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Examining The Future of Environmental Education in Schools

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ABSTRACT

Objective: Environmental education seeks to develop citizens' understanding of the environment, which is essential for tackling global issues, promoting sustainable knowledge between humans and nature, and building resilient people and communities. The objective of the current study is to evaluate the state of environmental education and strategies for fostering environmental responsibility, awareness, and knowledge in school to ensure a sustainable future.

Methods: A review of past research on the connection between environmental concerns and school-based environmental education was carried out. The use of environmental awareness strategies in pre-primary, primary, and upper-grade education was examined. Google Scholar, ResearchGate, Academia, worldwide blogs, and educational databases were consulted in order to retrieve and analysis the relevant material

Results: Currently, environmental education is progressively moving beyond the natural world and incorporating into a comprehensive framework that includes societal, economic, and political aspects. Devastating climate change made environmental education even more crucial as a future educational policy for young children, significantly adding to the worldwide conversation on sustainable development. Without a wide spectrum of individuals contributing a variety of perspectives and experiences, it is difficult to make sound environmental judgements or promote significant environmental change. Since everyone should have access to environmental education, it is imperative that it be redesigned with the marginalized at the forefront.

Conclusions: To increase the effectiveness of environmental learning, a communicator sharing various environmental experiences or a student activity might be crucial. The global impact of teachers' viewpoints on environmental education awareness and the quest of sustainable development are significant. Teachers are essential in providing sustainable development knowledge and cultivating the skills needed to meet Sustainable Development Agendas in formal education.

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Introduction

To address current environmental issues, environmental education (EE) is crucial as it enhances awareness, promotes sustainable behaviors, and prepares individuals to assume responsibility for the environment. In the current era, where issues such as pollution, climate change, loss of biodiversity, and resource depletion are prevalent, environmental education (EE) aimed at sustainable development remains a significant priority. EE serves as a transformative tool for students because it provides them with the knowledge, values, attitudes, and skills needed to tackle environmental challenges. It promotes proactive solutions to environmental issues and supports environmental advocacy efforts. Restricted human ability, questionable expertise, insufficient resources, and poor knowledge-to-practice integration all create obstacles to realizing the complete advantages of EE. Nevertheless, these challenges can be mitigated through interdisciplinary partnerships, community engagement in the creation of EE programs, and research on the quality and implementation of EE (Nyika & Mwema, 2021)

Environmental education greatly influences the quality of the environment. Awareness of environmental issues among residents boosts the desire to consume sustainably, while environmental demands enhance businesses' motivation to offer cleaner products. By reshaping the digital economy and enhancing human capital, it can promote the economy's organic growth (Ye et al., 2023). Understanding environmental safety and protecting the planet can be enhanced through environmental education. Furthermore, it can be advantageous to appreciate natural resources and engage in conservation efforts (Masalimova et al., 2023)

Education for Sustainable Development (ESD) fosters the planet's sustainable progress by tackling social, cultural, political, and quality of life issues. Individuals are educated to uphold ecological equilibrium and understand the link between safeguarding the environment and humanity through environmental education (EE) (Ramírez Suárez et al., 2023). Environmental awareness fosters the growth of social groups' and individuals' sensitivity to and comprehension of the environment in general and the related issues. To carry out environmental protection actions, having environmental knowledge is essential. Curriculum deficiencies, insufficient training, scarce resources, and absence of quantifiable results all impede the extensive influence of environmental education on communities (Yadav et al., 2018).

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The school serves as the perfect environment to provide training for the necessity of compassion and optimism for a better and more sustainable future. The education system ought to aim not just to inform citizens about environmental matters. It should integrate the principles of sustainability into its routine activities by adopting new management models and resource utilization (Ivorra-Catalá et al., 2024). Schools play significant role for carrying out research and encouraging environmental education. They provide distinct chances for exploring environmental concerns, promoting eco-friendly values, and acquiring hands-on skills. Schools offer an easily accessible environment with a mix of learners, teachers, and numerous resources for carrying out environmental education initiatives. Therefore, the goal of the present study is to better understand the importance of environmental education in schools by examining its trends, effectiveness, and necessary improvements.

Material and Methods

This study assesses the research carried out regarding the significance of environmental education in schools from 2009 to 2025. Relevant review and research data, articles, books, and theses published on different platforms, such as Academia.edu, ResearchGate, Scopus, Semantic Scholar, Sci-Hub, SciFinder, and Google Scholar, were examined, emphasizing the importance of environmental education. The search parameters encompassed all English-language literature pertinent to research on the status, understanding, methods, and investigation of environmental education across pre-primary, primary, and higher education stages. Keywords like "environmental education", "primary and secondary school", and "future perspectives of environmental studies" were used to find relevant literature via specialized search engines and websites. Attention was given to literature highlighting the benefits of incorporating environmental education into the school curriculum and its significance.

Results

The Value of Environmental Education in Resolving Environmental Issues

Education about the environment significantly enhances young people's awareness of their surroundings, encourages the adoption of eco-friendly social behaviors, and fosters their response to environmental crises. The EE curriculum needs to be reoriented to make it more appealing and responsive to local environmental issues in light of the current state of the environment, which is

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changing negatively and affecting all living things due to pollution and climate change. Additionally, relevant policies must be reorganized in order to raise awareness of environmental management issues among the general public, particularly among college and high school students (Puri et al., 2021). Educating students about the environment can result in long-term change. Students' knowledge, attitudes, intentions, and behavior may all be influenced by environmental education (Wetering et al., 2022).

The first intergovernmental summit on environmental education, the Tbilisi Declaration of 1977, placed a high priority on educating children and youth and encouraging environmental preservation (www.gdrc.org/uem/ee/tbilisi). The promotion of sustainable development and the development of attitudes toward environmental preservation are facilitated by EE. People can make more informed and responsible decisions because it promotes environmental literacy and a greater understanding of nature. Including EE in the curriculum is essential to change public opinion and promote social responsibility. EE is characterized by its interdisciplinary approach, practical and real-world activities, and relevance to sustainable development (Vladova, 2023).

Localized concerns or locally relevant aspects of larger issues are directly impacted by EE; it also demonstrates planned measurement or reporting frameworks, integrated action elements, and engagement with scientists, resource managers, and community organizations. EE is a conservation approach that establishes chances for collaboration among scientists, decision-makers, community members, and other stakeholders (Ardoin et al., 2020). Understanding global environmental challenges and problems has become crucial in the current situation in order to learn about how the world is evolving. It is a better idea to start teaching environmental studies in elementary school to help kids understand the need of conserving and safeguarding the environment. Governments should focus especially on addressing environmental issues and concerns. The values, knowledge, behavior, attitudes, and insights should all be developed and nurtured by every citizen (Pandey et al., 2022).

Climate citizenship and literacy regarding climate change are essential. The curriculum takes a piecemeal approach to teaching about climate change instead than a comprehensive one. The three components of the environmental literacy framework—functional, cultural, and critical-should guide climate change literacy (Stables, 1998). Particular focus should be paid to understanding the

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fundamentals of greenhouse effects and their worldwide repercussions, the human-centered implications of climate change, and investigating cultural views. Furthermore, in order to promote individual and group advocacy efforts among students and teachers in the design of teaching strategies for environmental education and climate change courses, climate citizenship requires elements such as personal responsibility, participatory action, and justice-oriented approaches (Çakır-Yıldırım et al., 2023).

School: A perfect place to teach environmental education

Environmental problems have been addressed by human activity at all scales, from local to global. Therefore, the recognized instrument for change is both formal and informal education. One way to instill in the next generation a concern for and determination to take action for environmental conservation and protection is through environmental education in schools (Sulaiman et al., 2008). By encouraging students' awareness, understanding, and pro-environmental behaviors, schools play a critical role in environmental education and ultimately help create a more sustainable future. Teachers may give pupils a strong awareness of and dedication to sustainability by incorporating environmental education into a variety of subject areas and using powerful teaching techniques like experiential learning (Verma & Dhull, 2017). The transition to a more sustainable global environment cannot be solved solely by scientific understanding and technical advancement; rather, they can only support it. Therefore, if we are to achieve a satisfactory level of environmental sustainability on a worldwide scale, people must be equipped with essential knowledge and education. Environmental education is a helpful preventative technique to rescue children living in polluted areas since it promotes learner knowledge of local environmental conditions and their active participation in resolving local issues (Llopiz-Guerra et al., 2024).

Spreading knowledge is only one aspect of environmental awareness education; another is influencing attitudes and actions towards the environment. Students can take the initiative to embrace and encourage sustainable lifestyles by learning about the causes and consequences of environmental deterioration. In order to raise a generation of environmentally conscious citizens who are dedicated to making positive changes, this understanding is essential. Beyond the individual, education has an impact on environmental awareness by influencing social norms and values. Education may spur group action to address environmental issues and accomplish sustainable development goals by fostering an informed and involved public (Nath, 2024).

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Teachers and students can relate their affection of the natural world to academics in a meaningful way with EE. Specific critical thinking abilities that are essential to "good science"—questioning, researching, formulating hypotheses, interpreting evidence, analyzing, drawing conclusions, and problem-solving—are emphasized in environment-based education. The students' science self-efficacy increased when they worked on real-world projects rather than just workbook tasks. Students get the confidence to research and resolve local issues, which improves their capacity to learn science. Results from EE courses are usually expected to include improvements in students' environmental attitudes, beliefs, knowledge, and inventiveness (www.neefusa.org). Students and teachers can become more aware of and knowledgeable about sustainability issues by using sustainable education strategies including environmental education and sustainability literacy. It is well known that teaching students about climate change and sustainability not only inspires them but also enhances their attitudes towards learning and welfare, which benefits their academic and personal growth (Zeeshan, 2023).

Implementing effective school-based environmental education

A suite of tools that develop and improve environmental attitudes, values, and knowledge as well as skills that equip people and communities to work together to take positive environmental action is what constitutes effective environmental education. It is not just a one-way transfer of information. EE can directly improve the environment and provide tangible solutions for conservation problems (Ardoin et al., 2020). The importance of group and community learning and action should be the main focus of EE researchers. They also need to pay more attention to how learning occurs within social-ecological communities, such as the connections between human well-being and environmental quality. The researcher must investigate social media, various information technologies, and urban and diverse people (Ardoin et al., 2012). Students' socioeconomic status, place of residence, and parents' educational attainment were all factors influencing their attitudes and behaviors towards environmental and sustainability education. Gender and class grade only had a minor impact. Students' assessments of environmentalism were impacted by some school sustainability initiatives, demonstrating the efficacy of targeted instructional initiatives (Mónus, 2022).

Action competency, which is influenced by students' experiences with ESD instruction at their school, can be developed. Under their own influence, the students did not, however, considerably

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increase their confidence in the action competence component. Initiatives for teacher professional development can help students acquire action competence for sustainability by gradually enhancing ESD instruction, at least in its holistic aspect (Olsson et al., 2022). A transformation in the paradigm of environmental education is necessary, and its effectiveness and significance for young children can be enhanced through the implementation of intervention programs centered on experiential activities. Gaining a deeper understanding of the strengths and weaknesses of the environmental education program, along with providing guidance for the future, will facilitate the necessary shift in thinking and values to cultivate responsible earth citizens. This presents challenges for children in contemplating ethical considerations regarding natural ecosystems and in fostering a profound connection with nature (Mishra, 2025). School curriculum rarely contains effective environmental education policies. Environmental education policy documents must be developed by the Education Department, which must also evaluate and oversee their implementation (Damoah & Omodan, 2022).

Programs for education, initiatives, and policies must all be revised. It is preferable to provide favorable circumstances in both the individual and structural dimensions for children's education to be effective, and the instruction should be delivered indirectly. Additionally, it can be advantageous to create and carry out community initiatives that encourage a favorable attitude towards the environment (Mousavi, 2024). Environmental education and Education for Sustainable Development (ESD) are interconnected discipline. Both are lifelong learning processes that can alter people's viewpoints and behaviors by emphasizing local cultures in the resolution of regional to global problems (Permanasari et al., 2021). Fostering the acquisition and transfer of the requisite knowledge, skills, attitudes, and behavior in relation to environmental protection and sustainable development is imperative in educational institutions. The active teaching and learning approach is more successful at promoting environmental education than the conventional teaching techniques used in the current curriculum (Alexander & Poyyamoli, 2014).

Informative Features to be involved in EE in school

To introduce schoolchildren to their immediate surroundings, an Environmental Orientation program should be implemented. This program should include training modules, practical exercises, and print materials that are specific to a given location. As the kid matures, EE in schools must be directed from local environmental issues to national and international environmental

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issues. EE should be taught in schools by investigation, experimentation, and analysis through conversation. Students must be given a clear explanation of the social-political economic factors that contribute to environmental issues. Motivating teachers to prioritize EE and providing them with a variety of tools and resources is the most fundamental prerequisite for all of these processes (Sonowal, 2009).

Textbook designers should make sure that pertinent EE aspects are incorporated into textbooks, particularly when it comes to subjects like ecosystems and cycles, pollution, resource usage, and environmental preservation. Additionally, the instructors must receive training and encouragement on how to use interactive and participative teaching techniques to include EE components into their lessons. Multimedia materials like pictures, movies, and simulations could be used to enhance textbook material and include students in the educational process. Students' comprehension of environmental issues could also be strengthened by planning extracurricular activities like field trips and environmental projects that are connected to the subjects taught in the textbooks. Lastly, it is crucial to embrace a multidisciplinary approach to EE, incorporating pertinent components into all high school courses (Laaloua, 2023).

Basic methods for teaching children about the environment include environment-oriented socialization, child empowerment, indirect education, developing and revising pertinent content, and building suitable infrastructure (Mousavi et al., 2024). There is a substantial social contextualization of the learners' environment in the textbook content. The textbooks' inherent emphasis on conviviality is both necessary and encouraging; yet, it would be better to incorporate the current environmental crisis—such as biodiversity, conservation, pollution, water scarcity, and global warming—and its mitigation (D'Souza et al., 2021).

The greater the amount of maternal education, the more aware the schoolchildren are of environmental education principles. More information and understanding of environmental education themes must be included in secondary school curricula. It is also advised to conduct trainings and seminars with an environmental subject, particularly environmental education, environmental concerns, and environmental education concepts, in order to raise awareness of environmental education (Ablak & Yeşiltaş, 2020). The learners and learning methodology is less diverse in terms of practical and theoretical approaches. The students' environmental knowledge and attitudes about their educational experiences and preferences are not adequate. There is a need

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of practical implications of the research, and studies focusing more on learning and the role learners play in the field of environmental education (Rickinson, 2001).

Important measures and reforms to promote EE in schools

Enhancing the curriculum in teacher education programs is essential, particularly by implementing more creative teaching strategies and exercises that help students develop their environmental awareness. Enhancing environmental qualities can be accomplished through activity-based environmental education. Therefore, in addition to being a required course in general education, environmental education ought to be incorporated into professional education programs (Masalimova et al., 2023). In order to promote high-quality education, it is necessary to enhance the way ESD is implemented. With the adoption and upgrading of curriculum to improve ESD, it is appropriate to investigate various approaches for integrating social, economic, and environmental factors in educational environments (Ramírez Suárez et al., 2023).

The gap between EE theories and practices can be closed by using participatory action research (PAR) to help teachers develop particular issue-related understandings. Prior to using PAR methodologies, EE instructors' idea and practice should be centered on supplying and evaluating environmental care-related information. Later, their ideas and methods seemed more focused on taking action (Paredes-Chi & V-de. Alva, 2020). The most significant facilitators of implementing the reform agenda in instructional practice seemed to be strategic management, reflexive collaboration, and trust among school actors. The implementation of transformation-oriented ESD through local school reforms and professional development will be aided by the addition of a new and threefold design criterion to the current ones, specifically the creation and ongoing negotiation of a shared vision and the development of trust (Gericke & Torbjörnsson, 2022).

Through field-based learning, the introduction of cutting-edge technologies like virtual reality (VR) and artificial intelligence (AI), and collaboration with international organizations, there has been promise in increasing environmental consciousness, particularly among younger people. By promoting active participation, addressing present challenges, and fostering a greater awareness of environmental issues, EE works to create a generation of responsible citizens who can help create a more sustainable future (Yadav et al., 2018). Decision-making must take into account the environment in addition to social, economic, and political factors. In order to achieve the expected benefits of actions, sustainability must be enforced across a broader range of responsibilities. Additionally, it calls for adjustments to the institutional and legal structures that uphold the

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common interest. These required adjustments are based on the knowledge that all people, including future generations, depend on an environment that is suitable for their health and well-being. This kind of understanding supports the right to use private and public resources at the appropriate social and economic scale (Ezimah, 2021).

Reorienting the environment education curriculum is necessary to make it more enticing and considerate of local environmental issues. Additionally, related policies need to be reorganized to increase public understanding of environmental management challenges, especially among school-age children. Future teachers envision a classroom that incorporates both cognitive and practical-behavioral components. A significant amount of general education is devoted to environmental education, and since primary school students learn from authority figures quickly and are highly influenced by their experiences, future educators will be able to educate children about current environmental issues and inspire them to take local action for a better future (Pandey & Pandey, 2025). The new product and "greener" alternative energy must be taught to the pupils participating in environmental protection initiatives. Environmental decisions should be influenced by the redesign and reinterpretation of environmental education. It should be prioritized to transfer best practices in environmental education, conduct research, and examine common subjects and cultural norms that have a positive impact on the environment (Boca & Saraçli, 2019).

Digital technologies have emerged as an essential tool and have shown a strong impact on the educational system. The entire educational system is undergoing a fundamental change as a result of these technologies. In addition to imparting knowledge, they also act as mentors, evaluators, and co-creators of information. Additionally, by improving energy efficiency and providing lower-carbon alternatives to fossil fuels, these technologies help prevent additional harm, make it easier to identify the sources of emissions, and even remove excess greenhouse gases from the atmosphere. Digital technologies seek to increase productivity and efficiency while lowering or eliminating waste and pollution. Students' lives have been made easier by technological advancements in education (Haleem et al., 2022). The emergence of online learning technologies, along with an emphasis on independent and critical thinking, highlights the necessity of equipping future educators with skills through digital tools. Utilizing digital tools such as Online Test Pad and MindMeister serves as an effective approach to addressing the challenge of fostering

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critical thinking in future teachers. These tools are user-friendly and readily available, enabling the creation of educational resources (Meirbekov et al., 2022).

Conclusion

For environmental education to be effective, information must be transferred unidirectionally in order to improve environmental attitudes, values, and knowledge. Additionally, skills must be developed that enable individuals and communities to work together to take positive environmental action. Environmental education may directly improve the environment and provide a tangible solution to conservation problems. Intentional measurement/reporting systems, integrated action components, cooperation with scientists, resource managers, and/or community organizations, and localized issues or locally pertinent aspects of larger issues should be the main focuses of EE initiatives. A successful reconnection between people and nature is essential to addressing today's environmental problems. Children's access to nature has a positive impact on their learning capacities, healthy development, social and personal growth, and wellbeing. To fully realize the potential of outdoor learning, a deeper understanding of its implementation is required, especially in early childhood education.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of APS University of Rewa, M.P., India. The patients/participants provided their written informed consent to participate in this study.

Author contributions

K. P. Pandey- reviewed the literature and conceived the study. S. Pandey- Wrote, edited and approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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