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Basic Challenges of Climate Change and Implications for Quality Education in Nigeria

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Abstract
In recent years, climate change has received significant global attention. It presents a unique challenge to sustainable human development. The scientific evidence is clear that climate change is likely to have negative impacts on efforts to achieve Nigeria's development objectives, including the targets set out in Nigeria Vision20:2020 and the Millennium Development Goals (MDGs). The objective of the paper is to examine the challenges of climate change and its implications on quality education in Nigeria educational system. The study is a survey carried out in three education zones in Ekiti State. A stratified random sampling technique was used to divide the State based on Ekiti North, Central and South senatorial districts, and from where a simple random sampling technique was employed to draw a sample of 900 teachers from 30 secondary schools in the state. Two research questions guided the study while a structured questionnaire made up of three sections was used for data collection. Data collected were analyzed using mean statistics. The findings of the study showed that climate change related problems adversely affect teaching and learning by causing lateness and absenteeism to school among teachers and students; destruction of buildings and learning materials; un-conducive learning environment among others. However, the study recommended that climate change should be integrated into secondary school curriculum while seminars, workshops, and conferences should be organized on adaptation and mitigation measures of climate change.
Keywords: Climate change, Quality education, Challenges, Sustainable development.

Introduction

Climate change is a topical issue worldwide because of its attendant problems that are threatening the sustenance of man and his environment. These are particularly becoming more severe in the underdeveloped and developing countries of which Nigeria is one. It has become a reality with grievous consequences. The impact of climate change includes floods, landslides, drought and famine. As weather becomes fiercer and storms increase in frequency and intensity, serious socio-economic consequences result; malnutrition and disease become common occurrences. Despite these multi-various impacts of climate change, the biggest obstacle is the lack of its awareness and knowledge and that Nigerians need to be educated and informed about it.

Climate change is a key priority for international development as its impact is likely to be disproportionately felt in developing countries. This is because developing countries are generally warmer, more prone to rainfall variability, more dependent on agriculture; the most climate-sensitive of economic sectors, and as a result of low income have limited risk mitigation infrastructure, both physical and financial (Stern, 2007). Increased instances of drought, flooding and severe weather events as well as incremental environmental change through processes such as inundation, desertification and salination are likely to exacerbate existing problems related to agricultural production, communicable diseases, migration streams, poverty and conflict (Smith and Vivekananda, 2007; UNICEF UK, 2008; WHO, 2008;Bangay and Blum, 2010).

There is enough evidence that climate change is taking place at the local level of Nigeria. Assessment report of the governmental panel on climate change by Building Nigeria's Response to climate change (BNRCC) Project (2011) shows that Nigeria and all the countries within Sub-Saharan Africa are highly vulnerable to the impact of climate change. Climate change is a significant and lasting change in statistical distribution of weather patterns over a period ranging from decades to millions of years (Wikipedia, 2012). It includes patterns of temperature, humidity, wind and seasons. Climate change is a global phenomenon which is evident in Nigeria. It is an international issue which requires both national and international approach and indigenous knowledge. The impact of climate change has no border and it directly affects global sustainable development, livelihood and man's ability to coexist on earth (Sambo, 2010).

However, education is the bedrock for meaningful development in any country. It is the wheel on which other developmental effort revolves. A country cannot develop beyond the level of education of its citizens. The cardinal role education plays in nation building informs the reason why many nations of the world invest heavily in education, and educationists all over the world are constantly carrying out research on how to improve the quality of education in order to meet the ever growing and changing needs of their societies. Unfortunately, education sector in many developing countries, such as Nigeria, is beset with many challenges which mar the efforts of the government and educationists in providing quality education.

To date, majority of research on education and climate change has focused on the impact of climate and associated environmental changes on schooling. According to Save the Children (2008) and UNICEF UK (2008),

it is children who will be hardest hit by the effects of climate change. These impacts will be seen, for instance, in the direct effects on educational provision associated with increasing incidence of severe weather events such as drought, flooding, and heat waves. Over the longer term, incremental environmental changes such as sea level change, salination changes in season patterns, desertification, soil erosion, species loss, are also likely to result in deteriorating livelihoods, which impact upon both household expenditure on schooling and the nutritional status of children (Bangay and Blum, 2010).

Therefore, one of the most pressing challenges facing the provision of quality education in Nigeria is climate change with its associated hazards. In recent times in Nigeria, flood has caused the loss of homes of many people which led to mass movement of people in search of better place of abode. Migration as a result of flood has adversely affected the education of the children where school buildings, teaching and learning materials were swept off thereby disrupting the education of the children. Loss of homes due to flood has heightened the insecurity condition of secondary school students in Nigeria, whose security and education are already being ravaged by the activities of militants. Farmlands, people's health, business premises, factories and offices as well are destroyed by flood thereby impoverishing the people and affect the quality of education in Nigeria. The paper aim at the challenges posed by climate change to provision of and accessibility to quality education in secondary schools in Nigeria, as well as the curricular interventions that can be used to tackle the challenges.

Research Questions

Two research questions were developed in this study and they are as follows:

i. What are the basic challenges of climate change affecting teaching and learning in secondary schools?
ii. What are the curricular interventions that can be applied in secondary school education to meet the challenges of climate change?

Literature Review

Climate change, or global weather patterns, or global warming can be described as the biggest environmental issue of our time. It is global in its causes but its consequences are far more reaching in developing countries, particularly Nigeria. It is a topical issue worldwide because of its attendant problems that are threatening the sustenance of man and his environment. These are particularly becoming more severe in the under-developed and developing countries (Small and Nicholis, 2003). Climate change has become the new reality of our time. It brings with it changes in weather patterns that can have serious repercussions for human beings, upsetting seasonal cycles, harming ecosystems and water supply, affecting agriculture and food production, causing sea levels to rise. Climate change has a cumulative effect on natural resources and the balance of nature. Its effects are already visible in |Nigeria. Offorma (2010) defined climate change as a continuous, rapid, and prolonged alteration of climate in one direction which reflects changes in the variability or average state of the atmosphere over time scales, ranging from decades to millions of years.

Climate change has also been defined as a phenomenon created by human beings and nature, which devastates the earth and causes hardship of unpredicted magnitude to the living (Intergovernmental Panel on Climate Change (IPCC), (2007). It is also referred to as global weather patterns. Udenyi (2010) opined that climate change is simply a change in the climate condition of the world and that the change is found by the scientists and others to be on the negative. United Nation on Environmental Programme, (UNEPA) (2000), defined climate change as extreme reactions of the weather phenomenon which creates negative impact on agricultural resources, water resources, human health, and depletions of ozone layer, vegetations, soil and doubling of $C0_2$ in the ecosphere. Omotosho (2007) defined climate change as a change of climate that is attributable directly or indirectly to human activities and, which alters the composition of the global atmosphere, in addition to natural climate variability observed over comparable time periods. Scientists have intensified the greenhouse effect by increasing the concentration of greenhouse gases in the atmosphere. Medugu (2009) submitted that climate change refers to an increase in average global temperatures caused by natural events and human activities, which are believed to be contributing to an increase in average global temperatures.

According to the most recent report from the Intergovernmental Panel on Climate Change (IPCC, 2007), eleven out of the last twelve years have been the hottest on record since 1850. The IPCC also estimated that the average global surface temperature from 1850/1899 to 2001/2005 has increased by 0.76^0C. The global sea level increased at an average rate of 1.8mm per year over the period 1961 to 2003 and, over the 20th century, sea levels rose by 0.17m. Since the middle of 20th century, human activities have been contributed to global warming; a phenomenon which is expected to continue to increase at a faster rate in the 21st century if there is no effort to address it.

Traditionally, educational institutions were established and structured on the basis of a strong belief in objective knowledge and forming the 'right' answers to every question. In this light, the task of education was to provide students with the truth and correct techniques. This role is still valid as factual knowledge and efficient techniques are crucial prerequisites for rational action. Yet it should not be the singular approach. Climate risks

contain a degree of uncertainty and addressing them requires being able to assess the interplay between a number of aspects, including ethical considerations of what is good and bad, rather than of solely aiming to uncover the truth.

Furthermore, the balancing act between tackling long-term sustainable development issues and more immediate economic imperatives is another challenge for the education sector. Globalization has drawn attention to the relationship between the competitiveness of country workforces and student performance, particularly within science. The effect on the educational system has been a greater focus on empirical tests and performance indicators, and less willingness among teachers and schools to experiment with new approaches to teaching and learning. Both these factors impact negatively on the innovative, interdisciplinary and competence-centered aspects of climate change education.

Climate change is unarguably the biggest environmental issue of our time. Climate change is global in its causes but its consequences are far more reaching in developing countries, particularly Nigeria. Climate change is an environmental, social and economic challenge on global scale (Scholze *et al.,* 2006; Mendelsohn *et al.,* 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).

Nigeria, as a developing nation is particularly sensitive to the effects of climate change. A large part of the economy depends on natural resources, which are particularly vulnerable to climate change. When those resources are affected, communities are implicated. Disease, loss of livelihoods and settlements can force entire communities into relocation or complete extinction and even refugee status. As critical as the effect of climate change is, it is not clear whether Nigerians are aware of what climate change is or its effect. Perhaps the biggest obstacle is the lack of awareness and knowledge as Olorunfemi (2010) had put it. Nigerians need to be educated and informed about climate change and how it can change our lives drastically. Lack of information (awareness) and knowledge (education) about climate change also means that many Nigerians are reluctant to accept the reality of climate change. Also, there is a lack of public policy, government preparedness and commitment to promoting climate change and its effects on the Nigerian citizens and the challenges this has posed to the education sector.

While there is emerging awareness of the current and potential impacts of climate change on education provision and learning, it is also clear that education, both formal and non-formal, from primary through to tertiary and adult education, has an important role to play in addressing this change. Education is recognized as an important first step in increasing resilience (Bonifacio *et al,* 2010). The United Nations Framework Convention on Climate Change (UNFCC) Article 6: Education, Training and Public Awareness (also known as the New Delhi work program) recognizes that education must play a key role in a holistic response to climate change at local, national and global levels. The Hyogo Framework for Action's (HFA; 2005-2015) priority 3 focuses on increasing resilience and building a culture of safety and resilience at all levels through the use of knowledge, innovation and education, and Goal 2 of the Millennium Development Goals (MDG) discusses the importance of primary education in reducing poverty.

Since the 1960s, a large body of research has sought to understand the links between increasing knowledge of environmental and development concerns, and social and environmental change. This work has used various terms and definitions, including 'development education', 'environmental education', 'education for sustainable development', among others (Palmer, 1998, Sterling, 2001, Bourn, 2008, Scott and Vare, 2008). Education for Sustainable development (ESD) has been a widely promoted philosophy in the last two decades.

The concept of ESD emerged in the late 1980s alongside international discussions of environmental protection and sustainable development. It was given much of its shape at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, and in the resulting *Agenda 21:*

> *Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. While basic education provides the underpinning for any environmental and development education, the latter needs to be incorporated as an essential part of learning (UNCED, 1992).*

The Study Area

Ekiti State the setting of the study is one of the six states created on 1st October, 1996 which makes Ekiti State one of the thirty-six states of the federal Republic of Nigeria. The State was carved out of the former Ondo state, which itself came out of the Old Western state created in 1967. It is now made up of Ekiti Central, Ekiti North, and Ekiti South senatorial districts (Fig.1).

Ekiti State is located between latitude 7^0 25' and 8^0 5'North and between longitude 4^0 45' and 5^0 46' East. The State is found to the south of Kwara and Kogi States while it is bounded by Osun State to the west. To the east and south of the State is found Ondo State (Fig.1). Ekiti State is a landlocked state, having no coastal boundary.

There are sixteen Local Government Areas (LGAs) in the State. Ekiti State enjoys a tropical climate with two distinct seasons. These are the rainy season (April – October) and the dry season (November – March). Temperature ranges between 21^0C and 28^0C with high humidity. The south-western winds and the north-east trade winds blow in the raining and dry (Harmattan) seasons respectively. Tropical forest exists in the south, while guinea savanna predominates in the northern peripheries.

An important feature of the State is the large number of hills it possesses, which are often the site of towns in which much of the population reside. In fact, the word 'Ekiti' was derived from Okiti; the local term for hill. Ekiti as a people settle in nucleus urban patterns, well linked with network of roads. The State can boast of more than 127 large and small, ancient and modern towns, hills and valleys that characterize the State. Apart from the fact that it is the only State with a warm spring in Nigeria, it is watershed and source of some prominent rivers such as Ero, Ose, Ogbese, Osun and others. Notable tourist attractions include the Ikogosi warm and cold springs and resort centre, Fajuyi memorial park, Arinta waterfalls, Orole and Olosunta hills, Esa cave, Egbigbu artificial lake, Ero, Egbe and Ogbese dams.

Education is the most viable industry of the people of Ekiti Sate, hence the adoption of "Fountain of Knowledge" as it slogan. Public primary and secondary schools are being established by the government while there are about eight tertiary institutions both private and government owned in the State. The government has also continued to register more private schools to accommodate school age children and ensure that the people's hunger for formal education is satisfied. There are some schools which are established to cater for the physically challenged person, the nomadic children, and schools that will cater for the youths who really wish to be self reliant. There are women education institution and development centres established in the State.

Agriculture is the main occupation of the people and it is the major source of income for the many in the State. Agriculture provides income and employment for more than 75% of the population of Ekiti State. The main cash crops are cocoa, coffee, kolanut, cashew, and oil palm. Other tree crops include citrus fruits and timber for wood based industries. Food crops that abound in the State include yam, cocoyam, cassava, maize, plantain/banana, rice, beans, tomatoes, and varieties of vegetable. Mineral resources in the State, though most of them untapped include cassiterrite, columbite, tantalite, and feldspar at Ijero-Ekiti, clays and kaolinite at Isan-Ekiti, granites, charnokites and banded gneisses in Ikere, Ado and Oye-Ekiti.

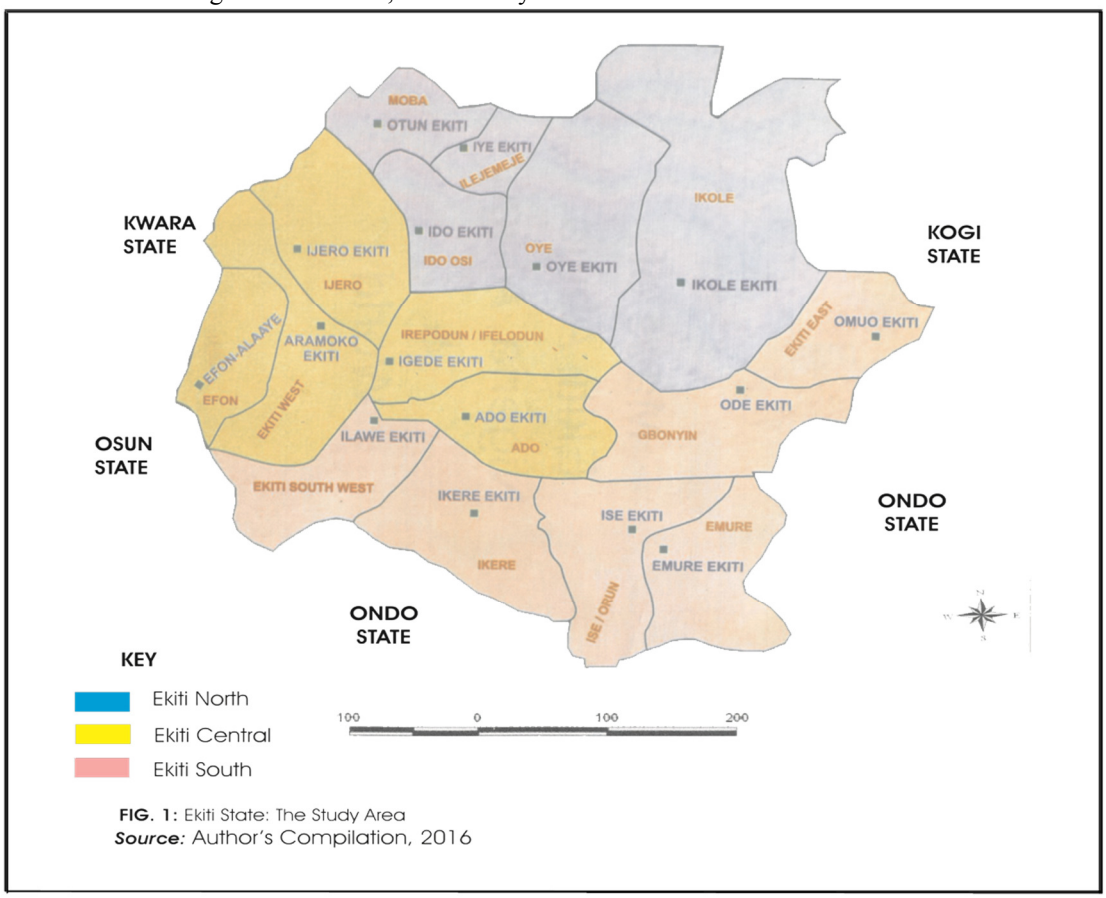

FIG. 1: Ekiti State: The Study Area
Source: Author's Compilation, 2016

Research Methodology

The research methodology involves a survey research design eliciting information from secondary school teachers

on the challenges of climate change to quality teaching and learning. The study was carried out by stratifying Ekiti State on the basis of the three senatorial districts representing the three education zones with a total of 141 public and 18 registered private secondary schools (see Fig. 1). A simple random sampling of 300 teachers from 10 sampled secondary schools representing 30 teachers in each school in each senatorial district making a total of 900 teachers from 30 secondary schools form the sample size. Data were collected with the use of structured questionnaire which is made up of three sections. The first section was based on socio-economic or personal characteristics of the teachers such as their age, sex, qualification, and years of experience while the second section was based on challenges of climate change on quality teaching and learning, and the last section was based on curricular interventions to climate change related problems. Data collected were analyzed using simple percentages and the General Mean Weight Values **(GMWV)**. The GMWV or the cutoff point for rejecting or accepting responses for any factor in a given group was determined by adding all the mean weights values in each group together and dividing this by the number of factors in this particular group. In so doing, those observations whose Mean Weight Value (**MWV)** fell above the cut-off point **GMWV** are accepted as the major responses that control the subject under study or vice versa.

Presentation and Interpretation of Result

Characteristics of Respondents

Education is the most viable industry of the people of Ekiti state; hence the people are in the fore front of educational development. Of the total 900 teachers sampled as the respondents 541 (60.1%) are males while 359 (39.9%) are females. This shows that a considerable proportion of women are into teaching profession in the State. However, about 1.3% of the respondents claimed to be less than 25 years while about 34.2% claimed to be between 25 – 34 years and about 5.6% claimed to be above 54 years of age. In all about 90% of the respondents are within the active working age in which productivity is expected to be high. Only 9.2% of the respondents claimed to be NCE holders while about 72% are said to be degree holders and only 19% claimed to be holders of other higher degree. Table 1 shows the analysis of socio-economic characteristics of respondents.

Table 1: Socio-economic Characteristics of Respondents

Parameters	Relative Frequency (%)
Gender	
Female	39.9
Male	60.1
Total (%)	**100.0**
Age	
Below 25 Years	1.3
25 – 34	34.2
35 – 44	37.5
45 – 54	21.4
Above 54	5.6
Total (%)	**100.0**
Educational Background	
NCE	9.2
B.A/B.Sc/B.Ed	71.8
M.A/M.Sc/M.Ed etc	19.0
Total (%)	**100.0**

Challenges of Climate Change to Teaching and Learning

Climate change as a new reality is the latest challenge to sustainable human development. In particular, it was observed by the respondents that climate change will impede efforts to reduce the poverty experienced by the majority of Nigerians and that climate change will likely lead to other changes such as ecosystem degradation and reduced availability of water and food. From the findings, it was observed that the educational system has been impacted by climate change, affecting school facilities and activities, school attendance, and learning. Table 2 shows the summary of the challenges posed by climate change to teaching and learning.

Table 2: Challenges of Climate Change to Teaching and Learning

S/N	Items Statements	SA	A	D	SD	X	Dec.
1.	Climate change problems destroy school buildings& equipment there by affect teaching and learning	2275	972	166	38	3.83	Agreed
2.	Climate change problems e.g. floods cause lateness among teachers and students	1828	1062	104	37	3.37	Agreed
3.	Absenteeism to school is common among teachers and students during rainy season	960	615	636	137	2.61	Disagreed
4.	Teachers and students have transportation problem getting to school due to climate problems	816	648	762	99	2.58	Disagreed
5.	Homes and properties are lost due to climate problems and this affect academic activities	1680	1092	186	23	3.31	Agreed
6.	Climate change challenges cause students to drop out of school	1592	1188	156	28	3.29	Agreed
7.	Excessive heat makes classroom un-conducive for teaching and learning	1928	843	206	34	3.35	Agreed
8.	Climate change challenges destroy teaching and learning materials	1896	918	108	66	3.32	Agreed
9.	Parents unable to provide school fees and learning materials due to climate change problems	1700	1158	68	55	3.31	Agreed
10.	Teachers and students lost their lives due to climate change health hazards	2028	840	261	26	3.51	Agreed
11.	Teachers and students fall sick due to pollution or contamination of air and water	1928	762	212	58	3.29	Agreed
12.	Climate change make cognitive task difficult	2032	639	208	75	3.28	Agreed
13.	Climate change problems affect instructional supervision which encourage truancy and laziness	1352	1059	220	99	3.03	Disagreed
14.	Climate change problems interrupt school calendar	1440	1002	336	38	3.13	Disagreed
15.	Climate change causes incompletion of curriculum content leading to half-baked school leavers	1880	993	84	57	3.35	Agreed
16.	Climate change adversely affects food production, leading to poor mental ability of students	1824	858	220	48	3.28	Agreed
17.	Climate change jeopardizes government's effort in eradicating illiteracy in the country	1680	906	134	111	3.15	Disagreed
	GMWV					**3.23**	

Source: Fieldwork, 2016

It was evident from the results of this study that some of the items scored above the **GMWV** of 3.23 which is an indication of acceptance among the respondents. This shows that the respondents agreed that climate change, with its attendant problems cause among others: destruction of school buildings and equipment, loss of teaching and learning materials, ill-health and lateness among teachers and students, incompletion of curriculum content, poor performance in examinations and school drop-out among secondary school students. These findings are in line with the observations made by Asian Disaster Preparedness Centre (2008) that there is evidence that flooding inhibits completion of school programme, with schools located in flood-prone areas subject to at least one and a half months of closure due to flooding. According to Bangay and Blum (2010), school absenteeism and drop out are higher in flood-prone areas. In the same light, Mbah (2014) stated that many children enrolled in secondary school do not complete their education due to challenges that make it difficult for them to attend and participate in school, of which climate related hazards are inclusive.

However, the respondents disagreed that absenteeism is a factor of rainy season and transportation problems to school is not due to climate change related problems. They also claim that climate change problems do not interrupt school calendar and do not jeopardized government's effort in eradicating illiteracy in the Nigeria.

Curricular Intervention to Challenges of Climate Change

Overloaded curricula frequently present additional challenges. Identification of the most appropriate issues and areas of knowledge require cooperation between local, national and international actors. Teachers at the secondary level needed support and training to deliver quality education about complex, climate related issues in ways which are both relevant to local environmental, social and political contexts, and which meet wider educational targets. From Table 3, however it was discovered that all the items have means above **GMWV** of 3.19 except the third item which stated the inclusion of atmospheric radiation measurement programme into secondary school curricula which has mean of 2.40, an indication of rejection. In other words, the respondents agree that climate change and

environmental science should be integrated into secondary school curriculum, while workshops, seminars and conferences on climate change should be organized for teachers and students. Resource persons or facilitators are also to be engaged in teaching teachers and students adaptation and mitigation measures to climate change.

Table 3: Curricular Intervention to the Challenges of Climate Change

S/N	Items Statements	SA	A	D	SD	X	Dec
1.	Introduction and integration of climate change related topics into secondary school curriculum	1920	963	124	37	3.38	Agreed
2.	Organization of seminars, conferences and workshops for secondary school teachers and students for enlightenment on climate change	2012	1176	08	01	3.55	Agreed
3.	Introduction of atmospheric radiation measurement programme into secondary school curriculum	680	549	770	162	2.40	Disagreed
4.	Inclusion of environmental science into secondary school curriculum	1576	1095	136	73	3.20	Agreed
5.	Engaged facilitators or resource persons to educate teachers and students on adaptation and mitigation measures of climate change **GMWV**	1808	1128	132	06	3.42 **3.19**	Agreed

Source: Fieldwork, 2016

The results of this study also shows that a number of curricular measures can be applied to tackle the challenges climate change related problems pose on teaching and learning. This agrees with the position of Mumuni and Amadi (2013) that climate change draws knowledge from diverse disciplines and sub-disciplines of science. They stress that a holistic understanding of climate change does not rely on knowledge from only one discipline or subject matter but amalgamation of subject matter with their diverse knowledge. This finding agrees with the fact that education is a veritable tool for tackling societal problems. In line with this finding, International Council on Human Rights Policy (2008) observed that education is as important as health and that a well educated populace is better equipped to recognize in advance the threats posed by climate change and to make preparations. According to Bourn (2008), learning which inculcate skills such as critical thinking and problem solving is keys to addressing climate change and sustainable development. It is therefore, imperative that both teachers and students keep abreast with current issues and particularly on climate change related issues in order to acquire the necessary knowledge and skills that will help them proffer solutions to the problems of climate change. However, the result of this study shows that the respondents did not agree that Atmospheric Radiation Measurement Programme (ARM) programme should be introduced in secondary schools. This finding is not farfetched due to the fact that secondary school teachers in Nigeria are already agitating against an already over-loaded curriculum.

Conclusion

Education remains a valuable factor towards national development. The real impacts of climate change towards the development of teaching and learning at secondary education are not farfetched. Interestingly, climate change is a global phenomenon and everybody both governments and civil societies are making concerted efforts in mitigating the challenges of climate change in Nigeria through several independent approaches. As a global phenomenon which is evident in Nigeria, it is an international issue which requires both national and international approach and indigenous knowledge. However, more collaborative effort with international bodies is required because climate change has no border. It is evident from the study that curricular measures can be adopted to mitigate the problems of climate change.

Recommendations

Based on the findings and conclusion of this study, the following recommendations are suggested to aid the understanding of climate change and improved education quality in Nigeria.

- The curriculum should be developed to address climate change impacts and adaptation at all levels of the education system especially as it concerns teaching and learning in secondary schools to aid quality education.
- Teachers should be trained on climate change adaptation teaching strategies and techniques at secondary level of education in Nigeria.
- Research on the provision of better understanding of the impact of climate change on teaching and learning activities on the physical school environment in Nigeria should be supported by the Ministry of Education.

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