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Climate Change Curriculum and its Management Implications in Nigerian Educational Institutions

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Abstract

Climate change is impacting negatively on human existence in developing and developed nations across the world. Incidentally, many people are ignorant of its causes and consequences. This paper posits that inclusion of this aspect of human life in the curriculum of educational institutions in Nigeria would enhance knowledge and skill acquisition on various aspects of climate change and how to manage them. Application of such knowledge and skills would allow an in-depth understanding of climate change and its complex mechanisms and interactions in order to be able to prevent or at least effectively manage its occurrences and impacts. Management implications of integrating climate change education into the school curriculum include provision of better funding, more climate education-related facilities and more teachers specially trained in climate change curriculum. Consequently, educational managers should map out strategies for successful introduction and implementation of the curriculum at the basic, secondary and tertiary educational institutions in Nigeria. Specifically, management strategies for successful incorporation of climate change education into the school curricula should include adequate planning, development of appropriate climate change modules and instructional materials. Adequate financing and appropriate pedagogy are equally important.

Introduction

In Nigeria, development of the nation is always a top priority of the Government, as evident from series of programmes which are initiated and executed at different periods under civilian and military regimes. For instance, there were national development plans and annual budgets in which resources were allocated to different sectors of the nation, with a view to achieving an all-round development. The Nigerian government is vigorously pursuing the United Nation's Millennium Development Goals which focus on eradication of poverty and hunger, reduction of child mortality, combating diseases and fostering sustainable development. This effort led to the launching of 'National Economic Empowerment and Development Strategy' (NEEDS) in 2004, and subsequently Vision 20-2020 in the year 2007 (Yahaya, 2008).

The preceding notwithstanding, the developmental efforts could be rendered futile by natural and man-made disasters which always occur in our environments. For example, there have been cases of flood disaster in the southern parts of Nigeria. There have also been cases of desert encroachment in the northern parts of the country and erosion in Eastern parts. These disasters, which according to Medugu (2009) are not unconnected with climate change, could constitute developmental setbacks.

Incidentally, many people seem to be ignorant of the havoc which climate change could cause, the few who are aware seem not to bother about its consequences. The Government's efforts to address the problem include the establishment of a climate change unit at the Federal Ministry of Environment, Housing and Urban Development. Also, 'National Environmental Standard and Regulation Enforcement Agency' was established in 2007 and had a mandate to ensure a healthy and disaster-free environment. However, happenings around the world are pointers to the fact that there is an urgent need to improve on the existing strategies for

mitigating and adapting to the effects of climate change. Unless problems arising from climate change are identified and realistically tackled, achievement of the nation's developmental objectives would be a mirage.

The Federal Government of Nigeria has adopted education as an instrument for effecting national development. Using education as a tool, knowledge and skills can be disseminated on practices which are capable of addressing developmental challenges. Thus, the education system has a vital role to play in provision of knowledge on causes, consequences and control of climate change. There is thus the need to integrate Climate Change Studies into the curriculum at the three levels of education in Nigeria. Management of the integration is very crucial in areas of planning, implementation and monitoring. Inadequate planning has always been the bane of development in Nigeria. The failure of Universal Primary Education (UPE) scheme in the 50s and recently the 6-3-3-4 system of education are examples in the education sector- So, adequate management steps need to be taken by educational managers to ensure that appropriate learning experiences are identified, relevant and adequate instructional materials are provided and competent personnel are trained so that effective teaching and learning of climate change can take place. The management implications of climate change education in the school curriculum would include among others need for adequate curricular planning in terms of content with emphasis on critical thinking skills; more funds to procure required materials (modules, books etc) and equipment; and more teachers particularly those trained in climate change education.

In this paper, causes and consequences of climate change and its inclusion in the curricula of educational institutions at primary, secondary and tertiary levels are discussed. Specific duties of managers of these institutions towards provision of an enabling environment for its teaching and learning are also identified.

The Nature and Causes of Climate Change

'Climate' is the pattern of weather in a region over a long period. Climatic conditions are not the same at any given location from one time to another. This is due to complexities in the interaction of atmospheric systems (Cunningham & Saigo, 1999). Climate change refers to a long time alteration in weather pattern, especially an increase in temperature and stormy activities. According to Wikipedia (2001), climate change is a long term change in the statistical distribution of weather patterns over a period of time which ranges from decades to millions of years. It may be limited to a specific region or it may occur across the whole earth.

Climate change may result from both natural and human causes. Natural causes include volcanic eruptions, ocean current, earth's orbital changes, solar variations and release of methane (a greenhouse gas) from arctic tundra and wetlands. The earth goes through a cycle of climate change which usually lasts about 40,000 years. This constitutes another natural cause (Causes of climate change, 2001).

Human causes are also referred to as man-made or anthropogenic causes. They constitute a major cause of climate change. Burning of fossil fuel gives off a greenhouse gas called carbon dioxide (CO₂). Fossil fuels are made of organic matter such as coal and oil. Increase in population implies increase in demand and use of fossil fuel. People breathe out CO₂ while trees that could absorb them are destroyed as a result of agriculture and deforestation. These activities increase the CO₂ that goes into the atmosphere (Mastrandrea & Schneider, 2009). Methane (CH₄), another greenhouse gas comes out from animals (cows, goats, pigs, camels, horses and sheep), Methane also comes as a result of oil drilling, coal mining and leaking gas pipelines. Other anthropogenic gases include chlorofluorocarbons (CFC), nitrous oxide (N₂O) and ozone (O₃). Although CFC releases have declined in recent years, the ones already in the atmosphere will persist for decades or centuries (Cunningham & Saigo, 1999). At global level analyses of greenhouse gases caused by human beings are carbon dioxide (50%) chlorofluorocarbons (20%), methane (16%), ozone (8%) and nitrous oxide (6%) (See figure 1)

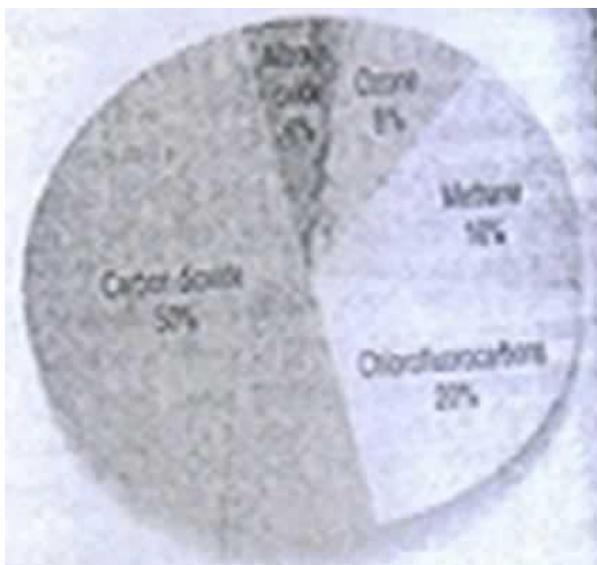


Figure 1: Contribution to Global Warming by Anthropogenic Releases of Gases into the Atmosphere.

Source: Cunningham, W.P. & Saigo, B.W. (1999).

As the greenhouse gases escape into the atmosphere, they continue to accumulate and increase in quantity. This will eventually increase the temperature of the earth's surface and result into global warming. Global warming implies an increase in the temperature of the earth's atmosphere, oceans and landmasses (Mastrandrea & Schneider, 2009).

Consequences of Climate Change

In Nigeria, as in many parts of the world, climate change has been affecting people adversely. For example, seasonal cycles, agriculture, water supply and food production are affected. This has led to floods, hurricanes, draughts, fire disasters, poverty, malnutrition, and health problems. Coastal regions are experiencing rising sea levels and storms while the desert is encroaching fast in the north. Therefore, there is need to step up measures to combat degradation of our environment, especially those that are man-made, so as to maintain a balanced ecosystem (causesofglobalwarming.net, 2011).

One major step in this direction' is creating awareness among the public across all nations. One likely effective method of creating this needed awareness could be by incorporating climate change into school curricula at all levels of the educational system.

Climate Change Curricula

Considering the magnitude of losses of human and material resources to the manifestation of climate change, there is the need to focus on the use of education in tackling the resultant crises from climate change. One way of doing this in Nigeria is to introduce climate change education into the curricula of our educational institutions in varying degrees at all levels.

Climate change education involves a basic understanding of scientific concepts coupled with attitudes and values that reflect self-respect for the environment and all its components, as well as a sense of personal and social responsibility (Young, 2009). Thus, climate education is interdisciplinary, cutting across science, social science and humanity courses (Agerup et al, 2004).

The interdisciplinary nature of climate education makes its integration into all the levels of education possible (Table 1). At the lower, middle and upper basic education levels, climate education could be integrated into subjects such as Basic Science & Technology, Social Studies, Civic Education, Religious Studies, Agriculture, Home Economics, Physical and Health Education. At the senior secondary school level, climate education could be integrated into the syllabuses of subjects like Agriculture, Geography, Physics, Chemistry, Biology,

Government, Economics, Commerce, Food & Nutrition, and Auto Mechanic. Furthermore, in tertiary institutions, climate education could be incorporated into Geology, Agriculture, Geography, Sciences and science-related courses such as Engineering and Technology as well as General Studies Education. Teacher education programme in colleges, faculties and institutes of education requires special attention on climate change integration. This is to ensure that teacher-trainees are well groomed in it, making it easy to impart the knowledge to their students after graduation.

Table 1
Integrating Climate Change into Nigerian Educational System

Level	Subjects for Integration	Implications for Educational Managers
Lower Basic (Primaries 1-3)	Basic Science and Technology, Social Studies, Religious Studies, Agriculture, Home Economics,	Organise workshop for existing teachers, provide instructional materials, and prepare modules.
Middle Basic (Primaries 4-6)	Basic Science and Technology, Social Studies, Religious Studies, Agriculture, Home Economics,	Organise workshop for existing teachers, provide instructional materials, and prepare modules.
Upper Basic (Junior Secondary Classes 1-3)	Basic Science and Technology, Social Studies, Religious Studies, Agriculture, Home Economics, etc.	Organise workshop for existing teachers, provide instructional material, and employ specialist teachers.
Senior Secondary School Classes 1-3	Physics, Chemistry, Biology, Agricultural Science, Geography, Government, Economics, Commerce, etc.	Organise workshop for existing teachers, provide instructional material, and employ specialist teachers.
Tertiary Institutions	Teacher Education, Sciences, Social Sciences, Arts, Technology, etc.	Train and employ specialists, provide instructional materials.

Sources: (1) Federal Ministry of Education (2008).
(2) Federal Republic of Nigeria (2004).

Management Implications

The success of any system of education is hinged on proper planning, efficient administration and adequate financing' (Federal Republic of Nigeria, 2004, p55). Therefore, educational managers, at ministries of education and school levels, have important roles to play in order to ensure the successful implementation of climate change curriculum (See Table 1). These management roles include the following:

Adequate Curricular Planning

There is the need to redefine our education system in terms of its purpose, content, approach and pedagogy towards redefining the society at large to address climate change. A culturally relevant and highly quality education that is empowering, inclusive, protective and child-centered would develop the competency, knowledge and skills that would enable the recipients live a safe and sustainable future in spite of the changing nature of the environments (St. Clair, 2010). In order to avoid boredom and lead to behaviour modification, climate change education must be child - centered and participative. The language of instruction should therefore be a combination of English and local languages, especially at the lower and middle basic levels.

Module Development

There is an urgent need to develop modules for climate education. Such modules would provide resources for teachers to plan and deliver useful and interesting lessons for their students on climate change. The modules should incorporate awareness on causes, impacts and prevention and management of climate change. Equally vital in the modules are knowledge of the nature of the environment and cultivation of habits to use it wisely, analysis and monitoring of observed changes in the environment as well as positive actions that could be taken by individuals and groups to forestall and manage climatic crises.

Development of Instructional Materials

New and relevant materials have to be developed and made available to teachers and students. Training on appropriate use of such materials is crucial to the success of climatic change education.

Adequate Financing

Planning, integration and implementation of a curriculum on climate change education would require substantial funding. Funding is needed to design an appropriate curriculum for climate change, train and equip the teachers and provide all tools (modules, reading materials etc) necessary for its effective implementation. In addition, the global nature of climate change makes linkage with other countries imperative. Reliable and consistent sources of funding (such as through Education Trust Fund - ETF) should be ensured. In addition to more funding by the governments, the following funding strategies are germane to successful integration of climate change education:

- **Financial Focus on Climate Change Education**

For a start, every public primary and secondary school should have a functional Geographical Garden. This would expose students to measurement of weather conditions and their interpretations. This trend should be improved upon at the higher level, in addition to motivating students to pursue careers in the pure, social and applied sciences.

- **Cost-sharing in Public Education**

All stakeholders have some responsibilities in ensuring that children acquire quality education that would effectively equip them for challenges of the environment. So, in implementing climate change education, the governments should provide relevant books and other learning materials, teachers (salaries, training and re-training) and other relevant equipment. The community should provide the enabling environment for climate study in terms of their habits and daily activities such as farming which have a bearing on weather conditions. In addition, the private sector could supplement government funding by providing funds and facilities for climate studies in our schools.

- **International Support**

Considering the awareness of the negative impacts on climate change all over the world, Nigeria could solicit assistance from international agencies such as UNESCO, WHO, UNICEF and World Bank to effectively implement climate change curriculum in our schools.

Closely related to seeking international support is the need for workable linkages and close communication with other countries of the world to learn more on measures that could be used to reduce the negative impacts of climate change.

Pedagogy Incorporating Critical Thinking Skills

One aspect of the cognitive or intellectual skills that students at all levels are supposed to imbibe as they go through the educational ladder as expressed in Nigeria's national policy on education is the ability to think for themselves. This refers to ability to engage in critical thinking to enable them acquire an objective view of the local and external environment as well as

become useful members of the society (FRN, 20(4)). Critical thinking has been defined in many ways.

Schafersman (1991) defined it as " the intellectual disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and or evaluating information gathered from or generated by observation, experience, reflection, reasoning". It was also conceived as "the intentional application of rational, higher order thinking skills, such as analysis, synthesis, problem recognition and problems solving, inference and evaluation" (Walker TRC, 2006, p.2).

Characteristics of critical thinking identified included: asking questions; defining a problem; examining evidence; analyzing assumptions and biases; avoiding emotional reasoning; avoiding over interpretation and considering other interpretations as well as tolerating ambiguity (ERIC Digest, 1988, p.1)

Critical thinking is particularly relevant to the study of climate change for objective observations and interpretations of weather conditions. Sadly enough however, critical thinking skills have not been adequately imbibed by teachers who would in turn train their students (Ijaiya, Alabi and Fasasi, 2010).

Conclusion

In conclusion, there is some awareness on global changing climate and the need for education on this. Therefore, on a short-term basis, public awareness on the ethics of climate change and its social dimensions is needed. However, the long-term and lasting approach should be the integration of climate change education into the curricula of educational institutions from basic to tertiary levels. This integration could be achieved by injecting different aspects of climate change into appropriate topics in arts science and social sciences subjects and courses at all levels of Nigerian education (as depicted in Table 1). This is to allow for in-depth understanding of climate change and its complex mechanisms and interactions in order to be able to prevent or at least effectively manage its occurrences and impacts.

Recommendations

Climate change requires necessary links among sciences, the environment and other areas such as culture, ethics and economy. Thus, youths are to be encouraged to study Arts, pure and social sciences and science-related professions such as Engineering and Technology that could anchor adequate research towards finding solutions to climate change challenges. One important form of such motivational efforts could be financial support for students in climate change related subjects right from secondary level of education.

The curriculum for climate change education should be designed in such a way as to make learners critical thinkers who can synthesize their observations and reach meaningful conclusions in order to be able to manage uncertainties and adapt to prevailing conditions.

It is also recommended that adequate planning is made regarding sources of funding, training of teachers, provision of relevant materials, pedagogy and linkage with other countries of the world for knowledge sharing and support.

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