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PROMOTING ENVIRONMENTAL AWARENESS AMONG PRIMARY SCHOOL STUDENTS IN THE SOKOTO METROPOLIS

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Abstract: This study investigates how gender and the location of a school influences students' environmental awareness among primary school students in Sokoto Metropolis, Nigeria. Using a 2×2 factorial survey design was used to assess 352 pupils across three dimensions: environmental knowledge, affective concern, and behavior. The results reveal that urban pupils and female students demonstrated higher overall awareness than their peri-urban and male counterparts, respectively. However, no significant interaction was found between gender and location, confirming that each variable contributes independently to environmental awareness. These findings align with global research indicating urban advantage and gender sensitivity in environmental attitudes but also underscore systemic gaps in curriculum delivery. This study highlights the need for targeted, locally relevant environmental education, especially in schools with under-resourced resources. It recommends integrating structured environmental content into early education and promoting experiential learning. This work contributes to efforts aimed at nurturing environmentally responsible citizens in developing contexts from a young age.

Keywords: Environmental Awareness, Primary Education, Gender Differences, School Location, Sokoto Metropolis

Introduction

Environmental degradation has become one of the most pressing challenges of the 21st century, threatening global ecological stability and human well-being across the globe. Issues such as climate change, deforestation, waste mismanagement, and the depletion of natural resources demand urgent responses not only through policy and technology but also through education. Environmental education, especially at the foundational level, is increasingly seen as a catalyst for cultivating responsible attitudes and behaviors in younger generations (Buchanan, Pressick-Kilborn, & Maher, 2019). Schools, particularly primary schools, play a pivotal role in shaping learners' understanding of their environment, promoting sustainable habits, and nurturing long-term

ecological consciousness (Zeegers, Paige, Lloyd, & Roetman, 2012). In a developing country like Nigeria, where environmental crises are compounded by weak infrastructure and population pressure, the significance of embedding environmental literacy within the basic education system cannot be overstated.

Environmental awareness is not merely about acquiring knowledge; it encompasses affective and behavioral components that lead to informed and sustainable choices. Several studies have documented varying levels of environmental awareness among students in different contexts. Astuti, Kardiyem, Setiyani, and Jaenudin (2024) found that while Indonesian university students had high levels of environmental knowledge, there was a significant gap in their readiness to act upon such knowledge. Similarly, Pradhan and Panda (2024) reported considerable gender and location disparities among Indian elementary school students, with urban students displaying better awareness than their rural peers. In China, Weng, Hu, Tao, and Xu (2018) linked low-carbon consumption behaviors to early environmental education, demonstrating that awareness built in the early years can influence future lifestyle decisions. Furthermore, Wang, Lavonen, and Tirri (2018) highlighted the emphasis placed on environmental and sustainability competencies in the national curricula of China and Finland, suggesting that prioritizing environmental education early in life is a global imperative.

Research on environmental awareness among primary school students in Nigeria is relatively sparse. Alimi and Olatumile (2016) assessed environmental protection awareness among Universal Basic Education students and reported low levels of awareness due to insufficient curricular emphasis and poor integration of environmental themes. However, their study did not disaggregate by age group, region, or school type, which limits its applicability to primary schools in Northern Nigeria. Dankani (2018), working specifically in Sokoto Metropolis, found that residents' awareness and positive attitudes toward urban forestry varied significantly, pointing to gaps in public engagement and education. Although this study was not school-based, it emphasized the region's distinct environmental context. Other findings (Irimia et al., 2025) show that both formal education and socio-environmental exposure often shape water management awareness among primary students, suggesting that early education can be a powerful tool in shaping attitudes toward sustainability.

A key gap identified across these studies is the lack of data specifically examining how demographic variables, such as gender and school location, influence environmental awareness at the primary school level. For example, Zeegers et al. (2012) and Pradhan and Panda (2024) identified significant main effects for gender and school type (urban vs. rural), yet very few studies have investigated their interaction in a factorial design. Buchanan et al. (2019) noted the potential of digital technologies to bridge awareness gaps, especially in under-resourced schools. However, empirical data from Northern Nigeria remain limited. Moreover, studies such as Van der Velde et al. (2017) and Wilcox, Van Sebille, and Hardesty (2015) have emphasized the global relevance of environmental literacy and citizen involvement. However, young learners, particularly those in peri-urban or resource-poor settings, are often underrepresented in these discussions. A more nuanced understanding of how environmental awareness is shaped by both internal (e.g., gender) and external (e.g., school context) factors at an early age is therefore urgently needed.

The Sokoto Metropolis offers a distinct socio-cultural and ecological context for exploring these interactions. The region is affected by environmental challenges such as desertification, poor waste management, and urban expansion (Dankani, 2018). However, empirical studies focusing on how these realities are reflected in children's environmental understanding are lacking. Drawing on Yin's (2014) case study framework and Zapf's (2010) theory of place-based environmental engagement, this research proposes a localized investigation into how

primary school pupils in Sokoto cultivate environmental awareness. Given the prevalence of environmental education models tailored to high-income or urbanized settings, this study contributes context-sensitive insight from a Northern Nigerian perspective, with potential implications for curriculum development, teacher training, and local environmental campaigns.

This study aims to assess the promotion of environmental awareness among primary school students in Sokoto Metropolis by examining how gender and school location influence knowledge, attitudes, and behaviors related to environmental issues. Specifically, this study investigates whether pupils from urban schools differ significantly from those in peri-urban schools in terms of environmental awareness and whether these differences vary by gender. This factorial approach allows testing of both the main and interaction effects. Based on prior literature, it is hypothesized that: (1) students in urban schools will demonstrate higher levels of environmental awareness than those in peri-urban schools; (2) female students will report greater affective and behavioral environmental concern; and (3) a significant interaction between gender and school location will influence overall awareness. The following research questions guide this study: 1. What is the current level of environmental awareness among primary school students in Sokoto Metropolis? 2. Are there significant differences in gender and school location-based awareness? 3. Is there a significant interaction between gender and location in shaping environmental awareness among students?

Method

Research Design

This study adopted a 2 × 2 factorial, cross-sectional survey design. The independent variables were gender (male, female) and school location (urban, peri-urban). The dependent variable was environmental awareness, operationalized as a composite of ecological knowledge, affective concern and self-reported pro-environmental behavior. A factorial design was chosen because prior research indicates separate effects of gender and location on awareness (Pradhan & Panda, 2024; Zeegers et al., 2012), yet their interaction in the Nigerian North-West remains unexplored.

Participants and Sampling

The target population comprised Primary 5 and 6 pupils in public schools within Sokoto Metropolis (≈ 7,800 pupils). A multistage stratified random sampling procedure was used. First, four Local Government Education Authorities (LGEAs) were grouped into urban and peri-urban strata. In each stratum, three schools were randomly selected (total = 6). Intact classes were sampled within each school, yielding N = 360 pupils (180 urbans, 180 peri-urbans; 50 % girls). The sample size exceeds Cochran's (1977) recommendation for categorical analyses and allows the detection of medium interaction effects ($f = 0.25$) with 0.80 power at $\alpha = .05$.

Instrumentation

Environmental awareness was measured with the Primary Environmental Awareness Scale (PEAS), adapted from items validated by Alimi and Olatumile (2016) and Astuti et al. (2024). The 24-item scale is divided into

1. Knowledge (8 multiple-choice items; KR-20 = 0.78),
2. Affective concern (8 Likert items; $\alpha = 0.82$) and
3. Behavior (8 Likert items; $\alpha = 0.80$).

Content validity was established through an expert review by two environmental educators and one curriculum specialist. A pilot with 40 pupils outside the study schools produced a scale-level content validity index of .92 and informed minor wording revisions for cultural relevance.

Data Collection Procedure

After ethics clearance and permission from the Sokoto State Universal Basic Education Board, the head teachers were briefed and parental consent/child assent was obtained. Trained research assistants administered the paper questionnaires during regular class periods in April 2025. Each session began with a scripted explanation and assurance of confidentiality. Completion time averaged 25 minutes. Returned questionnaires were screened; eight incomplete forms were excluded, resulting in 352 usable cases.

Data Analysis

Data were coded and analyzed using SPSS 28. Descriptive statistics were used to provide mean awareness scores. Normality and homogeneity assumptions were confirmed via Shapiro–Wilk and Levene tests. A two-way ANOVA assessed main and interaction effects of gender and location on overall awareness and on each subscale. The effect sizes were reported using partial η^2 (small = .01, medium = .06, large = .14). Where significant interactions emerged, simple-effects analyses with Bonferroni adjustment were conducted. Significance was set at $p < .05$.

Ethical Considerations

The study adhered to the Declaration of Helsinki and Nigeria's National Code for Health Research Ethics. Participation was voluntary; no personal identifiers were collected. Pupils could withdraw at any time without penalty. Data were stored on an encrypted drive accessible only to the research team and deleted five years after publication.

Limitations

Although the design enables inference of interaction effects, its cross-sectional nature cannot capture longitudinal changes in awareness. Self-report behavior may also inflate pro-environmental claims. To mitigate bias, neutrality was emphasized during administration and anonymity was ensured.

Discussion

This study set out to explore how gender and school location interact to influence environmental awareness among primary school students in the Sokoto Metropolis. It was hypothesized that (1) students from urban schools would demonstrate higher levels of environmental awareness than their peri-urban counterparts; (2) girls would report greater affective concern and environmentally responsible behaviors than boys; and (3) there would be a significant interaction between gender and school location influencing overall awareness levels. The findings broadly supported the first and second hypotheses. Urban students outperformed peri-urban students, and female pupils reported higher concern and behavioral engagement. However, contrary to expectations, the interaction effect between gender and location was not statistically significant, suggesting that although gender and location independently contribute to awareness, their combination does not amplify or moderate the effect in a meaningful way.

The higher awareness among urban students is consistent with prior studies in different national contexts that report better environmental education infrastructure and access to information in urban settings (Pradhan & Panda, 2024; Wang, Lavonen, & Tirri, 2018). Urban pupils may also be more frequently exposed to discussions on climate change, pollution, and conservation through digital platforms, school clubs, and teacher-led initiatives, aligning with Buchanan, Pressick-Kilborn, and Maher's (2019) emphasis on the role of technology in environmental learning. Similarly, the observed gender difference, with girls outperforming boys in affective and behavioral subscales, resonates with Zeegers, Paige, Lloyd, and Roetman (2012), who suggested that girls tend

to engage more empathetically with environmental topics. This may be influenced by socialization patterns or curriculum delivery styles that better resonate with girls' learning preferences. However, the absence of a significant interaction effect was unexpected, particularly given assumptions about gendered responsibilities in environmental practices and differences in school resources between locations.

One possible explanation for this non-significant interaction may be the socio-cultural context of the Sokoto Metropolis. Despite some variation in infrastructure, both urban and peri-urban schools in the sample may share similar pedagogical limitations in teaching environmental topics. Unlike countries with well-developed and differentiated environmental curricula (Weng, Hu, Tao, & Xu, 2018), Nigeria's Universal Basic Education curriculum embeds environmental themes sporadically across subjects (Alimi & Olatumile, 2016). This fragmented exposure leveled out the expected amplifying effect of combined gender and school location. Additionally, the content and delivery of environmental lessons may not substantially vary between urban and peri-urban settings, leading to similar trends across subgroups. These findings also resonate with Dankani's (2018) assertion that while environmental awareness exists among Sokoto residents, deep engagement and informed behaviors are often limited by systemic gaps in education and outreach.

That said, several study strengths enhance confidence in the findings. The factorial design allowed for a more nuanced understanding of how independent variables operate both separately and in combination, addressing a gap in previous research. Furthermore, the stratified random sampling ensured representation across different school types and demographic profiles, thereby reducing selection bias. The use of a locally adapted and piloted instrument also improved cultural relevance and measurement validity, following best practices outlined by Astuti, Kardiyem, Setiyani, and Jaenudin (2024). By measuring knowledge, concern, and behavior separately, the study contributes to the emerging consensus that environmental awareness should not be treated as a unidimensional construct (Irimia et al., 2025).

Nonetheless, limitations exist that warrant reflection. First, the reliance on self-report data may have introduced social desirability bias, especially in the behavioral domain, where students may feel compelled to report eco-friendly habits regardless of actual practice. Future studies could complement surveys with observational data or teacher assessments. Second, the cross-sectional nature of the study restricts causal inference; a longitudinal design would allow for tracking changes in awareness over time, especially in response to curricular interventions. Third, although the school location was classified as urban or peri-urban, the analysis did not account for intra-location variations in resources, teacher qualifications, or parental involvement, all of which could influence student awareness (Zapf, 2010). Addressing these limitations in future research would deepen understanding and support stronger policy recommendations.

The findings have significant implications for educational policy and practice in Nigeria and similar contexts. Consistent gender and location-based disparities suggest, the need for targeted environmental education strategies that are sensitive to local realities. Curriculum planners should consider incorporating structured environmental education modules across all subjects and training teachers to deliver them effectively, especially in peri-urban schools. Van der Velde et al. (2017) argue that even young learners can meaningfully engage with environmental content when given appropriate tools and support. Schools could also enhance experiential learning opportunities, such as school gardens or recycling projects, to bridge the gap between knowledge and action.

Future research could explore how other variables, such as parental education, teacher environmental literacy, and access to extracurricular activities, interact with gender and location to shape environmental awareness.

Rather than only increasing the sample size, researchers could employ mixed-methods approaches to capture the complexity of the students lived experiences. Moreover, given the promising results from technology-supported learning (Buchanan et al., 2019), experimental studies could assess the effectiveness of digital interventions in promoting environmental awareness among primary students in low-resource settings. These baby steps, grounded in local contexts and driven by empirical evidence, can gradually lead to a more environmentally conscious generation.

In conclusion, this study underscores the importance of contextual and demographic factors in shaping environmental awareness among primary school pupils in Sokoto Metropolis. While urban students and girls demonstrated higher awareness levels, the anticipated interaction effect did not materialize, prompting reflection on how environmental education is delivered across schools. By illuminating the independent roles of gender and location and highlighting both achievements and gaps in current pedagogical practices, the study contributes a grounded understanding that can inform future research, curricular reform, and targeted interventions. The findings reinforce the value of early environmental education as a foundation for sustainable development and social transformation.

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