

Critical Perspectives and Implementation Strategies for Early Childhood Sustainability Education

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Abstract: This article examines whether sustainability education is appropriate for children in early years education and explores the most effective forms it can take. Drawing on current policy frameworks, educational research, and developmental theories, the discussion demonstrates that introducing concepts of sustainability at a young age is not only suitable but also beneficial for cognitive, social, and emotional development. The article highlights how ESD aligns with children's natural learning processes through play, exploration, and collaborative activities. Examples from international policies and research studies are utilized to support the integration of ESD in early years curricula. The article concludes with recommendations for practical and developmentally appropriate methods to embed ESD in early childhood education settings, ensuring that sustainable attitudes and behaviors are nurtured from the earliest stages of learning.

1. Introduction

Education for Sustainable Development (ESD), pioneered by UNESCO, aims to equip individuals across all ages with the knowledge, skills, values, and attitudes necessary to foster a more sustainable, just, and equitable world, ensuring the safeguarding of the planet for current and future generations [8]. Framed as a lifelong learning process, ESD emphasizes not only environmental stewardship but also the interconnection of economic growth, social inclusion, and cultural diversity within a holistic educational strategy. Its influence has been cemented in major international frameworks, most notably the 2030 Agenda for Sustainable Development and the 17 United Nations Sustainable Development Goals (SDGs), which explicitly articulate education's vital role in transformative societal change. Nevertheless, the promotion of ESD in early childhood settings remains contentious. Questions persist regarding the developmental appropriateness of introducing complex sustainability concepts to young children, the risks of superficial greening of the curriculum, and the preparedness of early childhood educators to engage with ESD meaningfully. Critics warn that, without nuanced adaptation, ESD in the early years may be reduced to tokenistic activities or inadvertently induce anxiety, lacking the critical depth needed for true transformative learning. This paper critically examines whether sustainability education is developmentally suitable for early childhood and explores the challenges and opportunities of meaningful ESD integration. Drawing upon current empirical research, policy documents, and established pedagogical theories, it explores both the

theoretical justifications and the practical complexities of delivering ESD to young learners. The paper concludes by recommending evidence-based, developmentally appropriate approaches to embed ESD in early years education strategies that can foster critical thinking, agency, and environmental consciousness from the very beginning of formal learning.

2. The Case for Early Years Sustainability Education

The overuse of natural resources, environmental pollution from manufacturing, and recurring economic instability pose significant and multifaceted threats to humanity's future [10]. Recognizing these interconnected challenges demands a fundamental shift in how societies educate their citizens. The need for proactive thinking and responsible action, starting from the earliest stages of life, is underscored by the frequency and severity of environmental and social crises. At the heart of Education for Sustainable Development (ESD) lies the principle that key sustainable development issues, including economic growth, social justice, and environmental protection, must be woven into all stages of teaching and learning. The United Nations, since the adoption of the 2030 Agenda for Sustainable Development, has urged nations to advance educational initiatives that support long-term resource management, global cohesion, and economic resilience (www.un.org, n.d.). Integrating sustainability education at an early age is a proactive response to major global risks, yet debate persists around the appropriateness and impact of such education for young learners.

ESD is designed to be a lifelong learning process, with preschool through higher education forming a continuum. With more urgent threats to environmental and economic stability emerging, its relevance is greater than ever. ESD is recognized as a holistic and transformative form of education which addresses complex topics including climate change, poverty, sustainable consumption, gender equality, and human rights [9]. Crucially, ESD advocates for participatory, action-oriented, and inquiry-based learning strategies in place of traditional didactic approaches. For example, Nayar [8] highlights an eco-school in the UAE where students constructed mobile walls out of recycled cardboard boxes. This collaborative project not only reduced waste and saved the school money but also empowered students to connect classroom learning with real-world environmental issues and model positive behaviors for their community.

3. The Developmental Appropriateness of ESD in Early Childhood

The question of whether ESD is pedagogically suitable for children in early education is complex, intersecting with developmental psychology, neuroscience, and educational theory. Early childhood education is foundational, equipping children with the skills and dispositions they need to navigate later social and academic contexts. However, many caregivers and policymakers continue to underestimate its importance. As Sword [11] notes, only 25% of parents recognize the significance of early childhood education, an oversight that threatens to undermine children's cognitive and moral formation. Neuroscientific research reveals that children's brains are extraordinarily receptive during their early years, forming over a million neural connections per second [4,5]. This period is optimal for instilling values and fostering habits, including those related to sustainability. When young children absorb socially and environmentally responsible attitudes, they become uniquely poised to contribute to society's long-term resilience and well-being [4,5].

Globally, early childhood education has begun to reflect these insights. In the UK, the Early Years Foundation Stage (EYFS) guides learning and care for children aged 0-5, emphasizing play, communication, and fundamental skills such as literacy, numeracy, and social-emotional intelligence [2]. The curriculum encourages diversity, empathy, and active participation-objectives closely aligned with ESD. Notably, such curricula are intended to nurture curiosity, self-confidence, and a sense of belonging, all critical for enabling children to engage with sustainability topics.

A comprehensive understanding of early childhood is provided by Lee [6], who describes children as ‘human becoming’, dynamic, evolving individuals shaped by their families, nations, and historical contexts. While the specifics of a child’s development may differ depending on environment, certain universal milestones mark their growth. Developmental specialists delineate five main stages in early childhood: newborn (0-3 months), infant (3-12 months), toddler (1-3 years), preschool (3-4 years), and school age (4-5 years) [1,2]. Children progress through these stages by acquiring communication and phonics skills, physical abilities, social-emotional competencies, and cognitive skills. Cognitive functions such as recognition, memory, and judgment become increasingly sophisticated as children mature, suggesting that sustainability education must be carefully tailored to fit children’s evolving capacities.

Effective education equips all learners, children and adults alike, with the tools they need to navigate their environments. While delivery may differ, the quality and depth of ESD for children should not be inferior to that provided for adults. Researchers have observed that with ongoing, age-appropriate exposure, children are not only capable of grasping sustainability concepts but are also uniquely positioned to influence their families and peer groups [3,10]. The theories of Bruner [1,2] suggest education’s purpose extends beyond mere information transfer; it should foster independent thinking and enable learners to solve problems. His notion of ‘scaffolding’ supports the view that even complex ideas can be made accessible to children if introduced gradually, with learning stages building upon each other [7]. This approach is essential for sustainability topics, which are inherently multifaceted and sometimes emotionally demanding.

4. Children’s Rights and Citizenship: A Foundation for Sustainability Learning

Societal views often frame adults as the primary actors, yet children possess significant agency and deserve opportunities for autonomous thought and action. Recognizing children’s rights is central to how ESD is implemented in early years. The UN Convention on the Rights of the Child [12,13] guarantees children the right to express their views freely in matters that affect them, with their input valued according to age and maturity. While this principle does not imply full autonomy, it does support meaningful participation, an essential aspect of sustainability education. Early years ESD thus models’ responsible citizenship, encouraging children to think critically and act ethically for societal harmony. Furthermore, young children’s strong imaginations and rapid brain development position them to absorb values and habits quickly [12,13]. Early education is a critical opportunity to build social, emotional, cognitive, and physical skills holistically). By stimulating curiosity and nurturing self-confidence, ESD prepares children to become responsible, resilient, and compassionate citizens.

Reading [10] frames childhood and adulthood as distinct but interconnected phases, with education representing a fundamental intergenerational relationship. Children learn best through direct interaction and imitation of adults, particularly parents and grandparents. Such relationships offer valuable opportunities for moral development, resilience, and perspective-taking. Critical education from caregivers helps children to discern right from wrong, while ESD’s dual focus, quality educational material and role modeling, addresses both cognitive and affective domains. Intergenerational storytelling and joint activities, such as visiting a recycling center or gardening together) allow children to understand broader issues through concrete connections. This approach enhances children’s sense of identity and belonging and fosters awareness of their impact on future generations.

5. Critical Reflections on the Suitability and Practice of ESD in Early Years

Despite clear benefits, the adoption of Education for Sustainable Development (ESD) in early childhood education must be approached critically and reflectively. Several significant concerns require thoughtful consideration to ensure that the integration of ESD is genuinely effective, meaningful, and equitable for young learners.

Superficiality and Tokenism: A prevalent risk in ESD is the tendency toward superficial implementations, what is often referred to as “greenwashing” or tokenism. This occurs when sustainability education is reduced to isolated or symbolic activities, such as making crafts from recycled materials or discussing Earth Day once a year, with little critical engagement [8]. These activities may raise short-term awareness but rarely promote deeper understanding or lasting behavioral change. To move beyond tokenism, ESD must be embedded as a core value throughout the curriculum. It should encourage critical thinking and ethical reasoning, inviting children not just to comply with sustainable practices but also to question, reflect, and innovate. For example, children might be asked why recycling matters or how their choices impact local wildlife, fostering a genuine sense of agency and responsibility.

Emotional and Cognitive Risks: While it is important to develop environmental awareness from an early age, educators must remain sensitive to the developmental stage of their students. Addressing complex and potentially distressing issues such as global warming, deforestation, or poverty can be emotionally overwhelming, cause confusion, or foster eco-anxiety in young children. Young children, who are still forming basic understandings of the world, may lack the abstract thinking and emotional resilience required to process global-scale challenges. Therefore, it is essential that ESD for early years is rooted in positive action and hope, not fear or guilt. Educators should introduce environmental themes through local, concrete experiences, such as growing plants, caring for animals, or discussing community helpers, and through age-appropriate language and storytelling that emphasizes empowerment, collaboration, and solutions.

Teacher Preparedness and Curriculum Constraints: The effectiveness of ESD in early childhood largely depends on teachers’ confidence, knowledge, and pedagogical skill. Many early childhood educators admit to feeling unprepared or unsupported in teaching sustainability content, due to limited pre-service training, insufficient professional development, or overloaded curricula. In such cases, ESD is at risk of becoming a neglected “add-on” rather than an integrated and transformative aspect of learning. To address this, systemic support is required: professional development programs should equip educators with conceptual knowledge, practical strategies, and reflective tools for ESD, while leadership teams should prioritize sustainability as a whole-school commitment. Peer collaboration, mentorship, and community partnerships can further build educators’ capacity, ensuring that sustainability values are demonstrated as well as taught.

Cultural Relevance: One-size-fits-all approaches to ESD can inadvertently marginalize children from diverse cultural, linguistic, and socio-economic backgrounds. Sustainability challenges and solutions look different in every community, shaped by local resources, traditions, beliefs, and histories. ESD curricula must, therefore, be flexible and responsive, respecting families’ values and lived experiences. This means foregrounding local contexts, drawing examples from the children’s own environments, and inviting community members to share indigenous knowledge and traditional practices related to caring for the earth. By valuing multiple perspectives, ESD not only becomes more meaningful and accessible, but also affirms children’s identities, fostering social inclusion and equity.

Practical Evidence and Implementation Strategies: The real-world impact and viability of ESD in early childhood settings are increasingly evident in the literature. One illustrative case is the Spanish Association for the Promotion of Aluminum Packaging Recycling, which partnered with

early years specialists to implement sustainability education in kindergartens for children under six [3]. The activities involved hands-on learning about recycling, collaboration between children, teachers, and families, and the creation of permanent 'recycling corners' in the classroom. Teachers reported not only high engagement levels and enthusiasm among students but also advocated for curriculum changes to sustain these lessons throughout the school year.

This case exemplifies how thoughtfully integrated ESD can:

- 1) Spark curiosity and intrinsic motivation in children.
- 2) Inspire ongoing changes to classroom practices and routines.
- 3) Encourage family involvement, creating a bridge between school and home sustainability practices.
- 4) Build lifelong habits and awareness, as children become ambassadors of sustainability within their communities.

Other studies confirm these trends, indicating that young children can and do engage with environmental themes, provided that learning is concrete, interactive, and oriented toward action rather than fear or moralizing.

6. Best Practices for Early Years Sustainability Education

Drawing on current research and leading practice, the following are comprehensive strategies for implementing successful and meaningful ESD in early childhood settings[11,13]:

1) Experiential Learning:

Active experiences are central to young children's learning processes. Activities such as gardening, composting, nature walks, and recycling projects allow children to directly interact with their environment. These activities cultivate curiosity and an embodied understanding of ecological systems. For instance, by planting seeds and nurturing them, children observe the cycles of growth, understand interdependence, and practice patience and responsibility. Experiential learning is often enhanced through reflection and documentation, such as nature journals, photo diaries, or collective discussions.

2) Storytelling and Art:

Narratives whether through picture books, oral storytelling, puppetry, or drama make complex or abstract topics accessible and emotionally resonant. Stories can introduce sustainability dilemmas, foster empathy towards living things, and model problem-solving and cooperation. Integrating art projects (such as creating collages with natural or recycled materials, or dramatizing stories about environmental heroes) stimulates creativity and allows children to express their understanding in personalized ways. Meaningful stories present challenges along with solutions, helping children to envision themselves as capable contributors.

3) Routine Integration:

Embedding sustainability into daily routines reinforces learning through repetition and familiarity. For example, children can be part of setting up a classroom recycling system, turning off lights when leaving a room, participating in 'waste-free' snack programs, or caring for class pets and plants. These routines foster a sense of shared responsibility, consistency, and practical skill-building. Over time, sustainable choices become second nature rather than special projects.

4) Inquiry-Based Learning:

Children learn best when they are engaged in exploring their own questions and ideas. Educators can foster inquiry-based approaches by encouraging children to observe phenomena, pose their own questions ("What happens to our rubbish?" "Where does water come from?"), make predictions, test out solutions, and discuss findings. This process not only builds critical thinking but also strengthens collaboration, communication, and the scientific method. Projects might emerge from real-life

challenges observed in the classroom or community, such as noticing litter in the playground or a shortage of bees in the garden, and involve children in brainstorming, researching, and implementing creative responses.

5) Community and Family Engagement:

Sustainability education becomes more authentic and effective when extended beyond the classroom. Engaging families might involve sharing newsletters with home sustainability tips, organizing ‘green challenges’ for families, inviting parents or community experts to share their environmental skills, or collaborating on school gardens and recycling initiatives. Field trips to local parks, nature centers, or community gardens further expose children to broader ecosystems and foster civic pride. Community involvement also supports cultural relevance and contextual learning, making sustainability a shared social endeavor.

6) Modeling Behavior:

Children are keen observers, often learning through imitation. Teachers and caregivers play a powerful role by consistently modeling sustainable habits, such as careful use of resources, mindful shopping, respect for non-human life, and collaborative problem-solving. Discussing the reasoning behind choices (“I’m bringing my reusable bag because it helps reduce plastic waste”) adds an explanatory layer that enhances understanding. Importantly, adults who acknowledge their own learning and mistakes model a growth mindset.

7) Play-Based Approaches:

Play is the natural language of young childhood. Integrating sustainability education through playful activities not only makes learning enjoyable but supports holistic development. Dramatic play areas could represent a farmers’ market, zoo, or recycling center; water tables can be used to explore concepts like pollution, filtration, and conservation; building blocks can inspire designs of green cities or animal habitats. Play enables children to experiment, negotiate, and solve problems creatively, laying the groundwork for transferring these skills to sustainability contexts.

8) Culturally Responsive Curriculum:

Sustainability must be meaningful and relevant for all children. This requires curricula that respect and reflect diverse home lives, values, languages, and traditions. Encouraging children to share stories of sustainability practices from their families or cultures, such as methods for conserving water, traditional planting techniques, or special nature celebrations, honors their identities and broadens everyone’s perspective. Involving elders or cultural leaders in the classroom and celebrating the cultural dimensions of caring for the earth build bridges between generations and worldviews. This approach not only strengthens engagement but ensures inclusivity and equity in sustainability education.

In summary, the effectiveness of ESD in the early years’ hinges on intentional, reflective practice. Going beyond superficial gestures, educators should challenge children as thinkers and actors, while safeguarding their emotional well-being and honoring their diverse backgrounds. With such thoughtful strategies in place, early childhood ESD can sow the seeds for a more sustainable, just, and resilient generation.

7. Conclusion: Towards Critical and Transformative ESD in Early Years

Sustainability education in early childhood is not merely suitable; it is fundamental for preparing future generations to respond adaptively to pressing global challenges. Neuroscience and developmental psychology both affirm that young children are active constructors of meaning, capable of deep engagement with sustainability through carefully designed, age-appropriate, and inquiry-driven learning experiences. Early years education thus holds enormous potential to foster foundational knowledge, ethical awareness, and social responsibility. However, for ESD to be

genuinely transformative, its integration in early childhood must go beyond isolated lessons or symbolic green gestures. It requires a consistently thoughtful approach that values pedagogical depth, emotional wellbeing, and close attention to developmental needs. Educators must be well supported through sustained professional development so that ESD becomes embedded throughout the curriculum and is not treated as an add-on or afterthought.

It is equally vital to ensure that ESD is inclusive and culturally situated. Practices should draw on children lived experiences, family knowledge, and local community realities, making sustainability a lived value rather than an abstract ideal. Such meaningful engagement equips children not only with understanding but with the agency to question, reflect, and participate actively in shaping a more just and sustainable world. Embedding ESD in all aspects of early childhood education, whether through play, everyday routines, collaborative inquiry, or partnerships with family and community nurtures environmental awareness alongside resilience, empathy, and a strong sense of agency.

In summary, early childhood represents a critical window for building the foundations of sustainability, and the stakes for getting it right are high. By approaching ESD with critical reflection, creativity, and commitment, educators can inspire young children to become stewards of both their local communities and the wider world—planting the seeds for a sustainable future, beginning right from the start of life.

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