Climate Change Threat and Secondary School Students' Performance in Rivers and Bayelsa States: Implications for Educational Development

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Abstract

The study investigated climate change threat and secondary school students' performance in Rivers and Bayelsa States: Implications for educational development. Three research questions and three hypotheses guided the study. The population of the study was 91566 (Rivers=72344 and Bayelsa=19222) public senior secondary school students from Rivers and Bayelsa states respectively. The sample size of 546 (Rivers=400 and Bayelsa=146) respondents was determined using multi stage sampling technique. The instruments used were climate change questionnaire (CCQ) and students' performance questionnaire (SPQ). The instruments were validated by two experts in Measurement and Evaluation from Rivers State University and Cronbach Alpha was used to ascertain the reliability. Out of the 546 copies of questionnaire administered only 508 were properly filled and retrieved. The data collected for the study were analyzed using Pearson Product Moment Correlation Coefficient (PPMC) formula while t-transformation was used to test hypotheses using statistical package of social science (SPSS). The findings revealed that there is high and positive relationship between flooding and high temperature and secondary school students' performance in Rivers and Bayelsa States. Also, revealed was a low and positive relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States. The hypotheses revealed significant relationship between all the variables tested and secondary school students' performance in Rivers and Bayelsa States. Based on these findings, it was recommended among others that, the States' Government should train the schools' administrators and teachers on how to promptly respond in the case of flash flood emergency, Government of both states should install facilities that reduces exposure to heat such as heating, ventilating and air conditioning systems, room ventilation, fans, shade provision through tree planting and building.

Keywords: Climate change, threat, students' performance, development

Introduction

Climate change denotes a variation in the state of weather that are hazardous to living and non-living thing over 30 years and above. Intergovernmental Panel on Climate Change (IPCC, 2017) described climate change as a long-term shift in global weather and temperature patterns resulting from natural and human activities. Since the 19th century, human activity has been the primary driver for the shift in these elements, resulting in unprecedented changes in temperature and weather patterns that adversely affect humans, animals, and plants. Climate change can

persist over a long period of time, usually over decades and much longer and leads to extremes of weather conditions such as, flooding, high temperature, high rainfall, wind and humidity. In the past few years, the climate has been prone to changes characterized by temperatures, wind, precipitation, clouds and other whether elements. This phenomenon has caused the migration of humans occasioned by environmental vulnerability in the study areas leading to hunger, poverty and malnutrition. Moreover, it is likely that coastal communities will be more affected by the earth climate change as a result of increased precipitation would increase the vulnerability of coastal area to natural disasters (Ojala, 2013).

Intergovernmental Panel on Climate Change (2017) observed that climate change includes features such as rising temperatures, droughts and desertification; heavy precipitation, flooding and rising sea levels; and harsh weather such as cyclones, floods and droughts. Such conditions can impact diminishing water resources, causing increased malnutrition, waterborne diseases such as diarrhea, vector-borne diseases such as malaria. Floods and rising sea levels can cause drowning, injuries, and severe mental and physical trauma, particularly for communities living in small islands, developing states, settlements alongside major river deltas and low-lying coastal areas. In Nigeria, the southern coastal region is known to be susceptible to climate change threat like flooding that causes environmental degradation and hazards. In the recent times, Rivers and Bayelsa States have consistently experienced recurrent flooding as a result of increased precipitation and runoffs from rivers. In 2022 the Bayelsa State Government ordered both public and private primary and secondary schools to suspend all academic activities following the menace of flood in different parts of the state. According to the State Government the directive became necessary in order to safeguard the lives of teachers and students as flood water caused by the emptying of a Cameroonian dam was gradually submerging some parts of the state. Similarly, rampaging floods sacked residents of several communities in four Local Government Areas of Rivers state, the students and teachers were forced to stop school attendance and the school buildings used to accommodate the internally displaced residents of these communities. Furthermore, rising temperatures are causing serious risks to health through the propagation of waterborne illnesses, pollution, chemical hazards, and injuries. Also, vectors like mosquitoes and rats were on the rise and spreading diseases to more locations. All these problems primarily affect the teachers, students, teaching and learning processes and students' performance.

Jones (2018) asserted that, performance is a broad, general term used to denote accomplishment in an academic area. The performance of secondary school students may have relationship with climate change threat such as flooding, high temperature and high rainfall hence, the study examined climate change threat and secondary school students' performance in Rivers and Bayelsa States and their implications for educational development.

Conceptualizing Climate Change
Climate as used here refers to as, the atmospheric condition of a particular place at a particular time. According to Eden (2018), climate is the regular pattern of weather conditions of a

particular place which may be mild, warm or wet in nature. Nanthakumar, Sakthikumaran and Sivashankar (2018) averred that climate change is the changes in the earth's weather, including changes in temperature, wind patterns, and rainfall, especially the increase in temperature that is caused by the increase of particular gases, particularly carbon monoxide (Co3) (Clark, 20160. The researchers further state that, the amount of carbon monoxide in the atmosphere has a profound effect on the academic condition of a school.

Flooding and Students' Performance

Climate change has a direct impact on education. The primary impacts of climate change on education arise from the effects of extreme weather events, such as heavy rains accompanied by flash floods, strong winds and hail storms with short and long-term consequences (Kenson, 2020). In cases of flood, entire schools become inaccessible for weeks or even months until the water level drops. At such periods, damage to infrastructure and facilities make learning highly inconvenient or even impossible. Extreme weather conditions reduce the availability of safe drinking water, compromise sanitation and increase the incidence of weather-related diseases such as malaria and diarrhea diseases, leading to absenteeism and possible withdrawal of children from school (Ezenta, 2019). Besides, the primary impacts, climate change has secondary impacts on education arising from the ways in which households respond to, or choose to cope with and adapt to climate change as evidenced by income supplementing activities of household members, migration and child marriages (Adelabu, 2018).

According to Jesse (2019) increased frequency of heavy rainfall, floods, strong winds, and storms can cause damage to school buildings and property, resulting in an unconducive environment for teaching and learning activities; possible harm to students and teachers and impacts on school attendance and academic performance of students.

High Temperature and Student's Performance

Lecture halls and classrooms are built according to the prevailing weather and temperature conditions of such locations. Weather and temperature were stable and predictable when most schools were designed and built. As such, such spaces were conducive due to adequate lighting and ventilation. However, most of these designs and buildings are becoming non-conducive due to increased temperature. Many schools have become unfavorable for learning due to the lack of necessary cooling or heating options to mitigate these changes. Likewise, learning institutions in poor neighbourhoods do not have access to the funding that can reduce these effects. Therefore, students and their teachers are left to find ineffective ways of managing the situation. In corroboration of the above assertion, Anderson (2017) stated that;

1.   increased temperature may create uncomfortable conditions for learning. This means that when the classroom is hot due to increased temperature, both the teachers and the learners will not be comfortable to teach and learn as well, seeing that teaching and learning require concentration.

2.   increased temperature also causes heat stress which affects teaching and learning and other school activities. Take for example, when teaching and learning is going on and the teachers and learners are sweating due to none provision of air-conditioners and fans, classroom work will be affected because both the teachers and the learners may not be comfortable to teach and learn under such condition.

3.   increased temperature may lead to difficulty in teaching and class management; this implies that when the temperature is increased due to climate change, it will be difficult for the teachers to teach and manage their classrooms especially the learners because some of them may prefer going out to play or engage in other social activities outside the classroom instead of concentrating in their studies.

 The above listed conditions of teaching/learning can reduce learning capacities which in turn may lead to poor performance of students in academic work and also in such situations, completion of the curriculum as planned will not be achieved.

High Rainfall and Students' Performance

High rainfall and extreme weather events have both short-term and long-term socio-economic and health effects such as shortages of food on students and teachers, leading to malnutrition and famine in extreme cases. These socio-economic and health impacts can reduce school attendance and result in poor performance in academic work (Francis, 2014). Other impacts include a dearth of teachers and poor education standards in the most affected areas, and movement of students to schools in less vulnerable parts of the States.

Statement of the Problem

There is no doubt that the biggest challenges of secondary school students in communities of Rivers and Bayelsa states in recent times is climate change. If not proactively handled, its effects may become catastrophic to students' academic performance and delay in schooling. Climate change is one factor responsible for intense heat in these states causing heat in the classrooms thereby hindering students' concentration as they study in the classroom. It also causes flooding of the compounds and classrooms during the rainy season. In some cases, roads to the schools and houses of the students were flooded thereby hindering the community of school academic and relocation of students. Bayelsa State was reported to be one of the worst affected states in the 2022 flooding and Rivers State also experienced sea level rise and these threats disrupted the teaching learning process in both states. Can research proffer plausible solution to these perennial problems? Based on the fore-going, the researchers investigated climate change threat and secondary school students' performance in Rivers and Bayelsa States and their implications for educational development.

Purpose of the study

The study investigated climate change threat and secondary school students' performance in Rivers and Bayelsa States and their implications for educational development.

Specifically, the objectives of the study sought to;

1.   Examine the relationship between flooding and secondary school students' performance in Rivers and Bayelsa States.
2.   Ascertain the relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States.
3.   Determine the relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States.

Research Questions

The following research questions guided the study.

1.   What is the relationship between flooding and secondary school students' performance in Rivers and Bayelsa States?
2.   What is the relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States?
3.   What is the relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States.

Hypotheses

The following null hypotheses would be tested at 0.05 significant level.
1.   There is no significant relationship between flooding and secondary school students ' performance in Rivers and Bayelsa States.
2.   There is no significant relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States.
3.   There is no significant relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States.

Methodology

The study adopted correlational design**.** The population of study was consisted of 91566 (Rivers=72344 and Bayelsa=19222) students from 309 and 102 public senior secondary schools in Rivers and Bayelsa states respectively. Source: Planning, research and statistics, office of both states Universal Basic Education Board, 2021-2022. The sample size for the study was 400 students from Rivers and 146 students from Bayelsa. Multi stage sampling procedure was adopted for the study. Firstly, cluster sampling technique was used to group the Local Government Areas in both states into three Senatorial Districts. In Rivers State; Rivers East has 8, Rivers South-East 7 and Rivers West 8. In the case of Bayelsa State, Bayelsa East has 3, Bayelsa Central 3 and Bayelsa West 2 respectively. Secondly, random sampling technique was used to select 12 Local Government Areas with 174 schools and 40168 students from Rivers State. Three Local Government Areas having 41 schools and 5422 students were selected from Bayelsa state. Lastly, Taro Yemen's minimum sample formula was used to determine the number

of respondents from Rivers State while disproportionate and simple random sampling techniques were used to select 146 students from the 41 schools from Bayelsa which gave a total of 546 public senior secondary school students sampled for the study. Two instruments were used for data collection; Climate Change Questionnaire (CCQ) and Students Performance Questionnaire (SPQ), which had 14 and 10 items respectively. The questionnaire items were structured on a modified four-point Likert rating of Strongly Agreed (SA), Agree (A), Disagreed (D) and Strongly Disagreed (SD). All instruments were weighted; 4 points, 3 points, 2 points and 1 point respectively. The instrument used for data collection was face and content validated by two experts from the Department of Measurement and Evaluation of the Faculty of Education, Rivers State University. The purpose of the study and research questions were also made available to them at the time of validation. The corrections made by the experts were incorporated in the final production of the instrument. The internal consistency of the instruments was established through the application of Cronbach Alpha Statistic. The reliability coefficient of climate change was 0.80, students' performance was 0.82, flooding was 0.74, high temperature was 0.84 and high rainfall 0. 78 respectively. Copies of the questionnaire were administered by the researchers with the help of two trained research assistants. Out of the 546 copies of questionnaire administered, only 508 copies that is 373 copies from Rivers and 135 from Bayelsa States were properly filled and returned. This represents 93% success from the administered questionnaire.

The research questions of the study were answered using Pearson Product Moment Correlation (PPMC); based on the value and direction of the correlation coefficient. Correlation coefficients between 0.60 – 1.00 were considered to be High (H), 0.50 – 0.59 are Moderate (M) while correlation coefficients between 0.00 – 0.49 were Low (L). Hypotheses were tested using t-transformation by transforming the coefficient of correlation (r) to t in order to establish the significance or otherwise of the r–value. at 0.05 level of significance with 506 degrees of freedom. Data obtained were analyzed using Statistical Packages in Social Sciences (SPSS) version 23.00.

Results

Research question 1: What is the relationship between flooding and secondary school students' performance in Rivers and Bayelsa States?

Table 1: Pearson Product Moment Correlation Coefficient on the Relationship between Flooding and Secondary School Students' Performance in Rivers and Bayelsa States

Variable	$\sum$	$\sum^2$	N	df	$\sum XY$	r	Decision
Flooding (X)	10246	2661					
			508	506	2867	0.86	High Positive Correlation
Students' Performance (Y)	10360	3980					

Source: *Researcher's Field Result, 2023*

Result from Table 1 reveals a correlation coefficient of 0.86. This value is high and positive, indicating that there is high and positive relationship between flooding and secondary school students' performance in Rivers and Bayelsa States. This implies that flooding has a corresponding relationship with secondary school students' performance in Rivers and Bayelsa States.

Research question 2: What is the relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States?

Table 2: Pearson Product Moment Correlation Coefficient on the Relationship Between High Temperature and Secondary School Students' Performance in Rivers and Bayelsa States

Variable	$\sum$	$\sum^2$	N	df	$\sum XY$	r	Decision
High Temperature (X)	10197	2123					
			508	506	2732	0.88	High Positive Correlation
Students' Performance (Y)	10360	3612					

Source: *Researcher's Field Result, 2023*

Result from Table 2 revealed a correlation coefficient of 0.88. This value is high and positive, indicating that there is high and positive relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States. This implies that high temperature has a corresponding relationship with secondary school students' performance in Rivers and Bayelsa States.

Research question 3: What is the relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States?

Table 3: Pearson Product Moment Correlation Coefficient on the Relationship Between High Rainfall and Secondary School Students' Performance in Rivers and Bayelsa States

Variable	$\sum$	$\sum^2$	N	Df	$\sum XY$	r	Decision
High Rainfall (X)	10231	2659					
			508	506	2887	0.23	Low Positive Correlation
Students' Performance (Y)	10360	3399					

Source: *Researcher's Field Result, 2023*

Result from Table 3 revealed a correlation coefficient of 0.23. This value is low and positive, indicating that there is low and positive relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States. This infers that high rainfall has a corresponding relationship with secondary school students' performance in Rivers and Bayelsa States.

Hypotheses Testing

Hypothesis 1: There is no significant relationship between flooding and secondary school students' performance in Rivers and Bayelsa States.

Table 4: t-Transformed Analysis of Significant Relationship Between Flooding and Secondary School Students' Performance in Rivers and Bayelsa States.

Variable	$\sum$	$\sum^2$	N	Df	$\sum XY$	r	t-cal.	t-crit.	Decision
Flooding (X)	10246	2661							
			508	506	2867	0.86	33.22	±1.96	Sig. Rejected H_0
Students' Performance (Y)	10360	3980							

Source: *Researcher's Field Result, 2023*

Result from Table 4 revealed a high and positive relationship existing between flooding and secondary school students' performance in Rivers and Bayelsa States. To establish the significance of the relationship, a t-transformed t-value was computed and an index of 33.32 was obtained. This was compared with the critical t-value of ±1.96 at the 0.05 level of significance with a degree of freedom of 506, indicating that there is a significant positive relationship between flooding and secondary school students' performance in Rivers and Bayelsa States (calculated z = 33.22< critical t = ±1.96 at p < 0.05 and df = 506). Therefore, the null hypothesis of no significant relationship between flooding and secondary school students' performance in

Rivers and Bayelsa States was rejected and the alternative upheld. This implies that flooding affects secondary school students' performance in Rivers and Bayelsa States.

Hypothesis 2: There is no significant relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States.

Table 5: t-Transformed Analysis of Significant Relationship Between High Temperature and
Secondary School Students' Performance in Rivers and Bayelsa States.

Variable	$\sum$	$\sum^2$	n	Df	$\sum XY$	r	t-cal.	t-crit.	Decision
High Temperature (X)	10197	2123							
			508	506	2732	0.88	35.32	±1.96	Sig. Rejected H_0
Students' Performance (Y)	10360	3612							

Source: *Researcher's Field Result, 2023*

Result from Table 5 reveals that a high and positive relationship exists between high temperature and secondary school students' performance in Rivers and Bayelsa States. To establish the significance of the relationship, a t-Transformed t-value was computed and an index of 35.32 was obtained. This was compared with the critical t-value of ±1.96 at the 0.05 level of significance with a degree of freedom of 506, indicating that there is a significant positive relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States (calculated t = 35.32< critical t = ±1.96 at p < 0.05 and df = 506). Therefore, the null hypothesis of no significant relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States was rejected. This implies that high temperature affects secondary school students' performance in Rivers and Bayelsa States.

Hypothesis 3: There is no significant relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States.

Table 6: t-Transformed Analysis of Significant Relationship Between High Rainfall and Secondary School Students' Performance in Rivers and Bayelsa States.

Variable	$\sum$	$\sum^2$	n	df	$\sum XY$	r	t-cal	t-crit.	Decision
High Rainfall (X)	10231	2659							
			508	506	2887	0.23	17.38	±1.96	Sig. Rejected H_0
Students' Performance (Y)	10360	3399							

Source: *Researcher's Field Result, 2023*

Result from Table 6 reveals that a low and positive relationship exists between high rainfall and secondary school students' performance in Rivers and Bayelsa States. To establish the significance of the relationship, a t-Transformed t-value was computed and an index of 17.38 was obtained. This was compared with the critical t-value of ±1.96 at the 0.05 level of significance with a degree of freedom of 506, indicating that there is a significant positive relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States (calculated t = 17.38< critical t = ±1.96 at $p < 0.05$ and df = 506). Therefore, the null hypothesis of no significant relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States was rejected. This implies that high rainfall affects secondary school students' performance in Rivers and Bayelsa States.

Discussion of Findings
The finding was discussed under the following headings; Flooding, high temperature and high rainfall and students' performance in secondary schools in Rivers and Bayelsa States.

Flooding and Students' Performance in Secondary Schools in Rivers and Bayelsa States
Finding on Table 1 revealed that there was a high and positive relationship between flooding and secondary school students' performance in Rivers and Bayelsa States with a correlation coefficient of 0.86. Hypothesis 1 on Table 3 revealed that there was a significant positive relationship between flooding and secondary school students' performance in secondary schools in Rivers and Bayelsa States with a calculated t-value of 33.22 which was greater than critical t-value of ±1.96. The finding corroborates with Jesse (2019) who stated that increased frequency of floods results in an unconducive environment for teaching and learning activities, causes harm to students and teachers, impact school attendance and academic performance of students

High Temperature and Students' Performance in Secondary Schools in Rivers and Bayelsa States
Findings on research question 2 on Table 2 revealed that there is a high and positive relationship between high temperature and secondary school students' performance in Rivers and Bayelsa States with a correlation coefficient of 0.88. Again, information on Hypothesis 2 on Table 4

revealed that there was a significant positive relationship between high temperature and secondary school students' performance in secondary schools in Rivers and Bayelsa States with a calculated t-value of 35.32 which was greater than critical t-value of ±1.96. The finding is in tandem with Anderson (2017) who asserted that increased temperature create uncomfortable conditions for learning, causes heat stress which leads to difficulty in teaching and class management and reduces learning capacities which in turn may lead to poor performance of students in academic work.

High Rainfall and Students' Performance in Secondary Schools in Rivers and Bayelsa States

Findings on research question 3 on Table 3 revealed that there is a low and positive relationship between high rainfall and secondary school students' performance in Rivers and Bayelsa States with a correlation coefficient of 0.23. Also, information on Hypothesis 3 on Table 6 revealed that there was a significant positive relationship between high rainfall and secondary school students' performance in secondary schools in Rivers and Bayelsa States with a calculated t-value of 17.38 which was greater than critical t-value of ±1.96. The finding is in consonance with Francis (2014) who opined that high rainfall impacts socio-economic and health of students and teachers which reduces school attendance and result in poor performance in academic work.

Conclusion

In view of the results obtained from the study, it was concluded that there is a positive and high relationship between flooding and high temperature and a positive and low relationship and secondary school students' performance in Rivers and Bayelsa States.

Recommendations

Based on the findings of the study, the following recommendations were made.
1. The State Government should train the schools' administrators and teachers on how to promptly respond in the case of flash flood emergency.
2. Government of both states should install facilities that reduces exposure to heat such as heating, ventilating and air conditioning systems, room ventilation, fans, shade provision through tree planting and building.

Implications for Education Development

Climate change is a problem that can greatly affect the lives and education of students. It can make schools unsuitable for learning, and reduce the quality of education. Additionally, due to climate change and the difficulties associated with it, is rendering many learners malnourished, which further exacerbates health issues. Furthermore, children who are unable to attend school are more likely to become victims of domestic abuse and child abuse.

Finally, students unable to access their schools due to climate change problems are more likely to drop out of school. When students lack the required environments to learn, it can compromise their education. Teachers become unable to deliver effective instruction due to problems with classrooms, lecture halls, and teaching aids. On the other hand, learners cannot concentrate in class because the learning environment is no longer conducive. Over time, comprehension and retention decline, which reduces the quality of education students acquire. These issues are fundamental when it comes to climate change implication on educational development.

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