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**INCLUSIVE ENVIRONMENTAL EDUCATION
AND STUDENTS' ENVIRONMENTAL LITERACY:
A SYSTEMATIC REVIEW OF PARTICIPATORY AND ACCESSIBLE
PEDAGOGICAL STRATEGIES IN NIGERIAN UNIVERSITIES**

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ABSTRACT

Environmental literacy, defined as the integration of ecological knowledge, environmental attitudes, and pro-environmental behavioural competencies, is increasingly recognised as a critical graduate outcome for addressing Nigeria's escalating environmental challenges. Despite this importance, the effectiveness of environmental education in Nigerian universities is constrained not only by curricular and resource limitations but also by systemic issues of inclusion that exclude students with disabilities, low literacy backgrounds, and diverse cultural or linguistic orientations from meaningful participation in environmental learning. This systematic review synthesises peer-reviewed and grey literature on inclusive environmental education strategies and their relationship with environmental literacy outcomes, with specific relevance to Nigerian higher education institutions.

The review followed a structured systematic methodology involving a predefined research question, explicit inclusion and exclusion criteria, multi-database searching, and thematic synthesis of eligible studies. Evidence was drawn from both African and international higher education contexts where inclusive pedagogical approaches were implemented. The synthesis focuses on how accessibility-oriented instruction, participatory and community-based learning, integration of indigenous ecological knowledge, and Universal Design for Learning principles shape cognitive, affective, and behavioural dimensions of environmental literacy.

Findings indicate that inclusive environmental education approaches consistently enhance environmental literacy outcomes, particularly among students traditionally marginalised in conventional didactic learning environments. The review highlights five key evidence domains: conceptualisation of environmental literacy in African universities, structural barriers to inclusion in Nigerian environmental education, effectiveness of participatory pedagogies, governance and curriculum constraints, and the role of indigenous ecological knowledge in shaping inclusive learning frameworks.

The study concludes that strengthening environmental literacy in Nigerian universities requires a deliberate shift toward inclusive, participatory, and culturally responsive pedagogical systems rather than incremental curriculum adjustments alone.

Keywords: environmental literacy, inclusive education, environmental education, participatory pedagogy, Universal Design for Learning, indigenous ecological knowledge, Nigerian universities, Freire, Vygotsky, sustainability education, higher education, Nigeria

1.0 INTRODUCTION

Environmental literacy has evolved significantly since its early formulation by Roth (1968), shifting from a narrow focus on environmental knowledge to a multidimensional construct encompassing ecological knowledge, environmental sensitivity, attitudes, and pro-environmental behaviours (Hollweg et al., 2011; Orr, 1992). Contemporary understandings emphasise that environmental literacy is shaped not only by information acquisition but also by values, emotions, perceived behavioural control, and broader social contexts that influence how individuals engage with environmental issues. This expanded perspective is particularly relevant for higher education, where universities are expected to produce graduates capable of responding to complex sustainability challenges.

In Nigeria, the importance of environmental literacy is heightened by severe and escalating ecological pressures, including oil pollution in the Niger Delta, deforestation, desertification, coastal erosion, and rapid urbanisation (IPCC, 2022; NESREA, 2019; World Bank, 2020). Despite this urgency, environmental education in Nigerian universities remains largely constrained by traditional lecture-based pedagogies that prioritise factual knowledge over behavioural competence, values formation, and experiential learning (Ogunbode & Arnold, 2012; Omidiji, 2020). More critically, existing provision is often designed for a narrow student profile, excluding learners with disabilities, diverse linguistic backgrounds, and non-dominant cultural epistemologies, thereby limiting equitable access to environmental learning opportunities (Adefila et al., 2019; Kayode-Adedeji et al., 2020).

Such exclusion has important implications for environmental literacy outcomes, as unequal access to environmental education contributes to uneven competence development across student populations. This raises a key concern: environmental literacy in Ni-

gerian universities is shaped not only by curriculum content but also by the inclusiveness of its delivery systems. Addressing these inequities therefore becomes essential to improving the overall quality and impact of environmental education in the country.

From a social work perspective, particularly within the green social work tradition, environmental education is also an issue of social justice and inclusion. As argued by Dominelli (2012), environmental and social inequalities are deeply interconnected, and exclusion from environmental learning constitutes a form of structural disadvantage. This review is therefore positioned at the intersection of environmental education and social justice, examining how inclusive pedagogical approaches can strengthen environmental literacy while advancing equitable educational access in Nigerian universities.

1.1 Theoretical Framework

The relationship between inclusive environmental education strategies and environmental literacy outcomes is inherently multidimensional, requiring an integrated theoretical framework that accounts for behavioural change mechanisms, pedagogical power relations, accessibility structures, and socially mediated learning processes. This review therefore draws on four complementary perspectives—Hungerford and Volk's model of responsible environmental behaviour, Freire's critical pedagogy, Universal Design for Learning (UDL), and Vygotsky's social constructivism—to construct a unified explanatory lens for understanding how environmental literacy is developed, constrained, and potentially enhanced within Nigerian university contexts.

Hungerford and Volk's (1990) model of responsible environmental behaviour provides the behavioural backbone of the framework by explaining how environmental knowledge is translated into action. The model conceptualises environmental behaviour as the outcome of interacting variables organised into en-

try-level, ownership, and empowerment categories. Entry-level variables include environmental sensitivity and ecological knowledge, while ownership variables incorporate personal investment in environmental issues, issue-specific knowledge, and action skills. Empowerment variables—particularly locus of control and perceived ability to act—are identified as the strongest predictors of responsible environmental behaviour (Hines et al., 1987). This model challenges linear assumptions that knowledge acquisition alone leads to behavioural change, instead highlighting the importance of agency, skill development, and contextual empowerment. In the context of Nigerian universities, this implies that environmental education must move beyond lecture-based content delivery to include experiential learning, problem-solving tasks, and opportunities for students to engage directly with environmental issues affecting their communities.

Freire's (1970) critical pedagogy provides the socio-political and epistemological dimension of the framework. His distinction between the banking model of education and problem-posing pedagogy is particularly relevant to environmental education in postcolonial contexts such as Nigeria. The banking model, in which learners are passive recipients of knowledge, reinforces epistemic hierarchies that privilege Western scientific knowledge while marginalising indigenous ecological knowledge systems. By contrast, problem-posing pedagogy situates learners as active participants in the co-construction of knowledge, grounded in their lived experiences and socio-environmental realities. Applied to environmental literacy, Freire's framework highlights how environmental education can either reproduce exclusion or foster critical environmental consciousness (conscientisation), particularly when it engages with issues such as oil pollution in the Niger Delta, desertification in northern Nigeria, and deforestation in forest zones. It also underscores the importance of recognising students' local ecological knowledge as legitimate and

valuable forms of environmental understanding.

The Universal Design for Learning (UDL) framework (Rose & Meyer, 2002; CAST, 2018) provides the structural and pedagogical accessibility dimension of the analysis. UDL is grounded in the principle that educational environments should be designed to accommodate learner variability from the outset rather than retrofitted for accessibility. It is structured around three principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement. In environmental education, this translates into designing learning environments that do not rely exclusively on text-heavy materials, lecture-based delivery, or physically inaccessible fieldwork activities. Instead, it requires flexible instructional design that accommodates students with disabilities, diverse linguistic backgrounds, and varying levels of prior educational preparation. In Nigerian universities, where infrastructural and resource constraints are significant, UDL highlights both the necessity and the challenge of inclusive pedagogy, particularly in ensuring that environmental education does not systematically exclude vulnerable student groups.

Vygotsky's (1978) social constructivism, particularly the concept of the Zone of Proximal Development (ZPD), provides the developmental learning dimension of the framework. It posits that learning is most effective when it occurs through socially mediated interaction between learners and more knowledgeable peers or instructors. Environmental literacy, therefore, is not solely an individual cognitive achievement but a socially constructed process shaped by dialogue, collaboration, and cultural exchange. In Nigerian university classrooms, where students often come from diverse ecological and cultural backgrounds, this diversity becomes a pedagogical resource. Peer-to-peer learning allows students to share indigenous ecological knowledge, urban environmental experiences, and rural land-use practices, thereby enriching collective

understanding and expanding individual learning capacities within the ZPD.

Taken together, these four frameworks form an integrated analytical structure in which environmental literacy is understood as the product of behavioural empowerment (Hungerford & Volk), critical consciousness (Freire), pedagogical accessibility (UDL), and socially mediated knowledge construction (Vygotsky). This synthesis provides the conceptual foundation for analysing how inclusive environmental education practices can enhance environmental literacy outcomes in Nigerian higher education institutions.

1.2 Hypothesis

Drawing on the four theoretical frameworks presented above and the synthesis of Nigerian higher education and environmental education literature, this study advances a central hypothesis that inclusive environmental education constitutes a decisive determinant of environmental literacy outcomes in Nigerian universities. It argues that environmental literacy is not solely a function of content exposure, but is fundamentally shaped by how educational systems structure access, participation, cultural relevance, and learner agency across diverse student populations.

H1: Inclusive environmental education strategies—comprising accessible and multimodal instructional materials, participatory and community-based pedagogies, integration of indigenous ecological knowledge into formal curricula, and structural accommodations for students with disabilities and low-literacy backgrounds—produce significantly superior environmental literacy outcomes across cognitive, affective, and behavioural dimensions compared to conventional didactic approaches in Nigerian universities. These effects are expected to be strongest among historically marginalized learner groups and are mediated by perceived relevance, cultural resonance, and opportunities for active learner agency within the educational process.

Sub-proposition 1: Participatory and experiential environmental education will enhance environmental attitudes and behavioural intentions more effectively than lecture-based instruction.

Sub-proposition 2: Integration of indigenous ecological knowledge will improve environmental sensitivity and relevance, particularly among students from indigenous knowledge-rich communities.

Sub-proposition 3: UDL-aligned instructional design will reduce environmental literacy disparities among students with disabilities and low-literacy backgrounds.

Sub-proposition 4: Institutionalised inclusion policies and staff training in inclusive pedagogy will improve aggregate environmental literacy outcomes at the university level.

2.0 METHODOLOGY

2.1 Research Design and Protocol

This paper employs a systematic review methodology conducted according to a transparent and reproducible protocol, consistent with the definitional requirements of systematic reviews as distinguished from conventional narrative literature reviews by Gough, Oliver, and Thomas (2012) and by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement of Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, Brennan, Chou, Glanville, Grimshaw, Hrobjartsson, Lalu, Li, Loder, Mayo-Wilson, McDonald, McGuinness, Stewart, Thomas, Tricco, Welch, Whiting, and Moher (2021). The protocol was defined prior to literature retrieval and specified the research question, search strategy, inclusion and exclusion criteria, data extraction framework, quality appraisal approach, and synthesis method. This protocol-first approach is what distinguishes a genuine systematic review from a collection of papers organised thematically, as it en-

asures that evidence retrieval and synthesis are driven by a pre-specified logic rather than by post-hoc confirmation of preexisting conclusions.

The primary research question guiding this review is: what evidence exists that inclusive environmental education strategies—including accessible learning materials, participatory pedagogies, integration of indigenous ecological knowledge, and Universal Design for Learning (UDL)-informed instructional design—enhance environmental literacy outcomes among students in Nigerian and comparable sub-Saharan African university settings, and through what mechanisms, moderating factors, and institutional conditions do these effects occur? This question was developed according to the PICO framework adapted for educational research: Population (undergraduate and postgraduate students in Nigerian universities and comparable sub-Saharan African higher education institutions); Intervention (inclusive environmental education strategies); Comparison (conventional didactic environmental education); and Outcome (environmental literacy across its cognitive, affective, and behavioural dimensions).

2.2 Search Strategy

A comprehensive multi-database search was conducted to identify relevant peer-reviewed and grey literature. Databases searched included Scopus, Web of Science, JSTOR, Google Scholar, PubMed, ERIC, ScienceDirect, ProQuest Dissertations and Theses, and African Journals Online (AJOL), with ERIC included for education-focused studies and AJOL for African scholarship not well represented in global indexing systems. The search was conducted between January and March 2024 and covered publications from 1970 to 2024, with 1970 selected to capture foundational work following Freire's *Pedagogy of the Oppressed*.

Search terms were developed iteratively and combined using Boolean operators. Core strings includ-

ed environmental literacy, environmental education, and pro-environmental behaviour combined with inclusive education, UDL, participatory pedagogy, and disability-inclusive education, alongside geographic terms such as Nigeria, West Africa, and sub-Saharan Africa. Additional searches targeted indigenous ecological knowledge, critical pedagogy, place-based education, and policy-related terms including curriculum reform and environmental education governance in Nigerian higher education.

2.3 Screening and Selection Procedures

Retrieved records were screened in two stages. In Stage 1, titles and abstracts were screened against predefined inclusion criteria by the reviewer, with a random sample of 20 percent double-screened to assess consistency. In Stage 2, full texts of studies passing the abstract screen were retrieved and assessed against the full inclusion and exclusion criteria. The following inclusion criteria were applied: the study addressed any aspect of environmental literacy, environmental education, or environmental attitudes and knowledge in a university or higher education setting; OR the study examined inclusive education strategies, participatory pedagogies, UDL, or indigenous knowledge integration in educational contexts with generalisable implications for university environmental education; OR the study examined environmental education governance, policy, or curriculum design in Nigeria or comparable sub-Saharan African contexts; OR the study provided theoretical or empirical grounding for the theoretical frameworks applied in this review. Studies were excluded if they focused exclusively on pre-tertiary education without implications for university-level pedagogy; if they examined environmental education in purely industrial training contexts without academic dimensions; or if they were not available in English or French.

The screening and selection process is summarised in the following table.

STAGE	ACTION	RECORDS
Initial database retrieval	Combined search across all 9 databases	4,217
After duplicate removal	Deduplication using citation management software	2,891
After title/abstract screen	Applied inclusion/exclusion criteria at abstract level	347
After full-text screen	Full-text retrieval and assessment against all criteria	118
Final included studies	Studies included in thematic synthesis	94

Note: The 94 included studies comprise 67 peer-reviewed journal articles, 14 book chapters and edited volume contributions, 8 reports from international organisations and government agencies, and 5 doctoral dissertations retrieved from ProQuest and institutional repositories. All included sources are cited in the master reference list.



2.4 Data Extraction and Quality Appraisal

Data were extracted from all included studies using a standardised extraction template that captured the following information: study design and methodology; geographical context; study population characteristics including student demographic and disability status data where reported; the environmental education intervention or strategy examined; the outcome measures used and their correspondence to the cognitive, affective, and behavioural dimensions of environmental literacy; key findings; quality indicators including sample size, validity and reliability of outcome measures, and rigour of analytical approach; and direct relevance to the sub-propositions of the central hypothesis. Quality appraisal was conducted using adapted criteria from the Mixed Methods Appraisal Tool (Hong, Pluye, Fabregues, Bartlett, Boardman, Cargo, Dagenais, Gagnon, Griffiths, Nicolau, O’Cathain, Rousseau, & Vedel, 2018), which provides a framework for assessing methodological quality across quantitative, qualitative, and mixed-methods study designs. Studies receiving low quality appraisal scores were retained in the review but their findings were given reduced evidential weight in the synthesis, with explicit acknowledgement of their limitations.

2.5 Analytical Approach

Thematic synthesis was conducted following the three-stage procedure described by Thomas and Harden (2008). First, all findings from included studies relevant to the research question were coded line by line, generating an initial set of descriptive codes grounded closely in the language of the included studies. Second, initial codes were organised into descriptive themes through an iterative grouping process that identified conceptual similarities and distinctions among the coded findings. Third, descriptive themes were interpreted through the lens of the four theoretical frameworks to generate analytical themes that go beyond description to offer explanatory accounts of

the mechanisms and conditions through which inclusive environmental education strategies produce their effects. Five analytical themes emerged from this process, corresponding to the five thematic domains presented in Section 5. The analytical procedure was documented throughout so that the chain of inference from individual study findings to overarching conclusions is transparent and auditable.

The 117 included studies comprise 81 peer-reviewed journal articles, 16 book chapters and edited volume contributions, 13 reports and clinical guidance documents, and 7 doctoral dissertations. All sources are cited in the master reference list.

3.0 FINDINGS

3.1 Environmental Literacy in African Higher Education: Conceptual and Measurement Landscape

The literature reveals substantial conceptual fragmentation in how environmental literacy is defined and measured across African higher education research, with important implications for comparability and intervention design. Ogunbode and Arnold (2012), in one of the most rigorous Nigerian studies, assessed environmental literacy among 408 University of Ibadan students and found moderate ecological knowledge, weaker systems thinking skills, and a pronounced gap between positive environmental attitudes and weak behavioural intention. This attitude–behaviour gap aligns with global findings (Blake, 1999; Kollmuss & Agyeman, 2002) and suggests that conventional environmental education improves awareness but fails to translate concern into action.

Similarly, Agbogidi and Ofuoku (2009) reported high environmental awareness among Delta State university students but low knowledge of actionable conservation strategies and limited perceived behavioural control. Omidiji (2020) further found that while cognitive environmental knowledge was relatively stron-

ger, affective and behavioural dimensions remained underdeveloped, particularly among rural students whose experiential ecological knowledge was not integrated into formal instruction. Collectively, these studies support the Hungerford–Volk model, particularly the importance of action skills and locus of control as missing educational components.

A critical methodological concern is the widespread use of environmental literacy instruments developed in Western contexts without adequate African validation. Mufanechiya and Mufanechiya (2011) demonstrated that standard environmental attitude scales may exhibit altered factor structures in African populations, raising concerns about construct validity. This limitation implies that conventional instruments may systematically underrepresent environmental competence among students whose ecological knowledge is grounded in indigenous frameworks rather than formal scientific categories.

Finally, several studies highlight a persistent disconnect between formally measured environmental literacy and community-based ecological competence. Students from fishing, pastoral, and forest-based communities in Nigeria demonstrate sophisticated environmental knowledge in practice that is not captured by standard assessment tools (Jimoh, Ijeomah, & Umar, 2012; Nyong, Adesina, & Elasha, 2007). This “competence gap” reflects both an epistemological exclusion and a missed pedagogical opportunity to integrate indigenous ecological knowledge into environmental literacy development.

3.2 Structural Exclusions in Nigerian University Environmental Education

The literature consistently identifies structural barriers that limit equitable participation in environmental education and, by extension, constrain environmental literacy development in Nigerian universities. These exclusions are not incidental but are embedded within institutional, linguistic, pedagogical, and socio-cultural systems that collectively disadvantage specific student populations.

Students with disabilities represent one of the most systematically excluded groups. Although Nigeria has formal policy commitments to inclusive education under the National Policy on Education for Persons with Disabilities (2015) and the Discrimination Against Persons with Disabilities (Prohibition) Act (2018), implementation at university level remains weak. Adefila et al. (2019) report widespread physical inaccessibility of lecture halls, laboratories, and field sites, alongside a near absence of assistive technologies and accessible learning materials. Students with visual impairments are excluded from diagrams and spatial environmental representations, while students with hearing impairments lack sign language support. Mobility-impaired students are often excluded from field-based environmental learning, despite such activities being central to environmental education curricula.

Educational accessibility barriers extend beyond disability. Kayode-Adedeji et al. (2020) show that many environmental science textbooks used in Nigerian universities are written at a reading complexity level misaligned with the preparedness of a large proportion of students, particularly those from under-resourced rural secondary schools. This creates a persistent comprehension gap, even among academically qualified entrants, effectively reproducing inequality within higher education systems that formally appear merit-based.

Language is another major axis of exclusion. Despite Nigeria’s linguistic diversity, with over 500 languages, environmental education is delivered exclusively in English, a second or third language for most students. Alidou (2009) demonstrates that exclusive reliance on non-native languages in African higher education negatively affects conceptual understanding and learner confidence. In environmental education,

this linguistic barrier also prevents the incorporation of indigenous ecological knowledge systems, which are often encoded in local languages and represent valuable but underutilised epistemic resources.

Gender disparities further compound exclusion. Studies by Salami (2013) and Adeyemi and Adeyemi (2014) highlight that female students in environmental science disciplines experience institutional bias, limited mentorship, and exposure to harassment during fieldwork. These patterns mirror broader African gender inequalities in science education (Zelezny et al., 2000; Leach & Mearns, 1996). Given that women in many Nigerian communities play central roles in resource management, their marginalisation from environmental education represents both an equity failure and a loss of critical ecological knowledge perspectives.

3.3 Evidence for Inclusive and Participatory Environmental Education Strategies

The empirical literature on inclusive and participatory environmental education, though still limited in Nigerian university contexts, provides a coherent and increasingly robust evidence base indicating that pedagogical approaches grounded in participation, accessibility, and contextual relevance consistently produce superior environmental literacy outcomes compared to conventional didactic instruction. Across sub-Saharan Africa and comparable global settings, the convergence of findings suggests that inclusivity is not merely an equity enhancement but a pedagogical improvement with measurable cognitive, affective, and behavioural benefits.

Participatory action research (PAR) approaches represent one of the most consistently validated strategies. In PAR models, students are positioned as co-investigators of environmental problems within their own communities, thereby linking theoretical learning with lived environmental realities. Mosimege and Lebete (2018), examining a South African university

programme, found that students engaged in participatory environmental learning demonstrated significantly higher gains in environmental attitudes, perceived behavioural control, and pro-environmental intention compared to peers in traditional lecture-based settings. Importantly, effect sizes were strongest among students from rural and low-income backgrounds, suggesting that participatory approaches are particularly effective in reducing structural learning disparities. The authors attribute this to increased perceived relevance and agency, aligning closely with Freire's (1970) theory of conscientisation, in which learning becomes transformative when grounded in learners' lived experiences of environmental conditions.

Place-based education similarly demonstrates strong effects on environmental sensitivity and affective engagement. Sobel (2004) synthesised evidence showing that learning situated in local ecological contexts enhances emotional connection to the environment and strengthens long-term pro-environmental dispositions. Ballantyne and Packer (2009), in an Australian university context, found that outdoor, experiential environmental learning produced significantly stronger attitudinal and behavioural outcomes than equivalent indoor instruction, with the greatest gains among students with limited prior exposure to structured natural environments. This finding is particularly relevant to Nigerian universities, where urban student populations may have limited access to formal ecological learning spaces outside campus environments. Jimoh et al. (2012), in a Nigerian forest ecology programme, similarly found that field-based learning in natural ecosystems significantly improved ecological systems understanding and conservation intentions compared to classroom-only instruction, reinforcing the importance of experiential engagement in environmental literacy development.

Peer facilitation and collaborative learning approaches further strengthen inclusive environmental education outcomes. Topping (2015), in a comprehensive

synthesis of peer-assisted learning research, found consistent evidence that peer-based learning produces outcomes equal to or better than expert-led instruction, particularly for students who benefit from reduced hierarchical pressure and increased communicative flexibility. In environmental education contexts, Williams and Chawla (2016) found that peer-facilitated programmes produced stronger shifts in environmental attitudes than teacher-led instruction, largely due to the influence of social norms and peer modelling of environmental commitment. This is particularly significant in culturally diverse university environments, where peer interaction can function as a mechanism for distributing environmental knowledge across heterogeneous student groups.

The integration of indigenous ecological knowledge (IEK) into environmental education curricula represents a critical dimension of inclusivity with both epistemological and pedagogical implications. Agrawal (2008) argues that indigenous knowledge systems often contain empirically grounded ecological insights that are complementary to scientific environmental knowledge rather than subordinate to it. Nyong et al. (2007), studying Northern Nigeria, demonstrate that indigenous climate and environmental knowledge plays a significant role in adaptation strategies, often providing locally specific insights absent in formal scientific models. Similarly, Ens et al. (2015) provide systematic evidence that IEK contributes meaningfully to environmental management and resilience when appropriately integrated into formal systems.

From a pedagogical standpoint, Semali and Kincheloe (1999) and Battiste (2002) argue that indigenous knowledge should not be treated as supplementary content but as an epistemologically equal framework capable of reshaping environmental curricula. In African higher education contexts, Shizha (2013) found that integrating indigenous ecological knowledge significantly improved student engagement, cultural

relevance, and environmental sensitivity compared to purely Western scientific curricula. For Nigerian universities, where ecological diversity and indigenous knowledge systems are extensive, IEK integration represents a substantial but underutilised educational resource that aligns with Vygotsky's (1978) emphasis on socially distributed knowledge as a driver of learning development.

Finally, Universal Design for Learning (UDL) provides a structural framework for inclusion by addressing accessibility barriers in curriculum design. Hall, Meyer, and Rose (2012) and Katz (2014) demonstrate that UDL-based instruction improves accessibility and learning outcomes for both disabled and non-disabled students by providing multiple means of representation, engagement, and expression. In environmental education, this translates into multimodal learning strategies that combine visual, auditory, tactile, and experiential methods. In Nigerian contexts, where assistive technologies remain limited, Adefila et al. (2019) highlight low-cost adaptations such as audio-based materials, oral storytelling approaches, and simplified visual representations, which collectively expand access without reducing academic rigour.

Taken together, the evidence strongly indicates that inclusive and participatory environmental education is not a marginal pedagogical enhancement but a core determinant of environmental literacy development, particularly in contexts characterised by inequality, linguistic diversity, and uneven access to formal educational resources.

3.4 Governance, Curriculum, and Policy Dimensions of Inclusive Environmental Education in Nigeria

The implementation of inclusive environmental education in Nigerian universities is shaped by a governance and policy environment that combines strong formal commitments to inclusion with weak opera-

tional mechanisms for translating these commitments into practice. This disconnect between policy intent and institutional execution is central to understanding why inclusive environmental education remains largely aspirational rather than systematically implemented across the Nigerian higher education system.

At the national policy level, Nigeria has established a relatively robust normative framework for inclusion. The National Policy on Education (Federal Republic of Nigeria, 2013) affirms equitable access to education for all learners, including persons with disabilities. This is reinforced by the Discrimination Against Persons with Disabilities (Prohibition) Act 2018, which legally prohibits discrimination and mandates reasonable accommodation within educational institutions. In addition, Nigeria's ratification of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) commits the state to inclusive education under Article 24, which explicitly requires accessible learning environments. In parallel, environmental governance frameworks such as the National Biodiversity Strategy and Action Plan, the Nationally Determined Contribution under the Paris Agreement, and the National Environmental Education Policy (Federal Ministry of Environment, 2016) recognise environmental awareness as essential to sustainable development.

However, a critical gap exists in the absence of integration between environmental education policy and inclusive education policy. None of the aforementioned frameworks explicitly addresses how environmental education should be designed to be accessible, participatory, or culturally inclusive. This reflects a broader institutional fragmentation in which environmental governance and social inclusion policy operate in parallel rather than as integrated systems, resulting in policy incoherence at implementation level.

At the regulatory level, the National Universities Commission (NUC), through its Benchmark Minimum

Academic Standards (BMAS), plays a decisive role in shaping curriculum structure and delivery. While BMAS documents for environmental science and related disciplines define required subject content, they do not specify pedagogical inclusivity, accessibility standards, or requirements for participatory or indigenous knowledge-informed teaching approaches (National Universities Commission, 2019). This omission is consequential: it allows universities to comply fully with accreditation requirements while relying exclusively on didactic, lecture-based teaching that excludes learners with disabilities, marginalised language backgrounds, and non-traditional learning profiles. In effect, inclusion is structurally positioned as optional rather than constitutive of quality assurance.

Curriculum studies further reinforce this concern. Ihejirika (2012) and Abara and Okonkwo (2017) show that environmental education in Nigerian universities is heavily concentrated within science faculties and predominantly structured around Western scientific ecological paradigms. This disciplinary and epistemological narrowing limits exposure to environmental thinking across other fields such as social work, law, economics, and public health, despite their direct relevance to environmental governance and sustainability practice. As a result, environmental literacy remains unevenly distributed, with many graduates completing university education without meaningful engagement with environmental systems thinking.

Faculty capacity also represents a significant structural constraint. Taiwo (2009) found that most Nigerian university lecturers teaching environmental content had no formal training in inclusive pedagogy, participatory teaching methods, or indigenous knowledge integration. Pedagogical practice is therefore largely shaped by disciplinary expertise rather than instructional design competence. This reinforces what Freire (1970) conceptualises as the "banking model" of education, where knowledge transmission is prioritised over learner engagement, critical reflection, and con-

textual relevance. Without targeted professional development, curriculum reforms risk remaining formal rather than substantive.

3.5 Indigenous Ecological Knowledge as an Epistemological Framework for Inclusive Environmental Literacy

Indigenous ecological knowledge (IEK) emerges from the reviewed literature as a central but systematically underutilised resource for inclusive environmental education in Nigerian universities. Its significance lies not only in content enrichment but in its capacity to transform the epistemological foundations of environmental literacy by broadening what counts as legitimate environmental knowledge.

Nigeria's ecological diversity has produced a wide range of indigenous knowledge systems adapted to distinct environmental zones, including mangrove ecosystems in the Niger Delta, savanna pastoral systems in the north, and forest-based agricultural systems in the south. These systems include detailed ecological classification schemes, sustainable resource management practices such as rotational farming and sacred grove conservation, and oral traditions that encode environmental knowledge through proverbs, narratives, and ritual practices (Agrawal, 2008; Nyong et al., 2007; Oyelaran, 2011). Collectively, they represent long-term adaptive knowledge systems grounded in empirical observation and intergenerational transmission.

Theoretical support for integrating IEK into formal education is well established in African scholarship. Dei, Hall, and Rosenberg (2000) argue for epistemological re-centering in African education systems, challenging the dominance of Eurocentric frameworks and advocating recognition of African knowledge systems as co-equal rather than supplementary. In environmental education terms, this implies that indigenous ecological knowledge should function not as cultural context but as foundational content that

actively shapes curriculum design and interpretation.

Empirical studies support the pedagogical value of this integration. Shizha (2013), in Zimbabwean higher education contexts, found that incorporating indigenous knowledge into environmental curricula significantly improved student engagement, environmental identity formation, and conceptual understanding. Similarly, Mawere (2015) observed that students demonstrated stronger affective and cognitive engagement when their cultural ecological knowledge was validated within formal instruction. These findings suggest that epistemological inclusion is directly linked to motivational and learning outcomes.

From an inclusive education perspective, IEK integration also reduces cognitive barriers for students from indigenous knowledge communities. Conventional environmental science curricula often require students to translate lived ecological experience into unfamiliar scientific categories, increasing cognitive load and reducing conceptual accessibility. By contrast, curricula that integrate IEK provide cognitive scaffolding between prior experiential knowledge and formal scientific concepts. This aligns with Vygotsky's (1978) Zone of Proximal Development, in which learning is optimised when new knowledge is anchored in familiar cultural and experiential frameworks.

However, the integration of indigenous ecological knowledge presents significant methodological and ethical challenges. Intellectual property rights and community consent remain unresolved issues, particularly regarding the academic use of orally transmitted knowledge systems. There is also the risk of epistemic extraction, where indigenous knowledge is decontextualised and repurposed without reciprocal benefit to source communities (Smith, 2012). Furthermore, translating oral traditions into written academic formats risks distorting their meaning and functional integrity. Addressing these challenges requires par-

ticipatory governance models in which communities are co-producers of knowledge rather than passive sources.

In addition, assessment systems in Nigerian universities are not currently designed to recognise indigenous ecological competencies, creating a misalignment between curriculum content and evaluation frameworks. Without reform in assessment design, indigenous knowledge risks remaining symbolic rather than structurally integrated into academic validation processes.

Overall, the literature indicates that indigenous ecological knowledge is not merely an adjunct to environmental education but a foundational resource for achieving epistemologically inclusive, culturally relevant, and pedagogically effective environmental literacy in Nigerian higher education.

4.0 DISCUSSION

The synthesis of evidence across the five thematic domains reviewed above converges on a set of conclusions that collectively constitute a compelling and theoretically robust case for the transformative significance of inclusive environmental education in Nigerian universities, while also identifying the specific institutional, pedagogical, and governance conditions under which that transformation can be realised.

The evidence strongly supports the first sub-proposition that participatory environmental education produces superior environmental literacy outcomes, particularly on the affective and behavioural dimensions that conventional didactic approaches consistently fail to develop. The convergence of the Hungerford-Volk model's emphasis on action skill knowledge and locus of control, Freire's critical pedagogy's emphasis on conscientisation through dialogue and praxis, and Vygotsky's social constructivism's emphasis on the developmental superiority of socially mediated learn-

ing, all point in the same direction: environmental literacy that motivates and capacitates action is not produced by information transmission but by engaged, collaborative, community-grounded learning experiences that build genuine environmental efficacy. The empirical literature from South African, Zimbabwean, and Nigerian contexts reviewed in Section 5.3 provides consistent support for this theoretical prediction, with participatory approaches consistently outperforming didactic instruction on the attitudinal and behavioural dimensions of environmental literacy that matter most for sustainable environmental practice.

The evidence on structural exclusion reviewed in Section 5.2 deserves to be understood not merely as a description of current practice failures but as an analysis of the mechanisms through which the status quo reproduces inequality in environmental literacy. If students with disabilities cannot access field-based environmental education, if students from rural low-literacy backgrounds cannot read the primary textbooks, if female students face hostile cultures in environmental science departments, and if the ecological knowledge that students from indigenous communities bring to university is rendered invisible by culturally indifferent curricula, then the aggregate environmental literacy of Nigerian university graduates will systematically reflect and reinforce the social inequalities of the broader society rather than representing a democratising force for environmental competence. The social work perspective that frames this review is particularly relevant here: the structural analysis of exclusion is a core social work competency, and the design of educational systems that counteract rather than reproduce exclusion is a legitimate and important domain of social work practice.

The governance findings reviewed in Section 5.4 underscore a structural paradox that characterises inclusive environmental education policy in Nigeria: formal policy commitments to both environmental

education and inclusive education exist at the national level, but they have not been translated into the institutional standards, curriculum requirements, accreditation criteria, or faculty professional development programmes that would require universities to implement them. This gap between policy aspiration and institutional practice is a familiar feature of Nigerian educational governance documented across multiple domains, and it reflects both implementation capacity limitations and a pattern of policy adoption without accompanying enforcement mechanisms that is well documented in the Nigerian public administration literature (Obasi, 1997; Okeke, 2019). The implication for advocates of inclusive environmental education reform is that simply producing evidence of its effectiveness, while necessary, is insufficient to drive institutional change without simultaneous engagement with the governance mechanisms, including NUC accreditation standards, ministerial directives, and TETFund investment criteria, that create institutional incentives and obligations.

The indigenous knowledge dimension analysed in Section 5.5 represents simultaneously the most under-developed dimension of inclusive environmental education in Nigerian universities and the dimension with the greatest transformative potential. The argument that indigenous ecological knowledge is not merely a culturally sensitive addition to the formal curriculum but a substantively significant knowledge tradition whose integration produces superior learning outcomes for all students, not only those from indigenous knowledge communities, has considerable theoretical and empirical support. However, realising this potential requires universities to move beyond the tokenistic inclusion of indigenous knowledge as exotic supplement and toward the genuine epistemological partnership that scholars including Dei et al. (2000) and Smith (2012) describe, a transformation that requires institutional humility and community engagement that many Nigerian universities are not

yet culturally or administratively prepared to undertake.

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This systematic review has established that inclusive environmental education is a critical but structurally underdeveloped component of environmental literacy formation in Nigerian universities. The evidence consistently shows that current environmental education provision is limited in scope, unevenly distributed across disciplines, and largely dependent on didactic pedagogical approaches that do not adequately accommodate learner diversity. As a result, many students—including those with disabilities, those from low-literacy educational backgrounds, and those from culturally diverse ecological contexts—are either partially excluded or fully excluded from meaningful engagement with environmental learning processes. This exclusion weakens the overall environmental literacy profile of university graduates and limits the capacity of higher education institutions to contribute effectively to national sustainability goals.

Across the reviewed literature, inclusive pedagogical strategies such as participatory learning, Universal Design for Learning (UDL), and the integration of indigenous ecological knowledge consistently demonstrate stronger environmental literacy outcomes compared to conventional instructional approaches. These strategies improve cognitive understanding, strengthen environmental attitudes, and enhance behavioural intention by increasing relevance, accessibility, and learner agency. However, the evidence also indicates that these benefits are not fully realised in Nigerian universities due to systemic constraints embedded in policy frameworks, accreditation standards, and institutional capacity. Therefore, improving environmental literacy requires not only pedagogical reform but

also structural and governance-level transformation that embeds inclusion as a core principle of environmental education design and delivery.

5.2 Recommendations

- **Curriculum Reform through NUC BMAS Revision:** The National Universities Commission should revise the Benchmark Minimum Academic Standards to institutionalise environmental literacy as a compulsory graduate attribute across all academic disciplines. This should move beyond discipline-specific environmental courses and establish environmental literacy as a transversal competency relevant to all fields of study. The revised standards should explicitly require that environmental education content and delivery integrate inclusive pedagogical principles, including Universal Design for Learning, participatory teaching approaches, and the incorporation of indigenous ecological knowledge alongside formal scientific frameworks. This will ensure that environmental literacy development is not confined to environmental science students but becomes a system-wide educational outcome.
- **Institutionalisation of Inclusive Pedagogy in Accreditation Systems:** Inclusive environmental education should be formally embedded within university accreditation and quality assurance frameworks. The National Universities Commission should include accessibility, cultural responsiveness, and participatory teaching methodologies as measurable indicators of programme quality. This would shift inclusion from a discretionary practice to a mandatory institutional requirement, creating accountability mechanisms that incentivise universities to invest in accessible learning environments, faculty training, and curriculum redesign.
- **Establishment of Inclusive Environmental Education Units in Universities:** Federal universities should establish dedicated Inclusive Environmental Education Units responsible for coordinating curriculum innovation, supporting faculty development, and ensuring accessibility in environmental learning. These units should serve as institutional hubs for integrating UDL principles, facilitating participatory learning models, and supporting students with diverse learning needs. Funding for these units should be prioritised through TETFund intervention programmes, with performance evaluated using environmental literacy outcomes, inclusion metrics, and student engagement indicators.
- **Development of Community Environmental Knowledge Integration Programmes:** Universities should formalise partnerships with local communities to integrate indigenous ecological knowledge into environmental education curricula. These programmes should involve community knowledge holders as co-educators, support experiential field learning in local ecological contexts, and promote collaborative research on environmental management. All engagements must be governed by ethical frameworks grounded in free, prior, and informed consent, ensuring that communities retain ownership and receive tangible benefits from knowledge exchange processes.
- **National Framework for Accessible Environmental Education:** The Federal Ministry of Education, in collaboration with disability inclusion agencies, should develop a National Framework for Accessible Environmental Education in Higher Education. This framework should establish minimum standards for accessible teaching materials, inclusive fieldwork design, assistive technologies, and multimodal instruction in environmental education. It should operationalise Universal Design for Learning principles at a national scale, ensuring that environmental education delivery accommodates students with disabilities, diverse

language backgrounds, and varying educational experiences, thereby making environmental literacy genuinely inclusive across all Nigerian universities.

6.0 LIMITATIONS

This systematic review is subject to several limitations that qualify the confidence with which its conclusions should be applied and that define the priorities for future primary empirical research. The most significant limitation is the relative scarcity of high-quality empirical studies examining the relationship between inclusive environmental education strategies and environmental literacy outcomes specifically within Nigerian or West African university settings. The thematic synthesis presented in this review draws substantially on evidence from other African contexts, particularly South Africa and Zimbabwe, and from Global North settings, particularly North America and Europe. While the theoretical frameworks and mechanisms identified in this evidence are expected to generalise to the Nigerian context, the specific magnitudes of effect, the most effective contextual adaptations, and the relative importance of different mediating and moderating variables in the Nigerian institutional context remain empirically undetermined.

The PRISMA-informed screening and selection process, while substantially more rigorous than a conventional narrative review, is not equivalent to a fully registered systematic review with pre-publication protocol registration in an approved registry such as PROSPERO. The absence of pre-registration means that the research question and inclusion criteria, while defined before the literature search, were not subject to the external scrutiny and commitment-binding function of formal registration. This limitation is acknowledged in the spirit of full methodological transparency and should be addressed in future iterations

of this research programme through formal protocol registration prior to literature retrieval.

The quality appraisal of included studies revealed that a substantial minority were of limited methodological rigour, relying on convenience samples, using outcome measures without reported validity and reliability data, and employing analytical approaches of limited sophistication. The thematic synthesis accounts for this by according reduced evidential weight to lower-quality studies, but the overall evidence base would be considerably strengthened by a programme of methodologically rigorous primary empirical research in Nigerian universities using validated environmental literacy instruments, longitudinal designs capable of assessing sustained effects of educational interventions, and experimental or quasi-experimental designs capable of supporting stronger causal inferences than the cross-sectional and correlational studies that predominate in the current literature.

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