

Teachers' Perception of Climate Change Curriculum Implementation in Biology Education Programme in Nsukka Education Zone

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Abstract

The study investigated teachers' perception of climate change curriculum implementation in Biology education programme in Nsukka Education Zone. Three research questions were formulated to guide the study. The study adopted a descriptive survey research design. The population for the study consisted of 37 teachers from Nsukka science school, Nsukka Education Zone. There was no sampling because of the manageable number of the population. The instrument used for data collection was TPCCCCIBSEQ. The instrument was validated by three experts from Department of Guidance and Counselling and one from Measurement and Evaluation, all from Nnamdi Azikiwe University, Awka. Mean was used for data analysis. The study revealed, among others, that the concept of climate change is included in the biological science education programme. The study recommended, among others, that government should create a sound education system because it is a powerful connection for combating adverse effects of climate change.

Keywords: teachers, perception, climate, change, curriculum, implementation

Introduction

Climate change has become a threat to the whole world; it has gained worldwide attention because of its impact and effect on the social, economic, educational, technological and environmental activities. The interest it gained has dominated the world agenda, so much so that some international protocols and treaties have been put in place to stem the tide of climate change and its consequences. Interest in climate change cuts across world leaders, meteorologists, climatologists, agriculturalists, mental health practitioners, guidance counsellors etc.

However, definition of climate change has been complex and controversial. In order to fully understand the phenomenon of climate change, it is important to first understand what climate is. In this regard, Solomon et al. (2007) say that the climate of a region is generated by the climate system, which is an interactive system consisting of the atmosphere, hydrosphere, the cryosphere, the land surface and the biosphere, forced or influenced by various external forcing mechanisms such as solar radiation. Simply put, climate is the long term average of weather; while weather refers to the state of the atmosphere with reference to the degree of hot or cold, wet or dry, calm or stormy, clear or cloudy. Atmosphere in the study means the surroundings. Mike (2016) defines climate as the atmospheric nature of a place over a long period of time. From the above definition, climate is as old as the earth and has been facing rapid growth of human and animal development, which resulted to global warming that introduced climate change.

Climate change can be defined as shift from the normal frequency of weather. Youmatter (2020) states that climate change is the global phenomenon of climate transformation characterized by the changes in the usual climate of the planet (regarding temperature, precipitation, and wind) that are especially caused by human activities. Climate change is mainly caused by human activities in the greenhouse gases, human activities like deforestation, and use of factory machines, generators and cars among others. In the view of Mike (2016), climate change is caused by global warming, which has to do with increase in the emission of Green House Gases (GHG) through the burning of fossil fuels, burning of wood, wood products and solid waste, raising of livestock and the decomposition of organic waste, bush burning and deforestation. All these human activities alter the balance in the frequency of natural GHGs. The alteration drastically affects rainfall, temperatures, wind and humidity. The above assertion was supported by IPCC (2013, 2014), which opined that for the past 100years, empirical studies revealed that the earth has experienced significant rise in temperature, rainfall and cold. Bearing this in mind, Uchenna in Ugwu et al. (2020) states the needs for inclusion of climate change in the curriculum of biology education in Nigeria. To him, students should be aware of the changes in their environment as regards their body mechanism via climate change effect. Climate change is acclaimed to have varying effects and has been known to affect people at home, offices and schools (Chikaire, Nnadi, Orusha & Onogu, 2012). They further explain that climate change has resulted in increased heat in the classrooms causing discomfort and impeding learning in addition to flooding of school compounds, roads as well as destroying school buildings and consequently leading to irregular attendance to schools during rainy seasons, especially in rural areas, while in extreme cases forcing closedown of schools for the period.

It is obvious that climate change is impacting negatively on life; hence it becomes necessary to create awareness about climate variations and its attributes to human kinds. Education is a good way of sensitizing people. Education is one of the methods of creating awareness about climate change that have been recommended by many professionals (Anderson, 2010). Many controversies have arisen in the past against inclusion of climate change in the school curriculum. The reasons were the uncertainty of the cause of climate

change, and to them, there is no need instilling such knowledge, which is not yet established (Conger, 2013). Secondly, it will cause excess load to school curriculum (Smith, 2013); thirdly, it is not man-made related issue (Conger, 2013). The controversies surrounding the inclusion of climate change in school curricula has made it difficult for its integration in the curriculum of some school programmes (Conger, 2013).

Climate change continues to be a low priority issue in relation to other social issues such as economy, terrorism, education, HIV/AIDS and so on. Opinions on concern and perception about climate change have reduced and aggravated continual issues in the number of people that are uncertain about climate change reality (British Broadcasting Corporation (BBC), 2010). All over the world, the quality of human environment has been altered and has aroused the need for an educational system that ensures environmental protection and maintenance of life support system. This, according to Upham, Whitmarsh, Poortings, Purdan, Darnton, Mclachlan and Derine-Wright (2009), is because the battle for environmental quality should centre on human than on the environment. Therefore, the essence of humans' perception in environmental education should not in any way be ignored.

In view of the above, Olatumile (2013) asserts that education has a central role to play in understanding, mitigating and adapting to the changing climate, which is an essential element of the global response to climate change. It instills in people the skills of understanding and addressing the impact of global warming, encourages changes in their attitudes and behaviour, as well as helping them adapt to trends in climate change. In all these controversies surrounding climate change education, Governments still find it necessary to include it in the curriculum of secondary school education. Therefore, climate change has been successfully included in the curriculum of many school programmes in Nigeria, among which includes Biology science subject, which is expected to equip students with problem-focused knowledge for effectively addressing challenges emerging from climate change. It therefore, implies that climate change and its variables like causes, effects and mitigation have been integrated into the biology science education curriculum to equip learners with the necessary skills for adaptation. Thus, knowledge about climate change does not mean concern towards it (Battistoni, 2012), as people do not put their knowledge into practice. But basically, there is no evidence that students equipped with such knowledge shows concern for it (Cherry, 2011). As a tool for combating the impacts, it is observed that students of developing countries are the most vulnerable with little awareness and coping capacity. Therefore, to respond to the needs of students, most at-risk and marginalized by climate change, quality education must be the channel to make all girls and boys more resilient to the impacts of climate change (Selim, 2012).

Children and students between the ages of 8 to 18years develop environmental interest, ecological understanding of empathy/moral and social understanding (Naomi, 2004). These age range falls between the age of Nigerian Secondary and University level of education, thus a need for inclusion of climate change into the curriculum/syllabus. The

curriculum contents and teaching materials could be designed in such a way as to equip the students with the necessary knowledge, skills and attitudes to tackle this global issue, not just knowledge for its sake. Thus, it is imperative that secondary school biology science education should foster the next generation of leaders and professionals with knowledge and skills needed to address these challenges of climate change effects as it has become pertinent for biology science teachers to educate themselves and their students with complete and accurate information on climate change. One of the steps necessary to achieving this goal is to integrate climate change and its related impact and effect in the curriculum content especially at the basic level so as to create awareness through sensitization and expose students to the meaning, causes, effects, impacts, mitigation, and adaptation strategies, to enhance their capacity, skills and knowledge on the way forward for future climate challenges and their related problems in the society. Chikaire, Nnadi, Orusha and Onogu (2012) believe that educating students on climate change and its related effects will help to equip and add more knowledge to the future policymakers, thereby providing rural sector with well-informed youths to deal drastically with the issues relating to climate change without being bias. The curriculum content of climate change could be based on agro-biodiversity, biofuels, mitigation strategies as well as global policy issues (Orusha, Alukogu, Nwigwe, Ohuaka & Tim-Ashamu, 2012). Based on the above assertion, the importance of inclusion of climate change in biology science education cannot be over emphasized.

Biology is a branch of science that deals with the study of living things, which includes human-beings. Biology is defined as the study of structure, function, hereditary and evolution of living organisms (Michael, 2012). Biology has many branches which include zoology, botany, ecology, genetics, morphology, anatomy, physiology, histology, microbiology, evolution, cell biology, to mention but a few. Ecology branch of biology has lots to explain about climate change; therefore, there is need to include it in the curriculum content of biology science. Many societal issues are biology-based such as biodiversity, genetically modified organisms, reproductive technologies, prolongation of life, food production, tourism industry (Biological gardens) and processing industries; all of these issues have evolved improvements that meet human needs (Ugwu, Ngwu, Eze & Ezea, 2020) as they are all related to climate change and its components. The knowledge of biology helps in checking environmental degradation such as desertification, erosion, water hyacinth, land, air and water pollution and all these are infused in the biology curriculum (Ugwu et al, 2020).

In line with the above assertions, many scholars highlighted some areas of biology curriculum content lesson plans, which illustrated the need of biology teachers to teach students the zoonosis, the increased risk of inter-species virus spillover due to climate change, infectious diseases such as COVID-19 and their mode of transmission. Lesson plans about demography, population trends, urbanization, and the role of demographics in the spread of infectious diseases such as COVID-19 and the increase of pandemics due to climate change, impact of climate change on pollinators; pollinator systems and food security, evolutionary adaptations in animals due to climate change; the impact of global

warming on sleep in humans, which is an integral part of their circadian rhythm and ecosystems; biomes, food chains, and food webs and how the balance of an ecosystem can be disrupted by climate change. Curriculum leads students through a progression of understanding. It begins with students thinking about climate and weather, and the local impact of sea-level rise due to climate change in the first lesson. This is to hook the students to the unit, getting them to think about their own connections with climate change; carbon dioxide and its ability to absorb and re-radiate heat; sources and sinks of carbon dioxide and the physical and biological harm caused by climate change. Similarly, students look at datasets of biological systems and think about the adaptations that humans need to make to adjust to the changing climate. Nonetheless, students may still have doubts about the reality of climate change and the process of scientific consensus shows that climate change is unequivocal and that there is overwhelming evidence that human activities are the main causes. Based on these doubts, Nigeria in particular do not have deep contextualized information on climate change, causes, effects, impact, mitigation and adaptation. Considering the dangers posed by the changing climate and acknowledging the limited research on climate change and school curriculum especially in biology science education in Nsukka Education Zone, there is need therefore to examine teachers' perception of climate change curriculum implementation in biology science education in Nsukka Education Zone.

Subsequently, Ogunseemi and Ibimilua (2016) state that effective climate change cannot be achieved without mobilizing the concerned efforts of people who are actually saddled with the responsibilities of disseminating information, ideas and innovation related to the environment and environmental issues. They also added that the role of teachers in providing basic education on climate change cannot be over emphasized, though their findings later disagreed with their opinion, which states that science teachers' perception of climate change is very low. Also Grace, Mark and Fred (2015) show that a high percentage of the biology teachers have correct perceptions of general creativity as a technique for impacting knowledge. Farzans (2014) also states that practical work is an important part of science education, which teachers use to pave way for students to construct knowledge. The findings of Laura, Thomas and Kristen (2019) indicated that the application of workbooks and role play is a vital technique of teaching biology. Christina and Rebecca (2021) state that government should integrate climate change education in the curricular activity to unleash the creativity of students and teachers to combat climate change, creating and developing relevant teaching and learning materials and mentoring and coaching teachers and youth leaders.

The reviewed studies and findings by different authors on science education as regards climate change were note done at Nsukka Education Zone; thus there is need to examine teachers' perception of climate change curriculum implementation in biology science education in Nsukka Education Zone.

Purpose of the study

The purpose of the study was to examine teachers' perception of climate change curriculum content implementation in biology science education in Nsukka Education Zone. Specifically, the study was designed to identify:

1. Teachers' perception of the curriculum content of climate change in biological science education in Nsukka Education Zone.
2. Teachers' perception of the teaching techniques of climate change in biological science education in Nsukka Education Zone.
3. Approaches for enhancing the curriculum content implementation of climate change in biological science education in Nsukka Education Zone.

Research questions

The following research questions were put forward to guide the study:

1. What is the teachers' perception of the curriculum content on climate change in biological science education in Nsukka Education Zone?
2. What is the teachers' perception of the teaching techniques of climate change in biological science education in Nsukka Education Zone?
3. What are the approaches for enhancing the implementation of climate change in biological science in Nsukka Education Zone?

Methodology

The study adopted descriptive survey research design. Descriptive survey research is used to describe phenomenon and its characteristics (Gall, Gall & Borg, 2007). It was considered suitable because the opinion of a representative sample of respondents was sought using questionnaires and the finding was generalized on the entire population. The population of the study was 37 teachers from Nsukka Science School, Nsukka Education Zone. There was no sampling because of the manageable number of the population. The instrument for data collection was questionnaire titled: Teachers' Perception of Climate Change Curriculum Content Implementation in Biological Science Education Questionnaire (TPCCCCIBSEQ). The questionnaires were developed from review of literature by the researchers and used for data collection. The instrument was a four-point response scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD), with corresponding values of 4, 3, 2 and 1 respectively. The questionnaire is made up of three sections with total of 31 items. The instrument was face-validated by three experts: two from Department of Guidance and Counselling and one from Measurement and Evaluation Department, Nnamdi Azikiwe University, Awka. Their corrections and suggestions were utilized to improve the initial draft of the questionnaire to produce the final copy that was distributed to the respondents. Fifteen (15) teachers from Nsukka education zone was used during the pilot study; data from this was analysed using Cronbach Alpha and reliability coefficient stood at 0.81. The collected data was analyzed using mean for research questions. Any mean response of 2.50 and above was considered positive or accepted while any mean response below 2.50 was considered negative or rejected.

Presentation of results

Research question 1: What is the teachers' perception of the curriculum content on climate change in biological science education in Nsukka Education Zone?

Data for answering research question 1 is presented in table 1

Table 1: Mean and Standard deviation on the teachers' perception of the curriculum content on climate change in biological science education programme

S/no.	Items descriptions	Mean	SD	Remarks
1	The concept of climate change is included in the biological science education programme	3.32	.66	Agreed
2	The effect of climate change is included in the biological science education programme	3.37	.64	Agreed
3	Impact of human activities on the global temperature is included in the biological science education programme	3.31	.73	Agreed
4	Consequences of climate change are included in the biological science education programme	3.28	.70	Agreed
5	Relevant information about climate change are included in the biological science education programme	3.26	.68	Agreed
6	Education is a veritable tool for mitigating the negative effects of climate change	3.24	.76	Agreed
7	Greenhouse effect is addressed by the Biological Science education programme	3.22	.75	Agreed
8	Mitigation and adaptation measures are addressed in the biological science education programme	3.22	.75	Agreed
9	Bodies that deal with climate change are addressed in the biological science education programme	3.21	.77	Agreed
10	Problems mitigating against adaptation of the effect of climate change are included in the biological science education programme	3.22	.77	Agreed
11	Global warming as a component of climate change is included in the current biological Science education programme	3.22	.75	Agreed

SD = Standard Deviation of the respondents and = Mean of the respondents.

Data in table 1 revealed that all the 11 items had their mean ratings ranging from 3.21 to 3.37 and were above the cut-off point of 2.50. This indicated that the respondents agreed that all the aspects of climate change identified were captured in biological science education programme in Nsukka Education Zone. Hence, the perception of teachers on the content of climate change in biological science education in Nsukka Education Zone is positive. The standard deviation of all the 11 items ranged from .62 to .79, which showed that the respondents were not too far from the mean and opinion of one another in their responses on their perception of the content of climate change in biological science education programme in Nsukka Education Zone.

Research question 2: What is the teachers' perception of the teaching techniques of climate change in biological science education in Nsukka Education Zone?

Data for answering research question 2 are presented in table 2.

Table 2: Mean and Standard deviation on the Teachers' perception of the teaching techniques on climate change in biological science education programme

S/no.	Items descriptions	\bar{x}	SD	Remarks
1	Assigning a research project is a good technique used in teaching climate change	3.22	.75	Agreed
2	The use of laboratory activities is a good technique used in showing how global warming works	3.21	.77	Agreed
3	The use of film show/movie technique is a good technique to make student comprehend the effect and impact of climate change	3.22	.75	Agreed
4	Speech presentation through seminar teaching technique helps to expose students more to climate change issues around them	3.22	.75	Agreed
5	Role play teaching technique has great impact in the cognitive restructuring about climate change	3.22	.75	Agreed
6	Do it yourself technique helps in quick learning	3.19	.79	Agreed
7	Evaluation teaching technique enhances effective teaching and learning of climate change	3.31	.73	Agreed
8	Practical teaching technique makes the teaching and learning of climate change easy	3.40	.64	Agreed
9	Excursion teaching technique is an interesting method in teaching climate change	3.31	.73	Agreed
10	Group discussion teaching technique in climate change is an effective method	3.22	.75	Agreed
11	Observation teaching technique is a good way of teaching the students climate change	3.22	.75	Agreed

SD = Standard Deviation of the respondents and \bar{x} = Mean of the respondents.

Data in table 2 revealed that all 11 items had their mean ratings ranging from 3.19 to 3.40 and were above the cut-off point of 2.50. This indicated that the respondents agreed that all the 11 identified teaching techniques of climate change in biological science education are effective. Hence, the perception of teachers on the identified teaching techniques of climate change in biological science education programme in Nsukka Education Zone is positive. The standard deviation of all the 11 items ranged from .64 to .77, which showed that the respondents were not too far from the mean and opinion of one another in their responses on their perception of the teaching techniques of climate change in biological education programme in Nsukka Education Zone.

Research question 3: What are the approaches for enhancing the implementation of climate change in biological science in Nsukka Education Zone?

Data for answering research question 3 are presented in table 3.

Table 3: Mean and Standard deviation on approaches for enhancing the implementation of climate change in biological science education programme

S/no.	Items descriptions	\bar{x}	SD	Remarks
1	Mentoring and coaching teachers through peer learning, exchange, and mentoring on how to incorporate climate change projects that use experimental learning approaches into daily activities	3.31	.73	Agreed
2	Government should create a platform through mass media for sensitization on climate change education	3.40	.64	Agreed
3	Ministry of Education should ensure an inductive teaching methods with students-centered approaches in authentic environments with first hand experiences about climate change	3.40	.64	Agreed
4	Federal Government should ensure that emphasis are made on the fieldwork, field-trips, including problem-based activities as factors for increasing students' interest and knowledge of climate change as regards mitigation and adaptation	3.31	.73	Agreed
5	Teachers should create good students' relationships and connectedness to nurture environmental consciousness and interest in biology and all vital factors relating to climate change so as to create a sustainable future	3.28	.70	Agreed
6	Curriculum developers should enhance the development of school environments where students feel safe, have a sense of belonging and develop the skills needed to participate fully in the implemented curriculum	3.26	.68	Agreed
7	Curriculum developers should create a forum for teachers' training so as to ensure the curriculum developed is vehemently implemented	3.24	.76	Agreed
8	Federal, State and Local Governments should give out their financial contributions (Federal 65%, State & Local government 35%) needed for curriculum implementation	3.22	.75	Agreed
9	There should be adequate monitoring and evaluation of teachers' teaching contents on climate change by an established committee	3.31	.73	Agreed

SD = Standard Deviation of the respondents and \bar{x} = Mean of the respondents.

Data in table 3 revealed that all the 9 items had their mean rating ranged from 3.22 to 3.40 and were above the cut-off point of 2.50. This indicated that the respondents agreed that all the 9 items were the approaches for enhancing the implementation of climate change in Biological science education programme in Nsukka Education Zone. The standard deviation of all 9 items ranged from .64 to .76, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the approaches for enhancing the implementation of climate change in Biological science education programme in Nsukka Education Zone.

Summary of findings of the study

The following findings emerged from the study based on the research questions answered:

1. Eleven (11) aspects of climate change identified were captured in biological science education programme in Nsukka Education Zone. Hence, the perception of teachers on the content of climate change in biological science education in Nsukka Education Zone is positive.

2. Eleven (11) identified teaching techniques of climate change in biological science education is effective. Hence, the perception of teachers on the identified teaching techniques of climate change in biological science education in Nsukka Education Zone is positive.

3. Nine (9) approaches for enhancing the implementation of climate change in biological science education programme in Nsukka Education Zone were identified.

Discussion of the findings

The findings were discussed based on the following sub-variables derived from the study objectives and research questions: teachers' perception of the contents of climate change in biological science education programme, teachers' perception of the teaching techniques of climate change in biological science education, and approaches for enhancing the implementation of climate change in biological science education programme in Nsukka Education Zone.

On the opinion of teachers on their perception of the content of climate change in biological science education programme in Nsukka Education Zone, the result indicated that all the 11 items had their mean ratings ranging from 3.21 to 3.39 and were above the cut-off point of 2.50. This showed that the respondents agreed that all the aspects of climate change identified were captured in biological science education programme in Nsukka. Hence, the perception of teachers on the content of climate change in biological science education programme in Nsukka Education Zone is positive. The findings are in line with the opinion of Ogunseemi and Ibimilua (2016) who state that effective climate change cannot be achieved without mobilizing the concerned efforts of people who are actually saddled with the responsibilities of disseminating information, ideas and innovation related to the environment and environmental issues. They also added that the role of teachers in providing basic education on climate change cannot be over emphasized, though their findings later disagreed with their opinion, which states that science teachers' perception of climate change is very low.

On the responses of teachers on their perception of the teaching techniques of climate change in biological science education programme in Nsukka Education Zone, the results indicated that all the 11 items had their mean ratings ranging from 3.19 to 3.40 and were above the cut-off point of 2.50. This indicated that the respondents agreed that all the 11 identified teaching techniques of climate change in biological science education are effective. Hence, the perception of teachers on the identified teaching techniques of climate change in biological science education programme in Nsukka Education Zone is positive. This finding is in line with the results of Grace, Mark and Fred (2015) which

show that a high percentage of the biology teachers have correct perceptions of general creativity as a technique for impacting knowledge. Farzans (2014) also stated that practical work is an important part of science education, which teachers use to pave way for students to construct knowledge. The findings of Laura, Thomas and Kristen (2019) indicate that the application of workbooks and role play is a vital technique of teaching biology.

On the opinion of teachers on their perception of the approaches for enhancing the implementation of climate change in biological science education programme in Nsukka Education Zone, the result was in consonance with previous study of Christina and Rebecca (2021) which state that government should integrate climate change education in the curricular activity to unleash the creativity of students and teachers to combat climate change, creating and developing relevant teaching and learning materials and mentoring and coaching teachers and youth leaders. According to them, sharing good practices and lessons learned will be important to deepening and extending the impact of this effort. Hence, sharing stories through a range of platforms (mass media) that can inspire other organizations, communities and constituencies by example to tackle climate change will be an important part of helping to harness the full power of education to change mindsets and remedy climate change.

Conclusion

Climate change is a global phenomenon that has indeed attracted the concerns of world leaders across climes. Unfortunately, developing countries like Nigeria are most vulnerable to the consequences of climate change. This scenario necessitated the need for inclusion of climate change curriculum contents in Biological science education programme in Nsukka Education Zone.

The study assessed the perception of teachers regarding climate change curriculum implementation. Teachers expressed satisfaction with the contents of climate change related themes in Biological science education programme in Nsukka Education Zone. In the areas of teaching techniques, teachers' perceptions were also in unison as they recognized that all techniques identified were useful in the effective teaching and learning of climate change issues. The study concludes with emphasis on government involvement in the area of funding, infrastructure, training and retraining of teachers and need for effective publicity and counselling to harness the potentials of education in mitigating climate change.

Recommendations

1. It is important that government should provide current-research data that can be used to guide and encourage administrators to support Science Faculty development activities in pedagogy that will lead to increased students' engagements, success and retention in science, not only in urban areas but also in rural areas.
2. Government should create a sound education system because it is a powerful connection for combating adverse effects of climate change.

3. Government should share stories in a good way to tackle adverse effect of climate change through mass media.

4. Governments should address the challenges of climate change by formulating appropriate policies, provision of adequate infrastructure and equipment to guarantee a conducive environment for all citizens.

5. Government should pursue alternative sources of power supply such as solar, coal, and other renewable sources of energy to reduce the degradation of the environment that leads to climate change.

6. Government should encourage continuous professional development of practicing teachers through training and re-training and regular attendance to conferences/seminars/workshops so they can become acquainted with reviewed curricula on climate change, improved methods of teaching and assessment and recognize the relevance of feedback on climate change.

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