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Teachers as environmental educators: Exploring perceptions and practices of green pedagogies in fostering eco-literacy

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Keywords

Eco-literacy;
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Teacher Perceptions;
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Abstract

This study explores teachers' perceptions and practices of green pedagogies in fostering eco-literacy among students across diverse educational contexts in Africa, Europe, and Asia. Data were collected from an online questionnaire completed by 90 university educators from various disciplines, and we employed an interpretivist research approach. Thematic analysis revealed five key areas: definitions and understanding of green pedagogies, practical implementation strategies, fostering active citizenship, emotional impacts of eco-education, and perceived effectiveness of these approaches. Findings highlight that educators recognize the necessity of integrating sustainability into curricula and actively employ innovative methods, such as project-based learning and outdoor exploration, to engage students. However, challenges, including an exam-oriented culture and resource limitations, impede effective implementation. This research contributes significantly to the literature on environmental education, shedding light on teachers' perspectives that have been historically overlooked. It emphasizes the need for enhanced professional development and institutional support to cultivate eco-literacy, promoting responsible environmental citizenship in an increasingly complex global landscape. The insights gained from this study offer actionable strategies for educators and policymakers, reinforcing the importance of embedding eco-literacy within educational frameworks. These insights could inform the design of targeted professional development programs to enhance eco-literacy.

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Introduction

There has been a growing emphasis on environmental sustainability and eco-consciousness in educational settings. Integrating sustainability concepts into school curricula has significantly increased students' environmental awareness and sustainable behaviors (Frank & Ricci, 2023). A bibliometric analysis reveals that sustainability consciousness research primarily focuses on education, with students as the main subjects (Gulzar et al., 2023). Teachers' identities are essential to successfully implementing environmental education for sustainability, with school leaders playing a vital role in supporting these initiatives (Almeida et al., 2018). Some teachers unconsciously apply eco-pedagogic principles in language learning, orienting lessons towards the local environment and using project-based activities (Anggawirya et al., 2023). Creative play and learning in natural environments can effectively develop creative eco-literacy in elementary students, fostering adaptive, aesthetic, cognitive, communication, sensorimotor, and socio-emotional skills (Maulidah et al., 2021). Green education promotes environmental conservation, sustainability, and ecological awareness (Adnyana et al., 2023). It aims to transform social and cultural contexts by integrating nature as a central educational focus, fostering critical thinking and environmental consciousness (Duque-Romero & Bastidas, 2021). Basic environmental concepts are introduced in primary education, while secondary and higher education delve deeper into environmental issues and specialized programs (Adnyana et al., 2023). Green learning approaches have positively impacted student performance and confidence levels (Shannaq et al., 2012).

In light of escalating climate change challenges and environmental degradation, enhancing eco-literacy through educational frameworks has never been more critical. Educators are pivotal in cultivating awareness and behaviors that foster sustainability among future generations.

Anterior research argues that environmental education (EE) significantly impacts students' eco-literacy and environmental behavior. Studies have demonstrated that EE programs can enhance students' ecological knowledge, awareness, attitudes, and participation in environmental issues (Jannah et al., 2013; Hsu, 2004). Implementation of EE through faculty policies, curriculum, instructional methods, and campus culture has been found to effectively scaffold students' ecological literacy (Ikhsan et al., 2019). Using specialized EE kits can also improve environmental literacy, although knowledge levels may remain low compared to attitudes and behaviors (Jannah et al., 2013). Social studies teacher education students perceive EE as beneficial for developing cognitive, affective, and behavioral dimensions of ecological literacy (Durmuş & Kinaci, 2021). However, prior research has largely overlooked the perspectives of teachers responsible for delivering this education. Additionally, existing research has focused on specific teaching strategies or interventions without comprehensively understanding how teachers engage with green pedagogies in their daily practices. Despite the increasing recognition of the importance of eco-literacy, there is limited research on how teachers perceive and implement green pedagogies in the classroom.

This study seeks to address this gap by exploring teachers' perceptions and practices in the context of green pedagogies. This study aims to build upon existing literature by exploring teachers' perceptions and experiences with green pedagogies in diverse educational settings.

This study's research question is formulated as follows:

How do teachers perceive the implementation and impact of green pedagogies in fostering eco-literacy among students? Therefore, this study has two main objectives.

- The first is to explore teachers' understanding and engagement with green pedagogies in the classroom.
- The second is to examine teachers' perceptions of the effectiveness of green pedagogies in cultivating eco-literacy among students.

This research is significant as it provides insights into teachers' challenges and opportunities in integrating green pedagogies into their teaching practices. By understanding teachers' perspectives, this study contributes to developing strategies and policies that promote eco-literate educational practices and empower students to become environmentally responsible citizens.

This paper is structured as follows: The following section overviews key concepts related to eco-literacy, green pedagogies, and teacher perceptions. It also displays the study literature review. The subsequent section presents the study's theoretical underpinnings. The methodology section outlines the research design and data collection methods. Section Five presents and discusses the study's findings. Finally, the conclusion summarizes the key findings and contributions of the study.

Literature review

Definition and importance of eco-literacy in the context of environmental education

Eco-literacy is a multifaceted concept encompassing the ability to understand, analyze, and actively engage with environmental issues (Ginju, 2020). It involves developing skills to make informed environmental decisions and becoming "global citizens" (Ginju, 2020). Eco-literacy can be categorized into three levels: nominal, functional, and operational, reflecting increasing environmental awareness and action (Ginju, 2020). It is crucial for building a sustainable society that values and conserves the natural environment through a holistic approach (Sharma, 2023). Environmental education, however, has been criticized for its entanglement with neo-liberal and industrialized processes, leading to epistemological blind spots regarding environmental degradation (Daprano, 2020). A food eco-literacy approach has been proposed based on critical pedagogy, transformative learning models, and experiential encounters with food (Daprano, 2020). This approach aims to overcome the limitations of traditional environmental education and foster a deeper understanding of ecological

principles and their application in creating a sustainable human society (Sharma, 2023; Daprano, 2020).

Eco-literacy is essential for fostering environmental awareness and protection, mainly when introduced early in children's education (Kadarisman & Pursitasari, 2023). Studies indicate that novels can effectively elucidate complex ecological concepts, contributing to environmental consciousness (Khasanah et al., 2024). However, implementing environmental education in primary schools has been problematic, with limited success. Research suggests that primary school teachers often function at a level of ecological illiteracy or nominal ecological literacy, tending to prioritize attitudes and values over knowledge in environmental education (Cutter-Mackenzie & Smith, 2003). This lack of ecological literacy among educators poses a significant challenge to developing an ecologically literate citizenry. The integration of eco-literacy in science learning, literature, and teacher education presents opportunities for further research and improvement in environmental education practices (Kadarisman & Pursitasari, 2023; Khasanah et al., 2024; Cutter-Mackenzie & Smith, 2003).

Overview of green pedagogies and their theoretical foundations

Green pedagogy is an emerging approach to education that emphasizes environmental awareness and sustainability. This approach employs confrontation and provocation to promote sustainability skills, appealing to emotions and uncovering learner values to foster new perspectives (Fox & Wogowitsch, 2021). Green pedagogy aligns with Education for Sustainable Development (ESD) principles and implements evidence-based strategies such as concept change (Fox & Wogowitsch, 2021). While traditional pedagogical theories like cognitivism and constructivism remain relevant, emerging concepts such as social pedagogy and Education 3.0 are gaining traction (Halupa, 2015). In technical and vocational education and training (TVET), ESD pedagogy is a framework for developing generic green skills. However, a significant gap exists between theoretical approaches and practical implementation (Pavlova & Chen, 2019). Additionally, the animal turn in environmental education research has incorporated critical pedagogy, ecofeminism, and posthumanism perspectives, expanding the scope of green pedagogies to include human-animal relations (Spanning, 2017). Critical pedagogy plays a vital role in addressing the planetary ecocrisis, with eco-pedagogy emerging as a philosophy that challenges dominant eco-literacy paradigms and calls for the reconstruction of critical pedagogy in light of current ecological conditions (Kahn, 2010).

The role of teachers in promoting eco-literacy and sustainability education

Studies have found that teachers generally possess satisfactory environmental knowledge and attitudes but often demonstrate low degrees of environmental action (Liu et al., 2015). Implementing environmental education in schools has been problematic, with many primary school teachers

functioning at ecological illiteracy or nominal ecological literacy (Cutter-Mackenzie & Smith, 2003). However, teachers can contribute significantly to environmental education, with female teachers showing more sensitivity to the subject (Daraz et al., 2023). Measuring instruments have been developed to assess teachers' environmental literacy, revealing relationships between their literacy levels and academic training, learning area involvement, and environmental education training (Swanepoel et al., 2002).

Studies show a significant increase in publications and citations related to teacher education for sustainability over the past three decades (Gavinolla et al., 2022). However, the integration of sustainability into higher education curricula varies across institutions and countries (Lovren, 2017). In Finland, research indicates that teacher education programs may not adequately prepare student teachers to teach sustainability (Hofman-Bergholm, 2018). A survey of Finnish lower secondary school teachers revealed significant differences in their perceived competence and frequency of incorporating various sustainability dimensions in their teaching. Subject teachers were classified into three groups based on their approach to sustainability education, with biology, geography, and history teachers most likely to use holistic sustainability approaches (Uitto & Saloranta, 2017).

These findings underscore the importance of teacher professional development programs and school environmental education policies in enhancing eco-literacy among students and creating an environmentally informed citizenry. Moreover, previous research underscores the importance of effectively enhancing teachers' awareness and competence in sustainability education to implement it across disciplines. However, the current body of literature needs a comprehensive understanding of the specific perceptions and practices of green pedagogies employed by teachers in various educational contexts. While it highlights existing gaps in teacher training and the relationship between environmental literacy and teaching practices, it does not directly explore how these factors impact student eco-literacy. The emphasis on general trends and studies may also overlook the nuanced micro-level dynamics within classrooms. This study is significant as it fills these gaps by examining teachers' perceptions of green pedagogies, ultimately providing a nuanced understanding of their effectiveness in fostering eco-literacy. Additionally, this research aligns with global initiatives, such as the United Nations' Sustainable Development Goals, which emphasize the need for education systems to equip students with competencies for sustainable development. Insights gained could inform targeted professional development and educational policies, enhancing the integration of sustainability in teaching practices and promoting a more environmentally literate student population.

Theoretical framework: Transformative Learning Theory

Transformative Learning Theory, developed by Jack Mezirow in 1991, emphasizes the process of critical reflection as a means to foster personal and social change. It posits that learners can achieve transformative shifts in their

perspectives through questioning and reassessing their beliefs and assumptions. This theory outlines a cycle of ten stages, starting with a disorienting dilemma that prompts reflection (Mezirow, 1991). Individuals can develop a more inclusive and open worldview by engaging in dialogue, fostering critical thinking, and exploring new frameworks. The ultimate goal is to empower learners to take informed actions and contribute positively to their communities and society (Mezirow, 1991).

Transformative learning theory has been applied to understand attitudes and behaviors toward environmental issues and sustainability. Studies have shown that learning can lead to individual sustainability actions, though societal-level impacts are rare (Moyer & Sinclair, 2020). Instrumental learning provides the necessary skills and knowledge for action, while communicative learning and personal transformation are also observed (Moyer & Sinclair, 2020; Diduck et al., 2012). The theory has been used to examine learning outcomes and processes in natural resource and environmental management, including reflection, rational discourse, and applying new frames of reference (Diduck et al., 2012). In education for sustainable development, transformative learning has emerged as a field of inquiry, contributing to the design and implementation of educational interventions and assessments (Aboytes & Barth, 2020).

In the current study, the transformative learning theory provides a suitable framework for examining how teachers' understanding of green pedagogies can transform their teaching practices and their perceptions of their effectiveness in fostering eco-literacy among students. By adopting a transformative perspective, this study recognizes that teachers' beliefs and assumptions about the environment and sustainability may shape their teaching strategies and approaches.

Overall, the theory provides a suitable framework for understanding how teachers' perceptions and practices related to green pedagogies can be transformed to promote eco-literacy among students. It recognizes the potential for personal and professional transformation through critical reflection.

Research methodology

This study adopts an interpretivism research philosophy (William, 2024a) to explore teachers' perceptions and practices of green pedagogies in fostering student eco-literacy. Interpretivism allows for a deeper understanding of the subjective experiences and meanings that teachers ascribe to their engagement with sustainability education within diverse cultural and educational contexts. This paper uses the studies of Morrison (2018) and Kidman and Casinader (2019) as references for exploring teachers' perceptions and practices of green pedagogies in fostering eco-literacy. The target population comprises 90 university teachers from Africa, Europe, and Asia, representing various disciplines, including social sciences, engineering and technology, humanities, and health sciences. A convenience sampling approach was utilized to recruit participants who

have implemented or taught concepts related to green pedagogies.

Data was collected using an online self-administered questionnaire that incorporated closed-ended and open-ended questions. The questionnaire was designed to capture quantitative and qualitative data, with sections dedicated to teachers' definitions of green pedagogies, implementation strategies, and perceived effectiveness in fostering eco-literacy. Closed-ended questions facilitated statistical analysis, whereas open-ended questions allowed for nuanced insights into educators' practices and experiences. Thematic analysis (William, 2024b) is conducted on the qualitative responses using NVivo 14 software to identify key themes and patterns. Table 1 below presents the sample's features. Table 2 represents teachers' perceptions of whether or not incorporating green pedagogies is essential for effective teaching.

Table 1. Profile of the participants.

Attribute	Frequency	Percentage (%)
Teaching region		
Africa	10	11.11
Asia	70	77.78
Europe	10	11.11
Teaching subject		
Social sciences (Psychology, Sociology, Anthropology, Political Science, Economics, Geography, History)	40	44.44
Humanities (Literature, Languages, Philosophy, Arts)	30	33.33
Technology and Engineering (Information Technology, Computer Science, Engineering, Robotics)	10	11.11
Health Sciences (Medicine, Nursing, Pharmacy)	10	11.11
Teaching experience		
Less than 5 years	50	55.56
5-10 years	10	11.11
10-15 years	20	22.22
More than 15 years	10	11.11

Table 2. Perceptions of teachers regarding green pedagogies as essential for effective teaching.

Teachers' perceptions	Frequency	Percentage (%)
Strongly disagree	10	11.11
Disagree	0	
Neutral	40	44.44
Agree	30	33.33
Strongly agree	10	11.11
Total	90	100

Data analysis and interpretations

To enhance clarity, some participant responses are presented in quotation format, followed directly by analytical commentary that interprets the significance of each response about the study's research questions.

Perceptions of green pedagogies

The analysis reveals five key themes: the definition and understanding of green pedagogies, their practical implementation in teaching, fostering active citizenship and responsibility, creating a supportive learning environment, and their perceived effectiveness. Respondents emphasize the importance of integrating sustainability into educational practices, utilizing eco-friendly materials, and creating relatable learning contexts that enhance student engagement. Teachers view green pedagogies as essential for promoting environmental awareness and nurturing responsible, eco-conscious citizens equipped to tackle contemporary environmental challenges.

Definition and understanding of green pedagogies

Respondents demonstrated a clear and shared understanding of green pedagogies focused on environmental education and sustainability. Many participants articulated that these pedagogies aim to instil environmental awareness in students. For instance, one respondent stated, *"A teaching approach that educates our young generation on environmental sustainability, highlighting the educational objective of fostering a sense of responsibility for the environment."* Another described green pedagogies as *"teaching in a way that focuses on caring for the environment,"* further reinforcing the idea that the core of this approach is nurturing an understanding of ecological challenges. This collective emphasis on sustainability indicates that teachers view green pedagogies as essential to cultivating eco-literate students.

Practical implementation in teaching

The practical application of green pedagogies emerged as a significant theme, with respondents noting how these approaches enhance the learning experience. One teacher mentioned the integration of real-world contexts: *"They make language learning more relatable to students,"* indicating that green pedagogies help students apply their knowledge in meaningful ways. Moreover, respondents emphasized the importance of using eco-friendly materials, with one stating, *"This includes using eco-friendly materials and encouraging students to think about how their actions affect the planet."* It illustrates that the choice of resources is critical in implementing green pedagogies and demonstrates how they can directly engage students in discussions about sustainability.

Fostering active citizenship and responsibility

Teachers also highlighted the role of green pedagogies in promoting active citizenship and fostering a sense of environmental responsibility among students. One participant noted, *"All practices aimed at encouraging active citizenship among students in terms of sustainable development,"* suggesting that these pedagogies are not merely academic but are designed to empower students to contribute positively to their communities. This sentiment

reflects a broader belief that green pedagogies should equip students with the knowledge and skills to address environmental issues actively. Such perspectives indicate that teachers perceive their role as imparting knowledge and cultivating responsible and engaged citizens who care for the Earth.

Emotional and environmental context

Respondents also highlighted the emotional impact of green pedagogies. One teacher remarked on the benefits of creating a supportive atmosphere, stating it is like a *"breath of fresh air and comforting environment."* This quote suggests that green pedagogies can contribute to a positive emotional climate in the classroom, enhancing students' overall learning experiences. Such environments may inspire creativity and open-mindedness, allowing students to engage more deeply with sustainability topics and fostering a greater appreciation for the natural world.

The effectiveness of green pedagogies

Finally, teachers are generally optimistic about green pedagogies' effectiveness in fostering eco-literacy. While specifics on successful outcomes were not extensively detailed, the overarching sentiment expressed by respondents indicates a belief in the value of these pedagogies. One respondent claimed that green pedagogies *"help students learn about nature, understand environmental issues, and promote eco-friendly habits,"* which underscores the effectiveness of this approach in developing knowledge and responsible behaviors toward the environment. This outlook reveals the potential that educators see in using green pedagogies to prepare students for the environmental challenges they will likely face.

Practices and strategies

The analysis reveals three key themes related to incorporating environmental education in teaching practices: integrating environmental themes, creative strategies for student engagement, and measuring student learning. Respondents illustrate varying levels of commitment to embedding sustainability into their curricula, utilizing hands-on activities and innovative pedagogical methods. Strategies such as outdoor exploration and project-based learning are highlighted as effective means to captivate students' interest and foster a deeper connection to environmental issues. However, the approaches to assessing student understanding and engagement vary, signaling the need for more precise metrics in evaluating eco-literacy within educational frameworks.

Incorporation of environmental themes in teaching practices
The responses indicate a varied engagement with environmental themes in teaching practices, reflecting a spectrum of experiences from full integration to limited inclusion. Several respondents actively incorporate environmental themes into their instruction, exemplified by a participant who shared, *"I incorporate environmental*

themes by including lessons on sustainability, using eco-friendly materials, and encouraging students to think about their impact on the planet." It highlights a proactive approach to environmental education, emphasizing the importance of hands-on activities like recycling projects and nature studies. However, one respondent candidly acknowledged a lack of integration, stating, *"So far, I have not included any environmental themes into my teaching practices,"* illustrating that not all educators feel equipped to weave environmental themes into their curricula consistently. Overall, the theme reflects a recognition of the need for sustainability in education, as well as the varying levels of implementation among educators.

Creative strategies for engaging students

Respondents provided diverse creative strategies for engaging students in environmental education, showcasing an array of pedagogical methods. Common approaches included project-based learning, outdoor exploration, and simulation games. One respondent mentioned that *"using simulation games where students manage virtual ecosystems"* allows students to see the consequences of different actions on the environment, highlighting the effectiveness of interactive learning methods. Another educator emphasized outdoor engagement—*"I take students on nature walks to observe local wildlife and plants"*—demonstrating an effective way to connect students with their local environment. Additionally, multimedia such as *"videos, images, PPT, worksheets, and oral practice"* indicated a multifaceted approach to fostering engagement. This theme reveals that teachers are employing various innovative strategies to make environmental education relatable and compelling for their students, enhancing their learning experiences through active participation.

Measuring student learning and understanding

Responses concerning measuring student learning and understanding environmental concepts reveal both structured and anecdotal approaches. Some educators highlighted using formative assessments and performance rubrics to gauge students' grasp of environmental issues. One participant noted, *"Provide a rubric about environmental marks to see how far students achieve it,"* indicating a systematic approach to evaluation. In contrast, other responses were more interpretive; for example, a respondent mentioned measuring understanding *"through related assessments alongside active participation in discussions about real-world applications of environmental concepts."* However, a few teachers expressed uncertainty, as seen in the response, *"I have no idea about the measurements,"* which points to a gap in assessment practices within this area. This theme illustrates educators' diverse methods of evaluating student learning, ranging from structured assessments to informal observations and discussions. It highlights the ongoing challenges in effectively measuring eco-literacy.

Challenges and opportunities

The analysis reveals four critical themes related to the implementation of green pedagogies in educational settings: the benefits and impact of green pedagogies, challenges in their implementation, opportunities for enhancing eco-literacy, and the role of administrative support. Respondents highlight the potential of green pedagogies to foster environmental awareness and engagement among students. However, they face challenges, including an exam-oriented culture and a lack of resources. Opportunities for enhancing eco-literacy lie in interdisciplinary approaches and community involvement. Respondents stressed the need for more robust administrative support to facilitate the effective integration of sustainability into the curriculum, ensuring that eco-literate, responsible citizens are nurtured.

Benefits and impact of green pedagogies

Respondents identify multiple benefits associated with implementing green pedagogies, notably increased students' environmental awareness and a sense of responsibility towards ecological issues. One educator emphasized that *"students are highly aware of the urgency to protect and preserve the environment,"* reflecting a beneficial shift in perspective. Additionally, these pedagogies can create engaging and relevant lessons, fostering a connection between environmental concepts and real-world applications. The potential for interdisciplinary lessons to connect ecological concepts with various subjects is also noted, indicating that green pedagogies can enrich the learning experience and promote a holistic understanding of environmental issues.

Challenges in implementation

Despite the benefits, several challenges accompany the adoption of green pedagogies. A prevalent issue mentioned by respondents is the exam-oriented culture prevalent among students, particularly in Chinese educational contexts, which often prioritizes standardized testing over environmental themes. One teacher noted, *"Green pedagogies are not exam-centric, and therefore, this approach may not be effective in helping Chinese students learn for examination purposes."* Other challenges include a lack of training, inadequate resources, diverse student interests and language competencies, and the necessity of extra planning. Additionally, respondents pointed out difficulties in engaging students who may not be aware of or concerned about environmental issues, illustrating the complexity of implementing environmentally-focused teaching strategies within existing curricular frameworks.

Opportunities for enhancing eco-literacy

Respondents recognize several opportunities to enhance eco-literacy among students. Suggestions include organizing field trips, promoting the innovation of green technologies, and integrating environmental education into the curriculum. Educators advocate for a culture prioritizing environmental

awareness and sustainability within the school community. To further support these initiatives, respondents suggest improved training for teachers on green pedagogies and increased communication and resources to engage parents in the learning process. By fostering a cooperative effort between educators, students, and parents, there is potential to create a more robust environment for cultivating eco-literate individuals.

Administrative support for green pedagogies

Respondents highlight the importance of school administration in supporting the implementation of green pedagogies. Suggestions for administrative support include providing teacher training and development opportunities, preparing budgets for environmental activities like field trips, and shifting the focus from a strictly exam-oriented approach to one that emphasizes sustainability. Furthermore, fostering a school-wide culture that prioritizes environmental education and providing technological support and resources are critical steps in promoting the effective integration of green pedagogies into daily teaching practices. This theme underscores the need for a supportive institutional framework to enable teachers to implement innovative environmental strategies effectively.

Discussions

This section synthesizes the findings of this study within the broader context of existing literature on eco-literacy and green pedagogies. It delves into three key aspects: how the findings build upon prior research, deviations from established trends, and the study's novel contributions to the field. By analyzing teachers' perceptions and practices, this section illustrates the potential of green pedagogies to foster environmental awareness among students while addressing the challenges faced in their implementation. This discussion aims to highlight actionable insights for enhancing eco-literacy and supporting the effective integration of sustainability in educational frameworks.

Building on prior research findings

This study reinforces existing literature on the significance of eco-literacy in environmental education, elucidating how green pedagogies enhance student awareness and engagement with ecological issues. As Ginju (2020) highlighted, eco-literacy is crucial for fostering responsible, global citizens capable of making informed environmental decisions. The findings support previous assertions that integrating sustainability into curricula promotes positive behavioral changes among students, a sentiment echoed in the writings of Sharma (2023). Furthermore, the emphasis on practical applications and student-centered approaches aligns with findings in the literature that underscore the need for innovative pedagogical strategies—such as project-based and experiential learning—to facilitate deeper ecological understanding (Kadarisman & Pursitasari, 2023; Khasanah et al., 2024).

Deviation from anterior research trends

Contrary to earlier studies emphasizing severe ecological illiteracy among educators, this research reveals a more nuanced understanding of the current educational landscape. While challenges such as a predominantly exam-oriented culture and limited administrative support are recognized, educators in this study demonstrate a proactive inclination toward integrating environmental themes into their teaching. It contrasts with previous findings, which depicted a more static scenario where innovative pedagogies were rarely embraced (Cutter-Mackenzie & Smith, 2003). Additionally, this study highlights a shift towards collaborative community involvement—an aspect less emphasized in existing research. As pointed out, the reciprocal relationship between parents, educators, and students could enhance eco-literacy, marking a departure from traditional classroom boundaries in environmental education.

Novelty of the study

This study contributes novel insights into the perceptions and practices of green pedagogies, filling a critical gap in the literature by closely examining educators' viewpoints in a specific cultural context. The findings underscore the teachers' understanding of green pedagogies and their innovative strategies for integrating environmental education in practical, relatable ways. Moreover, the research advocates for multidimensional approaches to sustainability education by identifying key opportunities for enhancing eco-literacy—such as incorporating field trips and promoting green technologies. This holistic understanding of green pedagogies positions the study as a significant addition to environmental education research, emphasizing the need for comprehensive teacher training and broader curriculum reforms. The findings illuminate actionable paths forward, highlighting the imperative for administrative support to facilitate a robust educational framework that nurtures eco-literate individuals in a rapidly changing world.

In conclusion, this research critically reflects the current state of green pedagogies, offering a comprehensive overview of their benefits and challenges while proposing actionable insights for enhancing eco-literacy within educational settings. By bridging these gaps in the existing literature, this study lays the groundwork for further exploration and innovation in environmentally focused teaching practices.

Conclusion

This study investigates how teachers perceive and implement green pedagogies to foster eco-literacy among students within diverse educational contexts. Participants emphasized the importance of integrating sustainability into their teaching practices, employing hands-on activities and innovative strategies to engage students effectively. However, the study highlighted implementation challenges, such as an exam-oriented culture and limited resources, which hinder the broader adoption of eco-focused pedagogies.

Theoretical contributions

This study enriches the literature on green pedagogies by addressing the often-overlooked perspectives of teachers responsible for delivering environmental education. By applying transformative learning theory, the research highlights the potential for teachers' beliefs about sustainability to evolve through critical reflection, ultimately affecting their teaching practices. The findings reflect the dynamic interplay between theory and practice, suggesting that effective eco-literacy education requires a robust understanding of the pedagogical frameworks underpinning these initiatives, thereby bridging existing gaps in the theoretical discourse on environmental education.

Practical implications

The insights from this study bear significant implications for educational policy and practice. By identifying successful strategies for engaging students in environmental education, such as outdoor exploration and project-based learning, this research encourages schools to adopt more impactful green pedagogies in their curricula. Additionally, it underscores the need for targeted professional development programs that equip teachers with the skills and resources to integrate sustainability into their teaching effectively. Furthermore, strengthening administrative support for environmentally focused initiatives is essential to foster a school culture prioritizing eco-literacy and student engagement.

Limitations and prospective research opportunities

This study has limitations, including the reliance on self-reported data from a small, convenient sample of teachers, which may not fully represent broader educational contexts. Future research could expand the scope to include a more diverse range of educators across different educational settings and cultures, providing a more comprehensive understanding of green pedagogies. Additionally, examining the long-term impacts of these pedagogies on student outcomes would provide valuable insights into their effectiveness. Investigating specific interventions or training programs for teachers could also yield actionable recommendations for improving eco-literacy in educational institutions, ultimately enhancing the development of environmentally responsible citizens. Future studies could investigate specific case examples where green pedagogies have significantly changed student behavior and community engagement.

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