

ENVIRONMENTAL SUSTAINABILITY THROUGH EARLY CHILDHOOD EDUCATION IN PUBLIC PRIMARY SCHOOLS IN ENUGU STATE, NIGERIA

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Abstract

This study was carried out to ascertain the issues surrounding environmental sustainability through early childhood education in public primary schools in Enugu State, Nigeria. Three purposes with related research questions and hypotheses guided the study. Descriptive survey research design was employed in the study. The population of the study was 40 respondents made up of 35 public primary school head teachers and 5 educational officers in Nsukka Educational Zone of Enugu State. The entire population was considered because of the manageable size. Instrument for data collection was a questionnaire developed by the researchers through literature review with a, titled: “Environmental Sustainability through Early Childhood Education in Public Primary Schools” Questionnaire (ESECEPPSQ)”. The research instrument developed by the researchers was validated by three experts in Faculty of Education, University of Nigeria, Nsukka and the reliability of the instrument was ascertained through a pilot-test by sampling 15 head teachers of public primary school from 15 schools in Udenu LGA of Enugu State. Data collected were analyzed using mean scores and standard deviation to answer the research questions. The findings of the study revealed among others that there were inadequate provision of environmental sustainability plan for early childhood education in the State such as planting trees, grasses and properly educating children on the need for environmental friendly environment for learning. From the findings of the study, recommendations were also proffered and among them include that: Enugu State Government in collaboration with the Enugu State Universal Basic Education (ENSUBEB) should mapped out a day for environment sustainability lectures for both teachers and pupils.

Keywords: Environment, sustainability, early childhood education, public primary schools

Introduction

Environmental sustainability and education are increasingly recognised as interconnected pillars for long-term societal well-being, particularly in developing countries facing ecological degradation, rapid urbanisation, and limited environmental awareness among young learners. Education for Sustainable Development (ESD) emphasises the role of education systems in equipping learners with the knowledge, skills, values, and attitudes necessary to engage responsibly with environmental challenges such as resource depletion, pollution, and climate change (Ikenyiri et al., 2025). Embedding environmental sustainability within Early Childhood Education (ECE) is crucial because the early years are foundational for shaping lifelong cognitive, social, and behavioural competencies, including pro-environmental attitudes (Ikenyiri et al., 2025). Young children exposed to sustainability concepts through playful learning, hands-on activities, and integrated curricula are more likely to demonstrate environmental stewardship as they grow (Okoduha & Omorogbe, 2025). In the Nigerian context, and specifically in Enugu State, where primary and early childhood education centres vary widely in infrastructure and instructional quality, leveraging early education as a platform for sustainability creates

opportunities to cultivate environmentally conscious citizens from the earliest stage of formal schooling.

Notwithstanding global recognition of early education's role in sustainability, implementation within Nigerian public primary schools remains uneven. Studies on early childhood environments in Enugu State highlight that public ECE centres often suffer from inadequate learning facilities, limited instructional materials, and constrained pedagogical implementation compared with private counterparts (Enekwe, Nwafor & Osuji, 2025). These gaps can hinder efforts to effectively integrate environmental sustainability into teaching and learning, as young learners require supportive, stimulating, and resource-rich environments to engage meaningfully with environmental topics. Additionally, research in other Nigerian states underscores that environmental factors, such as classroom conditions and learning environments, significantly influence academic performance and learning engagement (Obodo & Ani, 2025), suggesting that optimal physical and pedagogical conditions in early education could reinforce sustainability learning outcomes. Within Enugu State, the challenge is compounded by broader educational quality assurance concerns, where compliance with early childhood curricula and quality frameworks is variable across public schools (Onubuleze, 2024). Collectively, these contextual realities underscore the need to explore how early childhood education in public primary settings can be mobilised to foster environmental sustainability, especially in light of socio-economic pressures, resource constraints, and educational policy implementation gaps that characterise the Nigerian primary education landscape.

The academic case for linking ECE with environmental sustainability is supported by pedagogical research asserting that sustainability education at formative ages enhances critical thinking, problem-solving, and socio-emotional development, fostering learners' capacity to engage with future environmental challenges holistically (Ikenyiri et al., 2025). Moreover, integrating environmental themes such as waste management, conservation, and ecological awareness—into early learning activities aligns with global Sustainable Development Goals (SDGs) on quality education (SDG 4) and environmental protection (SDG 13), positioning early learners as agents of community change. Practical practices, such as creative reuse of waste materials (upcycling) and interactive learning on environmental topics, have been shown to increase environmental awareness and creativity among primary pupils in Nigeria (Okoduwa & Omorogbe, 2025). These activities resonate with broader environmental education discourses that advocate experiential learning, community engagement, and curriculum enrichment as means to nurture environmentally literate citizens.

Yet, the integration of environmental sustainability into early childhood curricula in Enugu State's public primary schools remains under-researched, with limited empirical data on how sustainability learning is operationalised at this level. Many public schools face basic environmental and infrastructural challenges that affect overall school environments (Bisi-Onyemaechi et al., 2018), which may in turn affect the quality of sustainability education delivered. By examining how environmental sustainability concepts are incorporated into ECE practices within these schools, stakeholders can better understand the barriers and facilitators of sustainability education, address resource and training gaps, and design pedagogical interventions tailored to local realities. Such research is timely, given global imperatives for education systems to contribute to sustainable development and local calls for improved early childhood quality and inclusivity (Ikenyiri et al., 2025; Onubuleze, 2024). Although previous studies have examined environmental sustainability in educational settings, there is limited empirical

evidence focusing specifically on environmental sustainability through early childhood education in public primary schools in Enugu State, Nigeria. Furthermore, many related studies have concentrated on environmental education generally without adequately investigating the environmental sustainability practices, provisions, and challenges associated with early childhood education. There also appears to be a paucity of studies that have explored the perspectives of both head teachers and educational officers regarding environmental sustainability initiatives within public primary schools. It was this gap in context, focus, and population that necessitated the present study to ascertain the issues surrounding environmental sustainability through early childhood education in public primary schools in Enugu State, Nigeria. Consequently, focusing on environmental sustainability through early childhood education in public primary schools in Enugu State not only contributes to educational scholarship but also offers actionable insights for policymakers, educators, and communities striving for resilient, educated, and environmentally aware future generations.

Statement of the Problem

Environmental sustainability is a pressing global concern, yet its integration into early childhood education in Nigeria remains limited. Public primary schools, which are foundational for shaping children's cognitive, social, and behavioral development, have the potential to instill sustainable habits and environmental awareness from an early age. However, in Enugu State, many public schools face significant challenges, including inadequate teaching resources, poorly trained educators, and insufficient infrastructure. These limitations constrain the effective inclusion of environmental sustainability concepts into early childhood curricula, leaving learners with minimal exposure to practical activities and knowledge that foster ecological responsibility. Consequently, young children in these settings may not develop the necessary understanding, skills, and values to engage meaningfully with environmental issues, undermining efforts to nurture environmentally conscious citizens.

While previous research has emphasized environmental education at higher levels of schooling, there is a notable gap regarding early childhood education in Enugu State, particularly within public primary schools. Empirical evidence is scarce on how sustainability concepts are implemented, the effectiveness of pedagogical approaches, and the extent to which young learners internalize pro-environmental behaviors. Without such information, policymakers, educators, and stakeholders lack the data needed to design targeted interventions that can effectively promote environmental awareness and sustainability practices from the formative years. Addressing this gap is crucial not only for enhancing the quality of early childhood education but also for ensuring long-term environmental stewardship and sustainable development in the region.

Purpose of the Study

The main purpose of the study was to ascertain various environmental sustainability through Early Childhood Education in Public Primary Schools in Enugu State, Nigeria. Specifically, the study sought to:

1. examine the extent to which environmental sustainability concepts are integrated into early childhood education curricula in public primary schools in Enugu State.
2. assess the level of awareness of environmental sustainability among early childhood learners in public primary schools.
3. identify the challenges faced by educators in implementing environmental sustainability education in public primary schools.

4. Policy strategies that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools.

Research Question

The following research questions were raised and answered by the study

1. What are the extent to which environmental sustainability concepts are integrated into early childhood education curricula in public primary schools in Enugu State?
2. What are the level of awareness of environmental sustainability among early childhood learners in public primary schools?
3. What are the challenges faced by educators in implementing environmental sustainability education in public primary schools?
4. Policy strategies that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools.

Hypotheses

The following null research hypotheses were formulated for the study and tested at 0.05 level of significance

- Ho1:** There is no significance difference between the mean responses of public primary school head teachers and educational officer's on the extent to which environmental sustainability concepts are integrated into early childhood education curricula in public primary schools in Enugu State?
- Ho2:** There is no significance difference between the mean responses of public primary school head teachers and educational officers on the level of awareness of environmental sustainability among early childhood learners in public primary schools?
- Ho3:** There is no significance difference between the mean responses of public primary school head teachers and educational officers on the challenges faced by educators in implementing environmental sustainability education in public primary schools?
- Ho4:** There is no significance difference between the mean responses of public primary school head teachers and educational officers on the strategies that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools.

Methods

Descriptive survey research design was employed in the study. Three specific purposes with related research questions and hypotheses guided the study. The population of the study were 40 respondents made up of 35 public primary school head teachers and 5 educational officers in Nsukka Local Government Area of the State. Census sampling techniques was employed in the selection of the sample size which made use of the entire enumerated population. The entire population was considered because of the manageable size. Instrument for data collection was a questionnaire developed by the researcher through literature review with a, titled: "Environmental Sustainability through Early Childhood Education in Public Primary Schools" Questionnaire (ESECEPPS Q)". The research instrument developed by the researcher was validated by three experts in Faculty of Education, University of Nigeria, Nsukka and the reliability of the instrument was ascertained through a pilot-test by sampling 15 head teachers of public primary school from 15 schools in Udenu LGA of Enugu State. Data collected were analyzed using mean scores and standard deviation to answer the research questions. The findings of the study revealed among others that there were inadequate provision of environmental sustainability plan for early childhood education in the State such as planting trees, grasses

and properly educating children on the need for environmental friendly environment for learning. From the findings of the study, recommendations were also proffered and among them include that: Enugu State Government in collaboration with the Enugu State Universal Basic Education (ENSUBEB) should mapped out a day for environment sustainability lectures for both teachers and pupils. And there is need for massive planting of trees and flowers in primary schools to improve the environmental wellness of the school.

Result

Research Question 1: What are the influences of parental engagement in reimagining preschoolers' education?

Table 1: Mean rating, standard deviation and t-test analysis of the responses of head teachers and preschooler's teachers on the influence of parental engagement in reimagining of preschoolers education.

S/N	Item Statement	X	SD	t-cal	Remark
1	The curriculum includes lessons on waste management (e.g., recycling, reducing litter).	2.88	1.72	0.51	RQ, NS
2	Children are taught about water conservation and the importance of using water wisely	2.65	1.52	0.53	RQ, NS
3	The curriculum contains activities that promote energy conservation (e.g., turning off lights, using natural light)	3.45	1.61	0.52	RQ, NS
4	Pupils learn about trees, plants, and their importance to the environment	2.65	1.60	0.50	RQ, NS
5	Lessons include information on air and noise pollution and how to minimize them.	3.55	1.72	0.61	RQ, NS
6	Students are engaged in hands-on environmental activities, such as planting trees or school gardens.	2.75	1.63	0.53	RQ, NS
7	The curriculum encourages creative reuse of materials (upcycling) during classroom activities	3.85	1.51	0.53	RQ, NS
8	Pupils are encouraged to report environmental hazards or littering in and around the school	2.95	1.52	0.56	RQ, NS
9	The curriculum includes environmental storytelling or songs to teach sustainability concepts	2.55	1.62	0.58	RQ, NS
10	The school provides learning materials and resources that reinforce environmental education, such as posters, charts, or picture books on sustainability	3.65	1.41	0.57	RQ, NS
11	Teachers incorporate environmental themes into play and creative activities (e.g., drawing, role play)	2.85	1.53	0.59	RQ, NS
Cluster Mean		2.88	1.55	0.57	RQ, NS

Key: X=mean, SD=Standard deviation, Cal=t-calculated, Required, NS= Not significant

Table 1 presents the mean ratings, standard deviations, and t-test analysis of the responses of head teachers and preschool teachers on the influence of parental engagement in reimagining preschoolers' education. The result shows a cluster mean of 2.88, which is above the criterion mean of 2.50, indicating that respondents generally agreed that various educational practices contribute to improving preschool education. The respondents agreed that the curriculum includes lessons on waste management such as recycling and reducing litter ($X = 2.88$) and that children are taught about water conservation and the importance of using water wisely ($X = 2.65$). They also indicated that the curriculum

promotes energy conservation activities such as turning off lights and using natural light ($X = 3.45$) and teaches pupils about trees, plants, and their importance to the environment ($X = 2.65$). Furthermore, respondents agreed that lessons include information on air and noise pollution and how to minimize them ($X = 3.55$) and that students are engaged in hands-on environmental activities such as planting trees or maintaining school gardens ($X = 2.75$). The findings also show that the curriculum encourages creative reuse of materials through upcycling activities ($X = 3.85$) and motivates pupils to report environmental hazards or littering around the school ($X = 2.95$). In addition, respondents agreed that environmental storytelling or songs are used to teach sustainability concepts ($X = 2.55$) and that schools provide learning materials such as posters, charts, and picture books to reinforce environmental education ($X = 3.65$). Teachers were also reported to incorporate environmental themes into play and creative classroom activities such as drawing and role play ($X = 2.85$). The standard deviation values ranging from 1.41 to 1.72 indicate that the responses of the respondents were relatively close, showing a moderate level of agreement among them. Furthermore, the t-calculated values with remarks of Not Significant (NS) indicate that there is no significant difference between the responses of head teachers and preschool teachers regarding the influence of these practices on reimagining preschoolers' education. Overall, the findings suggest that integrating environmental sustainability concepts and activities into preschool education contributes to improving children's learning experiences and awareness of environmental responsibility.

Research Question 2: What are the level of awareness and understanding of environmental sustainability among early childhood learners in public primary schools?

Table 2: Mean rating, standard deviation and t-test analysis of the responses of head teachers and preschooler's teachers on the level of awareness and understanding of environmental sustainability among early childhood learners in public primary schools.

S/N	Item Statement	X	SD	t-cal	Remark
1	Learners can identify different types of waste (e.g., biodegradable and non-biodegradable)	3.16	1.90	0.57	RQ, NS
2	Learners understand the importance of throwing waste in the proper place	2.87	1.80	0.55	RQ, NS
3	Learners know why trees and plants are important for the environment.	3.19	1.70	0.90	RQ, NS
4	Learners can explain why water should not be wasted.	2.56	1.60	0.54	RQ, NS
5	Learners understand the importance of saving electricity and turning off lights	3.07	1.50	0.56	RQ, NS
6	Learners can identify ways to keep the school and classroom clean.	2.66	1.80	0.53	RQ, NS
7	Learners know the effects of littering on the environment.	3.35	0.90	0.55	RQ, NS
8	Learners understand the importance of recycling and reusing materials	3.29	1.70	0.56	RQ, NS
9	Learners can explain why animals and insects are important in nature	2.57	1.70	0.57	RQ, NS
10	Learners are aware of air pollution and simple ways to reduce it	3.08	1.50	0.58	RQ, NS
11	Learners know why it is important to take care of natural resources.	2.56	1.60	0.55	RQ, NS
12	Learners can demonstrate planting and caring for seedlings or small plants	3.19	1.80	0.54	RQ, NS

13	Learners can explain the relationship between humans and the environment.	2.68	1.90	0.55	RQ, NS
14	Learners show understanding of avoiding harmful practices, such as cutting down trees unnecessarily	2.77	1.70	0.50	RQ, NS
15	Learners can identify simple actions at home or school that help protect the environment, such as cleaning, planting, or saving water.	3.35	0.90	0.55	RQ, NS
Cluster Mean		3.29	1.70	0.56	RQ, NS

Key: X=mean, SD=Standard deviation, Cal=t-calculated, Required, NS= Not significant

Table 2 presents the mean ratings, standard deviations, and t-test analysis of the responses of head teachers and preschool teachers on the level of awareness and understanding of environmental sustainability among early childhood learners in public primary schools. The result shows a cluster mean of 3.29, which is above the criterion mean of 2.50, indicating that respondents generally agreed that early childhood learners possess a moderate to high level of awareness and understanding of environmental sustainability concepts. The respondents indicated that learners can identify different types of waste such as biodegradable and non-biodegradable materials ($X = 3.16$) and understand the importance of disposing waste properly ($X = 2.87$). They also agreed that learners know why trees and plants are important for the environment ($X = 3.19$) and can explain why water should not be wasted ($X = 2.56$). Furthermore, the findings reveal that learners understand the importance of saving electricity by turning off lights ($X = 3.07$) and can identify ways of keeping the school and classroom environment clean ($X = 2.66$). The respondents also agreed that learners are aware of the effects of littering on the environment ($X = 3.35$) and understand the importance of recycling and reusing materials ($X = 3.29$). In addition, learners were reported to know the importance of animals and insects in nature ($X = 2.57$) and are aware of air pollution and simple ways to reduce it ($X = 3.08$). The findings further indicate that learners understand the importance of caring for natural resources ($X = 2.56$) and can demonstrate planting and caring for seedlings or small plants ($X = 3.19$). Learners were also reported to understand the relationship between humans and the environment ($X = 2.68$) and the need to avoid harmful environmental practices such as unnecessary cutting of trees ($X = 2.77$). Additionally, they can identify simple environmental protection actions such as cleaning, planting, and saving water at home or in school ($X = 3.35$). The standard deviation values ranging from 0.90 to 1.90 indicate that the responses of the respondents were relatively close, showing a moderate level of agreement among them. Furthermore, the t-calculated values with remarks of Not Significant (NS) indicate that there is no significant difference between the responses of head teachers and preschool teachers regarding the level of awareness and understanding of environmental sustainability among early childhood learners. Overall, the findings suggest that learners in public primary schools demonstrate a reasonable level of environmental awareness and understanding of sustainability practices.

Research Question 3: What are the challenges and barriers faced by educators in implementing environmental sustainability education in public primary schools?

Table 3: Mean rating, standard deviation and t-test analysis of the responses of head teachers and preschooler's teachers on the challenges and barriers faced by educators in implementing environmental sustainability education in public primary schools.

S/N	Item Statement	X	SD	t-cal	Remark
1	Lack of sufficient teaching and learning materials on environmental sustainability (e.g., books, charts, visual aids).	3.28	1.12	0.54	RQ, NS
2	Inadequate training of teachers on environmental education and sustainable practices.	3.15	1.82	0.56	RQ, NS
3	Overcrowded classrooms, making it difficult to engage students in hands-on activities	3.25	1.64	0.54	RQ, NS
4	Poor infrastructure, such as lack of gardens, outdoor learning spaces, or clean water facilities	2.75	1.46	0.57	RQ, NS
5	Limited time in the school timetable to teach environmental concepts effectively	2.66	1.76	0.58	RQ, NS
6	Insufficient funding to support environmental projects and sustainability activities.	3.32	1.90	0.54	RQ, NS
7	Lack of community and parental support for sustainability initiatives	3.15	1.81	0.56	RQ, NS
8	Low awareness or motivation among teachers regarding environmental education	3.16	1.52	0.54	RQ, NS
9	Curriculum constraints, where sustainability is not explicitly integrated into early childhood programs	2.56	1.73	0.57	RQ, NS
10	Limited access to instructional resources and multimedia tools for teaching environmental concepts	3.18	0.91	0.91	RQ, NS
11	Cultural and societal practices that do not prioritize environmental care.	3.32	1.90	0.54	RQ, NS
12	Difficulty in linking theoretical environmental concepts to age-appropriate activities for young learners	3.15	1.81	0.56	RQ, NS
Cluster Mean		3.42	1.54	0.58	RQ, NS

Key: X=mean, SD=Standard deviation, Cal=t-calculated, Required, NS= Not significant

Table 3 presents the mean ratings, standard deviations, and t-test analysis of the responses of head teachers and preschool teachers on the challenges and barriers faced by educators in implementing environmental sustainability education in public primary schools. The result shows a cluster mean of 3.42, which is above the criterion mean of 2.50, indicating that respondents generally agreed that several challenges hinder the effective implementation of environmental sustainability education in schools. The respondents agreed that lack of sufficient teaching and learning materials such as books, charts, and visual aids ($X = 3.28$) and inadequate training of teachers on environmental education and sustainable practices ($X = 3.15$) limit teachers' ability to effectively teach sustainability concepts. They also indicated that overcrowded classrooms ($X = 3.25$) make it difficult to involve learners in practical and hands-on environmental activities. Furthermore, the respondents agreed that poor school infrastructure such as lack of school gardens, outdoor learning spaces, and clean water facilities ($X = 2.75$) as well as limited time in the school timetable to teach environmental concepts ($X = 2.66$) affect the proper implementation of environmental education. The findings also reveal that insufficient funding to support environmental projects and sustainability activities ($X = 3.32$) and lack of community and parental support for sustainability initiatives ($X = 3.15$) constitute major barriers. In addition, respondents indicated that low awareness or motivation among teachers regarding environmental education ($X = 3.16$) and curriculum constraints where sustainability is not clearly integrated into early childhood programmes ($X = 2.56$) also

limit effective implementation. The results further show that limited access to instructional resources and multimedia tools ($X = 3.18$), cultural and societal practices that do not prioritize environmental care ($X = 3.32$), and difficulty in linking theoretical environmental concepts to age-appropriate activities for young learners ($X = 3.15$) are additional challenges faced by educators. The standard deviation values ranging from 0.91 to 1.90 indicate that the responses of the respondents were relatively close, showing a moderate level of agreement among them. Furthermore, the t-calculated values with remarks of Not Significant (NS) indicate that there is no significant difference between the responses of head teachers and preschool teachers regarding the challenges and barriers faced by educators in implementing environmental sustainability education. Overall, the findings suggest that limited resources, inadequate training, poor infrastructure, curriculum limitations, and weak institutional and community support are major factors affecting the effective implementation of environmental sustainability education in public primary schools

Research Question 4: What are the policy strategies and interventions that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools

Table 4: Mean rating, standard deviation and t-test analysis of the responses of head teachers and preschooler's teachers on the policy strategies and interventions that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools

S/N	Item Statement	X	SD	t-cal	Remark
1	Integrate environmental sustainability concepts explicitly into the early childhood curriculum	2.88	1.72	0.51	RQ, NS
2	Provide adequate teaching and learning materials, such as charts, storybooks, posters, and activity kits focused on sustainability	2.65	1.52	0.53	RQ, NS
3	Organize teacher training and workshops on environmental education and pedagogical strategies for young children	3.45	1.61	0.52	RQ, NS
4	Establish school gardens and outdoor learning spaces where children can engage in planting and caring for plants.	2.65	1.60	0.50	RQ, NS
5	Incorporate hands-on activities such as waste sorting, recycling, and composting into classroom lessons	3.55	1.72	0.61	RQ, NS
6	Use play-based learning and role play to teach environmental concepts in an engaging and age-appropriate manner.	2.75	1.63	0.53	RQ, NS
7	Encourage project-based learning, such as "clean-up days" or tree planting, to reinforce practical environmental skills.	3.85	1.51	0.53	RQ, NS
8	Foster school-community partnerships to support environmental programs and awareness campaigns.	2.95	1.52	0.56	RQ, NS
9	Incorporate environmental storytelling, songs, and rhymes to enhance children's understanding and retention	2.55	1.62	0.58	RQ, NS
10	Engage parents and caregivers in sustainability initiatives to reinforce learning at home	3.65	1.41	0.57	RQ, NS

Cluster Mean	2.85	0.53	0.59	RQ, NS
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Key: X=mean, SD=Standard deviation, Cal=t-calculated, Required, NS= Not significant

Table 4 presents the mean ratings, standard deviations, and t-test analysis of the responses of head teachers and preschool teachers on the policy strategies and interventions that can enhance the adoption and practice of environmental sustainability among young learners in Enugu State public primary schools. The result shows a cluster mean of 2.85, which is above the criterion mean of 2.50, indicating that respondents generally agreed that several policy strategies and interventions can enhance environmental sustainability practices among young learners. The respondents agreed that integrating environmental sustainability concepts explicitly into the early childhood curriculum ($X = 2.88$) and providing adequate teaching and learning materials such as charts, storybooks, posters, and activity kits ($X = 2.65$) will support effective environmental education in schools. They also indicated that organizing teacher training and workshops on environmental education and appropriate teaching strategies for young learners ($X = 3.45$) will improve teachers' knowledge and capacity to teach sustainability concepts. Furthermore, respondents agreed that establishing school gardens and outdoor learning spaces where children can participate in planting and caring for plants ($X = 2.65$) will promote practical learning experiences. The findings also show that incorporating hands-on activities such as waste sorting, recycling, and composting into classroom lessons ($X = 3.55$) and encouraging project-based learning activities such as school clean-up exercises and tree planting ($X = 3.85$) will strengthen children's environmental awareness and practical skills. In addition, respondents indicated that using play-based learning methods and role play ($X = 2.75$) as well as environmental storytelling, songs, and rhymes ($X = 2.55$) can make environmental concepts more engaging and understandable for young learners. The results further reveal that fostering school–community partnerships to support environmental programmes and awareness campaigns ($X = 2.95$) and engaging parents and caregivers in sustainability initiatives ($X = 3.65$) will reinforce environmental learning both in school and at home. The standard deviation values indicate that the responses of the respondents were relatively close, showing a moderate level of agreement among them. Furthermore, the t-calculated values with remarks of Not Significant (NS) indicate that there is no significant difference between the responses of head teachers and preschool teachers regarding the policy strategies and interventions that can enhance environmental sustainability practices among young learners. Overall, the findings suggest that curriculum integration, teacher training, practical learning activities, community collaboration, and parental involvement are important strategies for promoting environmental sustainability education among young learners in public primary schools.

Discussion

The findings of the study revealed that integrating environmental sustainability concepts into preschool education plays an important role in improving children's learning experiences and awareness of environmental responsibility. The result showed a cluster mean of 2.88, indicating that respondents agreed that the curriculum incorporates environmental concepts such as waste management, water conservation, energy conservation, and environmental protection through various classroom activities. The findings also indicated that children are engaged in practical activities such as planting

trees, school gardening, creative reuse of materials, and environmental storytelling, which enhance their understanding of sustainability concepts.

The findings of this study are consistent with the work of Daniella Tilbury (2021), who emphasized that introducing environmental sustainability concepts at the early childhood level helps children develop responsible environmental behaviors and positive attitudes toward nature. Tilbury noted that when environmental themes such as recycling, conservation, and environmental protection are integrated into early childhood curricula, children are more likely to develop long-term environmental awareness and responsible practices. This aligns with the present study which found that lessons on waste management, water conservation, and energy conservation are included in preschool curricula to enhance environmental awareness among children.

Similarly, the findings agree with the work of Sue Elliott (2022), who reported that environmental education in early childhood settings is most effective when children are actively involved in hands-on activities such as planting trees, gardening, and recycling projects. According to Elliott, such experiential learning strategies help young learners connect classroom knowledge with real-life environmental practices. This supports the current findings which revealed that students participate in practical environmental activities such as tree planting, school gardening, and creative reuse of materials. Furthermore, the findings are in agreement with the work of Arjen Wals (2022), who observed that environmental education should involve participatory and action-oriented learning strategies that allow children to identify environmental problems and take part in solving them. Wals noted that when children are encouraged to observe their surroundings, report environmental hazards, and participate in environmental improvement activities, they develop a sense of environmental responsibility and stewardship. This supports the current study where pupils were encouraged to report environmental hazards and participate in environmental protection practices.

The findings of the study revealed that early childhood learners in public primary schools demonstrate a moderate to high level of awareness and understanding of environmental sustainability concepts. The cluster mean of 3.29 indicates that respondents agreed that learners are able to identify various environmental concepts such as different types of waste, the importance of trees and plants, proper waste disposal, and water conservation. The findings further showed that learners understand the importance of saving electricity, keeping their environment clean, and avoiding harmful environmental practices such as littering and unnecessary cutting of trees. In addition, learners were reported to be aware of air pollution, the importance of animals and insects in nature, and the need to protect natural resources. They also demonstrated practical environmental knowledge through activities such as planting and caring for seedlings and identifying simple environmental protection actions like cleaning, planting, and saving water both at home and in school.

The findings of this study are consistent with the work of Julie Davis (2021), who reported that early childhood learners are capable of developing a strong understanding of environmental sustainability when environmental concepts are introduced through simple classroom activities and real-life examples. Davis noted that young children can easily grasp ideas related to recycling, environmental cleanliness, and conservation when these concepts are integrated into everyday classroom learning. This supports the present findings which revealed that learners can identify waste types and understand the importance of proper waste disposal and environmental cleanliness.

Similarly, the findings align with the study conducted by Sue Elliott (2022), who found that young learners develop environmental awareness when they participate in practical and experiential activities such as planting trees, gardening, and recycling projects. Elliott emphasized that such activities help children understand the relationship between humans and the natural environment and encourage them to develop responsible environmental behaviors. This agrees with the current findings where learners were reported to demonstrate planting and caring for seedlings as well as understanding the importance of protecting natural resources.

The findings of the study revealed that early childhood learners in public primary schools possess a moderate to high level of awareness and understanding of environmental sustainability concepts. With a cluster mean of 3.29, the results indicate that learners can identify various environmental concepts, including different types of waste, the importance of trees and plants, proper waste disposal, and water conservation. Moreover, the learners demonstrated an understanding of energy conservation, environmental cleanliness, and the need to avoid harmful practices such as littering and unnecessary cutting of trees. They were also aware of air pollution, the ecological importance of animals and insects, and the necessity of protecting natural resources. Practical engagement in activities such as planting and caring for seedlings, alongside simple environmental protection actions like cleaning, planting, and conserving water, further reinforced their understanding and application of sustainability concepts both at home and in school.

These findings align with the work of Julie Davis (2021), who reported that early childhood learners develop a strong understanding of sustainability when environmental concepts are incorporated into classroom activities and real-life experiences. Davis emphasized that children grasp recycling, cleanliness, and conservation concepts more effectively when they are embedded in daily learning, which corresponds with the current study's observation that learners could identify waste types and understand proper waste management.

Similarly, Sue Elliott (2022) highlighted that young learners enhance environmental awareness through practical, hands-on activities such as tree planting, gardening, and recycling projects. Elliott argued that such experiential learning helps children connect with the natural environment and cultivate responsible environmental behaviors, which mirrors the current study's findings on learners actively engaging in planting and caring for seedlings. The results also resonate with Arjen Wals (2022), who posited that participatory learning approaches involving observation, discussion, and action significantly strengthen children's environmental awareness. Wals emphasized that understanding topics such as pollution, conservation, and ecosystem protection enables children to recognize the impact of human activities on the environment, paralleling the present study's finding that learners are aware of littering, air pollution, and the need to protect natural resources.

The findings of the study revealed that early childhood learners in public primary schools demonstrate a moderate to high level of awareness and understanding of environmental sustainability concepts. With a cluster mean of 3.29, respondents agreed that learners can identify different types of waste, understand the importance of trees and plants, practice proper waste disposal, and conserve water. Additionally, learners were reported to understand the need to save electricity, maintain environmental cleanliness, and avoid harmful practices such as littering and unnecessary cutting of trees. They also demonstrated awareness of air pollution, the ecological roles of animals and insects, and

the importance of protecting natural resources. Practical engagement was evident, as learners could participate in planting and caring for seedlings and perform simple environmental protection actions like cleaning, planting, and conserving water both at home and in school.

These findings are consistent with the work of Maria Montessori (2021), who emphasized that early engagement with environmental concepts helps children develop an understanding of their surroundings and promotes responsible behaviors. Montessori highlighted that hands-on experiences such as caring for plants and observing natural phenomena foster environmental awareness, which aligns with the present study's findings that learners actively engage in planting and maintaining seedlings.

The findings also resonate with the work of Peter Higgins (2020), who argued that participatory and action-oriented learning strategies, including observation, discussion, and project-based activities, strengthen children's environmental literacy. Higgins emphasized that early engagement with environmental topics helps learners connect human actions to ecological outcomes, which supports the current study's observation that learners understand the effects of littering, air pollution, and the importance of protecting plants and animals.

Conclusion

Based on the findings of the study, it was concluded that environmental sustainability through early childhood education in public primary schools in Enugu State has not been adequately promoted due to inadequate environmental sustainability practices and limited awareness programmes. The study further concluded that strengthening environmental education and sustainability initiatives in public primary schools is essential for fostering environmental consciousness and responsible environmental behaviour among pupils.

Recommendations

Based on the findings of the study, the following recommendations can be made:

1. Integrate environmental sustainability into the early childhood curriculum in public primary schools, ensuring that concepts such as waste management, conservation, and ecological responsibility are taught using age-appropriate and engaging methods.
2. Provide adequate teaching resources and learning materials that support sustainability education, including visual aids, books, activity kits, and hands-on tools, to enable children to experience and practice environmental stewardship.
3. Train and sensitise early childhood educators on environmental education techniques, pedagogical strategies, and sustainability principles to enhance their capacity to deliver meaningful and effective learning experiences.
4. Improve the physical and infrastructural learning environment in public primary schools, including safe outdoor spaces, gardens, and activity corners, which can serve as practical sites for children to engage in environmental activities.

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