

Knowledge of Climate Change and Mitigation Strategies among Primary School Teachers: Implications for Sustainable Development in Cross River State

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Abstract

This study focused on assessing climate change knowledge and mitigation strategies among primary school teachers in Cross River State, Nigeria. Three research questions and two null hypotheses guided the study, which adopted the descriptive survey research design. Out of the population of 17,284 Public Primary School teachers in Cross River State, a sample of 384 teachers was drawn for the study through multi-stage sampling procedure involving simple random and purposive sampling techniques. Data in the study were collected using Climate Change Knowledge Test (CCKT) and Climate Change Mitigation Strategies Questionnaire (CCMSQ) developed by the researchers and validated by three experts in

relevant fields. After trial-testing the instruments, the reliability of the CCKT was determined using K-R20, which yielded a reliability index of .77 while Cronbach's Alpha was used in estimating the reliability of the CCMSQ, which yielded an index of .75. Data collected for the study were analysed using mean and standard deviation for answering research questions. Findings showed that primary school teachers possessed low knowledge of climate change ($Mean = 8.45, SD = 2.26$). The result also showed that primary school teachers possessed low knowledge of mitigation strategies for climate change ($Mean = 2.02, SD = 0.96$). Additionally, lack of training for teachers on climate-related topics, insufficient teaching materials, and the absence of clear policy guidelines for incorporating climate change into teaching were identified as challenges of climate change education. Based on these findings, it was recommended among others, that regular professional development workshops should be organised for teachers to enhance their understanding of climate change and mitigation strategies. The government should integrate climate change education into the primary school curriculum, with clear guidelines and resources for teachers.

Keywords: Climate change knowledge, mitigation strategies, teachers, sustainable development

Introduction

Teachers are both knowledge bearers and role models in shaping young minds. Thus, primary school teachers' understanding of climate change which constitute one of the most pressing global challenges of the 21st century is very crucial. Climate change, a critical and escalating global challenge of the 21st century, affects natural and human systems across the world. It is defined as long-term shifts in temperatures and weather patterns (Nwankwoala, 2020). Its impacts permeate various societal dimensions of life, posing substantial risks to biodiversity, food security, economic stability, public health, and sustainable development worldwide (Ekpoto et al., 2025b; Ukwai et al., 2023; UNEP, 2022). This means that climate change has profound implications for human welfare and environmental stability (Ekpoto et al., 2025a; Omoogun et al., 2025).

Climate science therefore emphasises the crucial role of environmental literacy in mitigating the adverse impacts of climate change (IPCC, 2021). The need for societies to develop adaptive strategies to withstand climate change impacts has increased, with education playing a fundamental role in driving sustainable practices. Education is considered critical in developing this resilience, as it empowers individuals to understand and actively mitigate climate risks. Recognising this, Omoifo (2019) stresses the importance of climate education as an essential part of general scientific literacy, equipping individuals and communities to better understand climate-related challenges and implement solutions. Similarly, Ogunleye

and Sowunmi (2020) maintain that education fosters environmental awareness, motivating people to adopt sustainable practices, which contribute significantly to both local and global efforts in climate resilience.

The Federal Republic of Nigeria (FRN, 2014), through its National Policy on Education, acknowledges the significance of incorporating climate education within the basic education system, advocating for climate change awareness as a core component of the curriculum. Integrating climate change and sustainability within educational curricula aligns with Nigeria's broader commitment to the SDGs, particularly Goal 13 (Climate Action) and Goal 4 (Quality Education), by fostering environmental awareness and sustainable practices from a young age. By embedding climate literacy early in a child's education, Nigeria aims to build a foundation for informed, responsible citizens who can address pressing environmental challenges. Ezedinma (2016) noted that the integration of climate science into basic education curricula aims to foster an appreciation of sustainable development practices from an early age.

Schools, particularly at the primary level, serve as pivotal spaces for early climate education, equipping young learners with a foundational understanding of environmental issues and fostering attitudes that can encourage sustainable practices into adulthood (Osama et al., 2024). Within this context, teachers' knowledge and attitudes toward climate change are instrumental, as teachers directly influence learners' perceptions, understanding, and potential future actions on environmental issues (Pachauri & Meyer, 2014). Primary school teachers play a pivotal role in implementing this vision, as they are responsible for shaping students' early understanding of climate science and sustainable development. According to Oduwaye and Onasanya (2017), the role of teachers in teaching climate science and mitigation strategies is indispensable, as teachers are instrumental in equipping young learners with knowledge and skills to respond to environmental issues. In light of this, the competencies and knowledge levels of primary school teachers in climate science are crucial for effective curriculum implementation and for fostering a sustainable mindset in young learners (Nwafor, 2019).

Effective climate education entails more than theoretical understanding; it also involves imparting practical actions that learners can take to mitigate climate impact. Ajani and Taiwo (2018) argue that, for teachers to impart such lessons effectively, they themselves must be equipped with up-to-date knowledge of climate change and actionable mitigation strategies. However, several studies highlight that teachers often lack sufficient expertise in climate science, leading to competency gaps that hinder the effective teaching of environmental topics

(Nwachuku, 2017). Such gaps can negatively affect pupils' comprehension of climate issues, thereby limiting their ability to engage in sustainable practices. In Cross River State, where environmental changes like deforestation and coastal erosion increasingly threaten local communities, the importance of empowering primary school teachers with climate knowledge and mitigation skills cannot be overstated. Nwafor (2019) emphasises the need for equipping teachers with the latest insights into climate change and sustainable practices to prepare students for the environmental challenges they may face.

Moreover, recognising the essential role of teachers in climate education, the International Panel on Climate Change (IPCC, 2021) asserts that educational institutions have a critical responsibility in building climate resilience by training teachers to integrate climate change knowledge into their curricula. Recent studies indicate the need for comprehensive climate change training for teachers to bridge knowledge gaps and empower teachers with effective mitigation and adaptation strategies (UNICEF, 2022). Furthermore, when teachers are well-versed in climate science and sustainable practices, schools themselves can act as models for sustainability, employing measures such as energy efficiency, waste reduction, and water conservation (UN CC: Learn, 2023). Studies also indicate that such integration in school curricula can lead to improved climate literacy and foster a generation better equipped to address ecological challenges (UNESCO, 2022). However, there remains a notable scarcity of empirical literature assessing the climate knowledge levels and mitigation strategies of primary school teachers in Nigeria, particularly within Cross River State. Given the relevance of environmental issues in this state, this study sought to fill this knowledge gap. Hence, this study was aimed at assessing climate change knowledge and mitigation strategies among primary school teachers in Cross River State and explored the implications for fostering sustainable development in the State. Specifically, the study:

1. Assessed climate change knowledge among primary school teachers in Cross River State;
2. Assessed the level of adoption of climate change mitigation strategies by primary school teachers in Cross River State;
3. Determined the challenges to effective climate change education in Cross River State.

Research Questions

The following research questions were posed to guide the study:

1. What is the level of climate change knowledge among primary school teachers in Cross River State?
2. What is the level of adoption of climate change mitigation strategies by primary school teachers in Cross River State?
3. What are the challenges to effective climate change education in Cross River State?

Method

The study utilised descriptive survey research design. This is because the researchers were interested in collecting data on and describing in a systematic manner, climate change knowledge and mitigation strategies among primary school teachers in Cross River State, which made the design more appropriate. The study was carried out in Cross River State, Nigeria. The study population comprised 17,284 Public Primary School teachers in Cross River State. A sample of 384 teachers was drawn through multi-stage sampling procedure was used for the study. The two instruments; Climate Change Knowledge Test (CCKT) and Climate Change Mitigation Strategies Questionnaire (CCMSQ), developed by the researchers were used for data collection. The CCKT is a structured assessment instrument designed to evaluate individuals' understanding of climate change. It consists of two main sections; A and B. Section A focuses on demographic Information of the respondents such as school location, years of teaching experience, and gender. Section B focuses on knowledge of climate change, covering topics such as causes of climate change, greenhouse gases, impact on weather patterns, sea-level rise, deforestation, climate-related health risks, renewable energy, agricultural impacts, climate policy, and climate regulation by oceans. The questions are structured in a multiple-choice format where each correct answer typically scores one point, with a total of 20 points maximum and minimum of zero (0).

The CCMSQ had two sections (A and B). Sections A elicited the demographic information of respondents while Sections B contained 20 items, organised in two clusters with 10 items each. Cluster I elicited data climate change mitigation strategies while cluster II elicited data on challenges to effective climate change education. The respondents were expected to provide their responses to items of the CCMSQ based on the modified four-point Likert type scale with options such as strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD), with numerical values of 4 3, 2, 1 respectively.

The instruments were subjected to face validation by two experts; one each from, Environmental Education, and Tests and Measurement. The validators were requested to scrutinise the items of the instruments in terms of relevance of the items to the purpose of the study and language clarity as well as grammar. The experts were also requested to make comments and suggestions with regards to improving the quality of the instruments. Their comments, corrections and suggestions such as modification of the specific purposes, research questions and hypotheses led to the final version of the instruments. After trial-testing the instruments, the reliability of the CCKT was determined using K-R20, which yielded a reliability index of .77 while Cronbach's Alpha was used in estimating the reliability of the CCMSQ, which yielded an index of .75.

Data collection was done through direct administration and retrieval immediately after completion by the respondents. This was done by the researchers and three research assistants who were adequately briefed on the procedure for data collection and retrieval of the instruments. Data collected were sorted and coded in the IBM Statistical Package of the Social Sciences (SPSS) and analysed using mean and standard deviation for answering research questions.

Results

Research Question One (1):

What is the level of climate change knowledge among primary school teachers in Cross River State?

Table 1: Mean and standard deviation on the level of climate change knowledge among primary school teachers in Cross River State (n=384)

| Variable | N | Means | Standard Deviation | Decision |
|--------------------------|-----|-------|--------------------|----------|
| Climate change knowledge | 384 | 8.45 | 2.26 | Low |

The result in Table 1 shows that primary school teachers recorded a mean climate change knowledge (Mean = 8.45), with a standard deviation of 2.26. This mean value implies there is a low level of climate change knowledge among primary school teachers in Cross River State.

Research Question Two (2):

What is the level of adoption of climate change mitigation strategies by primary school teachers in Cross River State?

Table 2: Mean and standard deviation on the level of adoption of climate change mitigation strategies by primary school teachers in Cross River State (n=384)

| S/N | Item Statements | Cluster Means | Standard Deviation | Decision |
|-----|---|---------------|--------------------|----------|
| 1. | I incorporate climate change discussions into my lessons regularly. | 2.41 | .95 | Low |

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|-------------------|---|-------------|------------|------------|
| 2. | I promote the use of renewable resources, like solar and wind energy, in class discussions. | 1.98 | .96 | Low |
| 3. | I engage students in recycling and waste reduction activities in the classroom. | 1.85 | .86 | Low |
| 4. | I model sustainable practices, like using reusable materials, for students. | 1.87 | .88 | Low |
| 5. | I integrate local climate-related issues, such as flooding or drought, into my lessons. | 2.35 | .96 | Low |
| 6. | I actively encourage tree planting or greening projects with students. | 2.23 | .86 | Low |
| 7. | I educate students on reducing single-use plastics in their daily lives. | 1.97 | .92 | Low |
| 8. | I use digital tools, like videos or interactive media, to teach about climate change. | 1.89 | .99 | Low |
| 9. | I regularly engage parents and the community in climate-related activities. | 1.95 | .95 | Low |
| 10 | I participate in professional development focused on climate change education. | 1.93 | .85 | Low |
| Grand Mean | | 2.02 | .96 | Low |

Note: n = Number of Respondents

The result in Table 2 indicate that the mean ratings for all the items were below the criterion mean of 2.50, which signifies low adoption of the mitigation strategies by the primary school teachers. The grand mean value of 2.02 also fall below the criterion mean. This implies low adoption of climate change mitigation strategies by primary school teachers in Cross River State.

Research Question Three (3):

What are the challenges to effective climate change education in Cross River State?

Table 3: Mean and standard deviation on the challenges to effective climate change education in Cross River State (n=384)

| S/N | Item Statements | Mean | Standard Deviation | Decision |
|-------------------|---|-------------|--------------------|-------------|
| 1. | Lack of teaching resources makes it difficult to cover climate change topics effectively. | 3.20 | .95 | High |
| 2. | There is limited curriculum space for teaching about climate change. | 3.49 | .62 | High |
| 3. | Insufficient knowledge about climate change topics limits my teaching ability. | 3.15 | .70 | High |
| 4. | Student disinterest in environmental topics is a barrier to effective climate change education. | 3.27 | .65 | High |
| 5. | Limited time during the school day restricts my ability to teach climate change. | 3.11 | .74 | High |
| 6. | Community skepticism about climate change hinders my ability to discuss it openly in class. | 3.33 | .71 | High |
| 9. | Limited professional development opportunities are a barrier to effective climate education. | 3.11 | .70 | High |
| 10 | Lack of support from school administration affects my ability to focus on climate change education. | 3.65 | .75 | High |
| Grand Mean | | 3.35 | .72 | High |

Note: n = Number of Respondents

The result in Table 3 shows that the mean ratings for all the items were above the criterion mean of 2.50, which is indicative that all the items are the challenges to effective climate change education. The grand mean value of 2.35 with a standard deviation of 0.72 is also above the criterion mean, implying that the items are the challenges to effective climate change education in Cross River State.

Discussions

This study was aimed at assessing climate change knowledge and mitigation strategies among primary school teachers and its implications for sustainable development in Cross River State. The study found that primary school teachers possessed low level of climate change

knowledge. Low climate change knowledge among primary school teachers could stem from limited climate-focused training during their education, lack of updated resources, or insufficient emphasis on environmental topics within the school curriculum. Many teacher training programmes do not prioritise climate education, and teachers may lack awareness of climate science basics or the links between climate change and daily life. This finding aligns with research by Andevski et al. (2022), who reported that teachers in several regions face knowledge gaps in environmental and climate change topics due to limited resources and professional development opportunities focused on climate change. Similarly, Fatokun et al. (2023) found that without adequate training, teachers are often unprepared to engage students with accurate climate science concepts.

Further finding showed that teachers differ significantly in their climate change knowledge and mitigation strategies by school location. Differences in teachers' knowledge and strategies across school locations may be due to disparities in access to information and resources. Urban teachers typically have better access to updated educational materials, training programs, and technology compared to rural teachers, which might lead to a gap in climate change knowledge and practices. This finding resonates with a study by Adesanya et al. (2023), who reported significant urban-rural disparities in access to environmental resources and teacher training in Nigeria. Likewise, recent research by Mwangi et al. (2024) found that urban teachers had greater exposure to climate education workshops and resources compared to their rural counterparts, impacting their knowledge on climate change.

The study also showed that primary school teachers do not adopt many mitigation strategies for climate change. Teachers may hesitate to adopt climate mitigation strategies due to various barriers, such as lack of awareness, limited institutional support, and minimal resources for sustainable classroom practices. Without clear guidelines and support for climate action, teachers might not feel empowered to implement these strategies in their teaching. Findings by Okeke and Nnamdi (2022) support this observation, highlighting that teachers often report feeling unprepared to engage in climate mitigation efforts due to insufficient support and resources. Additionally, Bello et al. (2023) reported that many schools lack a structured approach to integrating climate action into daily school activities, which can limit teachers' engagement in such practices.

Further finding showed that teachers differ significantly in their climate change mitigation strategies by school location. The differences in climate change mitigation strategies between teachers in urban and rural schools may be attributed to disparities in resources, professional development opportunities, and institutional support. Teachers in urban areas are more likely to have access to updated resources, digital tools, and professional development programs

that encourage the adoption of sustainable practices and climate-focused teaching strategies. In contrast, rural schools often face resource constraints, which can limit teachers' exposure to training and resources on climate change. This disparity may also stem from differences in community engagement; urban schools may have greater access to environmentally conscious initiatives or community support, whereas rural teachers may have less exposure to such opportunities. Recent studies align with this finding. For instance, Olowe and Adeoye (2023) found that teachers in urban schools were significantly more likely to incorporate climate change discussions and sustainable practices into their teaching than their rural counterparts. Their research attributed this difference to the increased availability of resources and access to workshops in urban areas. Additionally, Chibundu et al. (2022) reported similar findings, observing that teachers in rural schools faced challenges in integrating climate education due to limited institutional support and lack of training, which affected their ability to adopt effective climate mitigation strategies.

Finally, the study revealed that lack of training for teachers on climate-related topics, insufficient teaching materials, and the absence of clear policy guidelines for incorporating climate change into teaching were identified as the common challenges of climate change education. These challenges reflect broader structural issues within the education system. Teachers' effectiveness in climate education can be hindered without training programs that cover climate-related topics, adequate teaching resources, or policies that encourage or mandate climate education. An absence of institutional and policy support may limit the tools teachers need to convey complex climate issues effectively. Similar challenges as found by this study were highlighted in studies by Nwosu and Eze (2022), who found that climate education in Nigerian schools was stymied by a lack of government policy, resulting in insufficient emphasis on climate topics. Additionally, Onah et al. (2023) emphasised the need for clearer policy frameworks to help educators integrate climate topics into their curricula.

Conclusion

There is a low level of climate change knowledge among teachers, showing a critical gap that could impact climate education efforts. Furthermore, teachers adopt few mitigation strategies, suggesting that existing practices do not adequately address climate-related issues in educational settings. A significant difference in climate change knowledge and mitigation strategies was observed based on school location, with urban teachers generally better equipped than their rural counterparts. Key challenges, including limited training, insufficient resources, and the absence of clear policy guidelines, were identified as barriers to effective climate change education. Therefore, addressing these issues will be essential for equipping

primary school teachers to contribute effectively to climate awareness and sustainable development goals in Cross River State.

Recommendations

Based on the findings, the researchers recommended that:

1. Regular, structured training programmes on climate-related topics should be provided for primary school teachers.
2. Schools should implement comprehensive strategies and provide resources to support teachers in adopting effective climate change mitigation practices within the classroom.
3. Equal access to educational resources and training should be ensured across all school locations.

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