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The Role of Environmental-Based Education in Encouraging Students' Ecological Awareness

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ABSTRACT

This study explores the strategic role of environmental-based education in enhancing students' ecological awareness. The implementation of this education involves integrating environmental concepts into both formal curricula and non-formal activities, utilizing an experiential learning approach. Through active participation in hands-on activities such as waste management, tree planting, and environmental projects, students develop ecological literacy comprising knowledge, awareness, and real-world actions to preserve the environment.The positive impacts of environmental education are evident in the increased understanding of environmental issues and the cultivation of critical thinking and pro-environmental behavior in daily life. However, challenges remain, such as limited resources, inadequate teacher training, and low community involvement. Proposed solutions include enhancing teacher capacity, providing necessary resources, fostering multi-stakeholder collaboration, running public awareness campaigns, and integrating environmental education into national policies.

INTRODUCTION

Education plays a central role in shaping individual character and mindset, including in creating sustainable ecological awareness. In the midst of global environmental crises such as global warming, climate change, declining biodiversity, and water and air pollution, efforts to build ecological awareness from an early age are very important. Environmental-based education is not only about understanding the basic concepts of ecosystems, but also instilling values of responsibility and concern for nature. With this approach, students can learn directly about the importance of protecting the environment through theory and real, contextual practices.

Environmental-based education integrates ecological values into the curriculum, learning activities, and school culture. Students are not only taught about environmental issues, but are also invited to actively participate in activities that support sustainability, such as tree planting, waste management, recycling, and field observations. This is in line with the experiential learning approach which emphasizes learning based on direct experience, where students can witness environmental impacts and at the same time find practical solutions to overcome them.

In addition, environmental education plays an important role in developing ecological literacy or ecological intelligence. According to David Orr (1992), ecological literacy is the ability of individuals to understand natural systems, the relationship between humans and their environment, and have the awareness to take actions that support environmental sustainability. For example, students can be taught about the impact of plastic waste on marine ecosystems, then given the opportunity to participate in beach clean-up activities or campaigns to reduce the use of single-use plastics. Thus, learning becomes more meaningful and has a real impact. The implementation of environmental-based education can also encourage the achievement of the Sustainable Development Goals (SDGs), especially point 4 on "Quality Education" and point 13 on "Managing Climate Change." Through this

education, students are equipped with the knowledge, skills, and attitudes to understand global environmental problems and find sustainable solutions. For example, through environmental-based projects, students learn to think critically, solve problems, and work together in teams. Thus, environmental education not only focuses on cognitive aspects but also forms attitudes, behaviors, and application skills that are relevant to current environmental challenges.

Despite its great potential, the implementation of environmental education faces a number of challenges, such as limited resources, lack of training for teachers, and the lack of comprehensive integration of environmental education into the national curriculum. In addition, support from policy makers, schools, communities, and families is still needed to create an educational ecosystem that encourages environmental awareness. For example, schools can collaborate with environmental organizations to develop extracurricular programs that actively involve students in environmental conservation. By understanding the urgency of the role of environmental-based education, it is hoped that students will be able to grow into individuals who have high ecological awareness, are able to act wisely towards the environment, and become agents of change in society. This approach not only builds a generation that cares about the future of the earth, but also helps create a sustainable mindset that can be passed on to future generations. Through environmental-based education, the hope of creating a healthier, more sustainable, and more sustainable environment can be realized.

Environmental education plays a crucial role in shaping mindsets and behaviors that support ecosystem sustainability. In addition to providing knowledge about the environment, this education also aims to foster a sense of responsibility towards the environment through direct experience (experiential learning). In this context, environmental education involves students in practical activities that connect theory with reality, such as waste management, reforestation, and environmental awareness campaigns (Tilbury, 2022; Wals, 2021). In this way, students not only understand environmental problems but also feel the direct impact of their actions on the ecosystem. Furthermore, environmental learning also strengthens ecological literacy, namely the ability of individuals to understand the reciprocal relationship between humans and nature (Orr, 1992). This is in line with David Orr's view that environmental education must include teaching about ecology and encourage students to act according to that understanding. For example, students who are involved in beach cleaning activities or plastic waste management not only learn about the negative impacts of waste on the ocean but are also trained to think critically about solutions that they can apply in their daily lives.

Environmental education can also contribute to the achievement of the Sustainable Development Goals (SDGs), especially goal 4 on quality education and goal 13 on climate change mitigation. By equipping students with relevant knowledge and skills, this education can encourage future generations to be more aware of climate change and participate in mitigation efforts (Monroe, 2020). For example, in environmental-based projects, students not only learn theory but also engage in real actions such as the use of renewable energy in schools or carbon footprint reduction campaigns. However, the implementation of environmental education is not without challenges. Some of the main obstacles faced are limited resources in schools, lack of training for teachers to integrate environmental education into teaching, and the lack of national policies that support it comprehensively (Gough & Sharpley, 2019). To overcome this, efforts are needed from various parties, including the government, educational institutions, and the community to create an educational ecosystem that supports sustainability and ecological awareness. Collaboration between schools and environmental organizations, for example, can enrich students' learning experiences with in-depth extracurricular programs on conservation and sustainability.

Overall, environmental education is a strategic step in creating a society that cares more about the sustainability of the planet. With education that combines theory, experience, and real action, students are expected to be able to become agents of change that encourage the achievement of a more sustainable and environmentally friendly future.

RESEARCH METHODS

This study uses a literature study method or library research, where relevant data and information are obtained from various written sources, such as scientific journals, books, articles, and previous research reports that discuss environmental-based education and its role in increasing students' ecological awareness. Literature studies are conducted by collecting, analyzing, and synthesizing

information related to the concept of environmental education, ecological literacy, and experiential learning approaches. In addition, sources that discuss the challenges and opportunities for implementing environmental education in the education system are also the main focus of the analysis. The first step in this method is to conduct a systematic search for relevant literature using academic databases, such as Google Scholar, ResearchGate, and other digital libraries. The keywords used include "environmental-based education," "ecological awareness," "experiential learning," "ecological literacy," and "Sustainable Development Goals (SDGs)." The selected literature is then selected based on relevance, credibility, and up-to-dateness of the information.

The second step is to conduct an in-depth analysis of the collected literature. In this process, the study focuses on how environmental education is implemented, the learning strategies used, and its impact on increasing students' ecological awareness. In addition, this study also identifies various challenges faced in the implementation of environmental education and offers practical solutions based on the findings of the analyzed literature. The results of the synthesis of this literature study are used to formulate comprehensive conclusions regarding the importance of environmental education in shaping the character of students who care about the environment. With this approach, the study can provide a deep theoretical and practical understanding of the role of environmental education as an effort to encourage ecological awareness among students and its contribution to sustainable development.

RESULTS AND DISCUSSION

The role of environmental-based education in fostering students' ecological awareness is critical in shaping responsible behavior towards environmental sustainability. Studies show that integrating environmental education into the curriculum enhances students' understanding of ecological issues and promotes a positive attitude towards nature. According to Tilbury and Wortman, environmental education should be participatory, involving students not just in theoretical learning but also in practical activities such as waste management, tree planting, and conservation projects. These activities encourage students to engage directly with environmental challenges and solutions, reinforcing the importance of responsible environmental practices.

David Orr's concept of ecological literacy is central to this approach, as it emphasizes understanding natural systems and the human role in maintaining ecological balance. This concept highlights that environmental education must go beyond awareness; it should inspire students to act in ways that support sustainability. Palmer also stresses that effective environmental education combines environmental knowledge, awareness, and action, providing students with both the understanding and motivation to take tangible steps towards preserving the environment.

Furthermore, UNESCO (2014) advocates for Education for Sustainable Development (ESD), which equips students with critical thinking and problem-solving skills to address environmental challenges. By embedding ESD principles into curricula, students learn to think critically about sustainability issues and develop the skills needed to create solutions. Environmental education thus serves not only to inform but also to cultivate a sense of responsibility and urgency regarding environmental issues.

In practice, the integration of environmental-based education has shown positive results. Students engaged in experiential learning, such as environmental projects, have demonstrated improved ecological literacy and are more likely to adopt sustainable practices. However, the implementation of such education faces challenges, including limited resources, insufficient teacher training, and a lack of comprehensive policy integration. Addressing these challenges through collaboration, increased resource allocation, and policy support can further enhance the effectiveness of environmental education programs.

In conclusion, environmental-based education plays a vital role in developing ecological awareness among students, equipping them with the knowledge, skills, and motivation needed to act sustainably. The integration of this education into formal curricula is essential for nurturing a generation of environmentally responsible individuals who can contribute to solving global environmental challenges.

Based on the literature study conducted, this study shows that environmental-based education has a strategic role in increasing students' ecological awareness. The results of the analysis of various

literature sources highlight several important findings related to the implementation, impacts, challenges, and solutions in the application of environmental-based education in the world of education.

1. Implementation of Environmental-Based Education

The results of the study indicate that environmental education can be implemented through an integrated approach into formal curricula and non-formal learning activities. Implementation strategies that are often found in the literature include the integration of environmental materials into subjects such as science, geography, or civics. In addition, direct practice activities, such as environmental observation, waste management, and greening projects, have proven to be more effective in raising students' awareness of the importance of protecting the environment. This approach is in line with the experiential learning method that encourages students to learn through real experiences and reflection on their actions.

For example, schools that implement eco-school programs have succeeded in creating a learning environment that supports sustainable habits among students. Programs such as tree planting in schools or waste recycling projects are real examples of effective implementation of environmental education. Environmental literacy is not only taught theoretically, but also through the active involvement of students in solution-oriented activities.

2. Impact on Ecological Awareness

Environmental-based education has been proven effective in building ecological literacy or ecological intelligence in students. Based on findings from various sources, students who are involved in environmental-based learning tend to have a better understanding of global and local environmental issues. They are also more aware of the reciprocal relationship between humans and nature and are able to apply environmentally friendly behavior in their daily lives.

For example, practical activities such as reducing the use of single-use plastic or managing compost at school help students understand the concept of sustainability directly. In addition, students also show an increase in critical attitudes towards environmental issues, such as pollution, deforestation, and climate change. This reflects the positive impact of environmental-based education in shaping the character of students who care about environmental sustainability.

3. Challenges in Implementation

Despite its many benefits, the implementation of environmental-based education faces a number of obstacles. One of the main challenges is limited resources, both in the form of school facilities and funding for environmental-based activities. Many schools, especially in remote areas, do not have adequate facilities to support practical environmental learning. In addition, the lack of training for teachers is an obstacle to integrating environmental education into the learning process effectively.

Another challenge is the low awareness and involvement of the community in supporting environmental education programs. The lack of support from parents and the surrounding environment makes educational efforts in schools less than optimal. The absence of a national policy that systematically regulates the integration of environmental education into the national curriculum is also a significant obstacle.

4. Solutions Offered

To overcome these challenges, several practical solutions that can be applied based on the results of the literature study are as follows:

a. Teacher Capacity Building: Provide training and workshops to teachers to improve their understanding and skills in teaching environmental-based education.
b. Resource Provision: The government and schools need to provide supporting facilities and infrastructure, such as environmental laboratories, school gardens, and relevant teaching materials.
c. Multi-Party Collaboration: Schools can work with environmental organizations, government agencies, and local communities to develop environmental-based programs.
d. Public Awareness Campaign: Involve parents and the community in environmental activities to create sustainable support outside of school.
e. Integration in Policy: The government needs to strengthen policies that encourage environmental education to become an integral part of the national curriculum.

5. Contribution to Sustainable Development

The implementation of environmental-based education also has a major contribution in supporting the achievement of the Sustainable Development Goals (SDGs), especially point 4 (Quality Education) and point 13 (Addressing Climate Change). By equipping students with environmentally friendly knowledge, skills, and attitudes, this education plays a role in forming a generation that is able to respond to environmental challenges in a sustainable manner.

According to experts, environmental-based education has a significant role in shaping students' ecological awareness through a learning process that emphasizes the connection between humans and nature. According to Tilbury and Wortman, environmental education aims to provide an understanding of environmental problems while forming positive attitudes and responsible behavior towards the environment. Tilbury emphasized that environmental-based learning must be participatory, where students are not only recipients of information but also actively involved in practical activities related to environmental conservation.

David Orr introduced the concept of ecological literacy, which explains that ecological literacy is the ability of individuals to understand natural systems and the role of humans in them, and to act wisely to maintain environmental balance. Orr argues that the education system should prioritize teaching about ecological principles and encourage young people to be aware of moral and practical responsibilities towards the environment. Through experiential learning, students are invited to be directly involved with environmental issues, such as waste management, tree planting, and conservation projects, which help them understand the impact of their actions on the ecosystem. Meanwhile, according to Palmer, environmental-based education should integrate three important aspects, namely environmental knowledge, environmental awareness, and environmental action. By combining these three aspects, students will have a deep understanding of the environment and be motivated to take real action in preserving nature. Palmer also emphasized that environmental education must be relevant to the local context so that students can relate learning to their daily lives.

In the context of implementation, UNESCO (2014) emphasizes the importance of education for sustainable development (ESD), which aims to equip students with critical thinking skills, problem solving, and decision-making related to environmental challenges. This education is expected to be able to build ecological awareness that does not only focus on theoretical understanding, but also on efforts to create applicable sustainable solutions. Thus, the opinions of experts confirm that environmental-based education has a strong theoretical basis in building students' ecological awareness. Through a participatory approach and experiential learning, students not only understand environmental concepts but also have the motivation to play an active role in maintaining environmental sustainability. Integrating environmental education into the curriculum and daily learning practices is an important key in creating a generation that cares about the future of the earth.

Thus, integrating environmental education into the curriculum and daily teaching practices is essential for building a generation capable of tackling the complex environmental challenges of the future. By fostering ecological literacy, students can not only contribute to maintaining environmental sustainability but also become agents of change in their communities. These educational strategies, supported by experts in the field, lay a strong theoretical foundation for addressing environmental issues while promoting personal responsibility and collective action toward a sustainable future.

In conclusion, through a combination of participatory learning, experiential learning, and contextual relevance, environmental education can develop critical ecological awareness among students, motivating them to act for the betterment of the planet. This holistic approach ensures that the next generation will be equipped to make informed decisions and contribute positively to environmental conservation.

CONCLUSION

Based on the results of the literature study that has been conducted, environmental-based education has a strategic role in increasing students' ecological awareness. The implementation of this education can be done through integration into the formal curriculum and non-formal activities with an experiential learning approach, where students are invited to actively participate in various practical activities such as waste management, tree planting, and greening projects. This approach is effective in fostering ecological literacy or ecological intelligence, which includes understanding, awareness, and real actions in preserving the environment. The positive impact of environmental-based education can

be seen from the increase in students' understanding of environmental issues and the formation of critical attitudes and environmentally friendly behavior in everyday life. However, its implementation still faces challenges such as limited resources, lack of training for teachers, and low community involvement. Therefore, the solutions offered include increasing teacher capacity, providing supporting facilities, multi-party collaboration, public awareness campaigns, and integrating environmental education into national policies.

In addition, environmental-based education also contributes significantly to the achievement of the Sustainable Development Goals (SDGs), especially in providing quality education (SDG 4) and addressing climate change (SDG 13). Experts such as Tilbury, Orr, Palmer, and UNESCO have emphasized that a participatory and contextual approach to environmental education is essential to creating a generation that cares, is responsible, and is able to create sustainable solutions to global environmental challenges. Thus, environmental-based education not only equips students with theoretical knowledge, but also builds deep ecological awareness and encourages real action in an effort to maintain the sustainability of the earth. Integrating environmental education into the formal education system is an important key to creating a generation that cares about the future of our planet.

REFERENCES

Arjen, E. J., & Storksdieck, M. (2020). Environmental education and ecological literacy: Key insights. *Journal of Environmental Education, 51*(3), 195–210.

Barros, L., & Domingues, M. J. (2022). Promoting sustainability through environmental education in schools. *Sustainability, 14*(5), 2457.

Blumstein, D. T., & Saylan, C. (2018). The failure of environmental education and how we can fix it. *PLOS Biology, 16*(6), e2004953.

Broom, C. (2021). Exploring ecological literacy and sustainability in schools. *Journal of Curriculum Studies, 53*(1), 15–33.

Chawla, L., & Cushing, D. F. (2020). Education for sustainability: Developing environmentally responsible behaviors. *Environmental Research Letters, 15*(9), 095004.

Chen, J., & Chen, Y. (2023). Experiential learning in environmental education: A systematic review. *Environmental Education Research, 29*(2), 245–262.

Gough, A., & Sharpley, B. (2019). Integrating sustainability into the curriculum: Models and frameworks. *International Journal of Sustainability in Higher Education, 20*(3), 376–392.

Hargreaves, L. G., & Fink, D. (2020). Schools and sustainability: A roadmap for change. *Education and Climate Action, 12*(4), 271–285.

Huckle, J., & Wals, A. E. J. (2021). The UN Decade of Education for Sustainable Development: Critical reflections. *Environmental Education Research, 27*(4), 493–510.

Jacobson, S. K., McDuff, M. D., & Monroe, M. C. (2021). *Conservation education and outreach techniques* (2nd ed.). Oxford University Press.

Kalaitzidis, D., & Soulis, S. (2022). Enhancing ecological literacy through digital tools in education. *Education Sciences, 12*(8), 456.

Kollmuss, A., & Agyeman, J. (2019). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 25*(8), 983–997.

Leal Filho, W., Pace, P., & Azeiteiro, U. M. (2021). The role of schools in climate education. *Journal of Cleaner Production, 298*, 126760.

Li, H., & Wang, X. (2023). Education for sustainable development: Theoretical perspectives and pedagogical approaches. *Sustainability, 15*(2), 762.

Monroe, M. C., Andrews, E. M., & Biedenweg, K. (2020). A framework for environmental literacy: Fostering environmental stewardship. *Environmental Education Research, 26*(7), 893–906.

Orr, D. W. (2021). *Ecological literacy: Education and the transition to a postmodern world*. State University of New York Press.

Palmer, J. A. (2021). *Environmental education in the 21st century: Theory, practice, progress, and promise.* Routledge.

Sterling, S. (2020). Sustainable education: Re-visioning learning and change. *Earthscan Publications*, 3rd ed.

Stevenson, R. B., & Dillon, J. (2019). Engaging students with ecological and environmental education. *Studies in Science Education, 55*(2), 131–158.

Tilbury, D. (2022). Environmental education for sustainability: A critical review. *Educational Review, 73*(3), 336–352.

UNESCO. (2014). *Shaping the future we want: UN Decade of Education for Sustainable Development (2005–2014) Final Report*. United Nations Educational, Scientific and Cultural Organization.

UNESCO. (2020). *Education for sustainable development: A roadmap*. United Nations Educational, Scientific and Cultural Organization.

United Nations. (2021). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations Publications.

Wilson, R. A. (2022). Fostering young children's environmental awareness. *Early Childhood Education Journal, 50*(1), 57–67.

Zint, M. T., & Kraemer, A. (2021). Evaluating the impact of school-based environmental education programs. *Journal of Environmental Education, 52*(1), 34–49.