CLIMATE CHANGE AWARENESS AMONG SCIENCE AND TECHNOLOGY TEACHERS OF SECONDARY SCHOOLS IN MINNA METROPOLIS NIGER STATE

C. S. Tukura[1] and A. S. Owodunni[2,*]
[1]*Department of Educational Technology, Federal University of Technology, Minna*
[2]*Department of Industrial and Technology Education, Federal University of Technology, Minna*
*Corresponding E-mail: s.owodunni@futminna.edu.ng (Tel: +2348034040840)

Abstract: *Climate change awareness is much needed for public support in its mitigation and adaptation. In this regard, public education is critical in raising levels of awareness on the subject. This research was designed to assess the level of climate change awareness among Science and Technology Teachers of Secondary Schools in Minna Metropolis of Niger State. Objectives of the study were to: assess teachers' level of climate change awareness, identify factors that causes climate change, effects of climate change on the society and strategies for reducing the effects of climate change. Descriptive survey design was adopted in which some 95 randomly selected respondents were drawn from 15 secondary schools within Minna Metropolis of Niger State. A structured questionnaire was administered to obtain data on teachers' knowledge and opinion on climate change. The findings of the study showed, among others, that the level of climate change awareness among secondary school science and technology teachers in Minna Metropolis of Niger State is not significantly low. Teachers registered a medium level of awareness albeit gaps in their knowledge. Hence, it was recommended that stakeholders should step-up climate change capacity building among the scence and technical teachers.*

Keywords: *Climate Change, Environmental Protection, Sustainablity, Technology Education*

Introduction

Interest in education about climate change has increased in recent years, attributable in part to expanded funding and leadership for educational programmes that address climate change (Anderson, 2012; UNESCO, 2009), the addition of climate change to educational curriculum guidelines (NRC, 2012), mounting awareness of unusual weather patterns (Trenberth, Fasullo & Shepherd, 2015), and the deepening concern of the likelihood of global environmental, social, and economic changes due to climate change (Adger, et al. 2013; Moorhead, 2009). Climate change constitutes one of the 21st century key challenges to development the world over (UNDP, 2007). As such, climate change and global warming have become issues of global concern in the recent decades. This is evidenced by the flurry of conferences, campaigns, reports and researches on this subject since the Rio Earth Summit in 1992. While there are natural causes of climate change, the current warring trend has been largely blamed on human activities mainly the burning of fossil fuels, industrial pollution, deforestation, and land use changes (IPCC, 2007; Weart, 2010). Global attention on climate change was sort for the first time by the Brundtland Report, Our Common Future, which stated that the unsustainable development practices of humankind have pushed the world's climate to a warming trend (UNWCED, 1987). On the contrary, the public's concern on climate change was not triggered by the Brundtland's report, but by the unusual northern hemisphere heat wave and drought of the summer 1988 (Christianson, 1999). Numerous studies conducted since then reveal that the vast majority of people across the world, especially in developing countries, are still unaware of climate change despite their high vulnerability to the impacts of climate change (Bostrom, *et al.*, 1994; Bord, Fisher & O'Conner, 1998). However, despite their awareness of changing weather patterns, people in Africa, are poorly informed about global climate change. The low level of awareness on climate change across sub-Saharan African countries is attributed to limited awareness campaigns on one hand and the fact that African countries have got too many problems ranging from poverty to political conflicts on the other hand hence climate change is never a priority issue (UNDP, 2007). Just like awareness, perception of climate change varies across regions in the world. Various studies show that people in developing countries are more likely to perceive climate change as a threat (GlobeScan, 2006). Contrary results were, however, reported by Pugliese and Ray (2009) who states that climate change is more likely to be perceived as a serious problem in the developed world than in developing countries,

despite developing countries being the most vulnerable to climate change impacts. Nevertheless, perception of climate change as threat has been increasing over the years (UNDP, 2007). In Nigeria effort has been made to create awareness about climate change, though not much was achieve. This study was designed to fill this gap by assessing the level of climate change awareness among secondary school teachers in Minna Metropolis of Niger State.

Statement of the problem

Climate change is real and its impacts have become obvious in Nigeria necessitating the need for reducing its cause and impact at the country level. However, causes, effects and mitigation of climate change require the public to be fully aware and perceive climate change as a problem of global concern. Science and technology teachers will thus have a critical role to play in the national climate change awareness campaign as educators of young Nigerians. Hence, some science and technology teachers in Nigeria may have limited understanding of climate change and this may affect their delivery on this subject. Therefore, the study sought to assess the level of climate change awareness among science and technology teachers in Minna metropolis of Niger State.

Research questions

1. What is the level of awareness on climate change among science and technology teachers in Minna Metropolis of Niger State?
2. What are the causes of climate change as perceived by science and technology teachers in Minna Metropolis of Niger State?
3. What are the effects of climate change on the society as perceived by science and technology teachers in Minna Metropolis of Niger State?
4. What are the strategies for reducing the effects of climate change as perceived by science and technology teachers in Minna Metropolis of Niger State?

Hypotheses

H_{O1}: There is no significant difference between the responses of male and female teachers on the causes of climate change as perceived by science and technology teachers in Minna Metropolis of Niger State.

$H_{O@}$: There is no significant difference between the responses of male and female teachers on the effects of climate change as perceived by science and technology teachers in Minna Metropolis of Niger State.

H_{O3}: There is no significant difference between the responses of male and female teachers on the strategies for reducing the effects of climate change as perceived by science and technology teachers in Minna Metropolis of Niger State.

Methodology

The design of the study was a survey research design. The population comprised of all the Science and Technology Teachers teaching in secondary schools in Minna Metropolis of Niger State. The sample for the study consisted of 95 Science and Technology Teachers drawn from secondary schools in the study area. Structured Questionnaires were used to obtain specific information from a representative sample of these teachers about climate change. To ensure validity of the instrument, the instrument was subjected to face validation by three experts in Environmental Science Education. The trial test for determining the reliability coefficient of the instrument was carried out using 30 science and technology teachers in Federal Capital Territory, Abuja. The reliability coefficient of the instrument was found to be 0.67 using Cronbach Alpha. Data were analyzed using frequency, percentage, mean and standard deviation to answer the research questions while hypotheses formulated were tested using t-test statistics at 0.05 level of significance.

Results

Table 1a: Awareness of Climate Change

Awareness	Frequency	Percentage (%)
Yes, aware	90	94.74
No, not aware	5	5.26
Total	**95**	**100%**

Table 1a indicated that 90 respondents (94.74%) were aware of climate change while 5 respondents (5.26%) were not aware of climate change.

Table 1b: Medium of Disseminating Information on Climate Change

S/N	Medium	Frequency	Percentage (%)
1.	National Radio station	75	83.33
2.	Vernacular radio station	68	75.56
3.	Television	90	100.00
4.	Newspapers and magazines	55	61.11
5.	Internet	50	55.56
6.	Public libraries	10	11.11
7.	Seminar/workshop	15	15.00

Table 1b indicated that 83.33% of respondents that were aware of climate change got the information through National radio station, 75.56% through Vernacular radio station, 100.00% through Television, 61.11% through Newspapers and Magazines, 55.56 % through Internet, 11.11% through Public libraries and 15.00% through Seminars and Workshops.

Table 1c: Degree of Respondents' Knowledge of Climate Change

Status	Frequency	Percentage (%)
Much	55	61.11
Little	35	38.89
Total	**90**	**100.00**

Table 1c showed that majority (61.11%) of the respondents that are aware knew much about climate change while minority (38.89%) of the respondents that know little about climate change.

Table 2: Mean and Standard Deviation of Respondents on the Causes of Climate Change

S/N	Item	Mean	Std. Dev.	Remark
1.	Deforestation	3.60	1.01	Agreed
2.	Combustion of fossil fuels	3.51	0.92	Agreed
3.	Poor agricultural practices (Example, fertilizers)	2.79	0.72	Agreed
4.	Air pollution from industries	3.33	0.83	Agreed
5.	Poor management of waste	2.95	0.92	Agreed
6.	Quantity of greenhouse gases in the atmosphere	3.05	0.95	Agreed
7.	Strength of the sun	2.66	0.82	Agreed
8.	Changes in the Earth's orbit	2.58	0.77	Agreed
9.	Changes in the orientation of the Earth's axis of rotation	3.00	0.76	Agreed

S/N	Item	Mean	Std. Dev.	Remark
10.	Climate change is caused by CO_2 content of the oceans	3.62	0.66	Agreed
11.	Climate change is caused by meteorite impacts	2.95	0.89	Agreed
	Grand Mean and Standard Deviation	3.09	0.84	Agreed

The data presented in Table 2 revealed that all 11 items had average mean values ranging from 2.58-3.62. This showed that the mean value of each of the items was above the cut-off point of 2.50, indicating that Science and technology teachers are of the view that those items are the causes of climate change. The table also showed that the average standard deviation (Std Dev) of the items ranged from 0.66-1.01, an indication that the respondents were not very far from the mean and one another in their response.

Table 3: Mean and Standard Deviation of Respondents on the Effects of Climate Change

S/N	Item	Mean	Std. Dev.	Remark
1.	Leads to rise in sea level	3.52	0.99	Agreed
2.	Leads to food shortages	3.58	1.01	Agreed
3.	It is associated with the increased frequencies of droughts and floods	2.65	0.93	Agreed
4.	It may lead to expansion of rivers and lakes	3.30	0.67	Agreed
5.	Leads to shrinking of lakes and rivers	2.93	0.74	Agreed
	Grand Mean and Standard Deviation	3.20	0.87	Agreed

The data presented in Table 3 revealed that all the 5 items had average mean values ranging from 2.65-3.65. This showed that the mean value of each of the items was above the cut-off point of 2.50, indicating that Science and technology teachers are of the view that those items are the effects of climate change in the society. The table also showed that the average standard deviation (Std. Dev.) of the items ranged from 0.67-1.01. This indicated that the respondents were not very far from the mean and one another in their response.

Table 4: Mean and Standard Deviation of Respondents on the Strategies for Reducing the Effects of Climate Change

S/N	Item	Mean	Std. Dev.	Remark
1.	Switching to electric vehicles	3.20	1.03	Agreed
2.	**U**nplugging all devices when not in use	3.33	0.98	Agreed
3.	Suppressing population growth	2.78	0.77	Agreed
4.	Putting a stop to chopping of forests	2.65	1.10	Agreed
5.	Foregoing use of fossil fuels	2.88	0.78	Agreed
6.	Encouraging the use of public transport always	3.02	0.89	Agreed
7.	Educating people on climate change	3.56	0.69	Agreed
8.	Saying no to the use of plastic	2.96	0.93	Agreed
	Grand Mean and Standard Deviation	3.04	0.90	Agreed

The data presented in Table 4 revealed that all the 8 items had average mean values ranging from 2.65-3.56. This showed that the mean value of each of the items was above the cut-off point of 2.50, indicating that Science and technology teachers are of the view that those items are the strategies for reducing the effects of climate change. The table also showed that the average standard deviation (Std.Dev.) of the items ranged from 0.69-1.10. This indicated that the respondents were not very far from the mean and one another in their response.

Table 5: t-test Analysis of the Mean Response of Male and Female Science nd Technology Teachers on the Causes of Climate Change

Category	N	X	Std. Dev.	Df	t-tab.	t-cal.	Sig.	Decision
Male Teachers	50	3.14	0.92					
				88	1.96	0.493	0.00	Accepted
Female Teachers	40	3.05	0.81					

The t-test analysis in Table 5 showed that there was no significant difference between mean response of male and female science and technology teachers on the causes of climate change. This was indicated by the overall calculated t-value of 0.493 which is less than the t-tabulated of 1.96 at degree of freedom of 88 and 0.05 level of significance. As a result, the hypothesis was accepted. In other words, male and female science and technology teachers did not differ significantly in their responses on the causes of climate change.

Table 6: t-test Analysis of the Mean Response of Male and Female Science and Technology Teachers on the Effects of Climate Change

Category	N	X	Std. Dev.	Df	t-tab.	t-cal.	Sig.	Decision
Male Teachers	50	3.23	0.90					
				88	1.96	0.324	0.00	Accepted
Female Teachers	40	3.17	0.85					

The t-test analysis in Table 6 showed that there was no significant difference between mean response of male and female science and technology teachers on the effects of climate change. This was indicated by the overall calculated t-value of 0.324 which is less than the t-tabulated of 1.96 at degree of freedom of 88 and 0.05 level of significance. As a result, the hypothesis was accepted. In other words, male and female science and technology teachers did not differ significantly in their responses on the effects of climate change.

Table 7: t-test Analysis of the Mean Response of Male and Female Science and Technology Teachers on the Strategies for Reducing the Effects of Climate Change

Category	N	X	Std. Dev.	Df	t-tab.	t-cal.	Sig.	Decision
Male Teachers	50	3.07	0.97					
				88	1.96	0.417	0.01	Accepted
Female Teachers	40	2.99	0.85					

The t-test analysis in Table 7 showed that there was no significant difference between mean response of Male and Female science and technology teachers on the strategies for reducing the effects of climate change. This was indicated by the overall calculated t-value of 0.417 which is less than the t-table of 1.96 at degree of freedom of 88 and 0.05 level of significance. As a result, the hypothesis was accepted. In other words, male and female science and technology teachers did not differ significantly in their responses on the strategies for reducing the effects of climate change.

Findings and discussion

1. It was discovered from Table 1 that majority of the teachers 90(94.74%) were aware of climate change. Also, 55(61.11%) of the teachers that were aware knew much about climate change. All the teachers 90(100.00%) that were aware of climate change got the information through Television. These findings is in line with the findings of Ochieng (2014) who carried out a study on climate change awareness and policy implications among secondary school teachers in Kisumu City, Kenya and discovered that majority of the teachers were aware of the climate

change although there was significant gap in their level of awareness. He also pointed out that library was considered most appropriate means of climate change information dissemination followed by the internet and local radio stations respectively while national radio stations and television were perceived the least appropriate.

2. Table 2 provided answer to research question 2. The result shows that majority of the teachers agreed that all 11 items are the causes of climate change. The hypothesis tested also revealed no significant difference in the opinions of male and female teachers. This finding is also in line with the findings of Ochieng (2014) who discovered in his study that secondary school teachers in Kisumu City, Kenya have some understanding of the basics of climate change though with gaps in their knowledge. These results corroborate the concerns expressed by RoK (2013) and Otieno, Pauker and Maina (2009) both of whom states that Kenyans are poorly informed about climate change and hence portrays significant gaps in their knowledge of the same. British Geological Survey also attributed the causes of climate change to factors like strength of the sun, changes in earth's orbit, quantity of greenhouse gases in the air, etc. Table 3 showed that the teachers agreed that the listed items were the causes of climate change. The hypothesis tested also revealed no significant difference in the opinions of male and female teachers. This finding is in agreement with the finding of Ochieng (2014) who pointed out that food shortages was considered the most significant effect of climate change, followed by increased frequency of droughts and floods, sea level rise.
3. The result in Table 4 revealed the views of the teachers on strategies for reducing the effects of climate change. The result showed that majority of the teachers agreed that the items were effective strategies for reducing the effects of climate change. The hypothesis tested also revealed no significant difference in the opinions of male and female teachers. This finding is supported by Lindsay Luke (2017) who carried out a study on The effects of climate change considerations in environmental assessment: A case study of British Columbia's Liquid Natural Gas Sector stating that effect of climate change can be reduced by switching to electric vehicles, unplugging all devices when not in use, etc. Kashyap Vyas (2019) also identified ways to reduce climate change to include putting a stop to chopping of forests, by encouraging the use of public transport, educating people on climate change and saying no to the use of plastic.

Conclusion

Climate change is a complex subject usually surrounded with a lot of skepticism hence the need for conclusive evidence to support climate change reality. The findings of this study have also revealed that science and technology teachers in Minna Metropolis of Niger State are aware of climate change. By implication, the relatively high level of awareness on climate change recorded by secondary school teachers is a positive ingredient in the country's policy on climate change knowledge transfer. Further, the study revealed that secondary school teachers in Minna Metropolis of Niger State perceive some factors as causes and effects of climate change. However, it is imperative that climate change awareness campaign be carried out among secondary school teachers to improve their understanding of climate change and enhance their capacity as agents of climate change knowledge transfer in the classroom.

Recommendations

1. The government should embark on comprehensive awareness creation programmes for secondary school teachers highlighting the content as well as methods for capacity building to ensure that teachers' understanding of climate change is improved.
2. The Ministry of Education, Science and Technology should organize seminars and workshops on climate change for teachers, especially those teaching subjects that have topics climate change to help them acquire current knowledge on this subject.
3. The Ministry of Education, Science and Technology should also develop and circulate learning materials on climate change to all secondary schools in Minna Metropolis of Niger State.

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