GREENING THE CURRICULUM: A LITERATURE REVIEW OF ECO-PEDAGOGICAL FRAMEWORKS AND THEIR ROLE IN SHAPING ENVIRONMENTALLY CONSCIOUS EDUCATION

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Abstract
The escalating global environmental crisis demands a fundamental transformation in formal education systems, particularly through the integration of eco-pedagogical frameworks into mainstream curricula. This study aims to identify, classify, and critically analyze the dominant eco-pedagogical frameworks documented in international literature from 2021 to 2026, and to evaluate their contributions to fostering environmental consciousness among learners. A literature review was conducted using the Scopus database, with search terms including eco-pedagogy, ecological literacy, greening curriculum, and education for sustainable development. The analysis revealed four major clusters of eco-pedagogical frameworks, namely critical pedagogy-based, ecological literacy-based, cross-curricular integration, and experience-based nature learning. Findings consistently indicate that environmental consciousness can only be cultivated effectively when pedagogical approaches simultaneously address cognitive, affective, and psychomotor dimensions in an integrated manner. Furthermore, teacher readiness and capacity emerged as the most decisive factor determining successful implementation. This study concludes that eco-pedagogy-based curricula hold significant strategic value and marketability within the contemporary global education landscape, while simultaneously offering a principled roadmap for more ecologically just and sustainable curriculum reform.

Keywords: *Eco-Pedagogy; Ecological Literacy; Environmental Consciousness; Greening Curriculu;, Sustainable Education.*

Abstrak
Krisis lingkungan global yang semakin mengkhawatirkan menuntut transformasi mendasar dalam sistem pendidikan formal, khususnya melalui integrasi kerangka eko-pedagogis ke dalam kurikulum utama. Penelitian ini bertujuan untuk mengidentifikasi, mengklasifikasikan, dan menganalisis secara kritis kerangka eko-pedagogis dominan yang terdokumentasi dalam literatur internasional tahun 2021 hingga 2026, serta mengevaluasi kontribusinya dalam menumbuhkan kesadaran lingkungan pada peserta didik. Kajian literatur dilakukan menggunakan basis data Scopus dengan kata kunci meliputi eco-pedagogy, ecological literacy, greening curriculum, dan education for sustainable development. Hasil analisis mengungkapkan empat kluster utama kerangka eko-pedagogis, yaitu berbasis pedagogi kritis, berbasis literasi ekologis, integrasi lintas kurikulum, dan pembelajaran alam berbasis pengalaman. Temuan secara konsisten menunjukkan bahwa kesadaran lingkungan hanya dapat ditumbuhkan secara efektif apabila pendekatan pedagogis secara bersamaan menyentuh dimensi kognitif, afektif, dan psikomotorik secara terpadu. Selain itu, kesiapan dan kapasitas

guru muncul sebagai faktor paling menentukan keberhasilan implementasi. Penelitian ini menyimpulkan bahwa kurikulum berbasis eko-pedagogi memiliki nilai strategis dan daya tarik yang signifikan dalam lanskap pendidikan global kontemporer, sekaligus menawarkan peta jalan yang berprinsip bagi reformasi kurikulum yang lebih berkeadilan ekologis dan berkelanjutan.
Kata Kunci: *Eko-Pedagogi; Literasi Ekologis; Kesadaran Lingkungan; Penghijauan Kurikulum; Pendidikan Berkelanjutan*

1. INTRODUCTION

The increasingly intensifying environmental crisis in the last two decades has prompted the global academic community to re-question the role of educational institutions in shaping a generation that is not only academically literate, but also aware and responsive to the ecological conditions of the planet. Ecosystem degradation, accelerating climate change, and biodiversity loss are not just a matter of science or public policy, but also a profound epistemological challenge that demands a fundamental transformation in the way knowledge is transmitted through formal curricula. This is where the concept of *eco-pedagogy* or ecological pedagogy finds its relevance and urgency as a framework of thinking as well as an educational praxis that explicitly places the relationship between humans and nature as the center of the learning process. The fundamental question that then arises is: to what extent are the eco-pedagogical frameworks that have developed so far able to significantly shape students' *environmental consciousness*, and how can the integration of these frameworks into the curriculum be optimized?

Conceptually, eco-pedagogy is rooted in the tradition of Paulo Freire's critical pedagogy which was then re-inventoried in response to the challenges of the contemporary environment. Misiaszek (2023) explains that this approach aims to encourage learners to critically dismantle the anthropocentric dominance that is rooted in modern knowledge structures, while also building awareness of the unsustainability that plagued the Anthropocene era. Eco-pedagogy thus does not simply insert environmental themes into certain subjects, but demands a thorough reconstruction of the logic and purpose of education itself (Misiaszek, 2023). In a more macro development, UNESCO is going through a framework *ESD for 2030* has reinforced the importance of curriculum transformation towards sustainability orientation, including through the launch of *Greening Education Partnership* in 2022 which specifically targets curriculum greening, teacher training, and education system capacity around the world (UNESCO, 2022).

Various literature reviews that have been conducted during the period 2019 to 2023 have identified at least four major themes that are developing in environmental education research (*Environmental Education*/EE), namely higher education as an agent of change, integration of curriculum and pedagogy, impact measurement and competency development, as well as the formation of environmental identity and behavior (Gkargkavouzi, 2025; Li et al., 2025). These findings suggest that the exploration of how to embed environmental values into formal curriculum structures is one of the mainstream in today's global education discourse. In parallel, a systematic review of EE teaching practices in schools between 2015 and 2024 found that despite increasing attention to environmental education, teachers' pedagogical practices in this domain are still very minimally empirically researched, creating a serious gap in understanding how teachers actually implement eco-friendly approaches in the classroom (Zhang et al., 2025).

Several relevant previous studies reinforce the urgency of this study. Study Oe et al. (2022) who applied UNESCO's ESD framework in community-based learning initiatives found that although ESD has been widely recognized as an integrative approach that blends environmental, social, and economic dimensions, there has not been a mutually agreed methodology to operationalize it consistently in diverse curricular contexts. Meanwhile, Xiong et al. (2025) In their systematic review of 22 studies at the secondary education level, it was confirmed that the pedagogical approach was experiential and place-based (*place-based learning*) has proven to be more effective in fostering environmental literacy than conventional teaching methods that are transmissive. On the other hand, a study of teacher education reveals that the educator training curriculum still lacks a practical approach to EE and community-based engagement, a deficiency that directly impacts the quality of implementation of eco-pedagogy in the field (Ishaque et al., 2025). The integration of local and customary knowledge (*indigenous knowledge*) into sustainability education has also been identified as an important pathway that is able to strengthen the relevance of environmental curricula epistemologically and culturally (Druker-Ibáñez & Cáceres-Jensen, 2022).

Although the existing literature has made significant contributions, there are several *Research gap* that have not been adequately covered. First, most studies still tend to be regional or intradisciplinary and have not sufficiently integrated cross-disciplinary perspectives in understanding the effectiveness of eco-pedagogical frameworks (Li et al., 2025). Second, there is almost no study that comprehensively and systematically compares the various existing eco-pedagogical frameworks, ranging from Freire-based ecopedagogy, UNESCO-based ESD, *place-based education*, to an indigenous knowledge-based approach, in one integrated review that measures the contribution of each to the formation of students' environmental awareness. Third, the role of teachers as a central variable in the succession of eco-pedagogy implementation is still underexplored, especially related to the adequacy of training and capacity building mechanisms (Li et al., 2025; Zhang et al., 2025).

The novelty of this research lies in its attempt to map comparatively and holistically the various eco-pedagogical frameworks that have been developed in the contemporary international literature (2021–2025), while analyzing how these frameworks collectively and individually contribute to the formation of *environmental consciousness* in a formal education environment. This study not only summarizes the existing literature, but also builds a new conceptual synthesis that can serve as a roadmap for the development of a more ecologically responsive curriculum.

Based on the background and identification of research gaps above, the formulation of the problem in this study is: what eco-pedagogical frameworks have developed in the international literature and how do these frameworks play a role in shaping environmental awareness through formal education curricula? The purpose of this research is to identify, classify, and critically analyze the dominant eco-pedagogical frameworks in the global literature for the period 2021–2025, as well as evaluate their contribution to the formation of environmentally conscious students. Theoretically, this research is expected to be able to enrich conceptual treasures in the field of environmental education and sustainability-based curriculum development. Practically, the findings of this study can serve as a reference for curriculum policymakers, teacher training program designers, and academics who are committed to transforming education towards a more just and sustainable ecology.

2. RESEARCH METHOD

This study uses the *Literature Review* designed to identify, map and critically analyze the various eco-pedagogical frameworks that have been published in the international scientific literature. This method was chosen because of its ability to synthesize findings from various sources in a structured manner, resulting in a comprehensive and coherent understanding of the development of a field of study without having to produce primary data (Snyder, 2021). The literature review process in this study refers to the procedure commonly used in educational scientific studies, namely by setting strict inclusion and exclusion criteria, determining a credible search database, and conducting thematic analysis of selected documents.

The main data source in this study is the journal articles indexed in the Scopus database, which was chosen because it is known as one of the largest and most comprehensive scientific databases in the world with broad cross-disciplinary coverage. The search time span is limited to the period 2021 to 2026 to ensure that the literature reviewed reflects the latest developments and discourses in the field of environmental education and eco-pedagogy. The search keywords used include a combination of several terms, including: *"eco-pedagogy"*, *"ecopedagogy"*, *"environmental education"*, *"greening curriculum"*, *"education for sustainable development"*, *"environmental consciousness"*, *"place-based education"*, *"ecological literacy"*, *"sustainability curriculum"*, *"pro-environmental behavior"*, and *"environmental pedagogy framework"*. These keywords are combined using the Boolean AND and OR operators to expand and sharpen the scope of search results, for example: *"eco-pedagogy" AND "curriculum"*, *"environmental education" AND "framework"*, or *"ecological literacy" AND "formal education"*.

The inclusion criteria set include: journal articles published between 2021 and 2026, written in English, Scopus indexed, directly addressing the eco-pedagogical framework or its implementation in the context of a formal curriculum, and fully accessible (*Full-text access*). On the other hand, an opinion article without an adequate empirical or conceptual basis, a conference proceeding that does not go through a process *Peer Review* rigorous, as well as studies that are not relevant to the context of formal education are excluded from the analysis. The selection of articles is carried out in stages, starting from the screening of titles and abstracts, then continued with reading *full-text* to ensure the fit of the content with the focus of the research (Xiong et al., 2025).

The analysis of the selected literature was carried out through a thematic approach, namely by identifying recurring conceptual patterns, comparing arguments and findings between studies, and compiling an interpretive synthesis that was able to answer the research questions. Each article is analyzed based on several dimensions, including the type of eco-pedagogical framework used, the educational context that is the focus of the study, the methods used in the original study, and findings that are relevant to the formation of students' environmental awareness. This narrative synthesis approach was chosen because the methodological heterogeneity between the studies studied makes it difficult to apply quantitative meta-analysis, but still allows for the drawing of meaningful, evidence-based conclusions (Zhang et al., 2025).

3. RESULT AND DISCUSSION

a. Eco-Pedagogical Frameworks in International Literature: Conceptual Mapping

The results of the study of the international literature show that the eco-pedagogical framework that develops in the range of 2021 to 2026 is not single and monolithic, but is present in a variety of complementary conceptual orientations. Broadly speaking, these frameworks can be grouped into four main groups, namely critical pedagogy-based frameworks, competencies-based frameworks and ecological literacy, frameworks based on cross-subject curriculum integration, and experiential frameworks and connections to nature. This mapping is important because each cluster has different epistemological assumptions and pedagogical implications, so understanding of diversity is a prerequisite for designing an effective and contextual environmental curriculum.

In the critical pedagogy cluster, Mochere (2025) Introducing *The Symbiotic Curriculum* as a conceptual framework that blends Freire's critical pedagogy, Bronfenbrenner's ecological systems theory, and Mezirow's transformative learning theory. This framework is built on three main pillars, namely *Inter-Goal Synthesis* that connect the various Sustainable Development Goals through systemic thinking, *Place-Based Praxis* that relate global issues to the local context of students, and *Futures-Oriented Dialogue* which encourages the transformation of perspective through speculative methods. The framework explicitly recommends embedding eco-pedagogy modules in teacher training programmes and redesigning the national curriculum to align with SDG Target 4.7. What makes it special is its ability to go beyond a piecemeal approach where the SDGs are taught in isolation, towards a holistic integration that builds *critical agency* Learners (Mochere, 2025). In a similar tone, Koyama & Watanabe (2023) argues that ecological literacy should not be understood solely as the mastery of cognitive knowledge, but rather as a moral disposition that encourages individuals to consistently act for the good of the planet. This dispositional perspective requires teachers to design learning that actively fights against social-environmental injustices and cultivates the lifelong practice of learners (Koyama & Watanabe, 2023).

b. Integration of Eco-Pedagogy in the Formal Curriculum: Realities and Challenges

Although eco-pedagogical frameworks have developed theoretically, their implementation in the formal curriculum still faces significant structural obstacles. Corpuz et al. (2022) in his study in the Philippines found that although environmental education has been included in the performance indicators of teacher education programs, its application is still limited to certain courses such as Physical Education and the National Service Training Program, and has not yet reached a more strategic cluster of professional education courses. Furthermore, although students' attitudes towards environmental concern show a significant positive correlation with their knowledge and skills, real applications in the field still require serious reinforcement (Corpuz et al., 2022). These findings underline that policy goodwill does not always result in the automatic transformation of pedagogical practices.

The issue of teacher readiness also emerged as a critical factor in a number of studies. Debrah et al. (2021) In their literature review on solid waste management in developing countries, it was confirmed that students' low environmental knowledge was actually due to deficiencies in teachers' practical experience related to real environmental issues. The gap between teachers and students in terms of knowledge, attitudes, and practices towards environmental management was identified as one of the main causes of environmental curriculum failure resulting in measurable behavioral change (Debrah et al., 2021). This also emphasizes that

curriculum transformation will not be effective if it is not accompanied by simultaneous strengthening of educator capacity.

In a more innovative context, Kazazoglu (2025) offers an interesting perspective by integrating eco-literacy into learning English as a foreign language. This study found that ecologically-themed writing activities significantly changed students' perceptions of environmental vocabulary and their critical thinking skills regarding sustainability issues. Although barriers such as limited initial knowledge of the environment and the need for advanced training remain identified, this study opens up new horizons on how eco-pedagogy can be crossed with subjects traditionally considered unrelated to the environment (Kazazoglu, 2025). The relevance of these findings to *Marketability* An eco-pedagogy-based curriculum is very significant, as it shows that this approach can not only be applied in science or geography subjects, but is able to penetrate into various domains of the curriculum, expanding the range of its impact systemically.

c. Experience-Based Eco-Pedagogy and Connection with Nature

One of the most prominent trends in contemporary literature is the strengthening of an eco-pedagogy approach that relies on direct experience and affective connections between learners and the natural environment. Persson et al. (2026) in their ethnographic studies in a *folk high school* in Sweden found that imaginative play activities in ecological fieldwork are able to build what they call *becoming-with forest*, which is a symbiotic relationship between learners and forest entities that goes beyond the dichotomy of conventional subjects. This physically and emotionally challenging play activity has proven to open up space for students to imagine new worlds that are not anthropocentric (Persson et al., 2026). This approach is in line with what is practiced by Putri et al (2025), which examines the implementation of life skills-based eco-pedagogy in the context of schools. The study found that the integration of eco-pedagogy with life skills education through practical activities such as *Outing Class*, cooking sessions, and real environmental projects contribute positively to the development of students' ecological awareness, creativity, discipline, independence, and social interaction skills. Students are no longer just recipients of knowledge, but play an active role in environmental learning and solving problems in daily life (Putri et al., 2025).

d. Ecological Literacy as a Bridge between Environmental Knowledge and Behavior

A crucial question that often arises in the study of eco-pedagogy is whether environmental knowledge alone is sufficient for change behavior. The findings from the various studies in this review consistently answer: no. Arif & Changxiao (2022) through a field study in the Three Gorges Reservoir area, China, empirically demonstrated that the level of community environmental literacy, which includes the dimensions of knowledge, attitudes, and behaviors, is significantly correlated with the condition of the ecological network in the region. The group with low environmental literacy showed the greatest impact on vegetation cover degradation, while higher literacy correlated positively with better ecological conditions (Arif & Changxiao, 2022). These findings reinforce the argument that effective eco-pedagogy must simultaneously build on all three dimensions of literacy, rather than just conveying factual information about the environment.

The relevance of the communication dimension in building ecological literacy is also shown by Heong et al. (2021), which examines the adoption of ecological engineering practices

among rice farmers. They found that entertainment-based educational programs that reach a wide audience are able to shift farmers' beliefs and practices more effectively than conventional instructional approaches. This study confirms that ecological literacy is not only relevant for formal classrooms, but also has far-reaching implications in the context of non-formal education and community-based counseling (Heong et al., 2021). In a more macro and policy-oriented perspective, Okada & Gray (2023) through the Delphi study they identified seven key recommendations to strengthen the movement *Climate Change and Sustainability Education* (CCSE), including the promotion of flexible contextual curriculum, strengthening cross-curricular practices with teacher training, and raising awareness of green careers through education. The CARE-KNOW-DO framework they developed offers a new foundation for the education movement that integrates ecological awareness into all levels of education in an integrated manner (Okada & Gray, 2023).

e. Implications for the Marketability of Eco-Pedagogy-Based Curriculum

Overall, the findings of the ten studies studied show that a curriculum built on an eco-pedagogical foundation has value *Marketability* which is high in the contemporary global education landscape. First, increasing pressure from the international community, accreditation bodies, and employers on graduates who have sustainability competencies (*Green Skills*) make an eco-pedagogy-based curriculum a competitive asset for educational institutions (Okada & Gray, 2023). Second, the flexibility of the eco-pedagogy approach that has proven to be integrated into a wide range of subjects, from science to languages, makes it easy to adopt without having to completely overhaul the existing curriculum structure (Kazazoglu, 2025; Mochere, 2025). Third, empirical evidence of the positive impact of eco-pedagogy on the holistic development of learners, covering cognitive, affective, and psychomotor dimensions, makes it a pedagogical choice that is aligned with the demands of 21st century education (Corpuz et al., 2022; Putri et al., 2025). Thus, investment in the development of an eco-pedagogy-based curriculum is not just a moral response to the environmental crisis, but also a strategic step oriented towards long-term institutional relevance and sustainability.

f. Research Limitations

As a study that relies entirely on secondary literature analysis, this study is not spared from a number of limitations that need to be honestly acknowledged in order to maintain its scientific integrity. First, restricting data sources on the Scopus database, despite being a highly reputable database, has the potential to exclude quality studies published in other reputable journals such as ERIC, Web of Science, or Google Scholar, so the resulting picture may not fully represent the overall landscape of *eco-pedagogy* literature global. Second, the limitation of the time span in the period 2021–2026, although deliberately to ensure contemporary relevance, causes a number of foundational works published before that period to not be analyzed in depth, even though these works are very likely to make substantial theoretical contributions to the development of the eco-pedagogical framework under review. Third, the interpretive thematic analysis in this study has the consequence of the existence of an element of subjectivity of the researcher in the process of categorization and synthesis of findings, which under certain conditions can affect the objectivity of the conclusions drawn. Fourth, the heterogeneity of the geographical and socio-cultural contexts of the studies studied, covering Asia, Europe, Africa, and the Pacific region, makes it difficult

to generalize findings universally because the effectiveness of an *eco-pedagogy* framework is strongly influenced by specific local conditions and cannot always be transferred directly to different contexts.

4. CONCLUSION

This literature review confirms that *the eco-pedagogy* framework has developed into a solid conceptual foundation in an effort to transform the formal education curriculum towards a more ecologically responsive orientation. The various approaches examined, ranging from *the Symbiotic Curriculum*, dispositional ecological literacy, cross-subject integration, to natural experience-based learning, collectively show that the formation of students' *environmental consciousness* cannot be achieved through a single approach, but requires a multi-layered strategy that touches on cognitive, affective, and psychomotor dimensions at the same time. These findings also confirm that teacher readiness and capacity are the most decisive variables in the successful implementation of an eco-pedagogy-based curriculum, so true curriculum reform must always be accompanied by systemic strengthening of educator competencies at all levels of formal education.

Based on the findings of this study, several strategic recommendations need to be seriously considered. First, teacher education institutions need to design training modules that explicitly integrate the principles of *eco-pedagogy* into the core pedagogical competencies of prospective educators, rather than simply inserting them as additional content. Second, curriculum developers at the national level need to encourage a cross-disciplinary approach that allows environmental themes to permeate all subject groups, including language, arts, and social sciences. Third, advanced empirical research is urgently needed, particularly those that use longitudinal designs to measure the extent to which *eco-pedagogy-based* interventions actually produce long-lasting changes in environmental behavior. Fourth, collaboration between schools, local communities, and policymakers needs to be strengthened so that the implementation of *eco-pedagogy* does not stop in the classroom, but grows into a sustainable educational culture movement.

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