

EXTENT OF AWARENESS OF THE CAUSES AND EFFECTS OF CLIMATE CHANGE BY SECONDARY SCHOOL STUDENTS IN ANAMBRA STATE: IMPLICATIONS FOR EDUCATIONAL MANAGEMENT

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Abstract

Climate change is a very devastating phenomenon that is currently sweeping across the globe. The increased frequency and intensity of climate change hazards such as flood, erosion, pollution and disease have brought untold hardship to millions of Nigerians and their environments, schools in Anambra State inclusive. The study ascertained the extent of awareness of the causes and effects of climate change by students in secondary schools in Anambra State. Two research questions guided the study and two hypotheses were tested. The study utilized the descriptive survey research design and involved a sample of 1,600 senior secondary school two (SS2) students drawn from the 33,402 SS2 students in Anambra State. A researcher developed instrument containing 26 items and titled "Students Climate Change Awareness Test (SCCAT)" was used for data collection. The instrument was duly validated by experts. A reliability coefficient of 0.84 was obtained using test-re-test method and Pearson product moment correlation. Data collected were analyzed using mean for the research questions, while z-test was used to test the hypothesis at 0.05 level of significance. The study found among others that students from private secondary schools were aware to a low extent while those in public secondary schools were aware to a great extent of the causes of climate change. It was also found out that students in public secondary schools were more of the effects of climate change than those in private secondary schools. Based on these findings, recommendations were made which include that private secondary school managements should engage in climate change campaigns which will aid understanding of the causes and effects of climate change among their students. Conclusions were drawn, and implications of the study highlighted.

Introduction

Climate change is an environmental development that is of concern both to developing and developed countries because of its negative impacts on the environment. Climate change can be perceived as the change in global or regional climate, apparent from the middle to the late 20th century and onwards; and is attributable largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels (Oxford Dictionaries.com, (2014). The United Nations Framework Convention on Climate Change (1994) defined climate change as a change that is attributable directly or indirectly to human activities, that alters the composition of the global atmosphere in addition to natural climate variability observed over a comparable time period. Elements of climate change are temperature, sunshine, rainfall, humidity, wind, atmospheric pressure, clouds among others. Based on the foregoing, climate change can be defined as a long term growing change in the weather condition that a given area experiences.

The survival and sustenance of human, animal and plant life require that a certain range of atmospheric temperature be maintained. The vegetation equally plays a vital role in this process of stabilization of atmospheric gaseous interplay, especially carbon dioxide and oxygen (Obasi, 2010). According to O'Hara, Sweeny and Wilby cited in Obasi, (2010), when the average condition of a system is relatively constant over time, an equilibrium exists which reflects the ability of the system to cope with forces either internal or external seeking to disturb it. Activities such as deforestation and poor land use have continued to reduce the absorptive capacity of plants and soil for carbon dioxide (CO₂).

The observed effects include sea level rise, changes in the range and distribution of plants and animals. Human health are also affected, both directly and indirectly through extreme periods of heat and cold, storms, floods, erosions and climate sensitive diseases such as malaria. On the strength of these, Porrit (2008), averred that climate change represents disruption on a scale far larger than the great wars and the global economic depression of the first half of the 20th century. Continuing, Porrit added that what we are looking at is 'the death of nature'. The great challenges posed by climate change to humanity call for urgent attention through concerted efforts. The issues need urgent and immediate action, and consequently, the global interest on climate change has made it compelling for most countries of the world to embrace climate change education as a precondition for environmental safety. The effect of climate change in Africa which seems to be the most vulnerable continent to climate change is catastrophic (Intergovernmental Panel on Climate Change (IPCC), 2007). This is especially relevant in Nigeria given its

southern location along the coast and its northern boundaries with the Sahara desert drier regions. The country's vulnerability to climate change impact stems from Nigeria's fragile economy which makes the local ability to respond, difficult. These anomalies are usually observed in form of changes in vegetation and eco-system, flooding, rise in sea level, erosion and even health hazards.

The vulnerability of Nigeria to climate change impacts is also as a result of its dependence on rain-fed agriculture with wide spread poverty, weak mitigation and weak response capacity (Igwebuike, Ezeugwu, Odoh, Okpalaku, & Okpalaku, 2009). These researchers pointed out that poverty, especially in the third world countries to which Nigeria belongs, has also driven the poor into the forest in search of means of livelihood. Millions of people are being forced, through hunger and want to destroy the very resources upon which their lives depend. Ironically, many societies have become endangered species in their own environment.

In Anambra State, it seems that many people, particularly in the rural areas, are not aware of the causes and effects of climate change. The state is witnessing cases of flooding, late onset and early cessation of rains, increasing temperature, incidence of malaria among others, all of which affect lives and livelihood. Gully erosions are devastating many communities, schools and institutions in the state. In fact, some villages have had substantial part of their communities destroyed by this gully erosion menace thus the people forced to live as refugees in their own communities. The seeming ignorance of most people in Anambra state and the country at large make them to sometimes engage in activities that contribute to the problems of climate change. This leaves one in doubt of the level of awareness of the causes and the effects of climate change and information sharing and dissemination system to facilitate action in the Nigerian education system. Considering these scenario, one wonders why emphasis on climate change awareness and strategies for its control have not been accorded much importance in Nigerian secondary schools those in Anambra state inclusive. Climate change as a topic features only in the secondary school Geography syllabus. Considering the fact that only few students offer this subject in secondary schools, it is possible that majority of the students may not know what climate change is all about, its causes and effects, hence the need for this study which investigated the extent of awareness of the causes and effects of climate change by secondary school students in Anambra State.

Climate change is unarguably the biggest environmental issue of our time. Though it is global in nature, its consequences are far more reaching in developing countries like Nigeria than in the developed economies. Climate

change is an environmental, social and economic challenge on a global scale, (Mendelson, Dinnar & Williams, 2006; Scholze, Annel & Prentice, 2006). It can be exacerbated by human induced actions such as the widespread use of land, the broad scale deforestation, the major technological and socio-economic shifts with reduced reliance on organic fuel and the accelerated uptake of fossil fuels (Millennium Ecosystem Assessment, 2005). According to Mvalisi and Ekwedigwe (2008), climate change results from two major phenomena of green house effect and ozone layer depletion. The phenomena are caused by both natural and human activities. Natural factors according to Mvalisi and Ekwedigwe include among others, volcanic eruptions, earth's tilt, ocean currents and the greenhouse effect - the last being the focus of this study.

Greenhouse effect is the trapping of heat on the earth's surface by Green House Gases (GHGs). The GHGs allow heat from the sun to pass through them to get to the earth's surface, but prevents the heat on the earth's surface from escaping from the earth. This results in heating up the earth's temperature – causing global warming. This process is analogous to the glass panes of a car which on a hot day allow sun light to pass through but prevent the heat generated by the opaque interior of the car from escaping, thus, making the interior of the car hot. Houghton and Woodwell (1989) indict humans as strong contributing factors to the generation of these GHGs through their activities. The authors stated that the world is warming, climate zones are shifting. Glaciers are melting and sea level is rising. Continury Houghton and Woodwell stated that these are expected to accelerate over the next years as the amount of CO₂, methane and other trace gases accumulating in the atmosphere through human activities increase. In the same vein, Oyegun (2007) asserted that the human activities of modern period which have contributed to the significant level of GHGs in the atmosphere include:

- i. A sharp rise in the use of fossil fuel that releases large amount of GHGs such as (CO₂ and methane (CH₂) into the atmosphere;
- ii. Aerosols which is a particular matter of sulfur from fossil fuel combustion in the atmosphere which exert cooling on weather and climate.
- iii. Cement manufacture which is the largest cause of man-made CO₂ emissions.
- iv. Land use, arising from urbanization and industrialization, as population of the earth increases, more people burn fossil fuels causing greater impact on the environment and global warming.
- v. Deforestation; clearing and burning of bushes to grow crops which release CO₂ to oxygen. The result is a greater concentration of CO₂, causing increased global warming. Also population directly impact on

deforestation as farmers cut down huge chunk of trees, clearing land for agriculture, more people require more food, and thus more farm land is needed to maintain food supplies.

About 97% of climate scientific researches in recent times agree that the climate warming trends over the past century are very likely due to human activities and most leading scientific organizations worldwide have issued public statements endorsing this position. Notable among these is the IPCC 4th Assessment Report (2007) supported by the American Medical Association (AMA) (2013) that the earth is undergoing adverse global climate change and that anthropogenic contributions are significant. In line with this is the assertion by the American Scientific Societies (ASS) (2009) that observations throughout the world make it clear that climate change is occurring and rigorous scientific research demonstrates that the GHGs emitted by human activities are the primary drivers. On its own part, the American Chemical Society (ACS) (2004) stated that a Comprehensive Scientific Assessment of our current and potential future climates clearly indicate that climate change is real, and largely attributable to emission from human activities and potentially a very serious problem. Corroborating the above view is the American Physical Society (APS) (2007) who stated that Global warming is occurring, and that if no mitigation actions are taken, that significant disruptions in the earth's physical and ecological systems, social systems, security and human health are likely to occur. We must therefore reduce emissions of GHGs beginning now.

From the fore going, it is evident that man is responsible for Climate Change and therefore, the issue of climate change must be located squarely on the shoulders of human beings.

Climate change has the potential to affect all natural systems thereby becoming a threat to human development and survival, socially, politically and economically (Pachauri, 2009). The IPCC 4th Assessment Report states that continued GHG emission would induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century. The Report further stated that delayed emission reductions significantly contain the opportunity to achieve lower stabilization levels and increase the risk of more severe impacts of climate change. Adinna (2009), IPCC, (2007), and Uja, Nze and Chukwu (2010) all agree that both current and anticipated impacts of climate change include:

- i. Abnormal increase in temperature, heat stress and weather variability;
- ii. Desertification and more intense and longer drought over wide areas;
- iii. Reduction in crop yield

- iv. General reduction in vegetation, natural water reservoir and surface streams (some of which unexpectedly dry up before the end of dry season)
- v. Persistent melting of ice which increase the sea level;
- vi. Changes in the intensity and distribution of precipitation often accompanied by extreme weather events such as thunderstorms, heavy winds and severe flooding;
- vii. Increased pests, diseases and weeds;
- viii. Depletion of human, plant and animal resources which may result in productivity reduction, enhanced poverty as well as malnutrition;
- ix. Depletion of the ecosystem and energy supply and increased energy demand; and;
- x. Widespread soil erosion and declining soil fertility.

The 4th IPCC (2007) represents the most recent comprehensive and official review and analysis of the state of global; scientific knowledge on climate change (Climate Action, n.d). The report advocates limiting the rise in temperature below 2°C in other to avoid adverse effects of climate change such as food shortage, malnutrition, spread of infectious diseases reduction of forest, deaths from heat waves, flood and droughts. Heinberg, (2007) warned that the Earth is rapidly approaching a tipping point beyond which climate change will become unstoppable. He in Hernberg went on to argue that unless effective measures are put in place to control carbon dioxide emissions over the next 10 years, the rise in the temperature of the earth could set lose self-reinforcing process that would be beyond human control. The projected impact of this on environmental stability and life on earth is better imagined than experienced. They include disruption in precipitation, shifts in vegetation belts, melting of the polar ice-caps and rise in sea level which could affect low-lying areas (Ayres & Hug 2008).

These findings of scientists are clearly in tandem with observations and events in most parts of Nigeria where climate change affects rainfall pattern, cause emergence of diseases and pests, as well as drop in crop and animal production, more gully erosions and increased incidences of flooding. This being the case, communities in Anambra state would seem to be especially at risk with serious consequences on property, livelihood, and environment. The 2012 flooding that occurred in most riverine areas in Nigeria and which submerged virtually the entire communities along the River Niger and River Benue, destroyed farmlands, and houses, killed many residents, paralyzed economic activities in the affected regions for more than three months and produced thousands of refugees across the country, is a case

in mind. The effect of that flood is unprecedented and it is rumoured that something similar is likely to occur in the nearest future. Apart from this recent flood, Nigeria has been experiencing weather conditions ranging from drought which culminated into rumour of acid rain, to excessive rainfall. Drought causes intense heat and dust, the prevalent heat is believed to be favourable for malaria carrying mosquitoes consequently, there has been an increase in the transmission of malaria from one person to another.

Climate change also leads to migration, since drought can force families to move to other areas with a promise of greener pastures. Statistics released by African Union in 2009 reveal that due to inadequate rainfall during the previous agricultural season, more than 15 million people in the African continent are faced with food scarcity. In a related development, Oladipo, (2010) in one of his treaties on climate change in Nigeria and Niger Republic confirmed that climate change is a serious threat to the efforts of poverty eradication and sustainable development in Nigeria and Niger Republic because the two countries have large rural population directly depending on rain fed agriculture.

It is regrettable and absurd that the Nigerian people including those who should be more knowledgeable such as secondary school students ignorantly engage in activities that aggravate the situation. Such activities include bush burning, cutting down trees and indiscriminate dumping of refuse, among others. Climate change is therefore a phenomenon that is currently in dire need of a wide range of publicity to create awareness of its causes and effects and pursue measures in order for the society to mitigate its effects in Anambra state especially in public and private secondary schools.

The following research questions and hypotheses guided the study:

1. To what extent are students in public and private secondary schools in Anambra State aware of the causes of climate change?
2. To what extent are students in public and private secondary schools in Anambra State aware of the effects of climate change?
1. Students in private and public secondary schools in Anambra State do not differ significantly in the extent of their awareness of the causes of climate change.
2. Students in private and public secondary schools in Anambra State do not differ significantly in the extent of their awareness of the effects of climate change.

The hypotheses were tested at 0.05 levels of significance

Method

This study utilized the descriptive survey research design. In a descriptive survey research design, data are collected from a sample of a population which are considered to be a representative of the entire population (Nworgu, 2015). This design is deemed appropriate for this study since data was collected through the use of questionnaire to elicit information from a sample of students as a representative of the entire students on existing issues of awareness of the causes and effects of climate change. The study was conducted in Anambra state, Nigeria and covered all the public and private secondary schools in the six education zones in the state.

The population of the study comprises all the 33,402 senior secondary two (SS2) students in the State. This number consists of 26,697 and 6,705 in public secondary schools and private secondary schools in the State respectively.

A sample of 1,600 students made up of 1,200 from public secondary schools and 400 from private secondary schools were involved in the study. The sample was drawn using proportionate stratified sampling technique.

A researcher developed instrument titled “Students Climate Change Awareness Test (SCCAT)” was used for data collection. It has two sections A and B Section A is made of two items which elicited information on biographic data of the respondents such as education zone of the respondents and type of school while section B was made up of two parts I and II. Part I with 12 items measured the extent of awareness of causes of climate change while part II which also has 12 items measured the extent of awareness of effects of climate change by the students. The items in the two parts of section B were structured on a 4-point scale of: Very Great Extent (VGE), Great Extent (GE), Low Extent (LE), and Very Low Extent (VLE) weighted 4, 3, 2 and 1 respectively. The instrument was duly validated by three experts one each in Environmental Studies, Educational Measurement and Evaluation and Educational Management. All the experts are lecturers in Nnamdi Azikiwe University. The reliability of the instrument was through test –re test and the coefficient calculated using Pearson Product Moment Correlation. This yielded a reliability co-efficient of 0.89. The instrument was deemed reliable as it is in line with Nworgu (2015) who stated that a reliability coefficient of 0.70 and above is adequate for a research instrument. The researchers employed the direct approach technique in the administration of the instrument to the respondents. Out of a total of 1,600 copies of the instrument pad ministered 1,370 representing 86% were successfully completed and retrieved. These were used for data analysis.

Arithmetic mean was used to answer the research questions while z-test was used to test the hypotheses at 0.05 level of significance. In answering the research questions mean scores from 0.00-0.4 were regarded as VLE, 1.00-1.99 Low Extent; 2.00-2.99 Great Extent and 3.00-4.00 Very Great Extent. For the hypotheses where the tabulated z value is greater than the calculated z at the given level of significance and degree of freedom the null hypotheses was not rejected. Otherwise the null hypotheses was rejected.

Results

Table 1: Students' Mean Ratings on the Awareness of the Causes of Climate Change

S/N	Item	Private Schools (n=360)		Public Schools (n=1010)	
		Mean	Decision	Mean	Decision
1	Solar radiation	2.71	GE	2.87	GE
2	Mountain building	2.07	LE	2.63	GE
3	Continental drift	2.07	LE	2.49	LE
4	Activities of man	2.68	GE	2.71	GE
5	Use of cement	2.10	LE	2.72	GE
6	Encouraging rail and other mass transportation system	2.24	LE	2.66	GE
7	Methane emitted during production of gas	2.45	LE	2.85	GE
8	Nitrous oxide emitted during the combustion of fossil fuels	2.63	GE	2.97	GE
9	Carbon monoxide from industries	2.54	GE	2.99	GE
10	Bush burning	2.05	LE	2.73	
11	Unplanned land use and management	2.05	LE	2.72	GE
12	Carbon monoxide from vehicles	2.62	LE	2.44	GE
Mean of Means		2.35	LE	2.73	GE

Results in Table 1 showed that students in private secondary schools were aware to a great extent on five items (namely items 1,4,7,8 and 13) out of the 12 while students in public secondary schools were aware to a great extent on all the items except item 3. It was therefore decided that students in public secondary schools were more aware of the causes of climate change than their

counterparts in private secondary schools. The mean of means for the two groups showed that students in private secondary schools were aware of the causes of climate change to a low extent $X = 2.35$ while their counterparts in public schools were aware to a great extent $X = 2.73$

Table 2: Students' Mean Ratings on the Awareness of the Effects of Climate Change

S/N	Item	Private Schools (n=360)		Public Schools (n=1010)	
		Mean	Decision	Mean	Decision
1	Changes in political conditions	2.83	GE	2.96	GE
2	Abnormal temperature	2.81	GE	2.84	GE
3	Lung problems/diseases	2.08	LE	2.47	LE
4	Over flooding and destruction of lives and properties	2.16	LE	2.57	GE
5	Suppression of heat and wild fire	2.84	GE	2.73	GE
6	Exposes the human body into dangers	2.13	LE	2.46	LE
7	Reduction in vegetation	2.78	GE	2.98	GE
8	Persistent melting of ice and severe flooding	2.66	GE	2.92	GE
9	Increased and severe flooding	2.75	GE	2.62	GE
10	Desertification and more intense and longer drought over wide grass	2.29	GE	2.86	
11	Widespread soil erosion and declining soil fertility	2.27	LE	2.86	GE
12	Increased thunderstorm	2.64	GE	2.82	GE
Mean of Means		2.52	GE	2.76	GE

The results in Table 2. showed that students in public secondary schools were more aware than those in private schools in terms of item by item analysis. Out of the 12 items listed, students in private schools were aware to a great extent on eight (8), and aware to a low extent on four where as students in public secondary schools were aware to a great extent on 11 items and recorded a low extent of awareness for only one item. It was therefore concluded that students in both private and public secondary schools were more aware of the effects of climate change to a great extent but that

those in public secondary schools were more aware than those in private secondary schools. Generally, as shown by the mean of means for public and private school, 2.52 and 2.72 respectively the two groups are aware of the effects of climate change to a great extent. However students in public secondary school showed higher level of awareness.

Table 3: z-test analysis of the Students’ Awareness of the Causes of Climate Change by School Type (Private and Public)

	School Type	N	Mean	SD	df	z-cal	z-crit	Decision
Awareness of the Causes of Climate Change	Private Schools	360	2.35	.839				
	Public Schools	1010	2.73	.86	1368	7.32	1.96	Significant

The results in Table 3 showed that private secondary school students had a mean rating of 2.35, while public secondary school students had a mean rating of 2.73. These yielded a z-calculated value of 7.32 which is greater than the critical z-value of 1.96 at df of 1368. The null hypothesis was therefore not accepted. Thus, there is a significant difference between the mean scores of students in private and public secondary schools in terms of their awareness of the causes of climate change.

Table 4: z-test analysis of the Students’ Awareness of the Effects of Climate Change by School Type (Private and Public)

	School Type	N	Mean	SD	df	z-cal	z-crit	Decision
Awareness of the Causes of Climate Change	Private Schools	360	2.52	.78				
	Public Schools	1010	2.76	.86	1368	4.61	1.96	Significant

The results in Table 4 showed the z-test analysis comparing students’ awareness of the effects of climate change on the basis of school type. This result indicated that there is a significant difference between students in private and public secondary schools in terms of their awareness of the effects of climate change. This is shown by the z-cal value of 4.61 which is greater than the critical z-value of 1.96, at df of 1368. Therefore, the null hypotheses

of no significant difference is not accepted. Thus, there is a significant difference between the mean scores of students in private and public secondary schools in their level of awareness of the effects of climate change.

Based on the data analysis for this study, the following major findings emerged; namely that:

1. Students in private secondary schools have low extent of awareness of the causes of climate change while those in public secondary schools were aware of this to a great extent.
2. Students in both private and public secondary schools had great extent of awareness of the effects of climate change but that the awareness was higher for students in public secondary. Schools then those in private secondary schools.
3. Students in private and public secondary schools differed significantly in their extent of awareness of the causes of climate change
4. Students in private and public secondary schools differed significantly in their extent of awareness of the effects of climate change

Discussion

One of the findings of the study is that the level of awareness of the causes of climate change among secondary school students in Anambra State was low in private schools while there was a great extent of awareness among public secondary school students. This implies that in Anambra State, most private secondary schools do not focus attention on climate change issues and factors that are responsible for climate change.

However, in terms of difference between private and public secondary schools, the study found out that students from public schools had significantly greater awareness of the causes of climate change than those in private schools. This disagrees with Faleke (2010) whose study using secondary school students in Addis Ababa revealed that students from private schools had greater awareness of environmental problems than those in public schools. He argued that the better awareness of students from private schools lies in the fact that most of them come from wealthy and literate families and as such are more enlightened than students in the public schools. However, this may not be the case in Anambra State as some of the public secondary schools have been handed over to voluntary agencies which may have affected the academic climate in these schools. Additionally, most of the public schools are manned by highly qualified and experienced teachers than is obtained in private secondary schools. This may imply that the teachers in public school may have offered good teaching on the issue of climate change.

This study also found out that students in private and public secondary schools had moderate awareness of the effects of climate change. This is in tandem with the findings of Faleke (2010) whose study indicated that the level of students' awareness of environmental problems including climate change, showed that students have moderate awareness of environmental issues which is the case in both public and private secondary schools in Anambra State. However, findings from the test of significant difference in means between students in private and public secondary schools on the effects of climate change showed that students from public schools performed significantly better than students from private schools in terms of awareness of the effects of climate change. This finding contradicts that of Shoeiri, Omidvar and Prahallada (2007) and Faleke (2010) both of who found out that student from private schools were significantly better than those from public schools in terms of awareness of environmental issues. The disagreement in the findings of the previous works and the current study could be attributed to differences in areas of study and population characteristics. One may not expect a research conducted outside Nigeria especially in a more developed economy to yield the same result with one conducted locally. Private secondary schools in these countries may be more advanced and equipped than those in Anambra State, Nigeria.

Conclusion

Based on the interpretations of the findings, and discussions of results, it is concluded that students in Anambra State secondary schools have moderate awareness of the causes and the effects of climate change. This implies a need for greater education on climate change in our secondary schools.

Recommendations

Based on the findings of this study, the following recommendations are made;

1. Secondary school managements especially those of private schools should engage in climate change campaigns which will aid further understanding of the causes and effects of climate change and its control mechanisms in secondary schools.
2. School administrators particularly those in private schools should be well empowered and involved in decision making with respect to climate change issues in view of the role of secondary schools in the education of the youths who are the leaders of tomorrow.
3. The Government of Anambra State should provide safe schools with adequate facilities for control of climate change. There should also be

sensitization and mobilization of teachers, students and communities on ways of controlling erosion and flooding.

4. School Approval Committees from the Ministry of Education should ensure that before schools earn government approval in the state that they must meet up the approved environmental conditions of the government agencies in charge of environment.

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