
Capacity Building through Teacher Preparation for Climate Change Education.

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Abstract

Faced with the impacts of Climate change on man and its environment, capacity building through the preparation of Science teachers in order to create awareness about Climate change issues in Schools and the society is inevitable. This study investigated the level of capacity building through preparation of science teachers during training on climate change education. The study adopted expo facto and descriptive survey designs. Five research questions guided the study. 117 Science teachers from 18 randomly selected Secondary schools in Obio-Akpor Local Government Area of Rivers State participated in the study. The research instrument was a validated researcher-constructed instrument named 'Teacher Preparedness on Climate Change Questionnaire' (TPCCQ) with a reliability coefficient of 0.70 obtained using Cronbach Alpha formula. The finding of the study revealed a low level of preparation of the science teachers for climate change education during training. The study however found a high level of awareness was found among them, which was attributed to self-study, media and the internet. Hence, it is recommended that Climate change education be included in the curricula for the training of science teachers. Also, workshops should be organised for practising teachers in order to enhance their capacity on Climate change education.

Introduction

According to United Nations Development Programme (UNDP) (n.d.), in 2015, United Nations adopted the Sustainable Development Goals (SDGs) as a call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. Some of these goals are affordable and clean energy (SDG 7), quality life on land (SDG 15) and Climate action (SDG 13). In Paris, Heads of States of 195 nations entered into an agreement to slow down climate change. This was necessary because it was predicted that if the rate of global warming is not slowed down by the year 2100, life will be intolerable, leading to epidemics on land as well as extinction of fish and life under water. Sea level was also predicted to rise due to the melting of the ice sheets, thereby putting coastal cities at risk (Blau, 2017). Some other effects of climate change are high temperatures and pollution

from fossil fuels (such as fossil fuel, wood, coal, e.t.c.), bush burning, emissions from vehicles and generating plants, as well as increase in acidity of ocean waters due to effluents from industries.

Appropriate Climate actions are actions that will reverse, reduce and eliminate the impacts of climate change and ensure a climate that will make life on land and life under water liveable, void of threat and danger to life and existence. Climate unfriendly activities such as illegal bunkering going on in Niger Delta Region, discharging soot into the atmosphere come with its associated discomforts and health complications. Thus quality life on land is being jeopardized and efforts to ensure affordable and clean energy are being hindered. There is therefore the urgent need for appropriate and adequate Climate action.

Quality Education specified as (SDG 4) should provide a holistic development of the learner. This agrees with the philosophy on which Education in Nigeria is based, as enshrined in the National Policy on Education (FRN, 2014), that the individual needs to be developed into a sound and effective citizen for each individual's sake and for the general development of the society. This is to be done through functional education in which school programmes will be relevant, practical and comprehensive. Therefore, some of the National educational goals are

- The inculcation of the right types of values and attitudes for the survival of the individual and the Nigerian society.
- The acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live in and contribute to the development of the society (FRN, 2014).

In the search of energy, livelihood and survival, many citizens embark on Climate unfriendly activities, not knowing their grave impact on humans, animals, the flora, the fauna, the environment and the Climate at large. This is where the school comes to the rescue. According to Armstrong, Krasny and Schuldt (2018), Climate change education is about educating, informing, warning, persuading, mobilizing and solving critical problem about the climate. The citizenry therefore need to be made aware of the consequences of their actions and the need to desist from them. But this knowledge can only be inculcated by Teachers who are grounded in Climate change education through adequate preparation in training.

Teacher preparation is a process or a form of training that leads to capacity building for prospective teachers which will develop and strengthen in them, abilities, skills, knowledge processes needed to succeed as a teacher. Teacher Education in Nigeria is aimed at producing highly motivated and efficient teachers who are provided with the intellectual and professional background adequate for their assignment (FRN, 2014). Sims and Falkenberg (2013) emphasized the need for re-orientation of pre-service teachers in terms of developing competencies which include real – life, problem - solving and experiential learning while Howard (2012) advocated the inclusion of the value dimension of sustainability in pre-service teacher education. Waldron, Mallon, Barry, and Martinez Sainz (2020) similarly noted that formal education has an important role to play in tackling climate change issues. This therefore places a demand for competency in the understanding of climate change issues on the teacher.

Capacity building is the process of developing and strengthening skills, instincts, abilities, processes and resources that organisations and communities need to survive, adapt and thrive in a fast changing world (UNAID, n.d). Karrow, DiGiuseppe, Elliot, Fazio and Inwood (2016) noted that

when pre-service teachers are adequately prepared in environmental education (which include climate change), they will be afforded capacities and competencies such as knowledge, skills and attitudes geared towards positive climate actions. When science teachers are therefore helped to build capacity in climate change education, they will acquire knowledge, skills, attitudes and competencies that will lead to a transformation from within. The transformation will lead to a sustained change of mind set and attitude towards climate change. This change of mind set and attitude will be imparted to the students who will in turn impact the larger society for appropriate climate actions.

The importance of teachers in a nation cannot be overemphasized. No society can develop beyond the quality of her teachers, likewise no teacher can give what he does not have. Are the teachers who are supposed to pass the knowledge across to the students aware of these issues? Ratinen, Viiri and Lehesvuori (2013) found that student teachers did not have the knowledge of climate change. Similarly, Boon (2015) found gaps in pre-service teachers' knowledge of climate change. In the same vein, Boon (2016) found that though the pre-service teachers have a favourable attitude to climate change education, their knowledge of climate change did not change as a result of their training in Bachelor of Education, while Berger, Gerum, and Moon (2015) found that pre-service teachers taught climate change showed a favourable response and many of them suggested that the course on climate change should be made compulsory.

Foss, and Ko (2019) found that science teachers were aware of some basic climate science but they had some misconceptions and scepticism about climate change. Similarly, Nicholls (2016) found that Teachers have different view about the causes of climate change though they accept that the climate is changing. Eze (2020) found that teachers had a higher level of awareness of climate change than their students and they are willing to adopt pro-environmental behaviour, and the higher the level of awareness of climate change, the higher the level of willingness to adopt pro-environmental behaviour.

Nicholls (2016) found that Teachers do not feel supported by their curriculum documents to teach climate change and as such shy away from it while those who included climate change in their lessons source information on it through personal investigation and self-learning. Foss and Ko (2019) found that the teachers supported the teaching of climate change but reported lack of training and absence of climate change in the curriculum as barriers to the climate change education. Little wonder, Falaye and Okwilagwe (2016) found that Secondary schools students have a low knowledge of climate change issues though they exhibited a favourable attitude to it, thereby recommending that teachers should be adequately prepared and sensitized on climate change issues in order to be able to impact the knowledge to the students.

Despite the importance of the SDGs, at less than a decade to the deadline of 2030, Nigeria, who is a member of UN, is far from realizing the goals of protecting the planet, affordable and clean energy (SDG 7), quality life on land (SDG 15) and climate action (SDG 13). Also, many climate-unfriendly activities are witnessed in the society. Could this be attributed to low awareness of climate change education? What is the level of preparation of science teachers during training for climate change education? This study therefore sought to investigate the level of capacity building through preparation during training of science teachers for climate change education.

Aim and objectives of the study

The aim of the study is to investigate the level of capacity building through preparation of science teachers during training on Climate change education. Consequently, the specific objectives of the study are to:

1. Investigate the level of preparation of science teachers during training for climate change education.
2. Determine the level of awareness of science teachers of the inclusion of Climate change concepts in Secondary schools curricula.
3. Ascertain the level of awareness of science teachers about the causes of Climate change.
4. Ascertain the level of awareness of science teachers about the effects of Climate change.
5. Investigate science teachers' sources of the awareness of climate change concepts.

Research Questions

1. What is the level of preparation of science teachers during training for climate change education?
2. What is the level of awareness of science teachers of the inclusion of Climate change concepts in Secondary schools curricula?
3. What is the level of awareness of science teachers about the causes of Climate change?
4. What is the level of awareness of science teachers about the effects of Climate change?
5. What is the source of science teachers' awareness of climate change?

Methodology

This study investigated the level of capacity building through preparation of science teachers during training on Climate change education. The study adopted expo facto and descriptive survey designs. 117 Science teachers from 18 randomly selected Secondary schools in Obio-Akpor Local Government Area of Rivers State participated in the study. The research instrument is a researcher-constructed Questionnaire named 'Teacher Preparedness on Climate Change Questionnaire' (TPCCQ). It was validated by experts in Science Education and Geography & Environmental Management. Cronbach alpha formula was used to obtain a reliability coefficient of 0.70 for the instrument. It was used to gather information from science teachers on their capacity through teacher preparation during training for climate change education. TPCCQ has five (6) sections. Section A gathered information on the bio-data of the respondents. Section B contains statements on the level of preparation of science teachers during training for climate change education, Section C contains a statement on level of awareness of science teachers of the inclusion of Climate change concepts in Secondary schools curricula, Section D contains statements on the level of awareness of science teachers about the causes of Climate change, Section E contains statements on the level of awareness of science teachers about the effects of Climate change, while Section F contains different sources of awareness of climate change out of which science teachers will choose. Statements in Sections B to E on TPCCQ were responded to on a 4 point Likert Scale of Very Low (VL), Low (L), High (H) and Very High (VH) rated 1, 2, 3, and 4 respectively. Mean and ranking were used to analyse the data generated for the study. For research questions 1 to 4, a criterion mean value of 2.50 was used as

basis for decision making. Calculated mean value less than 2.50 is considered to be Low level of awareness, while calculated mean that is equal to 2.50 and above is considered High level of awareness. Data generated for Section F was analysed using ranking.

Results and Discussions

Research Question 1: What is the level of preparation of science teachers during training for climate change education?

Table 1: Mean values of responses on science teachers' preparation for Climate change education during training.

S/N	Items	Mean	Decision
1	While in training, I was prepared to teach Climate change concepts and its causes.	2.03	Low
2	While in training, I was prepared to teach the effects of Climate change.	2.03	Low
3	Climate change concepts are included in the Curricula for science teachers in training.	2.21	Low
	Aggregate	Mean 2.09	Low

Table 1 shows an aggregate mean value of 2.09. This indicates a low level of preparation of science teachers during training for Climate change education. This finding agrees with that of Boon (2015) who found gaps in pre-service teachers' knowledge of climate change. It also agrees with Ratinen et al. (2013) who found that student teachers did not have the knowledge of climate change and Foss, and Ko (2019) who found that the teachers reported lack of training and Boon (2016) who found that the knowledge of pre-service teachers about climate change did not change as a result of their participation in Bachelor of Education programme.

Research Question 2: What is the level of awareness of science teachers of the inclusion of Climate change concepts in Secondary schools curricula?

Table 2: Mean values of responses on science teachers' awareness of the inclusion of Climate change concepts in Secondary school curricula.

S/N	Items	Mean	Decision
4	Climate change concepts are taught in Secondary schools.	2.45	Low

Table 2 shows a low level of awareness of science teachers of the inclusion of Climate change concepts in Secondary schools curricula as indicated by the mean value of 2.45. This finding may be due to the fact that there are actually few climate change related concepts in the Secondary schools curricula. This finding is corroborated by that of Falaye and Okwilagwe (2016) who found that though Secondary schools students exhibited a favourable attitude to climate change issues, they have a low knowledge of them. It also agrees with Foss, and Ko (2019) who found that the teachers reported absence of climate change in the curriculum as one of the barriers to climate change

education and Nicholls (2016) found that teachers do not feel supported by their curriculum documents to teach climate change and as such shy away from it.

Research Question 3: What is the level of awareness of science teachers about the causes of Climate change?

Table 3: Mean values of responses on science teachers' awareness of the causes of Climate change.

S/N	Items	Mean	Decision
5	Human activities are the major causes of Climate change.	3.33	High
6	The use of firewood for cooking is a cause of Climate change.	2.60	High
7	Gas flaring is a cause of Climate change.	3.38	High
8	Vehicular emissions are causes of Climate change.	3.00	High
9	Excessive Lumbering (Deforestation) is a cause of Climate change.	3.16	High
10	Burning of bush and refuse are causes of Climate change.	2.89	High
11	Emission of Greenhouse gases are causes of Climate change.	2.03	Low
Aggregate Mean		2.91	High

As shown on Table 3, an aggregate mean of 2.91 indicates a high level of awareness of science teachers about the causes of Climate change. However, a mean of 2.03 for item 11 indicates a low level of awareness that Emission of Greenhouse gases are causes of Climate change. These findings may be due to inadequate preparation on climate change concept during their training as earlier expressed by them. These findings agree with the finding of Eze (2020) who found that teachers had a higher level of awareness of climate change than their students and they are willing to adopt pro-environmental behaviour. This findings also conforms to the finding of Nicholls (2016) that Teachers have different view about the causes of climate change though they accept that the climate is changing.

Research Question 4: What is the level of awareness of science teachers about the effects of Climate change?

Table 4: Mean values of responses on science teachers' awareness of the effects of Climate change.

S/N	Items	Mean	Decision
12	The effects of Climate change are dangerous to man and his environment.	3.54	High
13	Global warming is an effect of Climate change.	3.53	High
14	Excessive heat is an effect of Climate change.	2.93	High
15	Meningitis and related diseases could be caused by climate change.	2.74	High
16	Melting of polar ice cap is an effect of Climate change.	3.34	High
17	Sea level rise is an effect of Climate change.	3.07	High
18	Flooding is an effect of Climate change.	2.96	High
19	Acid rain is an effect of Climate change.	2.82	High
	Aggregate Mean	3.12	High

Table 4 shows an aggregate mean of 3.12 which indicates a high level of awareness of science teachers about the effects of Climate change. This findings agrees with that of Foss and Ko (2019) who found that science teachers were aware of some basic climate science but they had some misconceptions and scepticism about climate change.

Based on this high level of awareness of science teachers about the causes and effects of Climate change as revealed on Tables 3 and 4, and considering the fact that the respondents indicated a low level of preparation while in training, what then is the source of science teachers' awareness of climate change? Their responses to the question is shown on Table 5.

Research Question 5: What is the source of science teachers' awareness of climate change?

Table 5: Frequency and percentages of responses on the source of science teachers' awareness of Climate change concept.

S/N	Source	Only	%	Plus other Sources	%	Total	%	Rank
1	Teacher Training	4	5.97	12	9.45	16	8.25	4th
2	Self-study	37	55.22	42	33.07	79	40.72	1st
3	Media	15	22.39	39	30.71	54	27.84	2nd
4	Internet	7	10.44	29	22.84	36	18.56	3rd
5	Friends	4	5.97	5	3.94	9	4.64	5th

Table 5 shows the ranking of the sources of the awareness of climate change concepts. The ranking from 1st to 5th has Self-study, Media, Internet, Teacher training and Friends respectively. This goes further to show that the science teachers did not get adequate awareness/ preparation to teach climate change concepts through Teacher training since it is ranked 4th among the sources. This

findings agrees with Nicholls (2016) found that Teachers who included climate change in their lessons source information on it through personal investigation and self-learning.

Implication of Findings

This study has revealed the fact that science teachers were not adequately prepared during training for climate change education. If this anomaly is not corrected, they will not be able to inculcate the knowledge to the students who are supposed to be foot soldiers who will carry the knowledge to their homes, families and the society at large.

Conclusion

Science teachers need to be adequately prepared during training for climate change education. This will enable the achievement of appropriate and adequate Climate action (SDG 13), Affordable and clean energy (SDG 7) and Quality life on land (SDG 15) in Nigeria.

Recommendations

1. Climate change education should be included in the curricula for teachers in training.
2. Science teachers in training should be given adequate preparation on Climate change education.
3. Workshops should be organized to train practising science teachers on Climate change education.
4. Climate change education should be included in Secondary schools curricula.
5. The society should be given adequate awareness of Climate change issues.

References

- Armstrong, A. K., Krasny, M. E., Schuldt, J. P. (2018). *Communicating climate change: A guide for Educators*. NY: Cornell University Press.
- Berger, P., Gerum, N. & Moon, M. (2015). "Roll up your sleeves and get at it" Climate change education in teacher education. *Canadian Journal of Environmental Education*, 20, 154-172.
- Blau, J. (2017). *The Paris Agreement: Climate change, solidarity and human rights*. Switzerland: Palgrave Macmillan.
- Boon, H. J. (2015). Climate change ignorance: An unacceptable legacy. *The Australian Researcher*, 42, 405-427.
- Boon, H. J. (2016). Pre-service teachers and climate change: A stalemate? *Australian Journal of Teacher Education (online)*, 41(4), 39-63.
- Eze, E. (2020). Sociographic analysis of climate change awareness and pro-environmental behaviour of secondary school teachers and students in Nsukka Local Government Area of Enugu state, Nigeria. *International Research in Geographical and Environmental Education*, 29(1), 89-105.

- Falaye, F.V. & Okwilagwe, E. A. (2016). Assessing the senior secondary students' knowledge, attitude and practises related to climate change: Implication for curriculum review and teacher preparation. *Journal of the International Society for Teacher Education*, 20(1), 43-53.
- Foss, A. W. & Ko, Y. (2019). Barriers and opportunities for climate change education: The case of Dallas-Fort Worth in Texas. *The Journal of Environmental Education*, 50(3), 145-159.
- Federal Republic of Nigeria (FRN) (2014). *National Policy on Education*. Lagos: NERDC Press.
- Howard, P. (2012). Who will teach the teachers? Re-orienting teacher education for the values of sustainability. In K. Bartels & K. Parker (Eds.), *Teaching sustainability/teaching sustainably*. 149 – 157. Sterling: Stylus.
- Karrow, D., DiGiuseppe, M., Elliot, P., Fazio, X. & Inwood, E. (Eds.). (2016). Initial teacher education capacities: What is the role of Ontario's faculties of Education? In M. Hirschhorn (Ed.), *What should Canada's teacher know? Teacher capacities: Knowledge, beliefs and skills*. 162 – 191. Ottawa: Canadian Association for Teacher Education.
- Nicholls, J. A. (2016). *Understanding how teachers' view on climate change shape their reported practices*. PhD Thesis, James Cook University. Retrieved from researchonline.jcu.edu.au/48975/
- Ratinen, I., Viiri, J. & Lehesvuori, S. (2013). Primary school student teachers' understanding of climate change: Comparing the results given by concept maps and communication analysis. *Research in Science Education*, 43, 1801-1823.
- Sims, L. & Falkenberg, T. (2013). Developing competencies for education for sustainable development: A case study of Canadian faculties of education. *International Journal of Higher Education*, 2, 1-14. <https://doi.org/10.5430/ijhe.v2n4p1>
- United Nations Academic Impact (UNAI) (n.d.). Capacity building. Retrieved from un.org/en/academic-impact/capacity-building.
- United Nations Development Programme (UNDP) (n.d.). Sustainable Development Goal. Retrieved from undp.org/sustainable-development-goals.
- Waldron, F., Mallon, B., Barry, M. & Martinez Sainz, G. (2020). Climate change education in Ireland: Emerging practice in a context of resistance. In D. Robbins, D. Torney & P. Brereton (Eds.), *Ireland and the climate crisis*. Palgrave studies in Media and Environmental Communication. https://doi.org/10.1007/978-3-030-47597-1_13