ENVIRONMENTAL EFFECTS OF GLOBAL WARMING: IMPLICATIONS TO THE PERCEPTION OF MATHEMATICS STUDENTS

Victoria O. OLISAMA (PhD) ^1

Department of mathematics, Adeniran Ogunsanya
College of Education, Oto/Ijanikin, Lagos State. Nigeria^**1&3**

Ogechukwu R. APPAH (PhD) ^2

Federal College of Forestry, Ibadan, Forestry Research Institute of Nigeria

&

Oluwakemi M. ODUMOSU (PhD)^3

Corresponding E-Mail: vicolisamaogechukwuappah@yahoo.com.uk

Abstract

This study investigated the environmental effects of global warming and implications to the perception of mathematics students. The population consisted of Mathematics students in public universities in western region of Nigeria. The sample, 154 respondents which consist of 40:200 level, 64:300 level and 50:400 level students were randomly selected from three public universities in western region of Nigeria. The instrument for data collection was a structured questionnaire: Students' Perception of the Environmental Effects of Global Warming (SPEEG). It was designed to obtain the Mathematics students' level of awareness of global warming. The Students' Opinion Descriptive Survey Design (SODSUD) was used for the study. It is a non-experimental research design which adopted the use of nonparametric test statistics of Analysis of Covariance (ANCOVA). The study discussed the role of Mathematics education in controlling the global warming and reduction of greenhouse effects for a sustainable development of the nation. The study discovered that mathematics students have high perception rate towards the effects of global warming on lives and property. It is recommended that environmental related courses be included in the Mathematics curriculum. Also, there should be a shift towards the development of global warming mathematical models and renewable energy such as solar power, wind power and hydrogen gas. This is to reduce the hazards caused by climate change for global warming remedy and sustainable development.

Key Words: Global warming, greenhouse effects, Sustainable development, Students' Perception of the Environmental Effects of Global Warming (SPEEG), Students' Opinion Descriptive Survey Design (SODSUD).

1. **Introduction**

Mathematics as a creation of the human mind is an indispensable catalyst to the understanding of national problem (Stamm, Clurk & Eblecas, 2000; Olisama & Appah, 2010). Mathematics serves as the touch stone of intelligence and wheel of scientific and technological innovations (Olisama, Areelu & Akudo, 2018; Otun-Ogbisi & Ukpebor, 2009). Experimental scientists with the mathematical knowledge observe phenomena and conduct experiments to obtain data about the way the universe behaves. Theoretical scientist generalizes and draws conclusions from these results to form models of how the universe works. Mathematical scientists then study these models to understand what the models predict about unknown behavior in phenomena One of these phenomena is the climate change.

There are three ways by which Mathematics is involved in climate change: description, prediction and communication. Indeed, without Mathematics, we would have little awareness of climate change as a system-wide phenomenon. Climate change has become one of the most pressing issues of the 21st century. The evidence that human activity is altering our planetary ecosystem is diverse and compelling [Intergovernmental Panel on Climate Change (IPCC), 2008]; Roper, 2004). Climate change is the change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties and that persist for an extended period, typically decides or longer (IPCC, 2008).

Climate change is thus described in terms of mathematical notions and procedures such as means and statistical tests. These techniques are applied to a wide variety of data, including air and sea temperature recordings and other standard methodological readings, as well as records of glacial melting or sea level (IPCC, 2008). It is worth noting, in passing, that much of this mathematics is well within the scope of school mathematics curriculum.

The greenhouse effect is essential to life on earth, however, the intensification of its effect is due to increased levels of greenhouse gases in the atmosphere which is considered to be the main contributing factors to global warming. The greenhouse gases occur naturally, and without them the planet earth would be too cold to sustain life. With more greenhouse gases in the mix, the atmosphere acts like a thickening blanket and traps more heat. This built up heat has drastically increased since industrial revolution in mid-17th-19th century by fossil fuel burning, and further accelerated by chloric-fluid carbon emission in the 20th century, leading to global warming. Earth has warmed and cooled many times since its formation about 4.4 billion years ago.

Global climate changes were due to many factors, which include:

a. Massive Volcanic Eruptions, which increased carbon-dioxide in the atmosphere.
b. Changes in the intensity of energy emitted by the sun.
c. Variations in Earth's position relative to the sun, both in its orbit and in the inclination of its spin axis (IPCC, 2008).

Greenhouse gases are rising, and temperatures are following in the increment. Before the late 1800s, the average surface temperature of Earth was almost 15^{o}c (59^{o}F) over the past 100 years the average surface temperature has risen by about 0.7^{o}c (1.3^{o}F), with most of the increase occurring since the 1970s (IPCC, 2008). Scientists have linked even the amount of warming to numerous changes taking place around the world, including melting mountain glaciers and

polar ice, rising sea level, more intense and longer drought, more intense storms, more frequent heat waves, and changes in the life cycles of many plants and animals.
Climate change appears to pose a risk to human security and environment due to its negative effects. Natural scientists report many potential unfavorable environmental changes as a consequence of climate change such as rising sea level, increasing drought and the destruction of ecosystems on a world scale [United Nations Environmental Program (UNEP), 2012].

Tackling climate change is one of the biggest challenges this generation faces. European countries, African countries, Nigeria inclusive are particularly vulnerable to climate change, because of their dependence on rain fed agriculture, high level of poverty, low level of human and physical capital, total dependence on the western world (UNEP, 2012).

Nigeria is particularly vulnerable to the impacts of climate change and this affects the country's natural resource base. It creates more scarcity, intensifies competition and, ultimately leads to conflicts (IPCC, 2008). In Nigeria, climate change impacts have ravaged most of the northern states, gradually turning the entire region into an arid zone or desert which leads to the devastation in the educational sector. The school curriculum has been affected and the level of concentration and its uses are not felt. The southern part of the country has to deal with severe coastal and soil erosion. The increase in the warming of the atmosphere has significant effects on both natural environment and human life. Obvious effects include glacis retreats, arctic shrinkage, and worldwide sea-level rise. There are also less obvious effects such as economic trouble, ocean acidification and population risks. As climate change emerges, everything changes from the natural habits of wild life to the culture and sustainability of a region. According to Falaju (2018), Climate change threatens livelihoods of 130 Niger Basin inhabitants in Nigeria and many measures have been introduced to curb the ugly situation. In an attempt to limit the effect of climate change on the Niger basin in Nigeria, the Niger Basin Authority, NBA, on 6 April, 2018 launched the Africa Development Bank (AfDB) $300m funding for technical and environmental studies, at the opening of the 36th Ordinary Session of the Council of Ministers of NBA in Abuja, Nigeria, (Newsroom, 2018).

Mathematical model and what the model predict about the climate change is the best way of combating global warming (Barwell, 2013; d'Ambrosio, 2010). Since complicated climate models that require super computers to calculate them have yielded empirical functions that can be used by less complicated computer models to study global warming. An appropriate calculation is done of the carbon-dioxide concentration in the earth's atmosphere due to burning fossils fuels, coal, crude oil and natural gas. Thus, measuring the factors that are responsible for global warming using Mathematics measurement is one of the ways to achieve the desired result. The climate change is a global issue. The dangers pose serious threat to existing environmental problems like desertification, erosion, flooding and ecological devastation (Roper, 2004; [Earth Policy Institute Website (EPIW), 2003]. This impaired the development of a nation.
According to Oguntimehin and Ifamuyiwa (2006), development is a process where a country achieves reasonable self-sustaining growth that facilitates and enhances industrial and technology prowess and interest of its people. Development commences when man can subdue his environment to manipulate and manage effectively everything in the environment and to increase the productivity of all things he needs to live a qualitative life. In other to sustain the development, there is a need for the economy to support the needs of the people over time. The fulfillment of the needs of the present generation should not compromise the ability of the future generation to meet their needs. When there is development, the standard of living will be better. Sustainable development ensures that progress in human well-being is extended over many generations, rather than just a few years. It is therefore important to increase the knowledge about global warming so as to be able to solve the causes and effects of global warming in the society for a sustainable development.

2. Climate Variability and Extreme Climate Events and Examples of Their Impacts

Projected changes during the 21st Century in Extreme Climate Phenomena and their Like hood	**Representative Examples of Projected Impact (all high confidence of occurrence in some areas)**
Higher maximum temperatures, more hot days and heat waves over nearly all land areas.	1. Increased incidence of death and serious illness in older age groups and urban poor. 2. Increased heat stress in livestock and wild life 3. Shift in tourist destination 4. Increased risk of damage to a number of crops 5. Increased electric cooling demand and reduced energy supply reliability.
Increased summer drying over most mid-latitude continental interiors and associated risk of drought.	1. Decreased crop yields 2. Increase damage to building foundations. 3. Decreased water resources quantity.
Intensified droughts and floods associated with El Nino events in many different regions.	1. Decreased agricultural and rangeland productivity in drought and flood prone regions. 2. Decreased hydro-power potential in drought – prone regions.
Increased intensity of mid-latitudes storms (little agreement between current models).	1. Increased risks to human life and health. 2. Increased property and infrastructure losses. 3. Increased damaged to crustal ecosystems.

Table1. Source: Intergovernmental Panel on Climate Change, (2008).

3. Mathematics and Global Warming

Discussing the role of the Mathematics in understanding climate change, may be helpful.

Since the language of science is Mathematics and the science of climate change involves good deal of Mathematics. These are three principal ways that Mathematics is involved;

3.1. Description

The description of climate change is mostly based on descriptive statistics. Indeed, without Mathematics, we would have little awareness of climate change as a system-wide phenomenon.

The techniques are applied to wide varieties of data including air and sea temperature recording and other standard meteorological readings as well as records of such things as glacial melting or sea level (both are increasing (IPCC, 2008). it is worth noting, in passing that much of this Mathematics is well within the scope of school Mathematics curricular (Barwell, 2013).

3.2. Prediction

Prediction of the course of climate change in the future is based on more advanced Mathematics. Developing predictions about future global regional or local effects of climate change draws on a range of advanced Mathematical methods, including Mathematical modeling, differential equations, non-linear system and stochastic process (Otun-Ogbisi et al., 2009). Several different climate models have been developed to relate to greenhouse gas emission to change in the Earth's climate, still there is Mathematical challenge in the developing methods of dealing with differences that arise between models for long-range predictions (Otun-Ogbisi et al., 2009).

Interest in Mathematical modeling in the Mathematics education has been growing over the past two decades in different parts of the World (Barwell & Suurtamm, 2011; Gutstein, 2006). This is due to the advances in technology that have helped to facilitate the creation of models by students. Mathematical modeling helps students to see the relevance of Mathematics in investigating and making sense of the world. So that Mathematics is not experienced as a static domain with little connection to students' love (Odumosu, Olisama & Areelu, 2018). In particular, Mathematical modeling uses real data to investigate a wide variety of issues.

3.3. Communication of Climate Change

It can be observed that climate change entails the use of Mathematics more particularly, Mathematics literacy; since the climate change is now being discussed in a wide range of non-scientific contents including the mass media, official websites, blogs, official publications, report and so on, the degree of Mathematical literacy is also necessary, in relation to the use and interpretation of data, graphs and accounts of the Mathematics involved.

Since Mathematics is involved, then it should be capable of providing the needed information to reduce the level of global warming.

According to Barwell, (2013), considering the role of learner, Mathematics education needs to respond to the climatic situation in these wider peer communities and prepare the learner to participate as an active critical citizen and the basis for such Mathematics education can be found in critical Mathematics education.

4. Control of Global Warming

Studies performed by the British government show that to avert potential disaster in relation to global warming UNEP (2012), greenhouse gas emission must be reduced by approximately 80%. But how can these vast amounts of energy be preserved?

4.1 Climate Policy: A strategy to reduce greenhouse gas emissions by 18% over a 10 years' period from 2002 has evolved. The policy involves reducing emissions through technology improvement and dissemination, improving the efficiency of energy use and voluntary programs with industry and shifts to cleaner's fuels.

4.2 Reforestation: Plants absorbs the greenhouse gas carbon dioxide [co_2] from the atmosphere for photosynthesis, the conversion of light energy into chemical energy by living organisms. Increased forest cover will help plants remove co_2 from the atmosphere and help alleviate global warming. Although having a small impact, this would help reduce one of the most significant greenhouse gases contribution to global warming.

4.3 Personal Action: We can reduce electricity use around the house. The average home contributes more to global warming than the average car. If we switch to energy-efficient lighting or reduce energy needed for heating or cooling, we will make a change in emission. This reduction can also be made through improving vehicle fuel efficiency. Driving less than needed or buying a fuel efficient car will reduce greenhouse gas emission.

4.4 Recycling: Whenever possible, greatly reduces the energy needed to create new products, whether it is aluminum cars, magazine, card board, or gases, finding the nearest recycling center will aid in the fight against global warming.

5. Research design

5.1 Population, Sample and Sample technique: The population consists of all Mathematics students in Federal government owned Universities in the western region of Nigeria. Using random sampling, 154 Mathematics students were selected from University of Lagos, University of Ibadan and Obafemi Awolowo University, Ile-Ife, Nigeria. 48 Mathematics students (27 males and 21 females; 12-200L, 20-300L and 16-400L; 25 rural and 23 urban) were randomly selected using simple random sampling technique from about 200 mathematics students in University of Lagos. Also, 61 (28 males and 33 females; 18-200L, 27-300L, and 16-400L; 30 rural and 31 urban) were randomly selected from about 300 Mathematics students in University of Ibadan. And, 45(25 males and 20 females; 10-200L, 17-300L, and 18-400L; 17 rural and 28 urban) were randomly selected from about 200 Mathematics students in Obafemi Awolowo University. Altogether, 80 males, 74 females, 72 rural, 82 urbans, 40-200L, 64-300L and 50-400L, were sampled for the study. The study was conducted in the second semester of 2017/18 academic session.

5.2 Research Instrument

The instrument for the research was a self-developed and structured questionnaire called Students' Perception of the Environmental Effects of Global Warming (SPEEG) which contained different variables. A series of specific items on 4-likert scales (Strongly Agree, Agree, Disagree and Strongly Disagree) were formulated to indicate the respondent's opinion to the questions raised concerning their views on global warming. The questionnaire contains two sections; A and B. Section A sought information on demographic data of respondents such as name of institution, sex, location of institution and levels of students. Section B consisted 8 items in which the respondents were to indicate the degree of agreement or rejection with each of the items to obtain answers to the raised questions. The response format was numeric, in which the items were judged in a single dimension and arranged on a scale of equal intervals.

The more favorable respondents judged the items, the higher the numerical value. The score for each of the items ranged from one to four. Positively worded items were scored using ascending scores while negatively warded items were scored in reversed order. The instrument was collectively approved and considered valid by the researchers and some mathematics experts. The face and content validity of the instrument was obtained by initially giving the drafts consisting of 12 items to four experts and senior colleagues who scrutinized it. Their inputs formed the basis for a thorough validity to ensure that the instruments actually measured what they were intended to measure in relation to the research hypothesis. The suggestions and the comments of the experts were applied and the items reduced to 8. The final version of the instruments was trial tested on a sample of 5 Mathematics students, each of whom was not part of the real study sample, but randomly selected from Covenant University, Ota and Lagos State University, Ojo. The collected data confirmed that the students did not encounter any problem while responding to the instruments. On the other hand, Cronbach's alpha was adopted to compute the reliability coefficient which result indicated 0.82, thus confirming that the scale was internally consistent and reliable. Analysis of Covariance (ANCOVA) was used to analyze the data. This is most imperative in view of the use of nominal data and the aim of the researchers to investigate whether the frequency observed in the sample deviated significantly from some theoretical population frequency. This is to determine whether to reject or not to reject the stated hypotheses.

5.3 Procedure for Data Collection

After intimating the selected students on the need for the research, the SPEEG was personally administrated by the researchers to the students. Each respondent was therefore given a copy of SPEEG which was filled and collected immediately. The rate of effect of global warming on the environment was determined from the 8-itemed instrument. The students' expected minimum and maximum perception rates lie between 1 and 32 respectively. This was split into low effect (1-15), average effect (16-24) and high effect (25-32). Furthermore, zero response to the instrument could mean that the students perceived no effect of global warming on lives and property. F-ratio Analysis of covariance statistics was used to analyse the data.

5.4 Research Questions

1. What is the perception rate of mathematics students towards the effects of global warming on lives and property?
2. How do students perceive the effects of global warming on lives and property based on institution?
3 What are the perceptions of mathematics students concerning the effects global warming on lives and property based on gender?

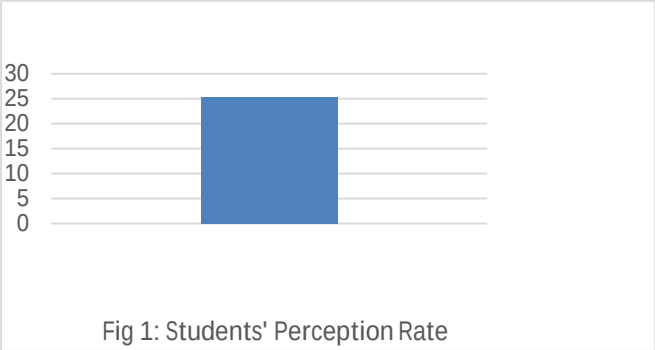
4. What are the perceptions of mathematics students in relation to the effects of global warming on lives and property based on location?
5. How do mathematics students perceive the effects of global warming on lives and property based on academic level?

5.5 Null Hypotheses

H01: Mathematics students do not differ significantly in the perception of the effects of global warming on lives and property based upon institution.
H02: Mathematics students do not differ significantly in the perception of the effects of global warming on lives and property based upon gender.
H03: There is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property based upon location.
H04: There is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property based upon academic level.

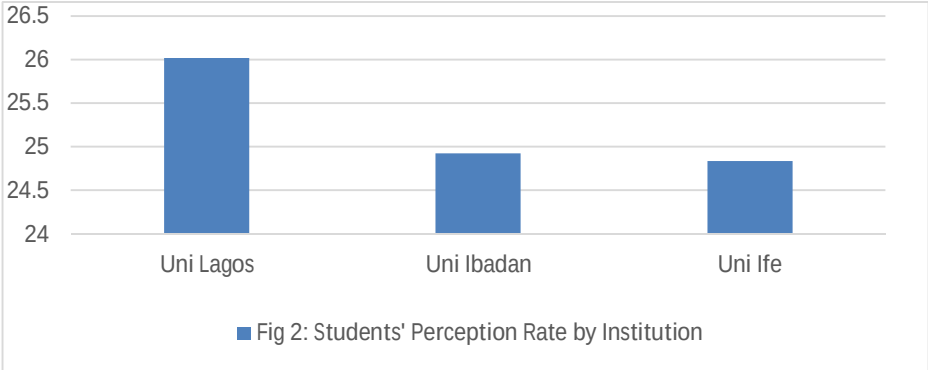
6. Results

Research Quest 1: What is the perception rate of mathematics students towards the effects of global warming on lives and property?



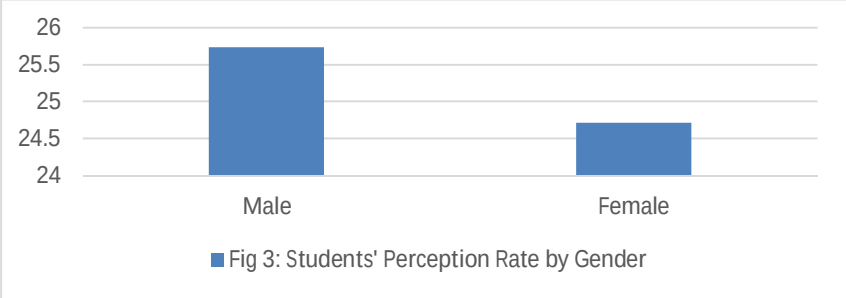
The result in Fig 1 shows that, all the sampled 154 mathematics students, perceived that global warming has 25.25 mean effects on the environment. This implies that mathematics students have high perception rate towards the effects of global warming on lives and property.

2. How do students perceive the effects of global warming on lives and property based on institution?



It is obvious from Fig 2 that the 48 Uni-Lag students have 26.02 mean rate of perception, 61 from Uni-Ibadan have 24.93 while the 45 from Uni-Ife have 24.84. This implies that students from the three institutions perceived high effect of global warming on the environment.
Note: Uni-Lag means University of Lagos, Uni-Ibadan means University of Ibadan and Uni-Ife means Obafemi Awolowo University, Ile-Ife.

3. What are the perceptions of mathematics students on the effects of global warming on lives and property based on gender?



The result in Fig 3 shows that the perceptions of 80 male and 74 female students with respect to the effect of global warming on lives and property are 25.74 and 24.72 respectively. It means that both genders have high perception of the effect.

4. What are the perceptions of mathematics students on the effects of global warming on lives and property based on location?

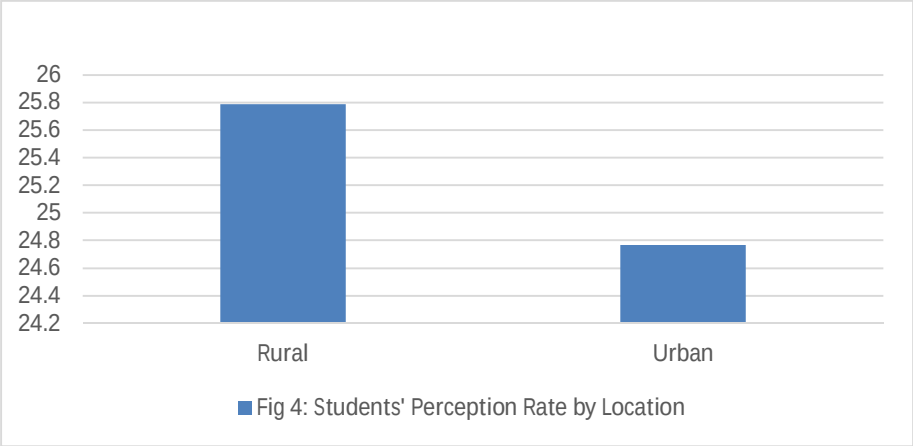
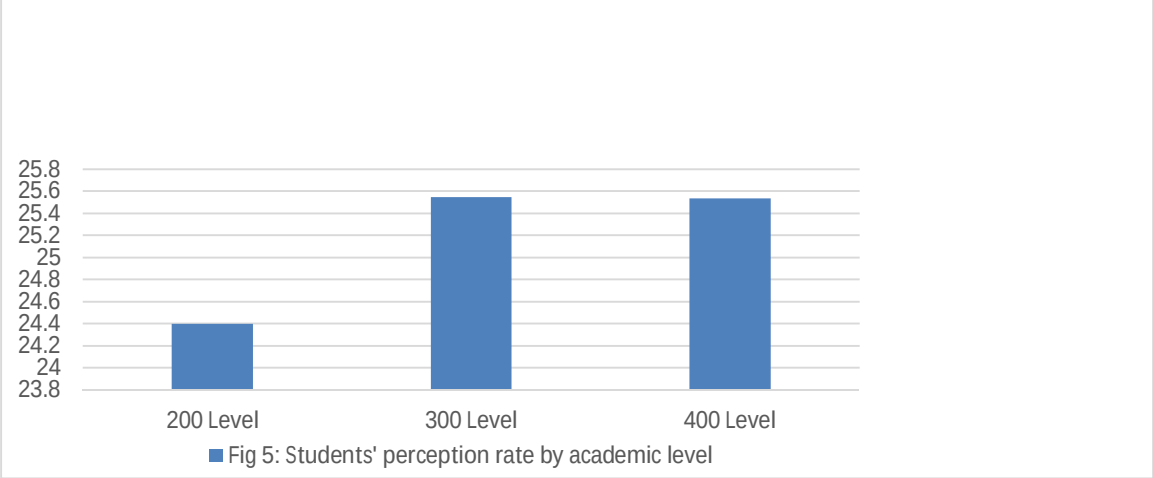


Fig 4 depicts the perception rates of the 72 rural and 82 urban students as 25.79 and 24.77 respectively. This denotes high perception of the effect of global warming at both locations.

5. How do mathematics students perceive the effects of global warming on lives and property based on academic level?



The result in Fig 5 shows that the 40 students in 200 level have 24.40 mean perception; the 64 students in 300 level have 25.55 mean perception while the 50 students in 400 level have mean perception of 25.54. This implies that the 200 level students have average perception of the effect of global warming on lives and property while those in 300 and 400 levels have high perception of the effect.

H01: Mathematics students do not differ significantly in perception of the effects of global warming on lives and property by institution.

Table 2: Students' perception of global warming effect by institution

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	41.995	2	20.998	3.181	.044
Within Groups	996.628	151	6.600		
Total	1038.623	153			

1) The result F (2, 151) = 3.18; $p<0.05$ shows a significant difference in students' perception of the effect of global warming on lives and property by institution. Therefore, the hypothesis which states that there is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property by institution was rejected.

Note: Df stands for the degree of freedom; F stands for the Analysis of Covariance (ANCOVA) and Sig. means the significant level. Sig. is the criterion that is used to make the decision. For example, either to reject the null hypothesis or not. If $p<0.05$, the null hypothesis is rejected but if $p>0.05$, the null hypothesis is not rejected.

H02: Mathematics students do not differ significantly in the perception of the effects of global warming on lives and property by gender.

Table 3: Students' perception of global warming effect by gender

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	40.095	1	40.095	6.103	.015
Within Groups	998.528	152	6.569		
Total	1038.623	153			

2) The result F (1, 152) = 6.10; $p<0.05$ shows a significant difference in perception of the effect of global warming on lives and property by gender. Therefore, the hypothesis which states that there is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property by gender was rejected.

H03: There is no significant difference in the perceptions of mathematics students of the effects of global warming on lives and property by location.

Table 4: Students' perception of global warming effect by location

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	40.151	1	40.151	6.112	.015
Within Groups	998.473	152	6.569		
Total	1038.623	153			

The result F (1, 152) = 6.11; $p<0.05$ shows a significant difference in perception of the effect of global warming on lives and property by location. Therefore, the hypothesis which states that there is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property by location was rejected.

H04: There is no significant difference in the perceptions of mathematics students on effects of global warming on lives and property by academic level.

Table 5: Students' perception of global warming effect by academic level

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	38.744	2	19.372	2.926	.057
Within Groups	999.879	151	6.622		
Total	1038.623	153			

The result F (2, 151) = 2.93; $p>0.05$ shows no significant difference in perception on the effects of global warming on lives and property by academic levels. So the hypothesis which states that there is no significant difference in the perceptions of mathematics students on the effects of global warming on lives and property by academic level was not rejected.

7. Discussion

The main result of this study showed that the entire 154 mathematics students sampled, perceived that global warming has 25.25 mean effects on the environment. And that increased summer drying has caused serious drought in the environment. Majority are of the opinion that many lives stock and wild life have died due to increased drought stress and that there are frequent cases of death due to unbearable weather condition. This implies that mathematics students have high perception rate of the effects of global warming on lives and property and Mathematics can help in solving the problems of global warming. This finding is not in agreement with that of Isah et al., (2011) which revealed that majority of students have 43.7% fair, 13.2% poor, 7.1% excellent, 45% good knowledge of global warming and only 16.1% perceive that global warming will affect the future generation. In likeness manner, Whitmarsh (2011) stated that the public expressed uncertainty about the existence of climate change and their views have remained highly consistent between 2003 and 2008. But Akhtar et al. (2019) ascertained that there is a significant impact of a carbon tax on energy consumption.

The finding of the study also revealed that there is a significant difference in the perceptions of mathematics students on the effects of global warming on lives and property by institution. This implies that students from the three institutions perceived high effect of global warming on the environment. This is indicated by the 26.02, 24.93 and 24.84 mean rate of perception of University of Lagos, University of Ibadan and Obafemi Awolowo University, Ile-Ife mathematics students respectively. The University of Lagos students have the highest perception rate. This implies that mathematics students have high perception rate of the effects of global warming on lives and property irrespective of the institution they attend. This result is in tandem with that of Bakac (2018) which revealed that students have high level of awareness of climate change and believe that it is an important problem in today's world. Also, Leiserowitz (2005) invigorated this finding when he revealed that the American public perceive climate change as a medium-sized risk that will mostly affect geographically and temporally distant communities and countries.

Furthermore, the research showed a significant difference in perception of the effects of global warming on lives and property based on gender. The perceptions of 80 male and 74 female students with respect to the effect of global warming on lives and property are 25.74 and 24.72 respectively. The implication is that both genders have high perception of the effects. But the perception of the male is higher. The perception depends on gender. The male mathematicians are likely to solve more global warming problems than their female counterparts. This did not support the result of Bakac (2018) who found that climate change perception of engineering faculty students did not differ across genders.

In addition, the study showed a significant difference in the perception of the effect of global warming on lives and property based on location. This depicts the perception rates of the 72 rural and 82 urban students as 25.79 and 24.77 respectively. This denotes high perception of the effect of global warming in both locations. But the perception rate of rural students is higher. The finding contradicts the research of Dewi and khoirunisa (2018) who posited that students who attend school in the urban area have a higher understanding of global warming than those who attend school in the rural area.

This study showed no significant difference in the perception of the effect of global warming on lives and property based on academic level. This interpreted that the 40 students in 200 level have 24.40 mean perception; the 64 students in 300 level have 25.55 mean perception while the 50 students in 400 level have mean perception of 25.54. This implies that the 200 level students have average perception of the effect of global warming on lives and property while those in 300 and 400 levels have high perception of the effect. The 300 and 400 level students are more likely to be useful in solving problems of global warming. However, the lower level students need more awareness programme.

Earlier studies on climate change in literature pointed out the public's and students' uncertainty of the presence of climate change, which has changed over time. In recent studies, an increase in students' awareness about climate change, the atmospheric release of green house and global warming has been seen. However, as this study also put it, students' consciousness of global warming and its effect has improved but have not reached the desired level, so educational curriculums on climate change need to be re-designed. These educational curriculums are expected to improve university students' scientific knowledge, attitudes and beliefs. Intensive education on issues of global warming especially the misconceived aspects is advocated. To reduce the hazards caused by climate change, a shift towards the development of global warming mathematical models and renewable energy such as solar power, wind power and hydrogen gas is recommended. The environmental management teams should organize an awareness programme to encourage the general public to exhibit a lot of caution in the way resources are utilized. For example, how to use energy effectively by turning off unused lights, motors, computers and other appliances. The ministry of environment and ministry of education should synergize and sensitize the general public on the effects of climate change.

In view of the research as revealed by the data collected and the analysis made, critical mathematics education is a theoretical approach that can form the foundation for solving the issues of climate change. For the continuation of improvements in human welfare within the limits of the earth natural resources, there is a need for sustainable development. Our present needs must be met without compromising the ability of future generations to meet their needs. Natural resources are limited. We should utilise just what we need and preserve the rest for the future generation so as to ensure environmental sustainability.

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STUDENTS' PERCEPTION OF THE ENVIRONMENTAL EFFECTS OF GLOBAL WARMING (SPEEG)

Section A

Name of institution: _____
Gender: Male ( ) Female ( )
Location: Rural ( ) Urban ( )
Levels: 200 ( ) 300 ( ) 400 ( )

Section B: Students' Perception of the Effects of Global Warming on lives and property

	SA	A	D	SD
1. The weather has become extra hot everywhere due to direct heat waves from the sun.				
2. Hospital patronage is on the rise as a result of increase in atmospheric temperature				
3. There are frequent cases of death due to unbearable weather condition.				
4. Increased summer drying has caused serious drought in the environment.				
5. Many lives stock and wild life have died due to increased drought stress.				
6. Rise in flood level has damaged millions of properties.				
7. Very low temperature in some lands is largely due to green-house effect.				
8. Recent increase in deforestation is due to unprecedented golly erosion				