Rethinking Education in the Anthropocene: Reclaiming Indian Knowledge Systems for a Regenerative Curriculum

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ABSTRACT

Sustainability education has gained increasing global and national policy attention. Yet mainstream curricula continue to draw predominantly on Western pedagogical and scientific frameworks. This marginalises indigenous ecological knowledge as a legitimate source of sustainability learning. This conceptual paper argues that indigenous ecological knowledge, the foundational strand of Indian Knowledge Systems (IKS), offers an under-utilised basis for a regenerative curriculum suited to the Anthropocene. Drawing on transformative learning theory and ecological literacy, the paper analyses how colonial legacies and anthropocentric curriculum design have historically excluded indigenous ecological wisdom from formal education. It provides scope for integrating practices like conservation of sacred groves, traditional water management and Gandhian *nai talim* in the designing of curriculum. The paper argues that the reclaiming of Indigenous Knowledge Systems is not simply about cultural preservation but it is a pedagogical imperative for developing ecologically literate and ethically grounded citizens who can respond to the converging crises of the Anthropocene.

Keywords: Anthropocene, Indigenous Knowledge Systems, sustainability education, curriculum design, decolonising education, regenerative learning

INTRODUCTION

The twenty-first century marks a decisive turning point in the relationship between human societies and the Earth's biophysical systems. Scientists increasingly describe the current epoch as the Anthropocene which is a proposed geological epoch in which human activity permeates planetary systems (Steffen, 2021; Hibbard et al., 2006). The Anthropocene encompasses global warming, accelerating species extinction and resource depletion (Steffen et al., 2011; Crutzen, 2002). These are questions of not merely scientific but of deeply educational importance. They reflect how societies have been taught to perceive, value and act upon the natural world (Sterling, 2010; Bonnett, 2004). Education has not directly caused these crises. But, conventional curricula are compartmentalised and anthropocentric, largely inherited from industrial-era models of progress. Such curricula have done little to rupture the worldviews that sustain ecological crises. This leaves the learners ill-prepared to respond (Kumar, 2005; Orr, 1992). Over the last two decades, sustainability education has therefore become a significant issue in global policy discourse. UNESCO's Education for Sustainable Development (ESD) framework and the Sustainable Development Goals (SDGs) have placed education as a key lever for sustainable futures (UNESCO, 2021; 2017). Considerable literature has explored ways to embed sustainability into curricula. This includes work on interdisciplinary learning (Wals, 2010), ecological literacy (Capra, 1996; Orr, 1992) and transformative pedagogy (Sterling, 2010; Mezirow, 1997). These frameworks converge on a common premise i.e. sustainability is not an extra subject that can be taught within the existing disciplinary boxes. Rather, it requires transforming the underlying values, assumptions and relationships on which curricula are based (Selby & Kagawa, 2010).

In India, this question arises at a particular juncture. From the nineteenth century, the needs of the colonial administration shaped the formal education system which was designed to produce a workforce oriented towards industrial and bureaucratic economies rather than ecological stewardship (Nambissan, 2012; Kumar, 2005).

Post-independence policies have gradually recognised environmental education as a necessity and successive documents, namely the National Policy on Education (Ministry of Human Resource Development, 1986), the National Curriculum Framework (NCERT, 2005) and the National Education Policy (Ministry of Education, 2020), have given it an increasing emphasis. However, researchers have found a persistent gap between policy intent and practice in the classroom. Students often acquire a general awareness of sustainability concepts but this rarely translates into sustained ecological action and teachers, though familiar with the language of the SDGs, often do not apply it meaningfully in instruction (UNESCO, 2021; Kumar, 2005). What remains far less examined in this literature is the epistemological dimension of this gap. India possesses a rich and continuous tradition of ecological knowledge embedded in indigenous practices. These include sacred grove conservation, community-based watershed and water-harvesting systems and traditional agroforestry systems such as the *zabo* system of Nagaland. They also include Gandhian educational philosophy centred on labour, locality and self-reliance (*nai talim*) and community forest governance through *van panchayats* (Shiva, 2005; Gadgil & Guha, 1992; Kumarappa, 1945). These systems encode sophisticated ecological understanding developed over centuries of sustained human-environment interaction. But they remain missing from the mainstream curricula of sustainability which still rely heavily on Western scientific and pedagogical frameworks (Sundberg, 2014; Shiva, 2005). Scholars of decolonial and indigenous education argue that this exclusion is structural and not accidental. It is a reflection of the legacy of colonial epistemic hierarchies that positioned Western science as universal and indigenous knowledge as merely local or pre-scientific (Sundberg, 2014; Battiste, 2002). Despite growing global interest in decolonising sustainability education, Indian scholarship has yet to conceptually articulate how indigenous ecological knowledge might be systematically integrated into curriculum design, rather than referenced symbolically.

This paper addresses that gap. It argues that transformative learning and ecological literacy frameworks already provide a sound theoretical basis for sustainability-centred curriculum reform and for incorporating indigenous ecological knowledge. However, this link has received little attention in the literature. The paper therefore examines conceptually how indigenous ecological knowledge can be systematically embedded in curriculum design, with the aim of laying the conceptual basis for a regenerative model of sustainability education suited to the Indian context in the Anthropocene. It is a conceptual study, synthesising theoretical literature, historical and policy analysis, and documented indigenous ecological practices, rather than an empirical one. It first establishes the theoretical rationale for integration, then examines the historical marginalisation of indigenous ecological knowledge in Indian education, next develops a case for reclaiming specific practices as curricular resources, and finally considers how implementation can be institutionalised.

THEORETICAL FOUNDATIONS FOR IKS-INTEGRATED SUSTAINABILITY EDUCATION

Education in the Anthropocene requires more than incremental curriculum reform. It demands a paradigmatic shift in how knowledge, learning and human-environment relationships are conceptualised. Two theoretical frameworks, transformative learning and ecological literacy, converge to provide the conceptual scaffolding for this shift. Each opens a direct pathway toward indigenous ecological knowledge as a substantive curricular resource rather than a peripheral cultural addition. In Mezirow's (1997) transformative learning theory, deep learning takes place when people critically reflect on their assumptions and reframe their worldviews. This is not just the addition of new information into existing frames of reference. In education for sustainability, this means questioning common assumptions about consumption, growth and human dominance over nature. Most of these ideas are inherited from the colonial and industrial models of progress that continue to shape the Indian curricula (Kumar, 2005). Indigenous ecological knowledge provides the kind of alternative worldview that transformative learning requires learners to encounter. IKS traditions see communities as embedded participants within ecological cycles, rather than seeing nature as a resource to be managed and extracted. These traditions are bound by reciprocal relationships of care and dependency (Shiva, 2005; Gadgil & Guha, 1992). This is in line with Freire's critical pedagogy that is focused on empowering learners to question the dominant social and epistemic structures (Freire, 1970). The dominant structure here is the presumed universality and superiority of Western scientific rationality over indigenous ecological reasoning (Sundberg, 2014; Battiste, 2002). Encountering IKS in the classroom is therefore not merely an exercise in cultural appreciation. It constitutes

precisely the kind of disorienting dilemma that transformative learning theory identifies as necessary for genuine perspective change (Mezirow, 1997).

Ecological literacy, introduced by Orr (1992) and expanded by Capra (1996), provides a complementary and equally direct bridge to IKS. It operationalises the shift differently. Where transformative learning addresses the cognitive and dispositional change required of learners, ecological literacy specifies what learners must concretely come to know and perceive. This includes the systemic interdependence of human and natural systems, understood not abstractly but through direct as well as place-based engagement with local ecosystems (Orr, 2004). This is a demanding pedagogical standard. Conventional environmental science curricula struggle to meet it, since they typically convey ecological concepts through generalised and often decontextualised content rather than lived as well as local observation (Capra, 1996). Indigenous ecological practices resolve this difficulty because they are, in effect, ecological literacy already institutionalised over generations of accumulated local observation. Sacred grove conservation encodes fine-grained biodiversity protection knowledge specific to particular landscapes. Traditional water-harvesting systems encode watershed management principles refined through centuries of adaptation to local hydrology and climate (Berkes, 2018; Gadgil & Guha, 1992). Where ecological literacy as a pedagogical goal must often be taught through simulated or imported case studies, IKS offers learners concrete, culturally embedded and immediately local demonstrations of ecological literacy already in living practice.

Taken together, these two frameworks perform distinct but mutually reinforcing work. Transformative learning explains why engaging with indigenous ecological knowledge is pedagogically necessary. It is precisely the kind of epistemic encounter capable of unsettling colonially inherited assumptions about nature and progress. Ecological literacy specifies what form that engagement should take, grounding sustainability learning in concrete, place-based and systemically aware practice. Neither framework was originally formulated with indigenous ecological knowledge in mind. Both, however, converge on pedagogical demands that IKS is uniquely positioned to satisfy. This is the central theoretical premise carried forward through the remainder of this paper.

THE MARGINALISATION OF INDIGENOUS KNOWLEDGE IN INDIAN EDUCATION

Despite their theoretical fit with sustainability education, indigenous ecological knowledge and the wider IKS remain largely absent from Indian curricula. The answer lies in the historical architecture of Indian education itself. Modern Indian schooling is based on the colonial model established under British rule. This model prioritised standardised curricula, examination systems and utilitarian knowledge that served administrative and economic purposes rather than ecological or cultural continuity (Nambissan, 2012; Kumar, 2005). It detached education from local ecologies and community life, and positioned Western scientific knowledge as universal and objective while treating indigenous ecological knowledge as folklore or superstition which is a pattern that decolonial scholars describe as an epistemic hierarchy (Sundberg, 2014; Battiste, 2002). Subjects were compartmentalised, and rote memorisation displaced the observational and experiential modes of learning through which indigenous ecological knowledge is traditionally transmitted (Berkes, 2018). These features have proved durable and continue to be acknowledged in recent policy (NCERT, 2023; Ministry of Education, 2020).

This exclusion persisted even after independence. The National Policy on Education (Ministry of Human Resource Development, 1986) and the National Curriculum Framework (NCERT, 2005) recognised the importance of environmental awareness. Both documents, however, gave little attention to indigenous ecological knowledge as a curricular resource in its own right. Environmental content remained confined to scientific and geographical framings. It was divorced from the knowledge systems of culture and community from which India's ecological traditions emerge (Shiva, 2005). This was a significant omission. Despite their stated commitments, reforms in sustainability education in India have therefore tended to reproduce a colonial epistemic hierarchy. Students learn about sustainability through imported frameworks, mainly from Western environmental science. Indigenous ecological practices such as sacred groves, traditional water management and community forestry are implicitly treated as cultural curiosities rather than as legitimate knowledge systems deserving of curricular integration (Gadgil & Guha, 1992).

This creates a curriculum that is structurally unable to decolonise itself (Shiva, 2005). The epistemological hierarchy that marginalised indigenous knowledge in the first place is still the basis for the frameworks introducing sustainability content. This omission can be addressed through the first major policy opportunity, the National Education Policy (Ministry of Education, 2020). Its distinct focus on holistic, multidisciplinary and experiential learning based on Indian knowledge traditions marks a significant change. This window, as the next section argues, can only be meaningfully utilised if IKS is integrated systematically into curriculum design rather than referenced symbolically.

RECLAIMING INDIGENOUS KNOWLEDGE SYSTEMS FOR CURRICULUM DESIGN

Reclaiming indigenous ecological knowledge for sustainability curricula is not a matter of supplementing existing content with cultural anecdotes. It requires treating specific indigenous ecological practices as substantive and teachable bodies of knowledge with their own methodologies, evidentiary bases and pedagogical logic. Three examples illustrate this potential concretely. Sacred grove conservation is practised across the Western Ghats, Northeast India and parts of central India. It represents a community-governed biodiversity conservation system in which specific forest patches are protected through religious and cultural sanction. These groves often preserve rare flora and fauna that formal conservation policy has failed to protect elsewhere (Gadgil & Guha, 1992). As curricular content, sacred groves offer students a living case study in community-based conservation governance. This can be studied through biology, social studies and ethics simultaneously. It demonstrates the kind of interdisciplinary engagement that ecological literacy theory calls for (Orr, 2004), while grounding it in a specifically Indian institutional practice rather than an imported model.

Traditional water-harvesting and watershed management systems, such as those historically developed in the arid regions of Rajasthan, similarly encode sophisticated hydrological knowledge adapted to local ecological conditions over centuries (Gadgil & Guha, 1992). Teaching these systems provides students the opportunity to develop ecological literacy (Orr, 2004) through a tangible and regionally relevant perspective. Such study can be made scientifically rigorous. Students can trace the relationship between rainfall patterns, community labour and resource distribution; measure catchment area and storage capacity in a traditional structure; compare soil moisture and groundwater recharge with and without it, or survey species richness inside and outside a sacred grove using standard sampling methods. In the same way, the soil biology of natural farming and *zabo* systems can be examined through testable questions about organic matter and microbial activity. Treating indigenous practices as hypotheses to be investigated with the methods of ecological science, rather than as articles of faith, is what lets the ‘evidentiary bases’ claim stands.

This is far more grounded than abstract global case studies disconnected from students’ own environments. Gandhian *nai talim* offers a third resource. It is an explicitly Indian pedagogical philosophy built on learning through productive manual work, self-reliance and community service (Kumarappa, 1945). Unlike sacred groves or watershed management, which are primarily content resources, *nai talim* offers a pedagogical model. It is directly compatible with the experiential and transformative learning approaches called for by Mezirow (1997) and Dewey (1938) while remaining rooted in Indian educational philosophy rather than borrowed frameworks.

Operationalising these resources requires a shift from textbook-based instruction toward place-based learning. Local landscapes, elders and community practices should become primary curricular sources (Shiva, 2005). Students should be encouraged to record traditional farming or water management techniques unique to their region. They might interview community elders about ecological practices of the past or map local biodiversity in relation to sacred or protected sites. This form of engagement does convey more than of ecological content. It repositions indigenous communities as knowledge holders rather than subjects of study, directly addressing the epistemic marginalisation discussed in the previous section (Battiste, 2002). Indigenous ecological knowledge should be presented as dynamic and evolving, not as a fixed inheritance. Learners should be invited to question, experiment, enlarge and compare it with other indigenous traditions globally and with contemporary Earth System Science. Some practices may be contested, adapted, discarded or superseded. This critical openness is consistent with the Freirean and Mezirow-based orientation of the paper, and it avoids replacing one fixed epistemic hierarchy with another. It is this systematic and methodologically serious integration of IKS, rather

than isolated cultural references, that distinguishes the regenerative curriculum model proposed here from existing sustainability education approaches in India.

TOWARD IMPLEMENTATION: INSTITUTIONAL AND POLICY PATHWAYS

Without the institutional and policy support needed, the simple redesign of curricula will not sustain IKS integration. The National Education Policy (Ministry of Education, 2020) provides a timely and explicit policy mandate for this work. It claims to be rooted in IKS, holistic and multidisciplinary learning. This mandate was largely absent from earlier policy frameworks such as the 1986 National Policy on Education or the 2005 National Curriculum Framework. Neither engaged indigenous knowledge as a substantive curricular category (NCERT, 2005; Ministry of Human Resource Development, 1986). Realising this mandate, however, requires attention to two practical pathways i.e. teacher preparation and institutional practice.

Teachers require sustained training in engaging with indigenous knowledge holders and designing place-based learning activities. They must also recognise community ecological knowledge as a pedagogically legitimate content and not as further cultural material (Shiva, 2005). Specialised professional development modules would give educators both ecological content knowledge and the pedagogical confidence to work with community knowledge holders. Teacher preparation should precede full-scale school implementation, so that teachers are not asked to teach what they have not been trained to teach. At the institutional level, schools and universities can further strengthen IKS integration through partnerships with local communities and indigenous knowledge holders. This would move sustainability education outside the classroom and into direct engagement with the ecological traditions it seeks to teach (Gadgil & Guha, 1992). Schools can make this concrete through local living laboratories, such as school gardens, watershed restoration projects and community compost hubs, where students practise regenerative principles directly rather than only studying them. Such partnerships would mark a significant departure from the largely symbolic sustainability initiatives common in Indian institutions such as observance days, isolated eco-clubs or one-off expert talks. A sustained and community-embedded model of curricular practice offers a genuine alternative.

CONCLUSION

This paper has argued that the Anthropocene calls for a fundamental reorientation of educational planning in India, from generic sustainability content to the systematic integration of indigenous ecological knowledge into curriculum design. Transformative learning theory and ecological literacy already offer a sound theoretical basis for treating this knowledge as a substantive curricular resource rather than a symbolic cultural add-on. Colonial epistemic hierarchies, however, have made Western environmental science the default framework in Indian education, obscuring the fact that India's own ecological traditions are both culturally embedded and theoretically compatible with these approaches. The paper identifies this underdeveloped link between established learning theories and India's indigenous ecological knowledge traditions, and suggests that it can be operationalised through scientifically rigorous, place-based pedagogy, specialised teacher training, institutional partnerships and living laboratories developed with knowledge holders. As a conceptual study, it does not test these proposals empirically, and future research should examine how they work in classrooms. The National Education Policy 2020 offers a timely policy opening; but its realisation will depend on sustained institutional commitment rather than symbolic gesture.

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