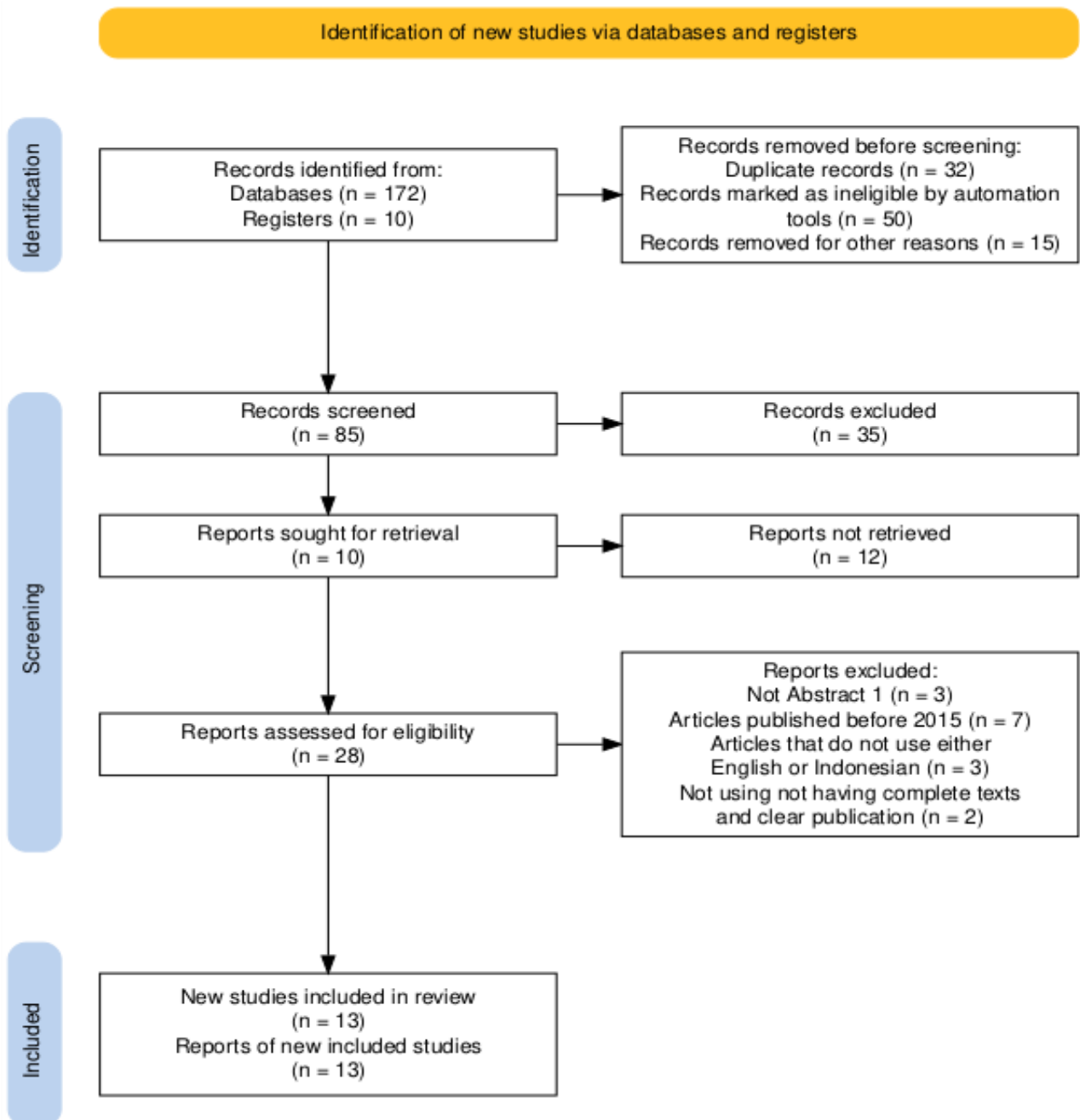
This research uses the SLR (Systematic Literature Review) method, which involves identifying, reviewing, evaluating, and interpreting all relevant research. Researchers follow the steps established in each process to systematically review and identify journals ([Triandini et al., 2019](#)).

This article focuses on answering the question: How can effective sustainability education strategies be implemented to support environmentally based educational

practices in green schools? The main objective of this research is to find the most effective strategy for implementing sustainability education in creating a learning environment that supports environmental awareness and sustainability in green schools.

In this process, the author conducted a literature search on Pubmed, Garuda, Google Scholar, Scopus, and Springer Link with the keywords "sustainability education," "environmental education practices," and "green schools." The literature found was selected based on inclusion criteria, namely research focusing on sustainability education and environmentally based educational practices in green schools and has relevant empirical data or findings. After screening, articles that met the inclusion criteria were analyzed in depth to identify trends, challenges, and practical strategies for implementing sustainability education in green schools. The article selection process according to the PRISMA procedure can be seen in the following picture:

Figure 1: Flow of Article Selection with Prisma



Based on the research results, 13 articles were found discussing the concept of green schools and their implementation in elementary schools as an effort to form sustainable behavior and environmental awareness. Of the 13 articles, several are research results published in international journals. A total of 8 articles discuss this topic globally, while the remaining five examine its implementation in Indonesian educational institutions. Based on the research methods used, 11 articles were found using qualitative methods, 1 article using mixed methods, and 1 article using quantitative methods. Based on the year of publication, 1 article was published in 2019, 5 articles were published in 2020, 1 article was published in 2021, 3 articles were published in 2022, 1 article was published in 2023, and 2 articles were published in 2024. These articles are spread across various journals focusing on education and the environment. The following are articles that discuss the implementation of the green school concept:

Table 1: Recapitulation of Research Article

No	Author	Journal Name/Year	Method
1	Cole et al.	Environment and Behavior/2020	Quantitative
2	Eslamieh et al.	School Administration/2019	Mix Method
3	Gericke et al.	Springer/2020	Qualitative
4	Ho	diva-portal.org/2020	Qualitative
5	Ichsan et al.	Journal of Community Service and Empowerment/2023	Qualitative
6	Maarif et al.	Journal of Education Research/2024	Qualitative
7	Sharma & Kanaujia	Springer/2020	Qualitative
8	Vakalis et al.	Critical Reviews in Environmental Science and Technology/2021	Qualitative
9	Verma & Grover	Journal of Public Affairs/2022	Qualitative
10	Iqbal	Uin Raden Intan Lampung/2024	Qualitative
11	Basit & Sundawa	Jurnal Moral Kemasyarakatan/2022	Qualitative
12	Ramdhania & Windarsih	CERIA (Cerdas Energik Responsif Inovatif Adaptif)/2020	Qualitative
13	Baghdadi	Journal of Positive School Psychology/2022	Qualitative

Based on the analysis of 13 articles discussing the concept of green schools, sustainable education, and environmental-based education practices at the elementary school level, a number of significant findings were found that can be used as a reference for the development of more effective and comprehensive environmental education.

These findings describe the various dimensions that need to be considered in implementing green schools to foster sustainable behavior and environmental awareness. For clarity, these findings are summarized in the following concept map, which will then be explained in detail below.

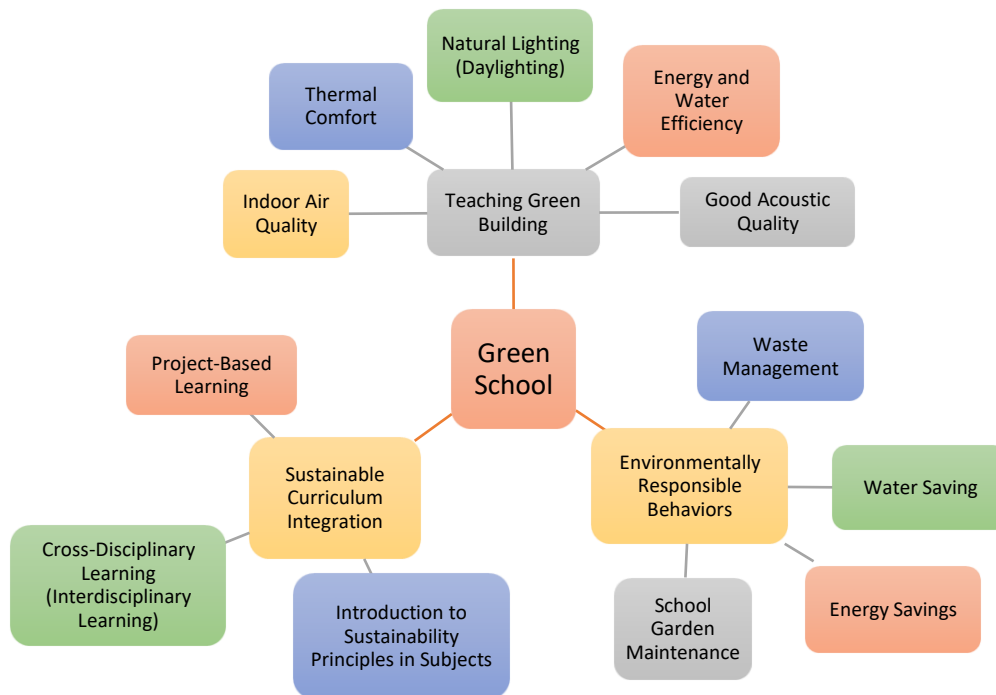


Figure 2: The Green School Concept in Elementary Schools as an Effort to Form Sustainable Behavior and Environmental Awareness

Green Elementary School

The green school movement began in the second half of the 20th century in response to growing awareness of global environmental issues such as pollution, deforestation, and climate change. Its starting point was the 1972 Stockholm Conference, where countries from around the world gathered to discuss environmental protection and promote more sustainability-oriented policies and education (Haidah, 2024), followed by the Earth Conference in Rio de Janeiro in 1992, underlining the importance of education for sustainability, to prepare future generations to face increasingly complex environmental challenges (Wendra & Sutrisno, 2023).

Europe led the way, with countries like Denmark and the United Kingdom introducing nature-based education programs in the 1980s and 1990s. International programs such as Eco-Schools, developed by the Foundation for Environmental Education in 1996, encourage schools to practice sustainability and manage resources in an environmentally friendly manner. In the United States, the green school concept gained ground in the early 2000s by introducing green building certifications, such as Foundation for Environmental Education for schools.

Green schools, commonly known as Green Schools, are educational initiatives that integrate sustainable practices into the school environment and activities to increase student's awareness and concern for the environment from an early age. Green schools are increasingly being implemented in elementary schools because several studies have shown significant benefits to students' academic and character development. Children are in a critical period at elementary school for forming attitudes, knowledge, and connection to nature (Barrera-Hernández et al., 2020). This is where green schools play a role as a learning medium that not only encourages academic achievement but also develops sustainable environmental awareness.

Research shows that green schools positively impact elementary school students' academic achievement. In school environments with natural elements such

as gardens, open areas, and good ventilation, students have higher levels of concentration and better ability to focus during class hours ([Vakalis et al., 2021](#)). Natural lighting, cleaner air quality, and reasonable noise control in green schools contribute to a healthier and more comfortable learning environment, which supports the teaching and learning process. This environment directly affects students' mental resilience and speed in completing academic tasks, which is essential, especially at the elementary school-age development stage ([Kelz et al., 2015](#); [Ichsan et al., 2023](#)). In addition, students who attend green schools show a better understanding of subject matter related to nature and the environment. This is related to the project-based learning method often applied in green schools, which allows students to learn academic concepts through direct interaction with the environment ([Burns & Manouchehri, 2021](#)). Thus, the benefits of green schools are not only limited to improving academic achievement but also include the development of more profound analytical and applied skills.

Green schools at the elementary school level have a strategic role in building a young generation that not only excels academically but also has an environmentally conscious character. Ecological literacy teaches students to understand and appreciate the surrounding environment, develop critical thinking skills, and build emotional connectedness with nature. The environmentally friendly design of green schools supports students' mental and physical health, creates optimal learning spaces, and contributes to environmental sustainability. Green schools are defined as school buildings designed to be environmentally friendly, aiming to create a healthy environment that supports the learning process while saving energy, resources, and costs. Green schools emerged from the need to reduce the negative impact of schools on the environment or ecological footprint and create a sustainable learning environment ([Sharma & Kanaujia, 2020](#)). Green schools also provide opportunities for students to understand the concept of sustainability in real terms because they can directly see the application of renewable energy and environmental conservation practices in the school environment ([Ho, 2020](#)).

Implementing the green school concept at the elementary school level is critical because this period is a crucial time to instill environmental values and accustom children to environmentally friendly habits from an early age. Through Learning and activities that support sustainability, elementary school students can grow into a generation that is more aware and responsible in protecting the environment throughout their lives ([Soleimani et al., 2019](#); [Ichsan et al., 2023](#)). Thus, elementary education institutions must consider implementing the green school concept as a long-term investment in forming an environmentally conscious generation that can face future sustainability challenges.

Teaching Green Building in Elementary School

Green schools help create an environment conducive to mental health, where students feel calmer and have a place to take a break from busy academic activities ([Shoari et al., 2021](#)). Green schools can also be a climate solution by significantly reducing emissions, supporting student health, and encouraging sustainable behavior. They can also inspire the younger generation to care about environmental sustainability and become real examples of positive actions in dealing with climate change ([Reimer-Watts et al., 2022](#)).

Green Schools need to be built with the Teaching Green Building concept, a type of building specifically designed to save resources such as water and energy while educating its occupants about sustainability ([Ho, 2020](#)). This building has visible environmentally friendly features, such as solar panels, water management systems, and recycling facilities. These features allow building occupants, especially students, to learn directly from their environment. In other words, this building is

expected to be a kind of "living textbook" that teaches the importance of protecting the environment indirectly to students who use it ([Cole & Hamilton, 2020](#)). Although the number of green buildings continues to increase, understanding of green buildings (green building literacy) is still limited to professionals in the building industry, such as architects, engineers, and designers. The general public and students do not have a deep understanding of the principles and functions of green buildings. Therefore, it is essential to understand the specific criteria that meet green school standards before building a green school. The following researchers will explain several specific criteria that schools can use to achieve ideal green school standards, namely:

Indoor Air Quality. Good air quality is an essential element for green schools. Good indoor air quality in schools is essential for student health and productivity. Indoor air pollution is a concern, especially since a person can spend up to 90% of their time indoors ([Syamiyah, 2021](#)).

Optimal air quality in Green Schools can be achieved by utilizing green spaces and natural ventilation. Planting plants around windows or creating a small garden in the schoolyard helps filter the air entering the room ([Okparavero & Coker, 2020](#)). These plants function as "natural filters" that absorb pollutants and produce oxygen so that the incoming air is cleaner and fresher ([Chandore, 2024](#)). In addition, schools can optimize natural ventilation by designing windows or cross ventilation that utilize natural wind ([Zivelonghi & Lai, 2021](#)). Cross ventilation allows air to circulate naturally in the room without air conditioning or fans, which is usually effective in areas with calm winds in the afternoon or evening ([Korsavi et al., 2020](#)).

Thermal Comfort. Comfortable room temperature is an essential factor in creating a conducive learning environment. Students who study in a place with a comfortable temperature tend to feel comfortable and more satisfied. This satisfaction contributes to their motivation to learn.

Green schools need to maintain the temperature and humidity in the room to keep it comfortable for students. When the temperature is too hot or too cold, students can feel uncomfortable, which makes it difficult for them to concentrate while studying ([Wang et al., 2021](#)). Thermal discomfort in the classroom can reduce the productivity and concentration of students and teachers, negatively impacting the quality of Learning ([Muhaimin et al., 2023](#); [Ichsan et.al., 2023](#)). With stable temperature settings and efficient heating or cooling systems, green schools create thermal comfort that supports focus and learning comfort ([Ruwaitah & Fibrianti, 2022](#)).

The study's results by [Ahmed et al. \(2021\)](#) show that cross ventilation can be applied cross ventilation can be applied to create thermal comfort in Green School and increase adequate airflow. In addition, solar chimneys can be used to create a pressure difference that draws hot air up and out of the room so that the air circulation remains cool. Windcatchers can also be installed in the school area to capture wind from outside and direct it into the room, making it more comfortable and energy efficient. Green schools can also plant trees on the side of the building that are often exposed to the hot sun (usually on the west or east side) to provide natural shade and lower the temperature around the building.

Natural Lighting (Daylighting). The use of natural light is an essential aspect of green schools. Natural lighting (daylighting) uses sunlight as the primary lighting source. In an educational environment, the classroom is the most frequently used room compared to other areas, so sufficient lighting is needed to support teaching and learning activities ([Khoirunnisa, 2023](#)).

Natural lighting helps improve the learning atmosphere, saves energy, and provides psychological benefits for students and teachers. The position and size of the windows are designed so that sunlight can enter without causing disturbing glare.

Natural lighting in green schools can be done by placing large windows on the east or west side to maximize morning and evening sunlight; green schools can also use skylights or transparent roofs in public spaces. Skylights allow direct sunlight to enter the room so that the room remains bright without requiring additional energy ([Siba et al., 2023](#)).

Energy and Water Efficiency. Energy and water efficiency are pillars of green schools. This strategy is environmentally friendly and reduces the school's operational costs. It includes using energy-efficient equipment, efficient lighting systems, and water management that saves consumption. Green schools must utilize natural energy when designing buildings and minimize using new resources. Schools can utilize natural resources around them, such as sunlight for lighting or wind for air circulation, to be more energy-efficient and environmentally friendly ([Siba et al., 2023](#)).

Green schools also need to practice water efficiency, namely, using water effectively to meet school needs without wasting valuable water resources. In this context, water efficiency includes measured water use, efficient irrigation practices, and the application of innovative water management technologies ([Iqbal, 2024](#)). At the elementary school level, the application of the concept of water efficiency in green schools plays a vital role, especially in educating students early on the importance of conserving water resources.

Good Acoustic Quality. Good acoustic quality is one of the critical aspects of Green School design because a quiet learning environment free from noise significantly affects the teaching and learning process. Good acoustic quality creates a comfortable space and supports students in understanding lessons more effectively. Green Schools must reduce noise from external sources (such as road traffic or construction activities outside the school) and internal sources, including mechanical systems such as air conditioning, heating, or ventilation devices ([Nguyen et al., 2021](#)). Uncontrolled noise can disrupt students' concentration and hinder their ability to hear instructions given by the teacher. This could reduce understanding of the subject matter delivered by the teacher ([Purwati, 2022](#); [Septiana & Widowati, 2017](#)).

Environmentally Responsible Behaviors in Elementary School

Environmentally responsible behaviors are concrete actions students take to protect and care for the environment around their school ([Cole & Hamilton, 2020](#)). These actions are knowledge and daily behaviors that support environmental sustainability and conservation. Elementary school is a critical period where children's habits and values begin to form, so it is essential to teach good values. Teaching environmentally responsible behaviors in elementary school can help students build sustainable habits, which they will likely carry into adulthood. Through the practice of Environmentally responsible behaviors, students learn about the direct relationship between their actions and their environmental impact. Here are some examples of Environmentally responsible behaviors that students can do in green schools.

Waste Management. [Indrawati et al. \(2021\)](#) stated that the ideal waste management approach is carried out on a 3R basis, which includes activities to reduce, reuse, and recycle waste. This is in line with what was conveyed by [Baro'ah & Qonita, \(2020\)](#), who argued that the 3R paradigm in waste management includes Reduce (R1), which is reducing consumptive lifestyles and using items that can be reused to prevent waste generation, Reuse (R2), which is utilizing waste that is still suitable for use for the same or different functions without processing; and Recycle (R3), which is sorting and processing waste into new products after the waste leaves

the environment. The 3R approach aims to reduce the burden on the final waste processing site.

Elementary school students need to be taught to sort waste, such as separating organic and inorganic waste and recycling items that can still be used (Pratama, 2015). They also need to be taught to reduce the use of plastic and bring their food containers and drinking bottles to reduce plastic waste. This is important because, according to Paramita and Firmansyah (2024), plastic waste can pollute the environment in the long term. Burning plastic produces gases that harm the air and human health, while plastic accumulation pollutes the soil and groundwater. So, the use of plastic waste needs to be reduced so as not to pollute the environment.

Water Saving. The international forum Decade for Action on Water 2018–2028, quoted by the official website of World Water Day, shows that around 1.9 billion people still live in areas with water shortages (Ratnasari, 2020). However, water waste still often occurs due to errors in tap use, where many users forget to close the tap after use or do not close it entirely so that the water continues to flow (Pramudya et al., 2020). Therefore, students must be trained to use water wisely, such as turning off the tap when not in use, especially when washing hands or watering plants.

Schools can also involve students in rainwater harvesting system maintenance programs to save water resources. This system collects and stores rainwater, which can later be used for daily needs at school, such as watering plants in the school garden, cleaning public areas, or other sanitation needs. This collection system helps reduce dependence on the primary water source and supports school water efficiency (Tuhuteru, 2023). This is also supported by the results of research (Irhaz & Putra, 2021), which show that using a rainwater harvesting system can save costs because the use of Regional Water Company water can be reduced. So that schools no longer need to spend high costs on providing clean water. Schools can use high rainfall as an alternative to providing clean water other than Regional Water Company water. The rainwater management system is so vital that it should be included in the education curriculum starting from elementary school (Indriatmoko & Rahardjo, 2015).

Energy Saving. The energy crisis that has hit the world, including Indonesia, cannot be ignored. Energy reserves in Indonesia continue to decrease over time. This condition is exacerbated by waste in its utilization (Rahmayanti et al., 2021). The fulfillment of energy needs in Indonesia is still very dependent on fossil energy, while the utilization of renewable energy has not developed optimally. Fossil energy reserves continue to decrease, and there have been no significant discoveries to increase new energy reserves (Apriliyanti & Rizki, 2023). As a result, Indonesia is vulnerable to fluctuations in the global energy market because some of its energy needs are met from imports. Domestic energy consumption continues to increase along with population growth, increased electricity consumption, and growth in the transportation and industrial sectors. Therefore, energy conservation is critical (Al-Bahij et al., 2020).

The community still lacks a deep understanding of the importance of energy saving in Indonesia. Instilling awareness of the need to save energy can begin in elementary school. Teachers can prepare students to have knowledge, attitudes, and behaviors that are wise in using energy from an early age (Wicaksono, 2018). So, students need to start being given an understanding of the importance of saving energy. Green schools can provide education about saving energy with various simple but effective steps. Students can be taught always to turn off lights and electrical equipment such as air conditioners and computers when not in use and to use environmentally friendly devices such as L.E.D. lights. Natural light can also be utilized by opening windows and curtains so that lights do not need to be turned on

during the day. Education about saving energy is reinforced through posters and competitions with the theme of saving energy to increase student awareness.

School Garden Maintenance. School gardens are facilities that beautify the school environment, provide coolness, and increase comfort. A beautiful environment makes students feel more at home and motivates them to learn ([Ramadaniyanti et al., 2023](#)). School gardens can be used to study, read books, discuss with friends, and do other activities because the environment is comfortable, beautiful, and relaxed ([Arafat & Aryaningrum, 2022](#)). Students will not feel bored because they spend too much time in class ([Tanjung & Namora, 2022](#)).

School gardens in green schools need to be maintained to create a clean, healthy, pollution-free, and comfortable environment ([Setyabudi et al., 2017](#)). School garden maintenance is essential to maintain the school environment's beauty, cleanliness, and comfort. Well-maintained gardens support students' physical and mental health, teach environmental responsibility, and create a more productive and enjoyable learning atmosphere ([Liyun et al., 2018](#)). In addition, school gardens reduce air and noise pollution with green vegetation that acts as a natural filter for pollutants and provides a cooling effect ([Widiawati et al., 2022](#)). Green schools can teach students about school garden care by watering plants every morning. Activities help foster students' sense of responsibility for the cleanliness and beauty of the school. In addition, teachers can facilitate group learning by inviting students to plant organic vegetables in small pots ([Mujiwati et al., 2020](#)). This approach does not require a large area, making it suitable for schools with limited space. Also, it increases students' creativity and understanding of the farming process and the benefits of consuming organic vegetables ([Fatmawati et al., 2023](#)).

Sustainable Curriculum Integration

Managing our ecosystems and creating a sustainable future is a significant challenge for humanity in a changing world. This challenge is exacerbated by the indifference or ignorance of many people towards sustainability ([Sengupta et al., 2020](#)). Younger generations, especially primary school students, often lack the understanding, commitment, or awareness of their roles and responsibilities in contributing to sustainability. Therefore, primary school education is critical to forming an early understanding of sustainability so that students can understand environmental issues early and grow up caring about sustainability.

The concept of sustainability is a theme that has both ancient and new roots. It has long been recognized in Native American cultures with "seven-generation" thinking that simultaneously considers ancestors and future generations ([Salas-Zapata & Ortiz-Muñoz, 2019](#)). On the other hand, it is new because it has become a buzzword in society to describe practices that reduce environmental impact, promote economic progress, and support health and well-being across generations ([Toli & Murtagh, 2020](#)). While sustainability is difficult to encapsulate in a simple definition, it can be meaningfully described through three interrelated components: environment, economy, and society ([Ruggerio, 2021](#)).

Sustainable Curriculum Integration is a way of incorporating sustainability principles into the school curriculum. This approach strengthens the "green school" concept by creating a holistic and consistent student learning experience. Hence, they are accustomed to seeing sustainability as part of everyday life. Education for Sustainable Development is designed to shape education that supports sustainability for future generations ([Zguir, 2021](#)). An effective curriculum for Education for Sustainable Development must integrate flexibility, cross-disciplinary Learning, theory-practice balance, and Active Learning to ensure sustainability in education ([Rodríguez-García et al., 2019](#)).

The concept of sustainability must be included in the elementary school curriculum, especially in core subjects such as mathematics, science, and social. This is very important to form a generation that cares about the environment, is creative, and is ready to face future challenges. Several things can be done to integrate the principle of sustainability in subjects.

Introduction to Sustainability Principles in Subjects. Every subject in elementary school can be linked to the context of sustainability. This aims to equip students to understand sustainability and its environmental impact. Introducing sustainability principles into the Curriculum means including topics related to sustainability in the subject. In this way, students learn about the relationship between sustainability and various aspects of everyday life. For example, in science lessons, students can learn to protect the environment and recycle. In Mathematics lessons, teachers can teach students about simple calculations related to resource use, such as calculating water and energy consumption. This can also be applied to social studies; teachers can teach students about environmental responsibility and the impact of their decisions on the surrounding environment.

Cross-Disciplinary Learning (Interdisciplinary Learning). Research discusses how innovation develops in groups of students consisting of various subjects (cross-disciplinary groups) compared to groups from only one subject (monodisciplinary groups) ([Braßler & Schultze, \(2021\)](#)). The results of this study indicate that cross-disciplinary student groups excel in generating new ideas. This finding underlies the importance of implementing cross-disciplinary Learning in elementary schools to encourage collaboration, knowledge sharing, and creativity, thereby increasing student understanding while fostering innovative attitudes from an early age. The research results reinforce this [Noy et al., \(2017\)](#), which suggests that elementary schools' curriculum and education policies for Sustainability Education should use a planned cross-disciplinary approach. This means that sustainability lessons in elementary schools should involve collaboration between subjects such as science, mathematics, and social studies. With this approach, students can see sustainability from various perspectives, making them more understanding and ready to apply this concept in everyday life. [Metzger et al. \(2017\)](#) research supports that sustainability teaching cannot be limited to just one discipline; collaboration between disciplines is needed to understand the relationship between the environment, economy, and society.

Elementary school teachers must encourage students to create flexible learning systems that facilitate collaboration between teachers from different subjects to help students understand sustainability holistically. Here are some examples of sustainability teaching in cross-disciplinary Learning: By combining science and Indonesian lessons, students learn about plants' basic needs and the photosynthesis process in science lessons. Then, in Indonesian lessons, they are asked to make a report or daily journal documenting the development of the plants they care for, thus practicing writing and observation skills.

Cross-disciplinary Learning can also be done in social studies and English lessons. In social studies lessons, teachers can teach students about the negative impacts of plastic waste on the environment and the importance of reducing its use. Furthermore, in English lessons, students are tasked with making a campaign poster in English to encourage school friends to reduce plastic use. This project helps students hone their English skills and deepen their understanding of environmental issues.

Project-Based Learning. Project-Based Learning is an innovative model emphasizing contextual Learning through complex activities. Students collect information to produce something useful for themselves and others ([Nakada et al., 2018](#)). Project-Based Learning offers an alternative to traditional Learning, which

tends to be more rigid, by preparing students to become independent learners and problem solvers early ([Setyawan & Purwanto, 2019](#)). Project-Based Learning trains students to think critically, work together, and adapt to various situations through real projects ([Nurhidayah, 2021](#)). Project-Based Learning is effectively implemented in elementary schools because Learning should not only focus on theory and basic skills. It is also essential to develop students' soft skills, such as communication skills, collaboration, and creative thinking ([Syakur et al., 2020](#)).

Project-based Learning approach makes students actively involved in learning by conducting research, working in teams, and creating valuable solutions ([Dini, 2022](#)). In sustainability, Project-Based Learning helps students understand the importance of protecting the environment, saving resources, and being responsible for nature and society. Here are some examples of the application of Project-Based Learning with the concept of sustainability in elementary schools 1) Recycling Project and 2) School Garden.

Waste recycling projects in project-based Learning allow students to explore information, solve environmental problems, identify issues scientifically, and understand the concept of recycling. This project also increases student engagement because the learning process is dynamic and interactive ([Hapsari et al., 2016](#); [Salsabila et al., 2024](#)).

Discussion of environmental problems should encourage students to actively identify, research, and solve problems ([Utomo, 2024](#)). Students can learn the importance of reducing waste by recycling used materials in the school environment. Recycling projects can be done simply by collecting used plastic or paper and turning them into works of art or new valuable items, such as plant pots or pencil cases.

School vegetable gardens are designed to increase the availability of vegetables for family consumption, using small land to suit household conditions in Indonesia. Teaching vegetable gardens in elementary schools is essential because it can instill basic knowledge about food security and nutrition from an early age. Students learn how to plant and care for vegetables, improving their practical skills and awareness of the importance of sustainability and healthy lifestyles ([Nurbaidah, R., & Wuryaningrum, 2024](#)). In this project, students work together to plant vegetables or flowers in the school garden. They learn to care for plants, understand the growth cycle, and the importance of greening for the environment. This activity can also be integrated with science lessons to learn about photosynthesis and the life cycle of plants.

Green schools implement sustainable practices to increase students' environmental awareness from an early age. In elementary schools, this concept is very important because it supports the formation of environmentally conscious attitudes, health, academic achievement, and student understanding through environmentally friendly design and project-based Learning. By instilling the value of sustainability, green schools play a role in forming a generation that is responsive to global challenges and responsible for nature. Green schools at the primary level create a healthy, comfortable, and sustainable learning environment. They feature environmentally friendly features such as natural ventilation, daylighting, energy and water efficiency, and noise control. This concept not only creates a comfortable study space but also instills environmental awareness in students.

Green schools are also an ideal place to instill environmentally friendly behaviors. Through activities such as sorting waste, saving water and energy, and caring for the school garden, students learn firsthand about the importance of sustainability. These activities form positive habits, such as bringing supplies in environmentally friendly containers, utilizing natural lighting, and maintaining the garden as a green space. By integrating sustainability into the Curriculum through subjects such as science, mathematics, and social studies, as well as practical

projects such as waste recycling and school gardens, students gain not only theory but also practical skills in caring for nature. This approach ensures that students grow into individuals who care and are responsible for the environment.

Conclusion

The Green School concept in elementary schools plays a strategic role in forming a generation that cares about the environment, is healthy, and is empowered to face sustainability challenges. With approaches such as teaching green buildings, project-based Learning, and integrating sustainability principles into the Curriculum, green schools have increased students' understanding of the environment while forming environmentally friendly attitudes and behaviors. Students learn the importance of preserving the environment through direct experience in activities such as recycling projects and school gardens. A healthy and environmentally friendly learning environment has also been shown to support students' academic achievement, improve health quality, and increase their connection with nature. Green Schools function as learning places and agents of change, instilling sustainability values. Thus, the implementation of Green Schools at the elementary level needs more attention in designing education policies so that they can become the foundation for creating a more sustainable future.

References

- Ahmed, T., Kumar, P., & Mottet, L. (2021). Natural ventilation in warm climates: The challenges of thermal comfort, heatwave resilience and indoor air quality. *Renewable and Sustainable Energy Reviews*, 138, 110669. <https://doi.org/10.1016/j.rser.2020.110669>
- Al Bahij, A., Nadiroh, N., Sihadi, S., & Amrullah, F. (2020). Analisis Pengaruh Literasi Energi Terhadap Hemat Energi Pada Siswa Sekolah Dasar. *Edukasi: Jurnal Penelitian dan Artikel Pendidikan*, 12(1), 1-10. <https://doi.org/10.31603/edukasi.v12i1.3401>
- Al Iqbal, U. (2024). *Assessment Sekolah di Kota Bandar Lampung Menggunakan Rating Tools Sekolah Hijau Kategori Efisiensi Air (EFA)*. Diploma thesis, Universitas Islam Negeri Raden Intan Lampung. <https://repository.radenintan.ac.id/id/eprint/35822>
- Apriliyanti, K., & Rizki, D. (2023). Kebijakan energi terbarukan: studi kasus indonesia dan norwegia dalam pengelolaan sumber energi berkelanjutan. *Jurnal Ilmu Pemerintahan Widya Praja*, 49(2), 186-209. <https://doi.org/10.33701/jipwp.v49i2.3684>
- Arafat, Y., & Aryaningrum, K. (2022). Pengaruh Pemanfaatan Taman Sekolah Sebagai Sumber Belajar Terhadap Hasil Belajar Pada Pelajaran Ipa Kelas V Sdn Sridamai. *Comserva: Jurnal Penelitian Dan Pengabdian Masyarakat*, 2(4), 454-460. <https://doi.org/10.59141/comserva.v2i4.256>
- Baghdadi, R. (2022). The relationship between Green education and sustainable development in Palestinian educational institutions. *Journal of Positive School Psychology*, 6(5), 541-561. <https://mail.journalppw.com/index.php/jpsp/article/view/5826>
- Baro'ah, S., & Qonita, S. M. (2020). Penanaman CiLi (Cinta Lingkungan) pada siswa melalui program lingkungan sekolah tanpa sampah plastik. *Jurnal PANCAR (Pendidik Anak Cerdas Dan Pintar)*, 4(1). <https://ejournal.unugha.ac.id/index.php/pancar/article/view/309>
- Barrera-Hernández, L. F., Sotelo-Castillo, M. A., Echeverría-Castro, S. B., and Tapiá-Fonllem, C. O. (2020). Connectedness to nature: its impact on sustainable behaviors and happiness in children. *Frontiers in Psychology*. 11:276. <https://doi.org/10.3389/fpsyg.2020.00276>

- Basit, A., & Sundawa, D. (2022). Analisis Penerapan Karakter Peduli Lingkungan di Sekolah Hijau. *Jurnal Moral Kemasyarakatan*, 7(2), 109-119. <https://doi.org/10.21067/jmk.v7i2.7569>
- Braßler, M., & Schultze, M. (2021). Students' innovation in education for sustainable development—a longitudinal study on interdisciplinary vs. Monodisciplinary learning. *Sustainability*, 13(3), 1322. <https://doi.org/10.3390/su13031322>
- Burns, E. A., & Manouchehri, B. (2021). Reconnecting children with nature: foundation and growth of the nature schools movement in Iran. *Interdisciplinary Journal of Environmental and Science Education*, 17(3), e2244. <https://doi.org/10.21601/ijese/10934>
- Chandore, H. D. (2024). The Role of Indoor Plants in Improving Air and Mind-Comprehensive Review. *International Journal of Environment, Agriculture and Biotechnology*, 9(4). <https://i.agriculturejournals.org/index.php/ijeab/article/view/249>
- Cole, L. B. (2019). Green building literacy: a framework for advancing green building education. *International Journal of STEM Education*, 6, 1-13. <https://link.springer.com/article/10.1186/s40594-019-0171-6>
- Cole, L. B., & Hamilton, E. M. (2020). Can a green school building teach? A pre-and post-occupancy evaluation of a teaching green school building. *Environment and Behavior*, 52(10), 1047-1078. <https://doi.org/10.1177/0013916518825283>
- Cole, L. B., Lindsay, G., & Akturk, A. (2020). Green building education in the green museum: design strategies in eight case study museums. *International Journal of Science Education*, 10(2), 149-165. <https://doi.org/10.1080/21548455.2020.1723182>
- Dinata, C., Rozaki, Z., Wulandari, R., & Azzahra, I. (2024). Peran Pertanian Dalam Mendukung Generasi Cemerlang Di Sektor Perekonomian Masa Depan. In *Seminar Nasional Agribisnis* (Vol. 1, No. 1, Pp. 56-60). <https://prosiding.umy.ac.id/semnasagriomy/index.php/ag/article/view/31>
- Dini, J. P. A. U. (2022). Inovasi Pembelajaran Dimasa Pandemi: Implementasi Pembelajaran Berbasis Proyek Pendekatan Destinasi Imajinasi. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(5), 3901-3910. <https://doi.org/10.31004/obsesi.v6i5.1886>
- Eslamieh, F., Oladian, M., & Safari, M. (2019). Conceptual design of green schools in Iran. *School Administration*, 7(2), 60-81. <https://doi.org/10.34785/J010.2019.227>
- Fatmawati, B., Ariandani, N., Muliawan, W., Fajri, N., Sarwati, S., Marzuki, M., & Wazni, M. K. (2023). Budidaya tanaman hidroponik melalui pendampingan pemanfaatan limbah anorganik sebagai media tanam di sekolah. *ABSYARA: Jurnal Pengabdian Pada Masyarakat*, 4(2), 269-278. DOI: <https://doi.org/10.29408/ab.v4i2.22001>
- Gericke, N., Manni, A., & Stagell, U. (2020). *The green school movement in Sweden—Past, present and future. Green schools globally: Stories of impact on education for sustainable development.* Springer Nature Switzerland, 309-332. https://link.springer.com/chapter/10.1007/978-3-030-46820-0_17
- Haidah, A. (2024). Konferensi Stockholm (1972): Gerbang Dialog Pertama Mengenai Isu Lingkungan Hidup Di Kancah Internasional. *Sajaratun: Jurnal Sejarah Dan Pembelajaran Sejarah*, 9(1), 1-9. <https://doi.org/10.37478/sajaratun.v9i1.4305>
- Hamdani, S., & Wathoni, N. (2024). Pendidikan Islam Dan Lingkungan Hidup: Solusi Dan Tantangan Pendidikan Islam Dalam Merespon Isu Lingkungan. *Ta'dib: Jurnal Pendidikan Islam Dan Isu-Isu Sosial*, 22(2), 115-139. <https://jurnal.iainwpancor.ac.id/index.php/tadib/article/view/1858>

- Handayani, R., Noor, I. G., & Dewi, R. S. (2024). Peran Pendidikan Karakter Peduli Lingkungan Di Sekolah Dalam Membentuk Generasi Cerdas Dan Bertanggung Jawab Terhadap Kelestarian Alam. *Ainara Journal (Jurnal Penelitian Dan Pkm Bidang Ilmu Pendidikan)*, 5(3), 372-377. <https://doi.org/10.54371/ainj.v5i3.560>
- Hapsari, D. D., Lisdiana, L., & Sukaesih, S. (2016). Pengaruh pembelajaran berbasis proyek berbantuan modul daur ulang limbah pada literasi sains. *Journal of Biology Education*, 5(3), 302-309. <https://doi.org/10.15294/jbe.v5i3.14864>
- Ho, T. A. T. (2020). *Place-based education with Teaching Green Building for ESD*. Linköping University. Department of Behavioral Sciences and Learning
- Ichsan, I. Z., Pertiwi, S., & Hermawan, Y. (2023). Empowerment knowledge of elementary school teachers for supporting green schools. *Journal of Community Service and Empowerment*, 4(1), 139-144. <https://doi.org/10.22219/jcse.v4i1.24522>
- Indrawati, D., Ruhayat, R., Indrawati, E., & Siami, L. (2021). Upaya Meningkatkan Partisipasi Masyarakat Dalam Pengelolaan Sampah Berbasis 3r Di Desa Cibodas Kecamatan Pasirjambu Kabupaten Bandung. *J. Din*, 6(1), 51-56. https://web.archive.org/web/20220519061202id_/https://publikasi.poliije.ac.id/index.php/j-dinamika/article/download/v6-i1-i/pdf
- Indriatmoko, R. H., & Rahardjo, N. (2015). Kajian pendahuluan sistem pemanfaatan air hujan. *Jurnal Air Indonesia*, 8(1), 245632. <https://doi.org/10.29122/jai.v8i1.2387>
- Irhaz, N., & Putra, F. P. (2021). Analisa Pemanfaatan Air Hujan Dengan Metode Penampungan Air Hujan (Pah) Dan Di Manfaatkan Untuk Kebutuhan Air Gedung Sekolah. In Seminar Nasional Ketekniksipilan, Infrastruktur dan Industri Jasa Konstruksi (KIIJK) (Vol. 1, No. 1, pp. 195-209). <https://prosiding.uika-bogor.ac.id/index.php/kiijk/article/view/347>
- Kamil, P. A., Putri, E., Ridha, S., Utaya, S., & Utomo, D. H. (2020). Promoting environmental literacy through a green project: A case study at adiwiyata school in Banda Aceh City. *IOP Conference Series: Earth and Environmental Science*, 485(1), 012035. <https://doi.org/10.1088/1755-1315/485/1/012035>
- Kelz, C., Evans, G. W., and Röderer, K. (2015). The Restorative Effects of Redesigning the Schoolyard: A Multi-Methodological, Quasi-Experimental Study in Rural Austrian Middle Schools. *Environment and Behavior*, 47(2), 119-139. <https://doi.org/10.1177/0013916513510528>
- Khoirunnisa, A. (2023). *Analisa Pencahayaan Alami Ruang Kelas pada Sekolah SMA N-1 Tanjung Pura Menggunakan Dialux Evo 11.1*. (Doctoral dissertation, Universitas Malikussaleh). <https://rama.unimal.ac.id/id/eprint/629/>
- Korsavi, S. S., Montazami, A., & Mumovic, D. (2020). Ventilation rates in naturally ventilated primary schools in the UK; Contextual, Occupant and Building-related (COB) factors. *Building and Environment*, 181, 107061. <https://doi.org/10.1016/j.buildenv.2020.107061>
- Kumalasari, F., Putri, Y. H., & Mavilinda, H. F. (2024). Studi Netnografi: Manfaat Sekolah Berbasis Alam Terhadap Kesehatan Anak. *Jurnal Ilmu Kesehatan Masyarakat*, 13(02), 131-141. <https://doi.org/10.33221/jikm.v13i02.2619>
- Lestari, H., & Siskandar, R. (2021). Cultivating green behavior of eco literacy-based elementary school students during the covid-19 pandemic. *Jurnal Penelitian Pendidikan IPA*, 7(1), 49-53. <https://doi.org/10.29303/jppipa.v7i1.477>
- Li, Q., Zhang, L., Zhang, L., & Wu, X. (2021). Optimizing energy efficiency and thermal comfort in building green retrofit. *Energy*, 237, 121509. <https://doi.org/10.1016/j.energy.2021.121509>

- Liu, Q., & Ren, J. (2020). Research on the building energy efficiency design strategy of Chinese universities based on green performance analysis. *Energy and Buildings*, 224, 110242. <https://doi.org/10.1016/j.enbuild.2020.110242>
- Liyun, N., Khasanah, W. N., & Tsuraya, N. A. (2018). Menanamkan Karakter Cinta Lingkungan Pada Anak Melalui Program "Green and Clean". *Kopen: Konferensi Pendidikan Nasional*, 1(1), 136-140. https://ejournal.mercubuana-yogya.ac.id/index.php/Prosiding_KoPeN/article/view/897
- Luís, S., Dias, R., & Lima, M. L. (2020). Greener schoolyards, greener futures? Greener schoolyards buffer decreased contact with nature and are linked to connectedness to nature. *Frontiers in Psychology*, 11, 567882. <https://doi.org/10.3389/fpsyg.2020.567882>
- Maarif, M. S., Kusrina, T., & Basukiyatno, B. (2024). Implementasi Kemampuan Manajerial Kepala Sekolah dalam Menciptakan Sekolah Hijau (Green School) di Tingkat SD. *Journal of Education Research*, 5(3), 3708-3722.
- Mahrus, M. (2024). Transformasi Pendidikan Agama Islam Berbasis Kesadaran Ekologis Pada Siswa. *Dirosat: Journal Of Islamic Studies*, 9(1), 109-122. DOI: [10.28944/dirosat.v9i1.1877](https://doi.org/10.28944/dirosat.v9i1.1877)
- Majdi, M. (2019). Program Sekolah Adiwiyata Dalam Pengembangan Sosio-Emosional Anak Usia Dasar di SDN Ngupasan Yogyakarta. *Al-Adzka: Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, 9(2), 85-98. <https://core.ac.uk/download/pdf/327227388.pdf>
- Metzger, E. P., Blockstein, D. E., & Callahan, C. N. (2017). Interdisciplinary teaching and sustainability: An introduction. *Journal of Geoscience Education*, 65(2), 81-85. <https://doi.org/10.5408/1089.9995-65.2.81>
- Muhaimin, M., Jumriani, J., Alviawati, E., & Angriani, P. (2023). Urgensi Kenyamanan Termal dalam Perspektif Pembelajaran. *Geodika: Jurnal Kajian Ilmu dan Pendidikan Geografi*, 7(1), 23-32. <https://doi.org/10.29408/geodika.v7i1.6451>
- Mujiwati, Y., Paramitha, M., & Maulana, M. Z. A. S. (2020). Menumbuhkan Rasa Kepedulian Siswa Terhadap Kebersihan Lingkungan Di Sekolah Ma Al Masyhur Bugul Kidul Kota Pasuruan. *Community Development Journal: Jurnal Pengabdian Masyarakat*, 1(2), 157-164. <https://doi.org/10.31004/cdj.v1i2.852>
- Nakada, A., Kobayashi, M., Okada, Y., Namiki, A., & Hiroi, N. (2018). Project-based learning. *Journal of the Medical Society of Toho University*, 65(4), 157-163. <https://doi.org/10.14994/tohoigaku.2017-010>
- Nguyen, P. Y., Astell-Burt, T., Rahimi-Ardabili, H., & Feng, X. (2021). Green space quality and health: a systematic review. *International journal of environmental research and public health*, 18(21), 11028. <https://doi.org/10.3390/ijerph182111028>
- Noy, S., Patrick, R., Capetola, T., & McBurnie, J. (2017). Inspiration from the classroom: A mixed method case study of interdisciplinary sustainability learning in higher education. *Australian Journal of Environmental Education*, 33(2), 97-118. <https://doi.org/10.1017/ae.2017.22>
- Nurbaidah, R., & Wuryaningrum, R. (2024). Model Pjbl Berbantuan Media Infografis Dalam Pembelajaran P5 Tema Kearifan Lokal Melalui Kebun Sekolah Mini Di Sdn Rowotengah 03. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 9(2), 7347-7362. <https://doi.org/10.23969/jp.v9i2.15841>
- Nurhidayah, I. J., Wibowo, F. C., & Astra, I. M. (2021). Project Based Learning (PjBL) learning model in science learning: Literature review. *Journal of Physics: Conference Series* (Vol. 2019, No. 1, p. 012043). IOP Publishing. <https://iopscience.iop.org/article/10.1088/1742-6596/2019/1/012043>

- Okparavero, O., & Coker, T. (2020). Use of Ornamental Plant as Phytoremediation in Reducing the Risk of Covid 19: A Review. In: *2nd International Conference, Virtual*, 10th – 11th Nov. 2020, The Federal Polytechnic, Ilaro <https://eprints.federalpolyilaro.edu.ng/1919/>
- Paramita, N. W. S. G., & Firmansyah, A. (2024). Efektifitas Kebijakan Plastik Berbayar Di Indonesia Dalam Upaya Pengurangan Pencemaran Sampah Plastik. *Jurnalku*, 4(2), 210-221. <https://doi.org/10.54957/jurnalku.v4i2.673>
- Pramudya, A. R., Alfeto, A., & Cristianti, C. (2020). Penggunaan Keran Air Otomatis dalam Penghematan Air. *Ultima Computing: Jurnal Sistem Komputer*, 12(1), 17-22. <https://doi.org/10.31937/sk.v12i1.1612>
- Prasetyo, A. N. (2020). *Panti Asuhan Nuansa Alam Berbasis Pendidikan Non Formal Pertanian Di Temanggung* (Doctoral Dissertation, Universitas Katolik Soegijapranata Semarang). <https://repository.unika.ac.id/25258/>
- Pratama, A. T. (2015). Sistem Pengolahan Sampah Ramah Lingkungan Di Sekolah Kota Medan. *BIOSEL (Biology Science and Education): Jurnal Penelitian Science dan Pendidikan*, 4(1), 1-12. <https://doi.org/10.33477/bs.v4i1.524>
- Puhakka, R., Rantala, O., Roslund, M. I., Rajaniemi, J., Laitinen, O. H., and Sinkkonen, A. (2019). Greening of daycare yards with biodiverse materials affords well-being, play and environmental relationships. *Int. J. Environ. Res. Public Health*, 16(16). 2948. <https://doi.org/10.3390/ijerph16162948>
- Purwati, N. (2022). Gangguan Dan Hambatan Perkembangan Pada Anak Usia Dini. *GUAU: Jurnal Pendidikan Profesi Guru Agama Islam*, 2(1), 451-468. <https://studentjournal.iaincurup.ac.id/index.php/guau/article/view/205>
- Rahmad, R., Syar, N. I., Syahmidi, S., & Mualimin, M. (2024). Child-Friendly Schools in Primary Education Institutions. *Al-Adzka: Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, 14(2), 121-134. <https://doi.org/10.18592/aladzkapgmi.v14i2.13738>
- Rahmayanti, L., Rahmah, D. M., & Larashati, L. (2021). Analisis Pemanfaatan Sumber Daya Energi Minyak Dan Gas Bumi Di Indonesia. *Jurnal Sains Edukatika Indonesia (Jsei)*, 3(2). <https://jurnal.uns.ac.id/jsei/article/view/70898>
- Ramadaniyanti, D. P., Umam, K., Alfayed, D., & Siswoyo, A. A. (2023). Peran Taman Sekolah sebagai Motivasi Siswa SD dalam Mencintai Tumbuhan Dan Alam Sekitar. *PENDAGOGIA: Jurnal Pendidikan Dasar*, 3(1), 36-46. <https://jurnal.educ3.org/index.php/pendagogia/article/view/128>
- Ramdhania, A., & Windarsih, C. A. (2020). Penerapan Kegiatan Ekstrakurikuler Berbasis Ekologi Menuju Sekolah Hijau Pada Lembaga Paud. *CERIA (Cerdas Energik Responsif Inovatif Adaptif)*, 3(4), 297-306. DOI: <https://doi.org/10.22460/ceria.v3i4.p%25p>
- Ratnasari, E. D. (2020). Hari Air Sedunia, 7 Fakta Mengejutkan Masalah Air. Available: <https://www.cnnindonesia.com/gaya-hidup/20180322115007-282-284979/hari-air-sedunia-7-fakta-mengejutkan-masalah-air>.
- Reimer-Watts, K., Abel, E., Coulombe, S., & Riemer, M. (2022). Co-creating cultures of sustainability and co-imagining the teaching green building: the use of a participatory Photovoice process in a HPGB context. *Sustainable Earth*, 5(1), 2. <https://link.springer.com/article/10.1186/s42055-022-00047-y>
- Rodriguez-García, A. M., López Belmonte, J., Agreda Montoro, M., & Moreno-Guerrero, A. J. (2019). Productive, Structural And Dynamic Study Of The Concept Of Sustainability In The Educational Field. *Sustainability*, 11(20), 5613. <https://doi.org/10.3390/su11205613>

- Ruggerio, C. A. (2021). Sustainability And Sustainable Development: A Review Of Principles And Definitions. *Science Of The Total Environment*, 786, 147481. <https://doi.org/10.1016/j.scitotenv.2021.147481>
- Ruwaidah, E., & Fibrianti, B. S. (2022). Perancangan Ruang Kreasi dan Baca Berbasis Arsitektur Hijau di Kota Mataram. *Empiricism Journal*, 3(2), 422-437. <https://doi.org/10.36312/ej.v3i2.2186>
- Salas-Zapata, W. A., & Ortiz-Muñoz, S. M. (2019). Analysis Of Meanings Of The Concept Of Sustainability. *Sustainable Development*, 27(1), 153-161. <https://doi.org/10.1002/sd.1885>
- Sengupta, E., Blessinger, P., & Yamin, T. S. (2020). Introduction to Integrating Sustainability into Curriculum. In E. Sengupta, P. Blessinger, & T. S. Yamin (Eds.), *Innovations in Higher Education Teaching and Learning* (pp. 3–14). Emerald Publishing Limited. <https://doi.org/10.1108/S2055-364120200000018018>
- Septiana, N. R., & Widowati, E. (2017). Gangguan pendengaran akibat bisung. *HIGEIA (Journal of Public Health Research and Development)*, 1(1), 73-82. <https://journal.unnes.ac.id/sju/higeia/article/view/13993>
- Salsabila, N., Rahmasari, S., & Sholeh, M. (2024). Dry Herbarium Based on Local Wisdom to Improve Student Learning Outcomes. *Journal of Educational Research and Practice*, 2(1), 1–10. <https://doi.org/10.70376/jerp.v2i1.64>
- Setyabudi, I., Nuraini, N., Alfian, R., & Nailufar, B. (2017). Konsep taman edukasi pada sekolah dasar di Kota Malang (Studi kasus : SDN Lowokwaru 3 Malang). *Jurnal RUAS*, 15(1), 23-34. <https://web.archive.org/web/20180423012645id/http://ruas.ub.ac.id/index.php/ruas/article/viewFile/222/210>
- Setyawan, R. I., & Purwanto, A. (2019). Model Pembelajaran Berbasis Proyek (Project Based Learning) Untuk Meningkatkan Hasil Belajar. *Jurnal Dikdas Bantara*, 2(2). DOI: <https://doi.org/10.32585/jdb.v2i2.372>
- Sharma, P. K., & Kanaujia, P. R. (2020). *Journey of green schools in India. Green schools globally: Stories of impact on education for sustainable development*. Springer. 203-226. https://link.springer.com/chapter/10.1007/978-3-030-46820-0_12
- Shoari, N., Ezzati, M., Doyle, Y. G., Wolfe, I., Brauer, M., Bennett, J., & Fecht, D. (2021). Nowhere to play: available open and green space in Greater London schools. *Journal of Urban Health*, 98, 375-384. <https://link.springer.com/article/10.1007/s11524-021-00527-0>
- Siba, M. N., Maromon, R. Y., & Neonufa, S. N. I. (2023). Perancangan Kawasan Pendidikan Advent dengan Pendekatan Arsitektur Hijau di Kabupaten Kupang. *GEWANG: Gerbang Wacana dan Rancang Arsitektur*, 5(1), 72-83. <https://ejurnal.undana.ac.id/index.php/gewang/article/view/10054>
- Soleimani, F., Soleimani, N., Jamali, A., & Shabannejad Khas, R. (2019). A Model Representation with Grounded Theory approach for Nature Schools Development in Iran. *School Administration*, 7(3), 123. <https://doi.org/10.34785/J010.1398.252>
- Syakur, A., Musyarofah, L., Sulistyaningsih, S., & Wike, W. (2020). The effect of project-based learning (PjBL) continuing learning innovation on learning outcomes of english in higher education. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, 3(1), 625-630. <https://doi.org/10.33258/birle.v3i1.860>
- Syamiyah, N. (2021). Pencemaran Udara Dalam Ruangan (Karbon Dioksida dan Total Senyawa Organik Volatile) Serta Gangguan Paru Pada Siswa SD di Depok.

- Journal Of Baja Health Science*, 1(02), 126-140. <https://doi.org/10.47080/joubahs.v1i02.1485>
- Tanjung, W. U., & Namora, D. (2022). Kreativitas Guru Dalam Mengelola Kelas Untuk Mengatasi Kejenuhan Belajar Siswa Di Madrasah Aliyah Negeri. *Jurnal Pendidikan Agama Islam Al-Thariqah*, 7(1), 199-217. [https://doi.org/10.25299/al-thariqah.2022.vol7\(1\).9796](https://doi.org/10.25299/al-thariqah.2022.vol7(1).9796)
- Toli, A. M., & Murtagh, N. (2020). The Concept Of Sustainability In Smart City Definitions. *Frontiers In Built Environment*, 6, 77. <https://doi.org/10.3389/fbuil.2020.00077>
- Triandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode systematic literature review untuk identifikasi platform dan metode pengembangan sistem informasi di Indonesia. *Indonesian Journal of Information Systems*, 1(2), 63-77. <https://doi.org/10.24002/ijis.v1i2.1916>
- Tuhuteru, S., Mahanani, A. U., Rumbiak, R. E. Y., Dewi, Y. S. K., Tulak, A., Tabuni, E., & Himan, R. (2023). Pemberdayaan Petani dalam Memanfaatkan Air Hujan untuk Sistem Budidaya Tanaman dengan Metode Water Harvesting. *Warta LPM*, 501-509. <https://doi.org/10.23917/warta.v26i4.1474>
- Utomo, D. S. (2024). Pengaruh model pembelajaran berbasis proyek terhadap kemampuan membuat produk daur ulang siswa SMA. *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi*, 27(1), 6. <https://doi.org/10.17977/um017v27i12021p63-72>
- Vakalis, D., Lepine, C., MacLean, H. L., & Siegel, J. A. (2021). Can green schools influence academic performance?. *Critical Reviews in Environmental Science and Technology*, 51(13), 1354-1396. <https://doi.org/10.1080/10643389.2020.1753631>
- Verma, R., & Grover, P. (2022). Role of social media in promotion of green school initiatives by government green schools in India. *Journal of Public Affairs*, 22(4), 2643. <https://doi.org/10.1002/pa.2643>
- Wang, X., Yang, L., Gao, S., Zhao, S., & Zhai, Y. (2021). Thermal comfort in naturally ventilated university classrooms: a seasonal field study in Xi'an, China. *Energy and Buildings*, 247, 111126. <https://doi.org/10.1016/j.enbuild.2021.111126>
- Wendra, M., & Sutrisno, A. (2023). Penerapan Hukum Internasional Terkait United Nation Framework Convention on Climate Change Dalam Menghadapi Perubahan Iklim. *Journal Evidence of Law*, 2(2), 265-275. <https://doi.org/10.59066/jel.v2i2.563>
- Wicaksono, R. W. A. G. (2018). Penanaman sikap peduli lingkungan dan sikap ilmiah siswa sekolah dasar melalui sosialisasi program sekolah peduli dan berbudaya lingkungan. *Adi Widya: Jurnal Pengabdian Masyarakat*, 2(1). <https://doi.org/10.33061/awpm.v2i1.2086>
- Widiawati, M., Barkah, R. F., & Ds, Y. N. (2022). Analisis Penerapan Pendidikan Lingkungan Hidup di Sekolah Dasar. *Jurnal Pancar (Pendidik Anak cerdas dan Pintar)*, 6(1), 181-186. <https://doi.org/10.52802/pancar.v6i1.333>
- Zguir, M. F., Dubis, S., & Koç, M. (2021). Embedding Education for Sustainable Development (ESD) and SDGs values in curriculum: A comparative review on Qatar, Singapore and New Zealand. *Journal of Cleaner Production*, 319, 128534. <https://doi.org/10.1016/j.jclepro.2021.128534>
- Zivelonghi, A., & Lai, M. (2021). Mitigating aerosol infection risk in school buildings: the role of natural ventilation, volume, occupancy and CO2 monitoring. *Building and Environment*, 204, 108139. <https://doi.org/10.1016/j.buildenv.2021.108139>