Pedagogy for Sustainability: Reorienting Education in an Era of Global Crises

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[1]Rachana Singh, [2]Dr Pooja Singh, [3]Dr Shalini Singh, [4]Dr Shubhanker Yadav
[1/2/3/4]Assistant Professor
[1]Ashoka School of Business, Sarnath, Varanasi, [2]Faculty of Management Studies, The M.S. University of Baroda, SoC, [3]Finance and Accountancy, Christ Deemed to be University, Delhi NCR, [4]Jaipuria Institute of Management Lucknow
[1]bisenrachana26@gmail.com, [2]psngh87@gmail.com, [3]shalini.dec1226@gmail.com, [4]shubanker141@gmail.com
https://doi.org/10.64882/ijrt.v14.iS1.1030

Abstract

The contemporary world is facing unprecedented environmental, social, and economic challenges arising from climate change, ecological degradation, and unsustainable patterns of production and consumption. Despite growing awareness and policy initiatives, meaningful progress towards sustainability remains limited, underscoring the need for deeper value transformation among individuals and societies. Education plays a critical role in addressing this gap by shaping worldviews, ethical responsibility, and critical consciousness. This paper critically examines the evolution of pedagogy for sustainability within the broader framework of Education for Sustainable Development (ESD), as promoted by UNESCO and embedded in the United Nations Sustainable Development Goals, particularly SDG 4.7. The study traces the shift from early environmental education focused on awareness and conservation to transformative, learner-centred pedagogies that emphasise critical thinking, social justice, and ecological responsibility. It further explores the tensions between sustainability education and dominant paradigms in business and management education, which have historically prioritised economic growth and profit maximisation, often conflicting with planetary limits. Focusing on the Indian context, the paper analyses the implications of the National Education Policy 2020, which advocates holistic, experiential, and transdisciplinary learning for sustainability. However, it argues that pedagogical practice remains constrained by rigid curricula, examination-oriented systems, and inconsistent teacher preparedness. The paper concludes by highlighting the fragmented and under-researched nature of sustainability pedagogy in India and calls for transformative, value-oriented educational approaches aligned with global sustainability imperatives and local socio-cultural realities.

Keywords*:* Education for Sustainable Development; Pedagogy for Sustainability; Transformative Learning; National Education Policy 2020; Sustainable Development Goals; India

Introduction

In a fast-paced, virtual world of monotonous uncertainty, cut off from the social and natural linkages of production that sustain our own survival, our way of life is unsustainable

since we are exhausting the planet's resources (Hay, 2005). Hence, all species are affected by climate change, air pollution, and other factors, which also have a catastrophic impact on ecosystems and the environment (Ahmad et al.,2020). Although many actions have been undertaken to reverse these unsustainable trends, no fruitful results have been seen, which could be due to an insufficient understanding or underestimation of potential outcomes by citizens-consumers (Kopnina, 2015). Here, the role of education becomes crucial and indeed pivotal to find solutions and build a more sustainable world (Broman & Robèrt 2017; Scalabrino et al., 2022). Education for Sustainable Development (ESD) is how UNESCO has responded to these pressing issues facing our world (UNESCO 2025). The concept of sustainability in education has undergone significant alteration in meaning over the past fifty years (Agbedahin, 2018). A substantial focus of the 1970s and 1980s was on environmental education-increasing knowledge about pollution and conservation. In the 1990s, the Rio Earth Summit of 1992 introduced the concept of ESD, incorporating social and economic dimensions in addition to environmental ones (Agbedahin, 2018; Tilbury, 1995). Community-centred, critical, and transformative pedagogies that aimed at changing people's beliefs and worldviews, rather than just their knowledge, were beginning to be highlighted by educators in the 2010s (Sterling, 2010). Since 2015, the United Nations Sustainable Development Goals have framed sustainability education as a global imperative (UNSDGs). Knowledge and skills acquisition for global citizenship, human rights, and sustainable development are highlighted in Goal 4.7 (UNESCO, 2017).

Yet, business schools have continued to espouse the ideals of economic growth, profit maximisation, and resource competition-through free-market capitalism-that increasingly contradict the ecological constraints now facing the planet. However, with the recent occurrence of natural calamities, pandemics, and social awareness, a shift has taken place toward socially responsible practices by businesses. Despite growing awareness of sustainability, humanity continues to overshoot the limits of the planet, providing opportunities for alternative approaches to education that encourage critical thinking and contest the internal contradictions of free market capitalism and its inability to address the crisis.

Pedagogy is the art, science, and philosophy of teaching-meanings and relationships that convey and build information, morals, and competencies. Alternatively, pedagogy could be defined as education directed at social ends (Hinchliffe 2001). Sandri (2020) expanded on a definition of pedagogy that emphasised a teacher's implicit philosophy and competencies, more than any other factor, influence learning, particularly in cases where transformational educational outcomes are pursued in response to complex global problems. WCED (1987) defined sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs. A pedagogy for sustainability answers the question, 'how might education contribute to social justice, ecological responsibility and critical awareness?' It challenges students to consider possible futures where human well-being is intertwined with the health of the Earth, and simultaneously challenges dominant discourses of growth and development.

The NEP 2020 has upgraded pedagogy for sustainability in India by promoting holistic, transdisciplinary, and experiential learning (Government of India, 2020). However, pedagogical vision has remained practically incarcerated because of strict curricula, exam-oriented institutions, and inconsistent teacher preparation. Furthermore, India's rich socio-cultural diversity makes sustainability education particularly important (MA, 2025; Lahiri, 2024; Leder, 2018). Finally, the global crises, in the form of rapid climate change and resource depletion, increasingly demand a shift in education from mere knowledge-based learning to a value transformation. Sustainability education is thus theoretically fragmented and empirically under-researched, despite a gradually increasing number of initiatives and policies in the Indian context (Hande, 2024). This paper critically analyses the development of the pedagogy for sustainability, its major theoretical underpinnings, and how it aligns with India's transitioning education and the UN SDGs.

Scope and Methodology

This paper aims to examine the evolution, theoretical frameworks, and implementation of pedagogy for sustainability in the Indian educational system. The analysis in this paper is threefold:

a) Conceptual evolution: The transformation of education from environmental education in the 1970s to the current pedagogical frameworks of transformative, experiential, and eco-pedagogy, represent the historical development and indicate a conceptual evolution with educational implementation as sustainability education.

b) Theoretical analysis: It considers how three of the most common learning theories, namely, transformative learning by Mezirow (1997), experiential learning by Kolb (1984), and eco-pedagogy by Freire (1970) affects teaching and learning of sustainability education.

c) Contextualizing the pedagogical application in the national agenda: It highlights and maps the potential applications of any of these pedagogies/learning theories to national agendas, like India's National Education Policy 2020 and international sustainability agenda like the United Nations' Sustainable Development Goals.

While this study is relevant to all levels of education, this review of literature is focused on teacher education and higher education. Contextually, this paper is focused on a Indian research, but with the conceptual lens offers a global perspective for formative and comparative insights. In doing so, this study draws together literature to identify theoretical deficits, practical barriers, and opportunities to advance the implementation of sustainability education through pedagogical practice or pedagogy model, it does not offer empirical fieldwork to enhance practical application of development.

Literature Review

i) Pedagogy for sustainability

According to a UN conference in 1992, "Education is vital for furthering sustainable development and enhancing people's capacity to deal with environmental and development issues" (UN-RIO, 1992, para. 36.3), which recognised the significance of placing environment and development education together. Environmental Education for Sustainability (EEfS) was born product of the call from academics for an environmental education reform with

development as a new priority. Pedagogy for sustainability is more than the traditional teaching methods, which is generally transmission based, i.e. the transmission of skills, knowledge and values to learners. Pedagogy for sustainability is a transformative approach to education that enables critical and systemic thinking and active engagement with multifaceted ecological and social issues. In the 1970s, environmental education originally was concerned with awareness-raising and encouraging personal behavioural change (Gough, 1999). It was seen as too technical and distant from social and cultural truths (Jickling & Wals, 2008). The definition of sustainability education moved forward to embrace not only an environmental perspective but also ethical, cultural, and political aspects. Tilbury (1995) and Sterling (2001) also argue that in addition to educating about sustainability, education must also 'be' sustainable in its own institutions and principles. Gutierrez-Bucheli (2025) conducted a study focused on how an engineering curriculum at an Australian university reacted to sustainability. It was reported that a transformative impact is supported by experiential learning and to learn in a way that was engaging and invited active learning and reflection. Another study conducted by Cordaro and Murphy (2025) undertook a systematic review and stated that systems thinking, critical thinking, and teamwork are the commonly occurring features in educational pursuits. Ghosh (2025) undertook a research study and reported in India, the major barriers preventing higher education institutions (HEIs) in India from embedding sustainability in management education, are; student apathy, not having space in the curriculum, and educator disinterest in teaching sustainability and related topics.

ii) Theoretical Framework - A Review in the Indian Context

Transformative Learning Theory (TLT)

The theory that arguably provides some of the best conceptual underpinnings for sustainable pedagogy is Transformative Learning Theory, as proposed by Mezirow (1997). It postulates that learning becomes transformative when people critically analyse and update their presumptions about the world, which, in the context of sustainability, means a shift from anthropocentric to ecocentric worldviews. Christie et al. (2015) believe that such learning processes, including discussion and introspection, foster systemic thinking, ethical reasoning, and empathy-all qualities considered imperative for sustainable living. Therefore, the focus of transformative pedagogy shifted from knowledge acquisition to the development of consciousness.

Several excellent theoretical considerations directly bear on the suitability of TLT for India, like Dhanraj et al. (2024) and Tyagi et al. (2025), stated the importance of transformative learning to enable children and young people to address problems both individually and collectively and promote a sustainable future, and to develop the proper mindset and character. Among the criticisms leveled against it, it is often seen as adopting a universal model of adult development and tending toward a very rational and decontextualised conception of learning (Moyer & Sinclair, 2020; Winter et al., 2015). Of most significant relevance is the tension between promoting individual change and enabling social action. An over-individualistic emphasis on perspective transformation risks neglecting the need for collective, systemic change when addressing India's severe sustainability problems, which are inherently structural

in nature and involve, for example, severe pollution, low labour standards, and entrenched social injustice. As noted by Boström et al., (2018) the structural and cultural factors are typically not systematically theorised in transformative learning theory, hence collective approaches and group identities are more culturally significant in India than individualistic frameworks, so there are strong resonances between this emphasis on the collective and other, more general criticisms of Western social science methodologies, which are often seen as culturally ill-matched.

Eco-pedagogy

Eco-pedagogy is an approach with moral and political dimensions, drawing from Paulo Freire's critical pedagogy originally formulated in 1970. Eco-pedagogy counters the commonplace nature of consumerism and economic growth that are destabilizing the environment. Kahn (2010) defined ecopedagogy as a form of education that develops "planetary consciousness," or a shared responsibility for the state of the planet. This type of work starts to feel particularly relevant in India, as many social justice issues, questions of land use and all other matters related to Indigenous rights can be related back to sustainability issues (Gadgil & Guha, 2000). Mukherjee (2019) stated, ecopedagogy can allow students to see environmental issues, not as scientific issues perpetuated by capitalism and colonialism, but as moral issues, as issues of fairness and coexistence.

Experiential Learning Theory

By underscoring the necessity of learning from experience, Kolb's (1984) theory of experiential learning expands transformative and critical thinking practices. Kolb states that learning takes place through cycles of action and reflection, wherein students experience things in the world, reflect on what happened, and reapply their new knowledge in the experience. Thus, rather than learning about sustainability, a teaching method will allow students to transform their emotionally and cognitively engage with sustainability by immersing students in authentic experiences, such as managing waste, conservation and energy action, and biodiversity projects (Sipos et al., 2008). We can particularly see this in various Indian courses incorporating campus greening and the Swachh Bharat Abhiyan, or Clean India Mission. Cornet et al. (2024) in their work shows the efficacy of implementing experiential learning to encourage learning for sustainability within India.

iii) Indian Indigenous Knowledge Systems (IKS)

Indigenous Knowledge Systems (IKS) is considered a diverse and expansive assemblage of knowledge, interpretation, and understanding of local ecosystems created by Indigenous + Native peoples through their connection and engagement with the natural environment, individual or community experiments, and observation (Moitra & Madan, 2025). Various forms of studies, including documents and papers, have been fairly consistently emerging over time that incorporate the ways IKS has been considered valuable and important in the context of education for sustainability, and often multiple other contexts too. For example, Barua and Mahanta (2021) state that by bringing traditional ecological knowledge into the context, this allows for continuity of cultural ways of knowing and helps contextualise sustainability. It has long been evident in Indian culture that there is respect for the environment

and a social responsibility that their culture has portrayed either in their traditional "gurukul" settings or other regional traditions (Gadgil & Guha, 2000). On the other hand, traditional epistemologies were excluded in favour of the Western scientific model in conventional education. The re-linking between IKS and formal education has cultural and ecological enrichment. Education becomes more relevant to local realities with the integration of IKS into the curriculum, allowing students to assess and compare different sources of knowledge for the benefit of the community. Long-standing Indian philosophical foundations reinforce the argument. The Atharva Veda, for example, embodies an attitude of respect towards nature, which has traditionally shaped resource use, joining together concepts of a circular economy and interconnection by viewing the Earth as a mother and everything else as her children.

In contrast, Moitra and Madan (2025) found that, although stakeholders felt Ayurveda had the potential for personal nutrition and health advancement, they did engage in self-directed learning about IKS to include in the curriculum. Stakeholders were reluctant to proceed with IKS use because the guidelines, policies, and other institutional work plans were not clearly articulated. Additionally, reservations were expressed regarding the students' preparedness to absorb the ideas of IKS without prior experience in the earlier stages of education.

iv. Alignment of NEP-ESD

While such initiatives, like UNESCO's Global Action Programme from 2014 to 2019, have institutionalised education for sustainable development globally, India's NEP 2020 embraces both through its strong advocacy for ethics, environmental stewardship, and critical thinking. Through this, NEP 2020 moves away from the rote memorisation developed over the past century. Consistent with these international frameworks, NEP 2020 targets competency development geared toward positioning graduates in the job markets of the 21st century. In doing so, the policy fosters critical thinking, problem-solving, and vocational training in ways that promote gender equality, as targeted in SDG 5, in addition to sustainable economic growth, emphasised in SDG 8. While the ESD principles provide the action-based and participatory pedagogy needed to connect classroom learning with real-world sustainability, the policy provides structural support for the same. However, there are barriers, including curricular integration issues, teacher preparation, and assessment techniques. Singh and Misra (2022) noted that, instead of being integrated into all fields of study, sustainability education remains confined to only a few courses or extracurricular activities. Secondly, the core concept of the SDG framework is "leave no one behind." Yet, India continues to suffer from significant socio-economic disparities and challenges related to the delivery of resources and quality education in remote areas. Thirdly, efficient, outcomes-based monitoring systems under the NEP 2020 are either immature or poorly executed. This shortcoming is serious, as well-thought-through, results-based monitoring seriously compromises NEP 2020's strong formal alignment with SDG 4.7: ESD risks remaining an input requirement (curriculum integration for compliance) rather than a verifiable output measured by transformative competency in the absence of M&E tracking real improvement in the competencies of learners, such as critical consciousness and systems thinking. It is for this reason that institutions can continue to attain obligatory standards

without actually effecting the needed cognitive and behavioural changes prescribed by the 2030 Agenda.

Discussion

The review suggests that the first pivotal outcome concerns the theoretical and historical development of sustainability education. This discipline moved from what was exclusively environmental education in the 1970s that primarily focused on awareness raising and conservation, to education for sustainable development in the 1990s, and in contemporary times, pedagogy for sustainability (Sterling, 2013). Sustainability education is pedagogy which goes beyond simply delivering knowledge to develop systems thinking and worldviews (Tilbury, 1995; Sterling, 2010). As a result, this demands a pedagogical framework which represents not only the delivery of knowledge, but also reflection, empathy, and emotional and moral responsibility. This transition in view in India now coincides with the National Education Policy (2020) which accentuates holistic & multi-disciplinary educational learning. Prior research indicates that sustainability pedagogy is successful in an applied setting grounded by useful theoretical frameworks, such as Transformative Learning (Mezirow, 1997), Experiential Learning (Kolb, 1984), and Ecopedagogy (Freire, 1970). These informative theories therefore provide a foundation for values-based, action-oriented education. Experiential learning takes place in the Indian context through initiatives such as the Swachh Bharat Abhiyan or green campus activities, which provide a site for sustainability education based on situated realities. In fact, the evidence suggests that when learning is experiential or participatory in nature, students are able to learn more deeply and become more motivated (Cornet et al., 2024). This also provides the basis for the assertion that if we are to achieve deep behavioural change, then sustainability education engaging both mind and heart, will be sustainable.

Additionally, the research underlines the additivity of Indigenous Knowledge Systems, to advance sustainability pedagogy. Traditionally, ecological knowledge has been linked to Indian consciousness through processes based on living in harmony and compassion (Gadgil & Guha, 2000). Scholars like Barua and Mahanta (2021) argue that by collaborating indigenous and local knowledge with traditional schooling, sustainability learning could become culturally meaningful and context relevant. The review also reports an increasing number of research projects, including Masoga and Shokane (2019), Kumari (2025), and Das and Halder (2025), which offer academic rationale for the integration of traditional ecological knowledge, Ayurveda, and community-learning strategies in sustainability education curricula. Notably, strict syllabi, lack of faculty training, and sparse institutional policy frameworks impede large-scale use (Tharakan, 2015; Yadav & Patil, 2025). Joining IKS with contemporary sustainability education thus, opens an inclusive option, which validates cultural diversity as a meaningful part of sustainability. Frameworks such as UN SDG 4.7 and UNESCO ESD are another example, which seek to support transformative learning as a way to embrace sustainability, human rights, and global citizenship. Additionally, critical and multidisciplinary education founded on sustainable principles, is under consideration within India's NEP 2020. The research study by Singh & Misra (2022) illustrates that, in spite of such alignment, significant issues still need to be tackled, such as, their poor preparation of teachers, incoherent

curriculum, lack of curricular integration across disciplines, and assessments that assess for memorisation over critical thinking. These studies indicate that changes to the systems will need to occur to sustain and institutionalise, such as developing newer assessments that assess skills such as ethical reasoning, teamwork, and problem-solving, along with faculty capacity-building initiatives.

Conclusion

Teaching for sustainability represents a significant change in how we think about education. It reimagines learning as the development of ecological consciousness, social responsibility, and ethical engagement instead of the transfer of knowledge generally associated with teaching. There is a teaching-with-an-environmentalist component in courses on sustainability education. However, just as importantly, is the change pedagogy makes to people's sense of self, and their relationship with the earth and others. The review presents that at core of sustainability pedagogy are constructs of transformative, experiential and critical pedagogy concepts; its success is extent that local realities are linked to global objectives. Sustainability pedagogy is most successful when it is tied to reflection and action. Further, the incorporation of IKS represents pedagogy for sustainability which provides meaning and inclusion, especially in a multicultural country like India. As it engages people with contemporary issues in sustainability, it fosters cultural continuity, and acknowledges traditional ecological knowledge and wisdom. India's policy framework is indeed highly supportive with the UNSDG and NEP – 2020 frameworks. However, the transition from policy to practice requires ongoing engagement, innovation, and teacher support. Finally, pedagogy for sustainability needs to be framed as a principle that shapes teaching and learning across the education levels, rather than as a sub-field of learning. It can lead to generations of learners who are informed and inspired to take action and become citizens that lead the way toward a just, equitable and environmentally resilient world. Education must help to cultivate the values of empathy, justice and shared responsibility if it is to achieve true sustainability.

Implications of the study

For Educational Practice: This study suggests a move away from traditional, "transmissive", content-based education to transformative, interactive, indigenous, and experiential learning paradigms which may more effectively develop students' capacity for critical thinking, ethical reflection, and ecological literacy through embedding sustainability into every area of study, not just offered as electives.

For Policy and curriculum design, policy actors worldwide should incentivise interdisciplinarity, making sustainability a primary theme across the curriculum and create evaluative systems that capture values, skills, and competencies not just student knowledge. The contextualisation, accessibility and cultural relevance of sustainability education can further be enhanced through the framework of Indigenous Knowledge Systems.

For Institutional Development: By combining teaching, research, and community engagement higher education can develop "living laboratories" for sustainability. Universities and teacher training facilities should offer faculty development programs that enhance educators' capacities in sustainability pedagogy, participatory learning, and reflective practice.

Scope for Future Research

- To close the current knowledge gap about the actual impact of ESD, research is required to assess the long-term results and effectiveness of ESD initiatives in India, specifically by measuring the development of sustainability consciousness, critical literacy, and behavioural change through mixed-method and longitudinal research.
- To conduct an investigation through systematic integration of indigenous, community-based, and place-based knowledge into sustainable education, which could include creating curricula and evaluation frameworks that, especially in the Indian context, combine conventional knowledge with cutting-edge sustainability science.
- Future studies should examine institutional systems, instructional challenges, and learning outcomes to evaluate progress of sustainability pedagogies in Indian higher education.

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