EXPLORING CLIMATE CHANGE IMPACT ON TEACHERS' EFFICIENCY AND STUDENTS' LEARNING OPTIMISATION IN LAGOS NIGERIA

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Abstract: *Amidst the myriad challenges that threaten Nigeria's educational system is the declining learning outcomes of students across schools in Nigeria. Identifying and mitigating the challenges and deploying global innovative best practices into Nigeria's educational system may provide the needed solution. Therefore, the impact of climate change (CC) on teachers' efficiency, educational resources and students' learning optimization in Lagos State was examined. A mixed research method, involving quantitative and qualitative methods, was adopted for the study. CC learning optimizations (CCLO) questionnaire was used as an instrument for data collection. Random sampling technique was used to select 480 respondents for the study. Frequency counts with percentages and a t-test*

statistical analysis were used to analyses the data. Result showed that CC effects like heat waves, high rainfall and flooding can threaten teachers' classroom efficiency, and learning resources and thus negatively influence students' learning outcomes. Excessive heat due to global warming could affect students' comprehension and retention. Extreme temperature and rainfall experienced in early school year can cause few years of schooling later in life. There was no significant difference in perception of impact of CC on student learning optimization based on gender (t-test). It was concluded that CC affects teachers' efficiency, learning resources, and students' learning optimization. Addressing the problem of CC can support teachers' efficiency and improve students' learning outcomes.

Key words: *Climate Change; Learning Optimization; Teachers' Efficacy; Lagos Schools; Learning Resources.*

Introduction

Lagos is a mega city with myriad challenges ranging from climate change (CC) to environmental pollution which have consequential effects on quality of life and education. The quality of education in the state has been a topic of discussion in recent years in meetings and conferences, with concerns about the factors that lower students' academic performances. Efficiency of teachers is fundamental to student academic achievement in schools. Many factors may influence teachers' level of effectiveness such factors include stress level, classroom management and workload. The level of teachers' efficiency influences teaching content and classroom effectiveness. A careful analysis of teachers' efficiency through various criteria has identified factors that enhance students' achievement. These factors include effective communication, engagement and clarification of tasks. An effective teacher makes an efficient school and creates an ideal environment for students to learn. Newsome et al., (2023) claimed that CC may impact teachers' efficiency leading to learning losses for the students. It also threatens the achievement of learning objectives and teachers' ability to teach their students very well. CC challenges may cause natural disasters like floods, increased temperature/global warming and wildfires. These disasters may affect the teaching ability of teachers.

Sometimes, due to the effects of natural disasters caused by CC that may affect schooling, teachers often shift from physical schooling to virtual schooling. This may seem effective in a short time however, studies have shown that in the long run, the frequent shifting between the learning environment may affect students' learning and teachers' efficiency. Teachers may face disruption of instructional time and may find it

difficult to make up for learning loss (Newsome et al., 2023). Rainfall, flood and excessive heat have been found by scholars like Ortsa and Ndidiamaka (2021) to affect teachers' performance. CC may also have negative impact on student learning and academic achievement. It could cause climate-related disasters that may lead to learning losses, reduced instructional days, damage to learning resources and extended closure of school (Newsome et al., 2023). Scholars like Onwumere, et al (2022) have identified CC issues that affect students' learning in senior secondary schools in Southeast Nigeria. They identified increased temperature, heat waves and extreme weather events as climate factors that affect student learning. This disaster could lead to the destruction of learning facilities, poor ICT learning facilities, and displacement of students and their parents. Hussaini (2023) noted that flooding and other extreme weather conditions could lead to disruption of learning, schooling, and students' attendance at school.

Cases of respiratory health issues due to poor air quality have been reported by scholars in research. Amanchukwu et al., (2015) reported that learners' poor attendance at school during climate-related disasters may be due to poor health issues leading to a decline in academic performance. Climate-related disasters may damage school infrastructure and learning resources. Many cases of school closure have also been reported due to flooding that makes schools inaccessible for students to learn. They may experience reduced attention span, compromised health and poor learning comprehension.

CC impact may further escalate gender gaps in education limiting opportunities for girls and cause psychological stress. Amanchukwu et al., (2015) express their concern about how girls are kept at home to perform domestic chores during extreme weather events, while boys are allowed to go to school. It can have adverse effects on human health, including an increased incidence of diseases such as malaria and diarrhea. The health effects of CC may affect learners' ability to learn effectively; it may decrease learners' levels of concentration, reduce comprehension ability and increase absenteeism. Interventions like climate awareness and literacy can build climate resilience among learners.

The impact of CC on students' learning in Nigeria is an area that has received little attention in research. While studies have been carried out on the effects of CC on various sectors of the Nigerian economy, including agriculture and health, there are only a few studies on the CC's effects on education, particularly on students' learning outcomes. This makes the impact of CC on education, learning and teaching difficult to understand in Nigeria. Therefore, there is a need to conduct further research to explore the relationship between CC and students' learning outcomes in Lagos, as well as to develop effective strategies to halt the

negative effects of CC on teachers' efficiency and students learning optimisation. Therefore, this study examined the impact of CC on teachers' efficiency, learning resources and students' learning optimisation. Also, the study analysed gender differences in the perception of individuals on the CC effects on students' learning optimisation. To achieve the overstated objectives, the study answers the following research question: What is the impact of CC on teacher efficiency? Does CC have any influence on the availability of learning resources? How does CC influence students' learning optimisation? One hypothesis was tested at $p < 0.005$ significance level that there is no gender difference in the perception of the CC effects on students' learning optimisation.

Materials and Methods

Research Design: The study adopted the descriptive survey research design. A descriptive survey research design was employed to gather data on teachers' perceptions and experiences related to CC and its impact on their learners' efficiency and learning optimisation. Creswell and Creswell (2018) opined that survey research methods are efficient and cost-effective for collecting and handling from a large sample survey, allowing for a generalisation of findings.

Study Area: This study was conducted in Lagos Nigeria. Lagos is an urban state in southwest Nigeria with the fastest-growing population and economy. Lagos is blessed with a large number of businesses and industries including the educational sector. It is one of the most populated cities in Nigeria. However, the state is faced with many challenges that usually plague a growing megacity. Some challenges currently facing Lagosians include but are not limited to air pollution, waste management, environmental degradation, and CC impact. The city is highly vulnerable to the impact of CC due to its geographical location and population. Studying the CC impacts on students' learning outcomes in Lagos is important for several reasons. Lagos is also vulnerable to extreme weather events, such as flooding and storms, which could be intensified by the effects of climate change.

Population of the study: Lagos State has 6 education districts for easy supervision and general administration of the schools. All the teachers in the six education districts formed the population for this study.

Sample and Sampling Technique: To select sample for this study, a multi-stage stratified random sampling technique was adopted. This was done to ensure that the results of this study were not biased but a true representation of the population (Mertens & Gere, 2016). This approach ensures that the findings from the study can be confidently generalised to the broader teacher population within the state (Sandelowski, 2012). The first stage involved stratification. Lagos State has six distinct education districts. This stratification acknowledged the potential for

variations in educational practices, environment, learners' peculiarity, ethnic background, socio-economic status or teacher demographics across different administrative divisions of Lagos State (Babbie, 2010). By including teachers from each district, the sample reflects this diversity. The second stage involved random selection within each stratum. Sixteen schools were randomly chosen from each of the six education districts. This randomised selection minimises bias and ensures that each school within a district has an equal opportunity to be included in the study (Israel, 1992).

A sample size of sixteen schools per district allows for a good representation of the schools within each region. The final stage involved further random selection within each chosen school. Five teachers from 96 selected schools were selected using random sampling technique (16 schools/district x 6 districts). The process of random selection of respondents helped to minimize bias towards certain teachers. Following these sampling techniques, a total of 480 teachers were selected for the study (5 teachers per school of 96 schools) (Cohen et al., 2013).

Research Instruments: The CC Effects on Teachers and Students (CCTS) questionnaire was used as an instrument for data for data collection.

Validity: The instrument was validated through face, content and construct validity testing.

Reliability: The reliability and internal consistency of the subscales were determined using Cronbach's alpha coefficient test.

Data Collection: Data was collected from teachers through a questionnaire. Interviews were conducted with teachers to supplement survey information.

Data Analysis: Quantitative data were analysed using frequency count with percentages and t-test statistical tools.

Ethical Consideration: consent was obtained from teachers and the school before participation in the study. Anonymity and confidentiality of participants' responses were ensured. The study was conducted following ethical research guidelines established by the university and the Lagos State authority.

Results

Climate Change and Teachers Efficiency:

The respondents' perceived effect of CC on teachers' efficiency is presented in Table 1 below. The influence of natural disasters; flooding, increased temperature and high rainfall as perceived by the respondents shows that climate-related disasters affect teachers' ability in achievement of learning outcomes and overall effectiveness in the

classroom.

Table 1: Effect of CC on Teachers' Efficiency

S/N	Effect of CC on the efficiency of a teacher	Strongly agree	Agree	Disagree	Strongly Disagree
		%	%	%	%
1	Natural disasters such as flooding can threaten teachers' ability to produce the learning outcomes promised to students	7.8	67.7	20.9	3.6
2	Heat waves due to global warming can lower teachers' effectiveness in school	35.4	52.1	10.4	2.1
3.	High rainfall can lower teachers' teaching ability	25.5	29.8	31.9	1.8
4.	Excessive heat (high temperature) can affect teachers' level of practical wisdom in the classroom.	42.3	30	23.4	4.3

The majority of the respondents (75.5%) strongly agreed and agreed that climate-related disasters (flooding) can affect teachers' ability to deliver promised learning outcomes to the learners. A significant majority (87.5%) of the respondents also acknowledged the impact of heat waves on teachers' ability to be efficient in their jobs. This factor appears to be the most concerning factor for the teachers. The responses were more evenly distributed regarding high rainfall. Slightly less than half (55.3%) agree or strongly agree that high rainfall impacts their teaching ability, indicating a mixed perception of its influence.

A substantial portion (72.3%, combining 'Strongly Agree' and 'Agree') of teachers believed excessive heat affects their practical wisdom in the classroom. This suggests a concern about how extreme heat can hinder their ability to make effective teaching decisions in real time. The table suggests that teachers are generally concerned about the impact of CC on their ability to teach effectively (Table 1).

Impact of CC on Learning Resources

The perceived effects of CC on learning resources in Lagos schools were determined through descriptive statistical analysis tools of frequency count with percentage and measure of central tendency (mean and standard deviation). (Table 2).

Table 2. CC and Learning Resources

S/N		Strongly Agree	Agree	Disagree	Strongly Disagree
		%	%	%	%
1	CC can damage learning materials in schools	29.2	52	14.6	4.2
2	The use of schools for emergency shelters during climate-related disasters like flooding prevents the continuation of education in the school setting.	25.4	45.4	27.5	1.7
3	Livelihood losses as a result of CC is a major hindrance to educational enrolment	40.6	53	2.1	4.3
4	Climate-displaced learners do face similar educational problems as refugees.	40.5	51.1	4.2	4.2
5	Flooding as a result of CC can make school buildings inaccessible to students for learning	52.8	43.7	1.3	2.2
6.	The impact of CC can make schooling expensive	34.1	53.2	10.6	2.1
7.	Flooding as a result of CC can make school buildings	46	47.8	4.2	2

	unsuitable for learning				

Flooding as a result of CC can make school buildings inaccessible for students to learn was perceived to be the major impact of CC on the school learning resources (93.8%) (Table 2). The second most perceived impact of CC on school resources was the impact of CC on losses of sources of livelihood which present a major barrier to educational enrolment (93.6%). The third perceived impact was that Climate-displaced learners do face similar educational problems as refugees.who do not have access to school and school resources to learn (91.6%). This was followed by the impact of CC on the cost of school. 87.3 % of the respondents perceived that as a result of CC schooling became expensive (87.35%). The respondents perceived that CC directly destroys learning materials (81.2%). Also, 70.8% of the respondents perceived that using schools as emergency shelters during environmental disasters like flooding prevents the continuation of children's education (70.8%)

CC and Student Learning Optimisation

Table 3 presents respondents' opinions regarding the impact of CC on students' learning optimisation.

Table 3. CC and Students' Learning

S/N		Strongly Agree	Agree	Disagree	Strongly Disagree
		%	%	%	%
1.	The impact of CC can increase the rate at which students dropping out of school	34.1	53.2	10.6	2.1
2.	Excessive heat can cause student comprehension ability to decline	45.8	48	2.1	4.1
3.	poor attendance at school later in life can be attributed to previous exposure to extreme temperature or	10.4	29	48.1	12.5

	rainfall in early life				
4.	CC effects like excessive heat in the classroom and flooding can lower students' performance in school	20.2	62	17.8	0
5.	Excessive heat in the classroom can cause students' retention to decline	45.8	48	2.1	4.1

Respondents perceived the decline in comprehension ability of students as the major impact of CC on students (70%). This was followed closely by students' ability to retain what was learnt in class (94%) while the increase in the rate at which students are dropping out of school was rated third (85%). However, respondents considered the statement that poor attendance at school later in life can be attributed to previous exposure to extreme temperature or rainfall in early life has the lowest impact of CC on students (38%) (Table 3).

Research Hypothesis

Ho1. **No significant difference in the perception of male and female respondents about the impact of CC on student learning optimisation**.

The outcome of the study is displayed in Tables 4 and 5

The findings in Tables 4 and 5 revealed no significant difference in the perception of male and female respondents about the impact of CC on students learning optimisation ($p > 0.05$) (t-test). Therefore, the hypothesis was not rejected.

Table 4: Descriptive Statistics

	Mean	Std. Deviation	N
Female	3.1341	0.46369	241
Male	3.1336	0.46502	239

Table 5: Gender Perception of CC Impact on Student Learning Optimisation

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.004	0.951	0.011	478	0.991	0.00047	0.04239
Equal variances not assumed			0.011	477.940	0.991	0.00047	0.04239

Discussion of Findings

According to this study, CC has a direct impact on schools and learning materials and can prevent the continuation of education especially when schools are used as emergency shelters during environmental disasters like flooding. Furthermore, CC does not only impact the environment, but it can also affect the educational systems, from school closure, and curriculum changes to increased disruption in school buildings and properties (Hussaini, 2023). The consequences of climate change, such as flooding and extreme heat waves, pose risks not only to students' learning optimizations but also to learning resources. The consequences of climate-related disasters such as flooding and increased temperature or excessive heat can lead to curriculum changes and disruption of the smooth running of the school and affect students' learning and academic achievement. This result aligns with the findings of (Hussaini, 2023; Hall et al., 2023).

The result of this study also shows that CC significantly impacts teachers' efficiency in various ways. Natural disasters such as flooding can threaten teachers' ability to produce the learning outcomes promised to students while excessive heat due to global warming can affect teachers' level of practical wisdom in the classroom. This result aligns with the findings of Sharitt et al., (2023) and Newsome, et al., (2023).

CC effects like excessive heat, high rainfall, and flooding were perceived to lower students' performance in school. CC may have far-reaching implications for student learning. CC may result in a lack of access to resources, and classrooms due to flooding. Many students are

worried about CC impact on them and their future careers. This fear of the unknown CC impact may reduce students' motivation to learn. Sometimes students may be afraid and not be sure whether another rain will fall in the morning of the next school day which may prevent them from going to school. This result was consistent with the findings of Hussaini, (2023).

Flooding due to CC can also make school buildings inaccessible and unsuitable for learning, and heat can reduce comprehension and retention, affecting the quality of education. Furthermore, the impact of CC can make schooling expensive and increase dropout rates. Climate-related disasters like sea level rise, increased temperature, flooding and global warming become more intense. The increase in temperature can lead to climate-related disasters such as high rainfall, flooding, and sea level rise. All these have direct and indirect effect on education. These results agree with Ortsa & Ndidiamaka, (2021) and Hussaini, et al., (2023).

Conclusion

Following the findings of this study, it can be concluded that CC could significantly affect Lagos State teachers' efficiency, school learning resources and students' learning optimizations. Respondents perceived flooding as the most significant climate factor that affects teachers' efficiency and school learning resources in Lagos State. Moreover, respondents considered the decline in students' comprehension ability and retention of what was learnt in class as the major impact of CC on students. Following the t-test analysis, the hypothesis set was accepted. This implies that there was no significant difference in the perception of respondents based on gender on the impact of CC on students learning optimizations in Lagos State Nigeria.

Recommendations based on the Findings of the study

Based on the findings of this study, it is recommended that

1. CC education should be integrated into the school curriculum
2. challenges of CC impact on teachers, learning resources and students' learning optimizations should be addressed.
3. teachers should be equipped with the needed skills and resources to adapt to climate change.
4. government agencies, parastatals and stakeholders in education should provide a framework for CC mitigation and adaptation in Lagos State and Nigeria as a country.
5. government should refrain from using school facilities as shelters for people displaced by climate hazards and victims of other disasters.

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