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Integrating Environmental Literacy into School Curricula: A Narrative Review of its Role in Educational Reform

Shah Fahad Ali Khan[1], Taj Ud Din[1], Shagufta Naz[1], Mehroon Nisa[1], Uzma Sher[1], Anita Mughul[2]

[1]University of Chitral, Pakistan.
[2]Independent Researcher.

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Correspondence to: Shah Fahad Ali Khan, University of Chitral, Pakistan.
Email: fahaduoch@gmail.com

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ABSTRACT

Environmental Literacy (EL) has been recognized as a vital education component, equipping children and youth with the knowledge, attitudes and behaviours to live sustainably. The significance given to environmental literacy in education has long been understood as an essential part of education, the key to responsible environmental action. This narrative, systematic literature review entailed a broad and systematic search of peer-reviewed literature on environmental literacy in children's education and summarizes current research regarding implementing EL in school and its influence on children's cognitive and behavioural development. The findings from the studies reviewed in the present study show that EL programme can influence children in their environmental concept knowledge, attitude toward nature, civic engagement and an internalised moral obligation in relation to conservation. Furthermore, these programs enable children to connect what they are taught in the classroom to the wider world and help them to engage in critical thinking and problem-solving about sustainability. EL programs are typically place-based and experiential and are now increasingly integrated with a community-based pedagogy. This paper also identifies key barriers and policy gaps hindering the incorporation of EL and provides practical recommendations on how to enhance EL in educational institutions.

INTRODUCTION

The increasing need to act on climate change, deforestation, and environmental degradation stress the importance of an informed and environmentally aware population (Rogayan and Nebrida 2019; Velempini 2025). Currently, children, the future stewards of our planet stand at a crucial intersection, and their attitudes, knowledge, and behaviours will profoundly determine the trajectory of our collective future (Chawla 1999; Hill 2012). Furthermore, environmental literacy (EL) involves much more than just understanding scientific facts; it comprises a set of attitudes, values, skills, and behavioral patterns that enable individuals to make decisions and take responsible action to care for their environment (Berkowitz et al. 2005; McBride et al. 2013). EL nurtures a concept of dependence of children on nature, fostering an ethic of care and civic responsibility for preserving the resources that sustain life (Jurin et al. 2010). Crucially, they bring this moral perception to bear on their relations with others, their political stance and perhaps their subsequent civic participation (Clayton 2017).

Schools are excellent platforms for the development of EL by providing a venue where children can relate what they are learning in their classrooms to real-life environmental concerns (Tilbury 1995; Palmer 2002b) . Learning in the classroom for them is a means of not only learning about how things works but also about their place in the world (Bentley 2012). The ultimate goal of EL is for children to grow up and be responsible, eco-conscious citizens who are engaged in nature preservation and environmental sustainability (Velempini 2025).

Research findings suggest that environmental literacy is gaining more importance in children's education globally (McBride *et al.*, 2013; Velempini, 2025). School-based programs such as Eco Schools Clubs and related activities allow children to become increasingly aware of climate issues and are responsible for the questioning of unsustainable practices on a local level (Lee 2014). In the Philippines, high school students who had received an in-depth environmental education showed high knowledge of climate change implications and policy instruments (Rogayan and Nebrida 2019). In the U.S., a study showed that students engaged in place-based education programs better retained science knowledge on environmental issues and civic dispositions than those in traditionally taught programs (Ernst and Monroe 2004). This growing body of empirical data collectively underscores the necessity to make EL a core, cross-cutting skill in

education, preparing children to become responsible policy makers, innovators, and stewards in their own right. This article seeks to highlight the learning and conservation contributions of EL in young people, constraints and policy directions for strengthening EL across education systems.

This study aims to (1) synthesize current literature on the effects of environmental literacy programs on children's knowledge, attitudes, and behaviors; (2) highlight policy mechanisms for strengthening EL delivery; and (3) provide a framework for future policy and practice to foster environmentally responsible, conscious, and engaged children.

MATERIALS AND METHODS

This narrative, systematic literature review entailed a broad and systematic search of peer-reviewed literature on environmental literacy (EL) in children's education according to Kennelly et al. (2008). ResearchGate, Google Scholar, CINAHL, Sciencedirect, ERIC and PloS One databases were searched for eligible articles using keywords like environmental literacy, environmental education, childhood education, and sustainability. The inclusion criteria for the studies were studies relevant to EL integration in schools for children in primary or secondary education and/or ELs and showing an impact on children's knowledge, attitudes, and/or behaviours. Studies explicitly designed for adult populations and opinion pieces without supporting evidence or lacking empirical data were excluded from the study. Data extraction entailed summarizing studies' objectives, methodologies, key findings, and conclusions. Thematic analysis was performed to identify common themes and patterns across the selected studies. The search was carried out through inter-operative keys using Boolean operators (AND, OR) as displayed in Table 1.

Table 1

Search keywords and strategies used in this narrative review

Keyword 1	Boolean Operator	Keyword 2
environmental literacy	AND	Children
environmental education	OR	primary education
environmental awareness	AND	Pedagogy
pro-environmental behavior	AND	Policy
education for sustainable development	AND	Curriculum
community engagement	OR	civic responsibility

Study Selection Process

A total of 145 articles were initially identified via these databases. Following the exclusion of duplicates (n = 25), 120 articles were considered further. A total 33 articles were then excluded for either containing no empirical data or for low methodological quality. Fifty-two were then excluded because they had little relevance to child education, resulting in 35 articles which were reviewed for inclusion in this narrative review. The references of chosen articles are indicated with an asterisk.

Data Extraction and Analysis

Key information from each paper was reviewed such as purpose of study, method, major findings, and policy implications as followed by Tilbury (1995). Thematic analysis was then applied to determine common themes and areas of need.

RESULTS AND DISCUSSION

This narrative review demonstrates that EL programs for children can generate important educational, behavioral, and attitudinal outcomes within a wide variety of settings (Ernst and Monroe, 2006; McBride *et al.*, 2013). What is more, these effects are not confined to the classroom; children take what they see home with them into their day-to-day lives, affecting their families, friends and even their future civic behaviour (Jurin *et al.*, 2010; Lee, 2014).

Educational Benefits of Childhood Environmental Literacy

EL programs help children grasp scientific and environmental concepts and enhance their ability to solve problems and make informed decisions (Stevenson et al. 2013). This provides very solid ground to develop critical and higher-order thinking skills on, in order to prepare students for future decisions in policy and community that involve nature conservancy (Tilbury and Wortman 2004). In addition, as children link classroom instruction with their lived world, their involvement and interest in learning grow, and so does their motivation to learn (Frensley et al. 2022). This demonstrates how powerful education can be in contributing to intellectual and civic development.

EL programs contribute to better academic results, which again is an indication of how integrated and context rich cross-curriculum programs can be used for children's schooling experience (Lieberman and Hoody 2000). This occurs as children are drawn into a more exciting experience and into wanting to learn more and then apply what they have learned to real-life situations (Stables 2003). In addition, EL fosters in children pro-social and ethical attributes and values and cultivates moral compass and civic engagement (Berkowitz *et al.*, 2005; Lindemann (2013) which contribute to how they view their social connections and their comprehension of fairness, justice, and public good (Clayton 2003).

Finally, the EL programs foster the furtherance of interdisciplinary thinking incorporating science, literature, art, policy and civic engagement (Tilbury and Wortman, 2004). This trains children to think from different viewpoints and work together towards solutions of complex problems and essential skills for facing future environmental as well as social crises (Sterling 2010). This integrated vision enables children to appreciate the links between knowledge and to become adapted, responsible and creative players in the insuring of a sustainable future (Velempini 2025).

Environmental Conservation Perspective

a. ***Fostering Pro-Environmental Behavior***: EL programs promote pro-environmental behavior through developing a sense of morality and civic duty toward the preservation of nature (Kollmuss and Agyeman, 2002; Ardoin *et al.*, 2020). This change in behavior results from the repeated exposure to sustainable habits, which children will bring into their adult life (Jurin et al. 2010). Moreover, inculcating a sense of identity and

stewardship of the environment in childhood shapes their future behaviors, policy support, and lifestyle patterns (Chawla, 1999). This is creating a generation of true custodians, who have deep interest in preserving their environment. Continued exposure to EL programs may result in the manifestation of discernible environmental actions such as recycling, energy-saving, and sustainable consumption practices (Kollmuss & Agyeman, 2002). Such behaviour is transferred into adulthood with the help of school and society.

b. ***Building Environmental Identity and Stewardship***: EL fosters children's sense of connectedness to community and ecosystem health, developing their understanding of relationships between humans and nature (Valentine 2000). This knowledge supports civil engagement and community commitment to the conservation of their home environment (Valentine 2000)(Ballantyne et al. 1998). Significantly, children often become a force for change within their families and communities, promoting pro-sustainability attitudes upwards to policy makers, businesses, and civic institutions (Lee 2014). Children develop their identity within authoritative societal narratives, including their place in the natural world (Valentine, 2000). Early Childhood Environmental Education help children develop an Environmental Identity as early as the first few years of life (Jurin et al. 2010). When kids feel a personal connection to nature, they are more likely to want to help care for it as they age (Kollmuss & Agyeman, 2002).

c. ***Community and Ecosystem Awareness***: EL raise awareness of local ecosystems and environmental issues through school gardening, clean-up drives , and biodiversity activities. This educational approach enhances children's comprehension of human–nature connections and supports local conservation (Ardoin et al., 2020).

d. ***Intergenerational Impact***: Children often serve as change agents in their home environment, changing how families view and behave regarding environmentally sustainable and conservation issues (Ballantyne et al., 1998). This ripple effect validates EL's influence beyond the classroom to homes and communities.

e. ***Supporting Global Sustainability Goals****:* Finally, EL also directly influences global sustainable development goals by promoting a positive attitude and a responsible behavior towards the environment (Leicht and Byun 2021). This suggests that education is not a stand-alone program, but is a shot in the arm toward the realization of well-being of human being and the planet (Palmer 2002b). Healthy futures can be ensured by increasing numbers of children who grow up knowing they personally can contribute to making things better—a change which education can make happen (McBride et al. 2013). EL focuses on raising environmental consciousness from a young age and supports the attainment of several SDGs, such as SDG 4 (Quality Education), SDG 13 (Climate Action), and SDG 15 (Life on Land) (Velempini, 2025).

Recommendations

Drawn from the review and supplemented by the gaps and challenges in the implementation of EL in schools, the following overall comprehensive is recommended:

a. **Integration and Reform of the Curriculum**
EL should be used across math, language arts, social studies, science, and art rather than restricted to science (Tilbury & Wortman, 2004; Stables 2003)). This inter-disciplinary approach encourages children to value 'the action around knowledge' and 'the real-world experience of the applications of knowledge' (Velempini, 2025). Curricula should be based on local ecological context, cultural practices and community epistemologies (Palmer, 2002) so that children can situate their learning in their own lives (Jurin et al., 2010). A framework can be developed that aligns curricula with SDG 4.7 to promote children to be responsible, environment friendly and flexible thinking citizens (Berkowitz et al., 2005). Preservice educators must be prepared with such EL methods, content, and pedagogy (Kennelly et al., 2012). There should be mechanisms in place that afford in-service educators the opportunities to be continuously developed through workshops, seminars, and professional learning communities (Tilbury & Wortman, 2004). Furthermore, a universal can be developed for accreditation to ensure high quality delivery of EL throughout schools (Berkowitz et al., 2005).

b. **Infrastructure and Distribution of Resources**
Outdoor learning environments should be established by creating green spaces, school forests, or community gardens, where students can engage directly with nature and understand its workings (Zhang et al. 2022). Instructional guides, multimedia resources, activity kits, and developmentally appropriate curricula for children can be developed and disseminated (Kennelly et al., 2008). Dedicated funding for EL should be secured through distinct budget lines for EL programs and related educational resources, supported by government agencies and community and environmental NGOs (Palmer, 2002).

c. **Involvement of the Community and Parents**
Families and community members should be engaged through the organization of workshops, campaigns, and service-learning activities to cultivate a shared understanding and interest in environmental matters (Ballantyne et al., 1998). Working relationships and coordination should be encouraged with local forestry, wildlife, agricultural, and environmental organizations to provide children with meaningful access to practitioners (Jurin et al., 2010). Grassroots support should be built by helping children launch campaigns, clubs, clean-up efforts, or tree-planting drives, thereby boosting their civic spirit and strengthening their sense of agency in driving meaningful, long-term change (Lee, 2014).

d. **Developing Policy and Accountability Structures**

Clear policy documents that oblige EL to be integrated into the curriculum should be developed to formalize its role in education systems (Velempini, 2025). A model should also be created to monitor and evaluate EL programs, with annual audits and surveys conducted to assess their effectiveness (McBride et al., 2013). Environmental literacy should be treated as a civic right; aligned with the recognition of environmental education or education for sustainability as a core civic responsibility (Berkowitz et al., 2005; Hill, 2012), EL is recognized as a fundamental civic and educational entitlement that ensures all children grow up possessing the knowledge and skills needed to care for their environment.

e. Barriers to Implementation

Although there are known advantages to EL, there are a number of barriers that prevent EL from being carried out (Palmer, 2002a; Kennelly et al., 2008). Scarce monetary, material, and human resources render it difficult for schools to embed EL in their syllabuses (Cutter-Mackenzie and Smith, 2003). In addition, many teachers are undertrained or uninstructed to teach EL are taught due to inadequate preparation and policy (Kennelly et al., 2008). Such ways of thinking about education also exacerbate increasing educational disparities, and a lack of access to EL opportunities is inhibiting children's progress and education particularly in poorer countries (Palmer, 2002).

CONCLUSION

This review of the literature indicates that EL programs are a means to children becoming responsible, environmentally caring adults who recognize their role in nature conservation. This change comes through integrated, experiential, collaborative, child-centered education-representing the notion that children are not only future citizens, but agents for the betterment of their world.

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