

## Assessing the Efficacy of two Instructional Media on Students' Awareness of Climate Change Issues in Biology

**Ikpeseogwu Ruth O. & Onyegegbu Nkadi**

Department of Science Education, University of Nigeria Nsukka.

### Abstract

The study examined the efficacy of two instructional media on students' awareness on climate change issues in senior secondary school biology. Two research questions and two null hypotheses guided the study. The study adopted a non-equivalent quasi experimental research design. A sample of 222 senior secondary years two (SS2) students made up the intact classes from four schools, of which two each were selected from urban and rural areas. A structured questionnaire titled Students' Questionnaire on Awareness on Climate Change Adaptation (SQACCA) and Climate Change Adaptation Achievement Test (CCAAT) were used for data collection. Findings showed that students' awareness and achievement on climate change concept were generally low. The use of simulations and documentaries helped increase students' awareness and achievement in climate change concept. This study has implications on the teachers for innovative teaching strategies, Documentaries and Simulations to real life problems of pollutions and climate change.

**Keywords:** Climate Change, Awareness, Efficacy, Documentaries and Simulations

### Introduction

The study of biology has influenced humans in areas such as health, environment and general human life. Biology is the study of living and non-living things and how they interact with each other. It is one of the core science subjects offered in secondary schools by majority of the students and in most schools. It deals with the study of the relationship between man and his environment and this is achieved in the study of various concepts in biology ranging from ecology, pollution, nature balance, and ecosystem management and among others.

Pollution is the introduction of harmful substances into the environment by man, making the environment unsafe for man. Pollution leads to an alteration in the abiotic component of the environment, such as a change in the weather and climate of a place.

Climate is defined as an area's long-term weather pattern. It is a measure of the weather over a period of 30 years (Planton, 2013). Climate is the average weather condition in a place over many years. It can also be defined as the numerical description of the mean and variance of quantities such as temperature, precipitation and wind over a period of time ranging from thousands to millions of years. Climate differs from weather in terms of time. Weather lasts for a short period while climate has to do with the weather condition of a place over a period of over 30years (International Panel on Climate Change, IPCC, 2007). Climate takes hundreds or even millions of years to change and these changes are caused by identifiable factors.

Factors causing climate change can be divided into two major groups; natural factors and human factors. The natural causes of climate change are basically natural occurrences that cause climate change. These include change in amount of sunlight reaching the earth surface, volcanic eruptions and changes in naturally occurring greenhouse gases (National Aeronautics and Space Administration, 2017). On the other hand, the anthropogenic causes of climate change involves human activities that either emit large amount of greenhouse gases into the atmosphere and

deplete the ozone layer or activities that reduce the amount of carbon absorbed from the atmosphere (Odjugo, 2011 & Mbah, 2014). The impacts of climate change are being felt by humans and will continue to impact on human society at large, including human health, settlements, food and fibre production, industry, energy and infrastructure, thus affecting the achievement of sustainable development. Climate change also impacts the natural ecosystems such as ecological systems, hydrology and water resources, coastal systems causing ecological destabilization, melting of polar ice, sea level rise, increase in temperature, increase in drought, wildlife at risk, wide spread fire, coastal flooding, desertification, aggravation of coastal and gully erosion and extreme weather conditions among others (Idowu, Ayoola, Opele and Ikenweibe, 2011). Despite the impacts of climate change being felt by man, human activities which lead to climate change have been carried on daily basis hence the need for awareness creation on causes and effects climate change, on humans.

Climate change awareness creation can be achieved through the introduction of climate change concept into secondary school teaching. This is supported by the United Nations Framework Convention on Climate Change (UNFCCC) which stated that Education is a vital component and a medium for responding to global climate change. The United Nations Framework Convention on Climate Change (UNFCCC) also encouraged Parties to promote, develop, support and implement public awareness programs on climate change and its effects through educational training.

In achieving this, Egbuna-Ojukwu (2016) developed an instructional package for achieving climate change adaptation among senior secondary school biology students. The package contains biology topics with infused climate change concepts. Egbuna-Ojukwu further suggested that innovative teaching strategies should be used in teaching biology topics with infused climate change concepts. This is supported by the UNESCO'S action areas which suggest the provision of guidance on the implementation of innovative teaching approaches aimed at integrating quality climate change education for sustainable development in school, to be adapted for local needs as required and used by government ministries, higher education institutions and schools. Based on this, the present study extracted the aspects of the developed instructional package for achieving climate change adaptation that are peculiar to pollution and taught them using two innovative instructional media, documentaries and simulations.

Innovative teaching media include hands on learning, storytelling, role play, sports based learning, visual clues, instructional conversation, word games, stimulating classroom environment, educational videos, and instructional media. Instructional media is defined as all aids used in the teaching and learning process. Instructional media cover whatever the teacher uses to involve all the five senses of sight, hearing, touch, smell and taste while presenting his/her lessons. It can also be defined as all the materials and physical means an instructor uses to implement instruction and facilitate students' achievement of instructional objectives. Instructional media include chalkboards, handout, charts, slides, videotape, documentaries, computers, DVDs, CD-ROM, interactive video conferencing. Instructional media could also include television, satellite communication, computer and other sophisticated technologies Vikoo (2008). The present study used documentaries and simulations to teach biology topics with climate change concepts infused.

A documentary is a non-fictional motion picture intended to save some aspect of reality, primarily for the purpose of instruction (Kietzman, 2016). A documentary is a film or video showing an event or persons based on facts. Simulations are instructional media in which the learner is placed in a world that is defined by the teacher who controls the parameters of this

world and uses it to accomplish the needed instructional results University of New South Wales, (2015).

Awareness is the ability to directly know and perceive, to feel, or to be conscious of events. Awareness is the state or ability to perceive, to feel or to be conscious of events, objects or sensory patterns (Ezeudu, Ezeudu & Sampson, 2016). Awareness means having idea of the existence of something. In view of the above definition, climate change awareness can be defined as the ability to know, perceive and understand the climatic changes going on in the environment, its causes and possible solutions. Majority of the Nigerian populace and Africa at large are unaware or do not understand what climate change is all about. According to United Nations Development Program (UNDP) report 2010, the level of climate change awareness in Nigeria is low and it is likely to continue if no intervention measure is put in place. This claim is supported by other researchers such as Odjugo (2013), Ekpo & Ekpo (2011), Nzeadible, Chukwone, Egbule & Agu (2011). Due to low level of awareness on climate change, people have ignorantly continue to engage in practices which destroy the environment. Adequate knowledge and awareness on climate change will help communities in reducing the vulnerability of societies to climate change related risks both now and in the future (Oruonye, 2011).

In order to carry out this study, a general purpose was set to, assess the efficacy of two instructional media teaching strategies on students' awareness of climate change. Specifically, the study sought to determine the: **Efficacy** of simulations and documentaries on students' awareness of climate change concepts and **Influence** of school location on students' awareness in climate change concept.

### **Research Questions**

From the issues raised, the following research questions guided the study.

1. What are the mean awareness scores of students on climate change concept taught using documentaries and simulations?
2. What is the effect of location on the mean awareness score of students on climate change concept?

### **Hypothesis**

Further to the research questions raised, two null hypotheses were formulated to guide the study and were tested at 0.05 level of significance;

**HO<sub>1</sub>**: There is no significant difference in the mean awareness scores of students taught using documentaries and those taught using simulations.

**HO<sub>2</sub>**: There is no significant difference in the mean awareness scores of urban and rural students taught using documentaries and those taught using simulations.

### **Method**

The design of this research study is quasi-experimental design. Specifically, it employed a pretest protest non-equivalent control group design. No control group was used because treatment was administered to the two groups.

### **Study Context**

The study was conducted in the Ika Education Zone of Delta state Nigeria. This zone is made up of two local government areas; Ika North East and Ika South Local Government Areas. Delta state is one of the oil producing states in Nigeria experiencing sharp degradation of the environment due to human activities by oil companies in drilling crude oils and flaming of gas in the open air. This has led to introduction of harmful substances into the environment, thereby causing pollution to land, water and air and making it unsafe for inhabitants. The schools used in this study are all located in these areas that are experiencing the impact of climate change due to many years of crude oil drilling activities.

### **Participants**

The target population of the study comprised of 4165 senior secondary year two (SS2) students in public secondary schools in the two Educational zones. A purposive sample technique was used in selecting 222 senior secondary year two (SS2) students. One hundred and twenty (120) students were sampled from the rural schools while One hundred and two (102) students were sampled from the urban schools. Four schools were selected from the 40 schools. Purposive sampling technique was used to select two (2) co-educational secondary schools each from urban and rural areas respectively. The criterion for purposive sampling was the availability of facilities needed to carry out the study and availability of two intact SS2 classes offering biology.

### **Materials**

In this study, Students Questionnaire on Awareness on Climate Change Adaptation (SQACCA) was used for data collection. The instrument was adapted from Egbuna-Ojukwu (2016). The Students Questionnaire on Awareness on Climate Change Adaptation (SQACCA) is divided into two sections. Section A is the students' information while Section B consists of fifty (50) items which were scored on a four-point scale. The instrument was subjected to face and content validity by specialists. Comments and recommendations from the specialists served as guide for the modification of the instrument. The instrument was trial tested and this enabled the researcher to determine the time to assign for the test, clarity of the test items, its appropriateness and adequacy. The reliability of SQACCA items was estimated using Cronbach Alpha formula which gave a reliability index of 0.70. The documentaries and simulations used were developed from YouTube.

### **Study Procedure**

Permission was obtained by the researcher from Delta State Ministry of Education to carry on the study in the selected schools. Senior secondary year two classes (SS2) were used for the experiment. Two intact classes each, from urban and rural sampled schools were selected. These classes were randomly assigned to experimental groups 1 and 2. The first class served as experimental group 1 (use of Documentaries) while the second class served as experimental group 2 (use of Simulations). A Pre-test, using the Climate Change Adaptation Achievement Test (CCAAT) and Students' Questionnaire on Awareness on Climate Change Adaptation (SQACCA) were administered to the two groups of classes in all the selected schools to establish their initial group equivalence. The pre-test lasted for four days; one day for each school. Thereafter, the treatment commenced simultaneously in all four schools. This involved the regular classroom biology subject teachers and the students. The class teacher introduced the lesson and explained the type of instructional media to be used after they had undergone one week training with the researcher on step by step procedures, how to use the instructional lesson plans and media packages, study protocols and administration of the tests to the students. The class teacher then played the video to the students and pause at intervals for the students to

discuss what they have viewed. The teacher further played the remaining part of the video for the students to watch and jot down points. The teacher finally discussed the points amongst the students and allowed them to ask questions. The treatment lasted for ten weeks while the post-test was also administered on the last week

### Data Analysis

The scores obtained from the pre-test and post-test were analysed using Mean and Standard Deviation to answer the research questions while Analysis of Covariance (ANCOVA) was employed for testing the hypotheses at 0.05 level of significance.

### Results

The results of the data analysis are presented and interpreted in the sequence of the research questions and hypotheses guiding them.

#### The Efficacy of Simulations and Documentaries on Students' Awareness in Climate Change Concepts.

1. What are the mean awareness scores of students on climate change concept taught using documentaries and simulations?

**Table 1: Mean and Standard Deviation of Pretest and Post-test Awareness Score of Students on Climate Change Concept taught using Documentaries and Simulations**

Variable	N	Pretest		Post-test		Mean gain
		$\bar{x}$	SD	$\bar{x}$	SD	
Documentaries	104	139.17	17.10	171.87	12.35	32.70
Simulations	118	146.79	20.61	171.33	15.98	24.54

The result of the study as presented in Table 1 shows that the group taught pollution with infused climate change concept using documentaries had a pretest awareness mean of 139.17 with a standard deviation of 17.10 and a post-test awareness mean of 171.87 with a standard deviation of 12.35. The difference between the pretest and post-test awareness mean for the group taught using documentaries was 32.70. Result also shows that the group taught using simulations had a pretest awareness mean of 146.79 with a standard deviation of 20.61 and a post-test awareness mean of 171.33 with a standard deviation of 15.98. The difference between the pretest and post-test awareness mean for the group taught using simulations was 24.54. Result shows that, for each of the groups, the post-test means were greater than the pretest means with the group taught using documentaries having a higher mean gain. This is an indication that documentary instructional approach had more effect on students' awareness of climate change adaptation than the simulation method.

#### Location and Awareness of Students on Climate Change Concept

2. What is the effect of location on mean awareness score of students on climate change concept?

**Table 2: Mean and Standard Deviation scores of Pretest and Post-test on the effect of Location on mean Awareness of Students on Climate Change Concept**

Variable	Pretest	Post-test
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Location	N	$\bar{x}$	SD	$\bar{x}$	SD	Mean gain
Rural	120	149.76	17.69	174.38	12.07	24.62
Urban	102	135.52	18.51	168.30	16.11	32.78

Results in Table 3 show that students from rural schools taught pollution with climate change concept infused had a pretest awareness mean of 149.76 with a standard deviation of 17.69 and a post-test awareness mean of 174.38 with a standard deviation of 12.07. The difference between the pretest and post-test awareness mean for students from rural schools was 24.62. Result also shows that the students from urban schools taught pollution with climate change concept infused had a pretest awareness mean of 135.52 with a standard deviation of 18.51 and a post-test awareness mean of 168.30 with a standard deviation of 16.11. The difference between the pretest and post-test awareness mean for students from urban schools was 32.78. However, for both students from rural and urban schools, the post-test means were greater than the pretest means with students from urban schools having a higher awareness mean gain. This implies that students from urban schools are more aware of climate change adaptation than the students from rural schools.

### The Difference in Awareness of Students using Documentaries and Simulations

1. There is no significant difference in the mean awareness scores of students taught using documentaries and those taught using simulations.

**Table 3: Analysis of Covariance (ANCOVA) on the Significant Difference in the Mean Awareness Scores of Students taught using Documentaries and those taught using Simulations.**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Dec.
Corrected Model	10001.062 <sup>a</sup>	4	2500.265	15.231	0.00	
Intercept	80015.330	1	80015.330	487.424	0.00	
PretestACCA	983.312	1	983.312	5.990	0.01	
Group	451.708	1	451.708	2.752	0.09	NS
Location	888.682	1	888.682	5.414	0.02	S
Group * Location	6328.892	1	6328.892	38.553	0.00	
Error	35622.636	217	164.160			
Total	6582005.000	222				
Corrected Total	45623.698	221				

The result in Table 3 shows the significant difference in the mean awareness scores of students taught pollution with climate change concept infused using documentaries and simulations. Result shows that with respect to the students taught climate change concept using documentaries and simulations, an F-ratio of 2.75 was obtained with associated probability value of 0.09. Since the associated probability value of 0.09 is greater than 0.05 set as level of significance, the null hypothesis ( $H_{01}$ ) which stated that there is no significant difference in the mean awareness scores of students taught climate change concepts using documentaries and simulations is not rejected. Inference drawn therefore is that there was no significant difference in the mean awareness scores of students taught climate change concept using documentaries and those taught using simulations. This means that though difference may exist in the mean

awareness level of students taught using documentaries and those taught using simulations, but the difference is not statistically significant.

### **Influence of School Location on Students' Awareness on Climate Change Concept.**

2. There is no significant difference in the mean awareness scores of urban and rural students taught using documentaries and simulations.

The result in Table 3 shows that with respect to the significant difference in the awareness scores of urban and rural students taught using documentaries and simulations, an F-ratio of 5.41 was obtained with associated probability value of 0.02. Since the associated probability value of 0.02 is less than 0.05 set as level of significance, the null hypothesis, which stated that there is no significant difference in the mean awareness scores of urban and rural students taught using documentaries and simulations is rejected. Inference drawn therefore is that there was a significant difference in the mean awareness scores of urban and rural students taught pollution with climate change concept infused using documentaries and those taught using simulations with those taught using documentaries having a higher mean gain.

### **Discussion**

The results of the analysis on the efficacy of Simulations and Documentaries on students' awareness on climate change concepts, showed that students taught pollution with climate change concept infused using documentaries had higher awareness than their counterparts taught using simulations. This revealed, according to the findings, that the use of documentaries as an instructional media is more effective than simulations. However, further analysis using ANCOVA showed that there is no significant difference in the mean awareness scores of students taught pollution with climate change concept infused. Difference may exist in the mean awareness level of students taught using documentaries and those taught using simulations, the difference is not statistically significant. This study supports the findings of Parant, Pascual, Jugel, Kerroume, Felonmeau and Gueguen (2016) who stated that in addressing climate change and global warming behaviours, the use of a persuasive message such as real life scenes of climate change impacts and human actions causing climate change is a valid and useful technique in creating awareness. Furthermore, this study supports the findings of previous studies such as Cohen and Patterson (2012) who stated that innovative teaching strategies can be used to increase student's awareness in science concepts; and the findings of Egbuna-Ojukwu (2016), stating that the use of innovative teaching strategies helped increased students' awareness in climate change concept.

Secondly, the research question on the influence of school Location on students' awareness on climate change concept showed that students from urban schools are more aware of climate change adaptation than the students from rural schools. Further analysis with ANCOVA also showed that there was a significant difference in the mean awareness scores of urban and rural students taught pollution with urban students having a higher mean gain. The result of this study agreed with some of the literature, which states that the climate change awareness level of students was generally low hence there is a need to introduced best ways to increase students' awareness in climate change concept (Ezeudu, Ezeudu and Sampson, 2016), and that climate change awareness level of students in both urban and rural areas of Nigeria was generally low and suggested that climate change education and awareness campaign should be carried out rigorously (Odjugo, 2013), On another view, Small and Nicholis (2003) opined that where people live (location) determine how much information and knowledge that gets to them particularly in developing countries like Nigeria. However, from literature, (Agiande, 2006, and

Igwebuike & Ikponmwosa 2013) found out in a study in Calabar, Nigeria, that location is no longer a barrier to students' knowledge of environmental problems like climate change and Ishaya and Abaje (2008) in a study in Kaduna also found out that location has no significant influence on students' awareness of the problems of climate change. These findings disagreed with the present study; reasons may be that they were older studies.

### **Conclusion and Recommendations**

Evidence are bound from this study's findings that Documentaries and Simulations instructional media increased students' awareness in climate change concept. When friendly innovative instructional media strategies like documentaries and simulations are neatly and meticulously initiated, planned and implemented in secondary school biology for climate change concept, it will get the students interested, motivated and capture their potentials to increase their awareness.

Study findings also, showed that location had an influence on students' awareness level and achievement in climate change concept as students in urban areas had higher awareness than their counterparts in rural areas. Combined efforts from the Federal and States Ministries of Education, Principals, School Managers and Teachers should be made to develop secondary schools in general and with more emphasis in the rural areas, with educational infrastructures, teaching and learning facilities like computers, electricity and stand-by generators. Again, the use of instructional media, documentaries and simulations should be encouraged during preservice teacher training and employ it more in the teaching of the subject especially in real life concepts such as pollution and other related concepts.

### **Educational implication**

The findings of the study have some educational implications for the students, biology teachers, authors of biology textbooks and curriculum planners. Biology teachers have a major role in introducing the use of documentaries and simulation instructional media as part of their teaching strategies. Results from this study have shown that students taught using these instructional strategies had a higher awareness in climate change concept in biology. This may not necessarily be limited to enhancement of awareness, but may also include the development of favourable attitudes and retention towards the subject biology. Classroom learning is enhanced by a variety of instructional strategies. The utilization of these instructional strategies can arouse students' interest, curiosity, motivation, imagination and stimulation which could lead to awareness and permanent learning in students. It is therefore, paramount that curriculum planners introduce these instructional strategies into the school curriculum. Biology textbook authors should also capture climate change issues in biology topics.

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