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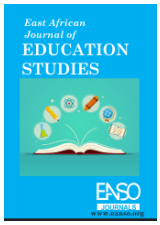

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Original Article

Evaluation of the Effectiveness of Climate Change Education (CCE) Strategies in the Zambian Education Sector: A Case of Selected Public Secondary Schools in Lusaka District

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Climate Change Education, Curriculum Integration, Teacher Preparedness, Student Engagement, Policy Implementation.

ABSTRACT

This study evaluated the effectiveness of climate change education (CCE) strategies in selected public secondary schools in Lusaka District, Zambia. Using a qualitative exploratory design, data were collected through interviews, focus group discussions, and document analysis involving students, teachers, headteachers, and education officials. The findings revealed that although climate change themes are integrated into the school curriculum, coverage is fragmented and often theoretical, with limited opportunities for practical engagement. Teacher preparedness was found to be inadequate, with many educators lacking specialised training and relying heavily on NGOs for supplementary support. Despite growing interest among learners, participation opportunities remain scarce due to weak institutional frameworks, poor policy implementation, and insufficient resources. The study concludes that while Zambia has laid a policy foundation for CCE, effective delivery requires enhanced teacher training, curriculum reform, resource provision, and stronger collaboration between schools, government, and NGOs to foster climate literacy and resilience among students.

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INTRODUCTION

The growing focus on climate change education has been driven by the undeniable adverse effects of climate change, increased funding for climate-related programs, and leadership in educational initiatives supporting climate action (Anderson, 2012). As global temperatures rise and extreme weather events become more frequent, the need for comprehensive climate education has never been more urgent. This education aims to foster climate literacy, enabling individuals and institutions to make informed decisions and adopt sustainable behaviours (Priatna & Khan, 2024)

Zambia has recently experienced severe climate-related challenges, prompting government action. On March 26, 2021, the Ministry of Lands and Natural Resources launched the first National Climate Change Learning Strategy to address these issues (UNCCLearn, 2021). This initiative reflects the country's commitment to integrating climate education into national development plans. Similar efforts are seen globally, as governments recognise the role of education in preparing populations, particularly youth, for a rapidly changing environment (Gov.uk, 2021).

Climate change education serves multiple objectives, including understanding climate science, promoting informed decision-making, and encouraging behavioural change (Gardner & Stern, 2008). The ultimate goal is to mitigate greenhouse gas emissions while enhancing adaptive capacities. Given the urgency of the crisis, educational systems must address both global earth systems and human behavioural dimensions, from societal levels down to individual household choices (Walter Leal Filho, 2021).

Educational institutions are increasingly seen as key players in climate action. Schools and universities must equip students with the knowledge and skills to contribute to mitigation and adaptation efforts (Walter Leal Filho, 2021). This involves integrating climate change into curricula, fostering critical thinking, and promoting sustainable practices. Without such interventions, societies will struggle to transition toward resilience and sustainability.

Climate change poses a significant threat to Zambia's socio-economic development, particularly in climate-sensitive sectors such as agriculture, tourism, water, and energy (UNCCLearn, 2021). If unaddressed, these challenges could derail Zambia's Vision 2030 development goals. Neighbouring countries like Kenya face similar struggles, with extreme weather events such as floods and droughts becoming more frequent (Government of Kenya, 2021). These regional patterns highlight the need for coordinated climate education strategies.

Given these threats, Zambia must adopt effective climate change education strategies to foster societal transformation. This includes policy reforms, teacher training, community engagement, and interdisciplinary learning approaches. By prioritising climate education, Zambia can empower its citizens to mitigate risks and adapt to changing environmental conditions.

This study explores climate change education strategies that can be implemented in Zambia to ensure a sustainable future. Through a combination

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of policy analysis, curriculum development, and stakeholder engagement, the research aims to identify best practices for fostering climate resilience at all societal levels. The findings will contribute to Zambia's efforts in combating climate change while supporting long-term socio-economic stability.

METHODOLOGY

Research Design

This study adopted a qualitative exploratory research design to gain an in-depth understanding of climate change education strategies in Zambia. The exploratory approach was ideal for examining the nature, effectiveness, and challenges of existing strategies, as well as for generating context-specific recommendations. This design allowed the researcher to explore perceptions, experiences, and opinions of different stakeholders without the constraints of quantification, thus providing rich and detailed data essential for the study's objectives.

Population and Sample Size

The target population for this study included key stakeholders involved in climate change education (CCE) in Zambia. These comprised Ministry of Education officials, environmental educators, curriculum developers, teachers, and representatives from environmental NGOs. These participants were selected due to their direct involvement in developing, implementing, or experiencing CCE policies and practices, making them essential informants for this research.

Additionally, the study focused on 20 public secondary schools within Lusaka District, ensuring a representative sample of educational institutions. This selection included 20 head teachers, as they play a crucial role in implementing school-based climate education initiatives. Furthermore, at least one class from each school was integrated into the study. Given that public secondary schools in Zambia average 35 pupils per class, the study encompassed approximately 150 students, providing insights into youth perceptions and engagement with climate change topics.

To ensure a strong policy and administrative perspective, the study included three key education officials: one from the District Education Board Secretary's (DEBS) Office, one from the Provincial Education Office, and one climate change focal officer from the Ministry of General Education. These participants provided crucial strategic insights into both national and local climate change education frameworks, helping to bridge the gap between policy development and practical implementation in schools.

Given the qualitative nature of the study, a purposive sampling approach was employed. While the overall study population involved headteachers, students, and education officials, the in-depth qualitative analysis concentrated on those participants most directly involved with climate education policy and practice. Data collection continued until the point of saturation, when no new significant themes were emerging. This ensured that the study captured rich, detailed perspectives while maintaining analytical manageability.

The combination of students, educators, policymakers, and NGO representatives allowed for a multi-stakeholder perspective on climate change education strategies in Zambia. This diverse sample ensured that findings were comprehensive and actionable, addressing both institutional and grassroots-level challenges in CCE implementation.

By integrating school-based participants with key policymakers, the study captured a holistic view of Zambia's climate education landscape, identifying gaps and opportunities for strengthening CCE strategies nationwide.

Sampling Design

A purposive sampling technique was employed to select participants who had direct knowledge and experience related to climate change education. This non-probability sampling approach ensured

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that participants were information-rich and relevant to the research objectives. In addition, snowball sampling was used to identify further knowledgeable individuals recommended by initial participants, especially in accessing key informants in remote or less-structured educational settings.

Data Collection Methods

Primary data was collected using in-depth interviews and focus group discussions (FGDs). Interviews were semi-structured, allowing flexibility to probe emerging themes while ensuring consistency across respondents. Focus groups were conducted with educators and community stakeholders to explore group dynamics and shared perceptions.

Data Analysis

Data were analysed using thematic analysis, a method well-suited for identifying, analysing, and reporting patterns (themes) within qualitative data. Transcripts from interviews and focus groups were coded manually or using software like NVivo. Thematic categories were developed inductively from the data, allowing findings to emerge naturally based on participants' experiences and insights. This analytical approach supported the exploratory nature of the study and aided in building grounded recommendations.

Validity and Reliability

To ensure credibility and trustworthiness, the study applied strategies such as triangulation (using multiple data sources), member checking (verifying findings with participants), and maintaining a research audit trail. Although qualitative studies do not rely on statistical reliability, consistency was ensured by using an interview guide, maintaining neutrality during data collection, and clearly documenting all procedures for transparency and reproducibility.

RESULTS

The thematic analysis generated four overarching themes and several subthemes, reflecting perspectives from students (n = 150), teachers, headteachers, and education officials. Students' voices were particularly central in shaping the findings, as they provided first-hand accounts of how climate change education (CCE) is experienced in classrooms and school environments.

Integration of Climate Change into the Curriculum

Subtheme 1.1: Fragmented Coverage

Teachers and curriculum developers emphasised that climate change topics were covered sporadically within subjects like geography, biology, and civic education, rather than as a standalone subject.

> "*We only talk about climate change in passing, especially in geography when discussing weather and natural resources. It is not treated as a full topic that students can master on their own."* (Teacher, School A)

Students consistently described climate change topics as being scattered across different subjects rather than being presented systematically. While geography and integrated science provided some exposure, learners felt the coverage was insufficient.

> "*If climate change is so serious, why is it hidden in small topics? It should be taught like mathematics or English, where you know exactly what you are learning."* (Student, School D)

This fragmented integration limited students' ability to develop a comprehensive understanding of climate issues, leaving significant knowledge gaps. Students echoed similar concerns, noting that they sometimes struggled to connect the scattered information across subjects.

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Subtheme 1.2: Lack of Practical Emphasis

Curriculum developers and head teachers expressed concern that existing content was largely theoretical, with little opportunity for hands-on engagement.

> "*The books talk about global warming and deforestation, but our learners hardly do practical activities to see how this affects their own environment."* (Head Teacher, School C)

Students emphasised the gap between theory and practice, noting that classroom teaching rarely translated into real-world activities.

> "*We are told about planting trees to stop soil erosion, but we have never done a tree-planting activity at school."* (Student, School F)

The absence of applied learning meant students were less likely to connect classroom knowledge with community realities.

Theme 2: Teacher Preparedness and Capacity

Subtheme 2.1: Limited Teacher Training

Many teachers admitted that they lacked specialised training in climate change education. While they were comfortable teaching science or geography, they felt underprepared to explain technical climate concepts.

> *"I was never trained specifically on climate change during my teacher education. I just use what I know from the textbook, but sometimes learners ask questions I cannot fully answer*." (Teacher, School F)

Many students felt their teachers struggled to explain technical concepts such as greenhouse gases, global warming, and renewable energy.

> "*When we ask deep questions about climate science, teachers sometimes tell us to just read on our own. It shows they are not very sure themselves*." (Student, School M)

This reflected a broader systemic gap where pre-service and in-service training did not prioritise climate education.

Subtheme 2.2: Dependence on NGOs and External Programs

Several teachers highlighted reliance on workshops organised by NGOs, which provided supplementary materials and basic orientation.

> "*Most of the knowledge I have is from an NGO workshop I attended two years ago. Without those programs, we would not even know how to explain some climate concepts properly*." (Teacher, School H)

Students appreciated when NGOs came to schools with workshops, drama groups, or tree-planting campaigns. These activities were described as more memorable than routine lessons.

> "*The NGOs explain things in a simple way. Sometimes I understand climate change better from them than from my normal lessons*." (Student, School K)

This reliance created inequalities between schools that had NGO support and those without.

Theme 3: Student Engagement and Awareness

Subtheme 3.1: Growing Interest among Learners

Students expressed a strong curiosity about climate change, often linking it to visible local issues such as erratic rainfall and rising temperatures.

> "*We hear about climate change on the news and see it when crops fail. So, when teachers explain it in class, we pay attention because it is something real in our lives." (Student, School L*)

This highlights that lived experiences served as an important motivator for students' interest in CCE.

Subtheme 3.2: Limited Platforms for Participation

Despite their interest, students felt they lacked platforms for active involvement in climate-related

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activities. Environmental clubs existed in some schools, but participation was low due to a lack of resources and institutional support.

> "*We wanted to start a tree-planting club, but there was no funding or guidance. It ended after a few weeks."* (Student, School G)

This underscores a missed opportunity to harness student enthusiasm for meaningful engagement.

Theme 4: Institutional and Policy Support

Subtheme 4.1: Weak Policy Implementation at School Level

Officials from the District Education Board and Ministry acknowledged that while Zambia had launched a national climate change learning strategy, actual implementation in schools was inconsistent.

> "*Policies are there on paper, but translating them into classroom practice is still a challenge because of limited funding and competing priorities."* (Education Official, DEBS Office)

While officials spoke of Zambia's national climate change learning strategy, students and teachers reported little evidence of structured implementation at the school level.

> "*We hear that there are government programs on climate change, but we don't see them in school. It is just talk."* (Student, School O)

> "*If the government really wants us to learn, they should bring resources and training, not just policies*." (Teacher, School B)

This disconnect between policy intent and classroom reality was a recurring concern.

Subtheme 4.2: Resource and Infrastructure Gaps

Teachers and head teachers lamented inadequate resources such as teaching aids, laboratories, and demonstration projects.

> "*We talk about renewable energy, but there are no solar panels in the school to show learners. Without materials, it remains theory."* (Head Teacher, School K)

Students often felt frustrated that they were taught concepts without the tools to explore them practically.

> "*We learn about solar energy, but our school doesn't even have a solar panel. How can we understand something we have never seen?"* (Student, School Q)

Both teachers and head teachers acknowledged that the lack of infrastructure, teaching aids, and budgetary support constrained effective climate change education.

The results reveal that while climate change education is recognised as important, it remains weakly institutionalised within Zambian secondary schools. Curriculum integration is fragmented, teacher capacity is limited, and student enthusiasm is undermined by a lack of participatory opportunities. Institutional frameworks exist but are hindered by poor implementation and resource shortages.

DISCUSSION

The findings revealed that climate change content in Zambia's Education Curriculum Framework (2013) is only integrated into subjects such as Geography, Biology, and Agricultural Science, rather than being offered as a standalone subject. This fragmented approach was confirmed by both teachers and students, who reported that climate topics were often treated superficially and lacked coherence. Learners struggled to connect scattered information across subjects, which supports earlier concerns that fragmented integration reduces comprehension of climate issues (MECcE Project, 2023).

Teacher preparedness also emerged as a major challenge. Participants highlighted that many teachers lacked specialised training in climate change education, relying mainly on textbooks or knowledge acquired from NGO workshops. This

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limited capacity constrained teachers' ability to explain technical concepts, which is consistent with previous research pointing to systemic gaps in both pre-service and in-service training (Education Profiles, 2024; EJSIT, 2023). The study's findings therefore confirm that while initiatives such as the FAO-led FACE-NDC project are working to build teacher capacity and improve curriculum integration, these reforms have not yet translated into noticeable improvements at the school level.

Students demonstrated strong interest in climate change education, largely because they connected it to lived experiences such as drought, erratic rainfall, and crop failures. This enthusiasm, however, was undermined by the lack of structured opportunities for participation. Although some schools had environmental clubs or occasional NGO-led activities, most learners reported limited platforms for sustained involvement. These findings echo earlier studies showing that while youth-driven initiatives, such as peer-to-peer education or climate ambassador clubs, can strengthen engagement, their reach remains uneven across schools (CDKN, 2023; Global Resilience Partnership, 2023).

At the institutional level, the study found that although Zambia has introduced policy tools like the National Climate Change Learning Strategy (2021), weak implementation and inadequate resources continue to hinder delivery at the school level. Teachers and students consistently cited shortages of teaching aids, demonstration equipment, and funding, which aligns with national reports identifying resource gaps as critical barriers (Education Profiles, 2024). The FACE-NDC reforms and youth-driven initiatives thus represent important solutions, but the present findings suggest that their benefits are not yet widely felt in ordinary classrooms.

The discussion shows that while policy frameworks and external initiatives exist, the study's findings highlight limited curriculum integration, low teacher preparedness, weak institutional support, and resource shortages as the immediate barriers. Addressing these gaps will require translating policies and NGO-led projects into tangible classroom-level improvements that match the enthusiasm and lived realities of students.

CONCLUSION

The study demonstrates that Zambia has made commendable efforts to introduce climate change education through national strategies and curriculum frameworks. However, weak implementation, limited teacher capacity, inadequate resources, and insufficient student participation hinder effective delivery. Addressing these challenges requires a holistic approach that strengthens teacher training, ensures practical and systematic integration of climate change into the curriculum, and creates participatory platforms for learners. Moreover, consistent policy enforcement, resource mobilisation, and collaborative partnerships with NGOs and other stakeholders are essential. By closing the gap between policy intent and classroom practice, Zambia can build a generation of climate-literate citizens equipped to drive sustainable development and resilience in the face of climate change.

RECOMMENDATIONS

To strengthen the effectiveness of climate change education in Zambia, the study recommends prioritising teacher capacity building through both pre-service and in-service training programs that focus on climate literacy. Curriculum reforms should move beyond fragmented coverage to provide structured and practical learning opportunities that connect classroom knowledge with community realities. Schools should be supported with adequate teaching aids, demonstration materials, and funding to facilitate participatory learning. Furthermore, stronger collaboration between the government, NGOs, and schools is needed to scale up initiatives such as FACE-NDC reforms and youth-led climate clubs, ensuring that students' enthusiasm is matched with sustainable platforms for engagement. Consistent

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monitoring and policy enforcement will also be critical to bridging the gap between national strategies and school-level implementation.

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Ethical Approval

This study was permitted by the Eden University and ERES Converge Ethics Committee. Permission to collect data from the study site was also obtained from **the** Board of Graduate Studies and other relevant authorities. Participants who took part in the study completed consent forms and were assured of anonymity.

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