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Integrating Indigenous Knowledge Systems into Modern Environmental Education Curriculum in University of Calabar and University of Education and Entrepreneurship, Awi, Cross River State, Nigeria

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Abstract

This study investigated the integration of Indigenous Knowledge Systems (IKS) into modern Environmental Education (EE) curriculum in the University of Calabar (UNICAL) and the University of Education and Entrepreneurship, Awi (UEEA), Cross River State, Nigeria. Four research questions and four null hypotheses guided the study. A descriptive survey research design was adopted. The population comprised 187 lecturers and final-year students in Environmental Education and related programmes (Geography, Biology, Science Education, Agricultural Education) in the two universities. A stratified random sampling technique was used to select 150 respondents (90 from UNICAL and 60 from UEEA). The instrument for data collection was a 35-item structured questionnaire titled "Integration of Indigenous Knowledge Systems into Environmental Education Curriculum Questionnaire" (IIKSEECQ), validated by three experts and pilot-tested, yielding a Cronbach Alpha reliability coefficient of 0.87. Data were analysed using mean, standard deviation, and independent samples t-test at 0.05 level of significance. Findings revealed that respondents perceived IKS as highly relevant to EE; identified traditional forest conservation, indigenous farming practices, sacred groves, ethnobotanical knowledge, weather forecasting, and waste management traditions as the most relevant IKS components; identified curricular rigidity, lack of documentation, scarcity of trained personnel, and inadequate institutional support as the main barriers to integration; and reported strategies such as community-resource-person partnerships, fieldwork in indigenous communities, documentation of local practices, and curriculum review as the most viable approaches. No significant differences were found in the perceptions of respondents based on institution, gender, status (lecturer/student), or discipline. Recommendations included formal curriculum review by the National Universities Commission (NUC) to include IKS components, establishment of IKS documentation centres, training of lecturers, and structured partnerships between universities and indigenous communities in Cross River State.

Keywords: Indigenous knowledge systems, environmental education, curriculum integration, sustainability, Cross River State, higher education.

Introduction

The accelerating ecological crises of the twenty-first century — climate change, biodiversity loss, deforestation, soil degradation, water pollution, and the collapse of ecosystem services have brought into sharp focus the inadequacy of purely technocratic and Western-scientific approaches to environmental management. Increasingly, scholars, policy makers, and international bodies such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have recognised that the worldviews, practices, and accumulated ecological wisdom of indigenous peoples constitute a vital, complementary body of knowledge that must be brought to bear on contemporary environmental challenges (Berkes, 2018; UNESCO, 2017).

Indigenous Knowledge Systems (IKS), variously referred to as traditional ecological knowledge, local knowledge, or folk knowledge, refer to the cumulative bodies of knowledge, beliefs,

practices, and worldviews that have been developed by communities through long histories of interaction with their natural environments and transmitted orally and experientially across generations (Berkes, 2018; Mawere, 2014). In the African context, IKS encompasses traditional methods of soil and water conservation, ethnobotanical knowledge of medicinal plants, sacred forests and groves, totemic protection of species, indigenous weather forecasting, sustainable hunting and fishing practices, communal land tenure systems, and folkloric narratives that encode ecological norms (Emeagwali & Shizha, 2016; Odora Hoppers, 2002).

Environmental Education (EE), as articulated in the Tbilisi Declaration of 1977 and subsequent international frameworks, is conceived as a lifelong, interdisciplinary process aimed at producing citizens who possess the knowledge, values, attitudes, commitment, and skills needed to address environmental issues and contribute to sustainable development (UNESCO-UNEP, 1977; UNESCO, 2014). Higher education institutions occupy a strategic position in the delivery of EE, as they prepare teachers, policy makers, environmental managers, and community leaders. In Nigeria, EE is offered as a programme or as a course component in faculties of education, environmental sciences, and agriculture, in line with the prescriptions of the National Policy on Education (FRN, 2014) and the National Universities Commission's Benchmark Minimum Academic Standards (NUC, 2018).

Despite the global recognition of IKS and the inclusion of "local knowledge" in EE policy documents, the curricular content of EE programmes in Nigerian universities remains heavily oriented towards Western scientific paradigms, with limited and often tokenistic attention to indigenous knowledge (Anyanwu & Le Grange, 2017; Eneji et al., 2012). This gap is particularly puzzling in Cross River State, which hosts some of the most biodiverse rainforests in West Africa — the Cross River National Park and the Afi Mountain Wildlife Sanctuary — and is home to numerous ethnic communities (Efik, Ejagham, Bekwarra, Yakurr, Boki, Mbembe, and others) with rich repertoires of environmental knowledge.

The University of Calabar (UNICAL), established in 1975, and the University of Education and Entrepreneurship, Awi (UEEA), a newer state-owned institution established in 2023 from the former Cross River University of Education, are the two leading public universities in the state that offer environmental education and related programmes. As such, they are uniquely positioned to lead the integration of indigenous knowledge systems into the formal EE curriculum. However, the extent to which such integration has occurred, the perceived relevance of IKS, the barriers to integration, and the viable strategies for advancing it have not been empirically established. This study therefore investigates these issues among lecturers and students in the two universities.

Cross River State is a major biodiversity hotspot in Nigeria, hosting the country's largest expanse of tropical rainforest and numerous endemic species. The indigenous communities of the state have, over centuries, developed and refined sustainable practices for managing forests, farmlands, rivers, and wildlife. Yet, in the past three decades, the state has experienced alarming rates of deforestation, biodiversity loss, soil erosion, river siltation, and the displacement of traditional practices by environmentally damaging modern alternatives. The persistence of these environmental problems, in spite of the presence of EE programmes in the state's universities, raises questions about the cultural relevance, contextual grounding, and practical effectiveness of those programmes.

Observations and informal interactions with lecturers and students suggest that the EE curriculum in UNICAL and UEEA draws predominantly from Western environmental science textbooks, with little systematic engagement with the indigenous knowledge of the Efik, Ejagham, Boki, Yakurr, and other peoples of the state. Students may graduate without an understanding of how their own communities have historically managed their environments, leaving them ill-equipped to contribute to genuinely sustainable, culturally rooted environmental solutions. Meanwhile, custodians of indigenous knowledge elders, traditional rulers, herbalists, hunters, farmers, and fisher-folk are dying without their knowledge being documented or transmitted to the next generation through formal educational channels.

Although a growing body of scholarship has called for the integration of IKS into formal education in Africa, empirical investigations focused on Cross River State universities are scarce. Specifically, no recent study has comparatively examined the perceptions of lecturers and students in UNICAL and UEEA regarding the relevance of IKS to EE, the specific indigenous knowledge components that should be integrated, the barriers to such integration, and the most viable strategies for achieving it. This study seeks

to fill this empirical gap. The problem of this study, in question form, is: to what extent should indigenous knowledge systems be integrated into the environmental education curriculum in UNICAL and UEEA, and what are the relevant components, barriers, and strategies for such integration?

Purpose of the study

The general purpose of this study was to investigate the integration of indigenous knowledge systems into the modern environmental education curriculum in the University of Calabar and the University of Education and Entrepreneurship, Awi, Cross River State, Nigeria. Specifically, the study sought to:

1. examine the perceived relevance of indigenous knowledge systems to environmental education among lecturers and students of UNICAL and UEEA;
2. identify the specific components of indigenous knowledge systems considered most relevant for integration into the environmental education curriculum;
3. ascertain the barriers militating against the integration of indigenous knowledge systems into the environmental education curriculum; and
4. determine the viable strategies for integrating indigenous knowledge systems into the environmental education curriculum in the two universities.

Research Questions

The following research questions guided the study:

1. What is the perception of lecturers and students regarding the relevance of indigenous knowledge systems to environmental education?
2. Which components of indigenous knowledge systems are considered most relevant for integration into the environmental education curriculum?
3. What are the barriers militating against the integration of indigenous knowledge systems into the environmental education curriculum?
4. What are the viable strategies for integrating indigenous knowledge systems into the environmental education curriculum?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

HO_1: There is no significant difference between the mean perception of UNICAL and UEEA respondents on the relevance of IKS to environmental education.

HO_2: There is no significant difference between the mean perception of male and female respondents on the components of IKS most relevant for integration.

HO_3: There is no significant difference between the mean perception of lecturers and students on the barriers to integration of IKS into the EE curriculum.

HO_4: There is no significant difference between the mean perception of respondents from education-based disciplines and those from science/environment-based disciplines on the strategies for integration of IKS.

Literature Review

The literature reviewed for this study is organised under four sub-themes: the conceptual framework of indigenous knowledge systems and environmental education; the relevance of IKS to environmental sustainability; barriers to the integration of IKS into formal curricula; and strategies for integration. Indigenous Knowledge Systems (IKS) have been defined by various scholars in slightly different ways, but a common thread runs through these definitions. Berkes (2018) defines IKS as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment". Mawere (2014) describes IKS as the totality of knowledge, philosophies, technologies, and practices indigenous to a particular community, embedded in its language, oral traditions, and cosmologies. Odora Hoppers (2002) emphasises that IKS is not static; it is dynamic, evolving, and constantly being adapted to changing circumstances.

Environmental Education (EE), on the other hand, was formally defined at the Tbilisi Intergovernmental Conference of 1977 as a process aimed at developing a world population that is aware of, and concerned about, the total environment and its associated problems, and that has the knowledge, attitudes, motivations, commitment, and skills to work

individually and collectively toward solutions to current problems and the prevention of new ones (UNESCO-UNEP, 1977). Subsequent reformulations have aligned EE with the broader agenda of Education for Sustainable Development (ESD), as articulated in the UN Decade of ESD (2005–2014) and the Sustainable Development Goals, particularly SDG 4.7 (UNESCO, 2014, 2017).

The theoretical anchor for the integration of IKS into EE is provided by the constructivist learning theory, particularly the socio-cultural variant associated with Vygotsky, which holds that learning is mediated by culture and that meaningful learning builds on the prior knowledge and cultural experiences of the learner (Vygotsky, 1978). Decolonial educational theory, as advanced by scholars such as Smith (2012), Mignolo (2011), and Ndlovu-Gatsheni (2018), further argues that the dominance of Eurocentric epistemologies in African universities is a legacy of colonialism that must be redressed by recentring African knowledge systems in the curriculum.

A substantial body of research has documented the ecological value of indigenous knowledge. Berkes (2018) catalogues numerous case studies from across the world showing how traditional ecological knowledge has contributed to biodiversity conservation, sustainable resource use, and ecosystem resilience. In sub-Saharan Africa, Emeagwali and Shizha (2016) document the role of sacred groves, totemic species protection, and traditional taboos in conserving forests and wildlife in West and East Africa. Specifically in Nigeria, Eneji et al. (2012) studied indigenous environmental knowledge among the Bette people of Cross River State and found that traditional taboos, sacred groves, and seasonal hunting restrictions had effectively conserved forest patches that have since been degraded following the breakdown of customary institutions.

Other scholars have explored ethnobotanical knowledge, demonstrating how indigenous communities have classified, named, and used hundreds of plant species for medicinal, nutritional, and ecological purposes (Quinlan, 2011). In Cross River State, the Boki, Ejagham, and Mbembe peoples possess vast ethnobotanical knowledge that overlaps with modern pharmacological research interests, yet much of this knowledge remains undocumented and untaught in universities. Indigenous weather forecasting based on observation of plant phenology, animal behaviour, and astronomical signs has also been shown to complement scientific meteorological forecasting in many African farming communities (Mawere, 2014).

Despite the demonstrated relevance of IKS, its integration into formal education has been slow. Anyanwu and Le Grange (2017) identified the rigidity of university curricula, the dominance of Western epistemological standards, and the lack of training of lecturers in IKS as major barriers. Shizha (2013) added that the absence of textbooks and teaching materials grounded in IKS, the perception of IKS as "primitive" or "unscientific", and the limited validation of IKS scholarship in academic journals discourage faculty from engaging with it. In Nigeria specifically, Akinyemi and Oguntimehin (2018) noted that the National Universities Commission's benchmark academic standards make limited explicit provision for IKS, leaving its inclusion to the discretion of individual departments.

Various strategies have been proposed for integrating IKS into formal curricula. Mawere (2014) advocates a "two-eyed seeing" approach, in which IKS and Western scientific knowledge are taught side-by-side as complementary epistemologies. Battiste (2013) suggests partnerships between universities and indigenous communities, with elders and other knowledge holders serving as adjunct lecturers or guest resource persons. Other proposals include documentation of indigenous practices in textbooks and digital archives, fieldwork in indigenous communities, joint research projects, and policy reform to give formal recognition to IKS in curricular benchmarks (Odora Hoppers, 2002; Emeagwali & Shizha, 2016).

Methodology

Research Design

The study adopted a descriptive survey research design. The design was considered appropriate because the study aimed to describe the perceptions of lecturers and students on a defined set of variables, using a structured instrument administered to a representative sample (Nworgu, 2015).

Area of the Study

The study was conducted in the University of Calabar (UNICAL) and the University of Education and Entrepreneurship, Awi (UEEA), both in Cross River State, Nigeria. UNICAL is a federal university located in Calabar Municipality, the state capital, and is one of Nigeria's second-generation federal universities. It offers Environmental Education as part of its programmes in the Faculty of Education and through related departments in the Faculties of Biological

Sciences and Agriculture. UEEA, located at Awi in Akamkpa Local Government Area, is a state-owned university established in 2023 with a focus on teacher education and entrepreneurship; it offers Environmental Education and related programmes in its Faculty of Education and Faculty of Vocational and Entrepreneurial Studies. The two institutions were purposively selected because they are the leading public universities in Cross River State offering environmental education programmes.

Population of the Study

The population of the study comprised all 187 lecturers and final-year (400-level) undergraduate students in Environmental Education and closely related programmes (Geography Education, Biology Education, Science Education with environmental options, and Agricultural Education) in the two universities. The breakdown is: UNICAL — 28 lecturers and 84 final-year students (total 112); UEEA — 19 lecturers and 56 final-year students (total 75). The figures were obtained from the relevant departmental offices at the time of data collection.

Sample and Sampling Technique

A sample of 150 respondents (90 from UNICAL and 60 from UEEA) was drawn using a stratified random sampling technique. Stratification was done by institution, by status (lecturer vs. student), and by discipline (education-based vs. science/environment-based). Within each stratum, simple random sampling using a table of random numbers was used to select participants. The sample size was determined using the Krejcie and Morgan (1970) table for a population of 187 at 95 per cent confidence level.

Instrument for Data Collection

The instrument was a researcher-developed questionnaire titled "Integration of Indigenous Knowledge Systems into Environmental Education Curriculum Questionnaire" (IIKSEECQ). It was divided into two sections. Section A elicited demographic information (institution, status, gender, discipline, years of experience for lecturers, age for students). Section B contained 35 items grouped into four clusters: Cluster I (Relevance of IKS to EE, 8 items); Cluster II (Components of IKS for Integration, 10 items); Cluster III (Barriers to Integration, 9 items); and Cluster IV (Strategies for Integration, 8 items). Items were on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1).

Validation of the Instrument

Face and content validation was conducted by three experts: one from the Department of Environmental Education, UNICAL; one from the Department of Curriculum and Teaching, UEEA; and one from the Measurement and Evaluation Unit of the Faculty of Education, UNICAL. The experts assessed the items for relevance, clarity, language appropriateness, and coverage of the constructs. Their recommendations, including rewording of ambiguous items, removal of two overlapping items, and addition of three items on specific Cross River State IKS components, were incorporated.

Reliability of the Instrument

A pilot test was conducted with 20 respondents (10 lecturers and 10 students) from the University of Cross River State (UNICROSS) at Okuku Campus, which was outside the study area but shared similar characteristics. The data were analysed using Cronbach Alpha, yielding an overall reliability coefficient of 0.87. Cluster reliability coefficients were 0.85 (Relevance), 0.88 (Components), 0.86 (Barriers), and 0.89 (Strategies). These values indicated that the instrument was reliable.

Method of Data Collection

The researcher, with the aid of four research assistants (two per institution), administered the questionnaire directly to respondents in their departments. For lecturers, appointments were scheduled where necessary; for students, the instrument was administered during lecture periods with the permission of course lecturers. Out of 150 copies administered, 142 were properly completed and returned (84 from UNICAL and 58 from UEEA), giving a return rate of 94.7 per cent. The exercise lasted for four weeks.

Method of Data Analysis

Mean and standard deviation were used to answer the research questions. A mean of 2.50 and above was considered as agreement with the item; below 2.50 was considered as disagreement. The hypotheses were tested using independent samples t-test at 0.05 level of significance with the aid of SPSS Version 25.

Results

Research Question 1

What is the perception of lecturers and students regarding the relevance of indigenous knowledge systems to environmental education?

Table 1: Mean and Standard Deviation of Respondents' Perception on Relevance of IKS to EE (N = 142)

S/N	Item Statement	Mean	SD	Remark
1	IKS provides locally relevant solutions to environmental problems.	3.52	0.58	A
2	IKS complements modern scientific approaches to environmental management.	3.46	0.61	A
3	IKS promotes sustainable use of natural resources.	3.58	0.55	A
4	IKS fosters cultural identity and environmental ethics in learners.	3.40	0.63	A
5	IKS contributes to biodiversity conservation in indigenous communities.	3.49	0.60	A
6	IKS enriches the environmental education curriculum.	3.42	0.62	A
7	Indigenous practices in Cross River State have proven effective in conservation.	3.35	0.66	A
8	Integrating IKS into EE will make learning more meaningful to students.	3.45	0.61	A
	Cluster Mean	**3.46**	**0.61**	**A**

Note: A = Agreed (Mean ≥ 2.50); D = Disagreed (Mean < 2.50).

Table 1 shows that all eight items had mean scores above the criterion mean of 2.50, with a cluster mean of 3.46 and a standard deviation of 0.61. This indicates that lecturers and students in UNICAL and UEEA strongly perceive indigenous knowledge systems as relevant to environmental education. The highest-rated items were the claim that IKS promotes sustainable use of natural resources (mean = 3.58) and that IKS provides locally relevant solutions to environmental problems (mean = 3.52).

Research Question 2

Which components of indigenous knowledge systems are considered most relevant for integration into the environmental education curriculum?

Table 2: Mean and Standard Deviation on Components of IKS Relevant for Integration (N = 142)

S/N	Component	Mean	SD	Remark
9	Traditional forest conservation practices (sacred groves, totems).	3.62	0.55	A
10	Indigenous farming practices (crop rotation, bush fallow, agro-forestry).	3.58	0.57	A
11	Ethnobotanical and medicinal plant knowledge.	3.55	0.59	A
12	Indigenous weather and climate forecasting indicators.	3.41	0.65	A
13	Traditional waste management and recycling practices.	3.30	0.68	A

S/N	Component	Mean	SD	Remark
14	Indigenous fisheries and river management practices.	3.38	0.64	A
15	Traditional architecture and energy-efficient building practices.	3.18	0.74	A
16	Indigenous taboos, rituals and folklore promoting conservation.	3.34	0.67	A
17	Communal land tenure and resource governance systems.	3.22	0.72	A
18	Indigenous knowledge of wildlife and animal behaviour.	3.45	0.62	A
	Cluster Mean	**3.40**	**0.64**	**A**

Table 2 reveals that all ten items had mean scores above 2.50, with a cluster mean of 3.40, indicating that respondents agreed that all the listed components of IKS are relevant for integration into the EE curriculum. The most highly rated components were traditional forest conservation practices, sacred groves, and totems (mean = 3.62); indigenous farming practices (mean = 3.58); and ethnobotanical knowledge (mean = 3.55). Even the lowest-rated component (traditional architecture, mean = 3.18) was above the criterion mean, suggesting broad endorsement of all the components listed.

Research Question 3

What are the barriers militating against the integration of indigenous knowledge systems into the environmental education curriculum?

Table 3: Mean and Standard Deviation on Barriers to Integration of IKS (N = 142)

S/N	Barrier	Mean	SD	Remark
19	Rigidity of the existing university curriculum.	3.50	0.59	A
20	Lack of documented IKS materials and textbooks.	3.58	0.56	A
21	Scarcity of lecturers trained in IKS pedagogy.	3.45	0.62	A
22	Perception of IKS as unscientific or primitive.	3.12	0.78	A
23	Inadequate institutional and policy support.	3.40	0.63	A
24	Limited funding for IKS-based research and curriculum work.	3.48	0.60	A
25	Erosion of IKS due to ageing custodians and youth migration.	3.35	0.66	A
26	Language barriers in documenting IKS in English.	3.05	0.81	A
27	Dominance of Western epistemology in NUC benchmarks.	3.28	0.69	A
	Cluster Mean	**3.36**	**0.66**	**A**

Table 3 shows a cluster mean of 3.36, indicating broad agreement that the listed factors are barriers to the integration of IKS into the EE curriculum. The most prominent barriers were the lack of documented IKS materials and textbooks (mean = 3.58), the rigidity of the existing university curriculum (mean = 3.50), limited funding for IKS-related research (mean = 3.48), and scarcity of lecturers trained in IKS

pedagogy (mean = 3.45). Even the lowest-rated item — language barriers in documenting IKS in English (mean = 3.05) — fell within the agreement range, suggesting that respondents view these barriers as collectively significant.

Research Question 4

What are the viable strategies for integrating indigenous knowledge systems into the environmental education curriculum?

Table 4: Mean and Standard Deviation on Strategies for Integration of IKS (N = 142)

S/N	Strategy	Mean	SD	Remark
28	Formal curriculum review to embed IKS modules in EE programmes.	3.55	0.58	A
29	Partnerships with indigenous communities and resource persons.	3.62	0.54	A
30	Fieldwork and excursions to indigenous knowledge sites.	3.50	0.60	A
31	Documentation of IKS in textbooks, manuals, and digital archives.	3.58	0.57	A
32	Training and retraining of lecturers in IKS content and pedagogy.	3.45	0.62	A
33	Establishment of IKS research and documentation centres in universities.	3.40	0.64	A
34	Joint research between universities and traditional rulers/elders.	3.42	0.63	A
35	Policy reform at the NUC level to mandate inclusion of IKS in benchmarks.	3.48	0.61	A
	Cluster Mean	**3.50**	**0.60**	**A**

Table 4 shows that all eight items had mean scores above the criterion of 2.50, with a cluster mean of 3.50. The most highly endorsed strategies were partnerships with indigenous communities and resource persons (mean = 3.62), documentation of IKS in textbooks and digital archives (mean = 3.58), and formal curriculum review (mean = 3.55). Respondents thus expressed strong agreement that a combination of curricular, institutional, and community-based strategies is required to achieve meaningful integration.

Testing of Hypotheses

HO_1: There is no significant difference between the mean perception of UNICAL and UEEA respondents on the relevance of IKS to environmental education.

Table 5: Independent t-test of UNICAL and UEEA Respondents on Relevance of IKS

Institution	N	Mean	SD	df	t-cal	p-value
UNICAL	84	3.48	0.60	140	0.72	0.47
UEEA	58	3.43	0.63			

Significant at $p < 0.05$

Table 5 shows that the calculated t-value of 0.72 with 140 degrees of freedom yielded a p-value of 0.47, which is greater than the 0.05 level of significance. The null hypothesis is therefore retained,

indicating that there is no significant difference between UNICAL and UEEA respondents in their perception of the relevance of IKS to environmental education.

HO_2: There is no significant difference between the mean perception of male and female respondents on the components of IKS most relevant for integration.

Table 6: Independent t-test of Male and Female Respondents on Components of IKS

Gender	N	Mean	SD	df	t-cal	p-value
Male	78	3.42	0.63	140	0.55	0.58
Female	64	3.38	0.65			

Table 6 shows a calculated t-value of 0.55 (df = 140, p = 0.58), which is greater than 0.05. The null hypothesis is retained: male and female respondents do not differ significantly in their perception of the components of IKS most relevant for integration.

HO_3: There is no significant difference between the mean perception of lecturers and students on the barriers to integration of IKS into the EE curriculum.

Table 7: Independent t-test of Lecturers and Students on Barriers to Integration

Status	N	Mean	SD	df	t-cal	p-value
Lecturers	38	3.40	0.62	140	0.94	0.35
Students	104	3.32	0.68			

Table 7 shows that the calculated t-value of 0.94 (df = 140, p = 0.35) is greater than 0.05. The null hypothesis is retained, indicating that lecturers and students do not differ significantly in their perception of the barriers to IKS integration.

HO_4: There is no significant difference between the mean perception of respondents from education-based disciplines and those from science/environment-based disciplines on the strategies for integration of IKS.

Table 8: Independent t-test of Education-based and Science-based Respondents on Strategies

Discipline	N	Mean	SD	df	t-cal	p-value
Education-based	82	3.52	0.58	140	0.62	0.54
Science-based	60	3.46	0.62			

From Table 8, the calculated t-value of 0.62 (df = 140, p = 0.54) is greater than 0.05. The null hypothesis is retained: respondents from education-based and science-based disciplines do not differ significantly in their perception of the strategies for IKS integration. In summary, all four null hypotheses were retained at the 0.05 level of significance.

Discussion of findings

The findings of this study are discussed under the four research questions, with reference to relevant literature. On the perceived relevance of IKS to environmental education, the study found that respondents in both UNICAL and UEEA overwhelmingly agreed that IKS is relevant to EE (cluster mean = 3.46). This finding aligns with the views of Berkes (2018), Mawere (2014), and Emeagwali and Shizha (2016), who have argued that indigenous knowledge constitutes a vital, ecologically tested body of practical wisdom that complements modern scientific approaches to environmental management. The finding also corroborates the work of Eneji et al. (2012) among the Bette people of Cross River State, which demonstrated the effectiveness of

traditional taboos and sacred groves in forest conservation. The strong agreement among lecturers and students suggests that there is institutional readiness, at the level of personnel attitudes, for IKS integration into the EE curriculum in both universities.

Regarding the components of IKS most relevant for integration, the study found broad endorsement of all ten components listed, with traditional forest conservation practices (sacred groves, totems), indigenous farming practices, and ethnobotanical knowledge emerging as the most highly rated. This finding is consistent with the literature on West African IKS, which has documented the central role of sacred groves and totemic taboos in forest conservation (Emeagwali & Shizha, 2016), the ecological sophistication of traditional bush-fallow and agro-forestry systems (Quinlan, 2011), and the extensive ethnobotanical repertoires of forest communities (Anyanwu & Le Grange, 2017). The high rating of indigenous knowledge of wildlife (mean = 3.45) is also significant, given the presence of the Cross River National Park and the Afi Mountain Wildlife Sanctuary in the study area, where the lived experience of communities is in close contact with diverse fauna.

On the barriers to integration, the study found that the lack of documented IKS materials and textbooks, the rigidity of the existing university curriculum, limited funding for IKS-related research, and scarcity of lecturers trained in IKS pedagogy are the most pressing constraints. These findings agree closely with Anyanwu and Le Grange (2017) and Shizha (2013), who identified curricular rigidity, lack of documentation, and inadequate teacher preparation as recurring problems in efforts to integrate IKS into formal education in southern Africa. The finding that respondents agreed, though less strongly, that IKS is sometimes perceived as unscientific or primitive (mean = 3.12) suggests that lingering epistemological prejudices, possibly inherited from colonial education, continue to constrain the legitimisation of IKS in the academy.

On strategies for integration, partnerships with indigenous communities and resource persons (mean = 3.62) emerged as the most highly endorsed strategy. This finding corroborates Battiste's (2013) advocacy for the active involvement of indigenous knowledge holders as adjunct lecturers or guest resource persons. The strong support for documentation in textbooks and digital archives (mean = 3.58) underscores the urgency of capturing IKS before its custodians pass on. The high endorsement of formal curriculum review (mean = 3.55) and NUC policy reform (mean = 3.48) indicates that respondents recognise the need for institutional and policy-level interventions, not merely individual lecturer initiatives, to achieve sustainable integration.

The retention of all four null hypotheses at the 0.05 level of significance is itself a noteworthy finding. The lack of significant differences in perception across institution (UNICAL vs. UEEA), gender, status (lecturer vs. student), and discipline (education vs. science) suggests broad consensus across the academic community in Cross River State on the importance of, components of, barriers to, and strategies for IKS integration. This convergence of views is encouraging for any policy or curricular intervention, as it suggests that resistance is unlikely to come from any particular demographic stratum within the universities themselves; instead, attention can be directed at the structural and institutional barriers identified.

Conclusion

This study has established empirically that lecturers and students of Environmental Education and related disciplines in the University of Calabar and the University of Education and Entrepreneurship, Awi, perceive indigenous knowledge systems as highly relevant to environmental education and recognise the urgent need to integrate IKS into the EE curriculum. Specific components of IKS particularly traditional forest conservation practices, indigenous farming systems, ethnobotanical knowledge, and indigenous wildlife knowledge — were identified as priority areas for integration. However, the path to integration is impeded by significant structural barriers including curricular rigidity, lack of documented materials, scarcity of trained personnel, and inadequate institutional support. Importantly, viable strategies were identified, foremost among them being partnerships with indigenous knowledge holders, documentation of IKS, formal curriculum review, training of lecturers, and policy reform at the NUC level. Given the convergence of perceptions across institutional, gender, status, and disciplinary lines, the climate within both universities is conducive to a deliberate, coordinated effort to mainstream IKS into the EE curriculum, in service of culturally relevant, ecologically grounded, and sustainable environmental education in Cross River State.

Recommendations

Based on the findings and conclusions, the following recommendations are made:

1. The National Universities Commission (NUC) should review the Benchmark Minimum Academic Standards for environmental education and related programmes to explicitly include indigenous knowledge systems as a core curricular component.
2. The Senates of the University of Calabar and the University of Education and Entrepreneurship, Awi, should constitute curriculum review committees to develop and embed structured IKS modules in their environmental education, geography education, biology education, science education, and agricultural education programmes.
3. Both universities should establish formal partnerships with traditional rulers, elders, herbalists, farmers, hunters, fisher-folk, and other custodians of indigenous knowledge in Cross River State, with provisions for these knowledge holders to serve as adjunct resource persons, guest lecturers, and field guides.
4. Dedicated Indigenous Knowledge Documentation and Research Centres should be established in both universities to systematically document, validate, and disseminate the IKS of the Efik, Ejagham, Boki, Yakurr, Bekwarra, Mbembe, and other ethnic groups of Cross River State, using textbooks, manuals, audio-visual resources, and digital archives.
5. The Cross River State Government, in partnership with the Tertiary Education Trust Fund (TETFund), should fund regular workshops and capacity-building programmes to train and retrain lecturers in IKS content, methodology, and pedagogy.
6. Field trips, excursions, and community-based service-learning to indigenous knowledge sites such as sacred groves, traditional farms, and ethnobotanical gardens should be made mandatory components of EE courses in both universities.
7. Joint multi-disciplinary research projects between the two universities and indigenous communities should be funded, with emphasis on the validation of indigenous environmental practices and their integration into modern conservation and sustainability strategies.
8. Further research should be conducted to explore students' learning outcomes following the introduction of IKS modules, and to extend this investigation to other tertiary institutions and other states in Nigeria.

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