Integrating Climate Change Issues in the Upper Basic Schools of the Gambia: A Test Case of the Upper Basic School Curriculum

Article *in* Environmental Earth Sciences · July 2020

CITATIONS
0

READS
117

1 author:

Tobi Owa
University of Gambia
1 PUBLICATION **0** CITATIONS

SEE PROFILE

Journal of Environment and Earth Science www.iiste.org
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online) DOI: 10.7176/JEES
Vol.9, No.4, 2019

Integrating Climate Change Issues in the Upper Basic Schools of the Gambia: A Test Case of the Upper Basic School Curriculum

O.O. Oluwatobi[1]* Francis Adesina[2] B.L.J. Jammeh[3]
1.West African Science Service Center on Climate Change and Adapted Land Use (WASCAL)
2.Department of Geography, Obafemi Awolowo, Ile-Ife, Nigeria
3.Curriculum Department, Ministry of Education, The Gambia

Abstract
The study reported here focuses on integrating climate change issues in School curriculum in The Gambia. The objectives are to determine the extent to which climate-related themes presently feature in the Upper Basic (lower secondary) schools of The Gambia; propose an integration plan for enhanced climate themes in the school curriculum; and identify suitable teaching methods for conveying climate change information to students. A curriculum audit of two subject areas in the Upper Basic School where Climate issues could be taught was done. Also, a determination of suitable teaching methods for climate change themes was done with a set of questionnaires administered to 104 teachers and educators. Literature review was used to determine suitable themes for integration in the school curriculum and to obtain appropriate teaching methods. The Likert scale was used to rate the suitability of the various methods. The findings revealed that there are gaps in the curriculum in relation to climate change. For example, they showed an insufficient explanation of the impacts of climate change on human health and an omission of climate change impacts on the ecosystem. Of the 14 teaching methods which constituted the items included in the questionnaire, 12 were considered appropriate for teaching climate change themes. There was no significant difference between the mean responses of educators and teachers on the appropriate methods for teaching climate change topics. The study recommends inclusion of themes such as renewable energy sources into the school curriculum.
Keywords: Climate Change, Teaching Methods, Curriculum, Integration, Upper Basic School
DOI: 10.7176/JEES/9-4-05
Publication date: April 30th 2019

1. Introduction

The debate about whether climate is changing has largely been laid to rest. Increased frequency of extreme climatic events, floods and storms especially in the tropical environment are some of the signals of changes in the climate. For instance, globally, virtually every successive year since 2010 has been hotter (e.g. UK Met Office, 2017). Robison and Brooks (2010) observed that " Variation in rainfall: drought and flooding – the intrusion of saltwater along the River Gambia during dry seasons, as well as soil degradation, has led to decreases in areas of lowland rice planting. Flash floods in the inner delta of the Niger River have led to loss of pastoral areas and breeding areas for fish. In the Grand Popo region of Benin, floods have occurred annually from July November since 2000, making travel impossible without a canoe."

As agreed under the United Nations Framework Convention on Climate Change especially within the context of the Paris Agreement of 2015, communities and individuals must continue to take concrete actions to assuage the negative impacts of climate change through mitigation and adaptation actions, Some of the actions will require adopting practices and lifestyles that limit the production of greenhouse gases. They will also include actions that make it possible for the individuals and communities to cope with the growing adverse impacts of climate change.

A critical requirement is proper education on the phenomenon of climate change and about what to do to address it. Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits (wikipedia.org). The individual and the society at large must know and appreciate the fact that the phenomenon has come to live with us for many years ahead. They must know the anthropogenic causes of the phenomenon and be conscious of what is required both to live with the known impacts, and contribute to slowing down the rate of the change.

Considerable sensitization is going in many countries in West Africa to raise awareness on this major environmental challenge of our time (e.g., Robinson and Brooks, 2010; https://www.usaid.gov/west-africa-regional/environment). In the Gambia, some efforts which have been made included the initiatives put in place by The Gambian government such as the production of a simplified version of The Gambia's First National Communication (FNC), containing some climate change initiatives, in an A5 booklet with illustration in colored pages which was later distributed for use in educational institute countrywide as a teaching aid. Training of teachers during the first and second phases of a Training of Information Program on the Environment (TIPE) project is another good initiative. Some other programs carried out included a series of training programs on the Kyoto Protocol process, which took place from 2004-2012. Training was also given to 12 professionals who

work at the land use change and forestry (LUCF) and agricultural sectors by a three-year Greenhouse Gas Inventory (GHGI) project implemented in the Gambia. (Gambia's Second National Communication). As robust as some of these campaigns are, they are yet to make appreciable impacts on attitudes of several individuals and communities. There is clearly a need to pay more attention to infusing climate change issues into the formal education system to constitute what makes an educated person in a particular country. This is the focus of this paper with particular attention on the republic of Gambia. For this to be effectively done, the curriculum must be adjusted to include climate change content. Curriculum can therefore be defined as a deliberately and systematically planned body of knowledge, skills and attitudes which are grouped into subject topics and taught to learners in schools (Ikehi et al., 2014). Curriculum is also viewed "… as the document used as instructional guide in formal institutions", (Chakeredza, *et al*., 2009). Ikehi *et al*., 2014 pointed out that "curriculum is a deliberately and systematically planned attempt to change the behavior of young and inexperienced to enable them gain the insight that helps them solve problems for a better society" and the list of subject topics taught in schools is what is generally referred to as curriculum. Again, curriculum could be planned and received. Planned curriculum referred to the blueprint in syllabuses and prospectus while actual or received curriculum refers to what is realized in terms of pupil's experience (Kelly, 2009)

Integration simply refers to the incorporation of something into another in order to improve it (Ikehi et al 2014). To actualize the goal of effecting an attitudinal change in the general public through climate change education the following objectives were targeted.

To determine the extent to which climate-related themes presently feature in the Upper Basic (lower secondary) schools of The Gambia;

To propose an integration plan for enhanced climate themes in the school curriculum; and

To identify suitable teaching methods for conveying climate change information to students.

2. Methodology

To achieve objectives 1&2

A curricula audit was done to determine the specific climate change topics already been taught in Upper Basic (lower secondary) schools of The Gambia. This was done to identify the existing gaps in them in relation to climate change education. A list of climate change themes developed was used for the audit and observations were made on areas that need adjustments in the curriculum as well as where integration of new climate change themes could be carried out. The result of the audit also revealed all the climate themes already featured in the curriculum.

To achieve objective 3

A research question was developed and answered by the study. Descriptive survey research design was employed for the study. The sample for the study was 104, 25 educators at the Ministry of Basic and Secondary Education and 79 teachers in schools which participated in an environmental program, selected using purposive sampling. The sample selection considered those who are well placed to answer the questions. A 14-item structured questionnaire was developed from the literature reviewed for the study and was used for data collection. Weighted mean was used to answer the research questions. Standard deviation was used to validate the mean. To answer the research questions, each item was assigned real limit number as follows; stronglyagree-4.50-5.00, agree-3.50-4.49, strongly disagree- 2.50-3.49, Disagree- 1.50-2.49, Don't know- 1.00-1.49. Any item with a weighted grand mean (X_G) of 3.50 and above was considered as "agree" while any item whose weighted grand mean is below 3.50 was considered as "disagree". The standard deviation was used to determine the closeness of the respondents from the mean and to each other and otherwise.

3. Results

Table1. Climate Change Themes for Integration

Theme	Units	Content
1. Climate change concept	1. Meaning of the concept 2.Definition of related concepts 3. Aims and purposes of studying climate change 4. The climate system The climate parameters 5. The basic science of climate change	What is climate change? Difference between weather and climate Relationship between weather and climate What is greenhouse effect? Consist of five major components; The atmosphere, hydrosphere, cryosphere, land surface and the biosphere. Temperature, humidity, wind, precipitation The atmosphere; structure of the atmosphere; troposphere, mesosphere, stratosphere, thermosphere and exosphere.

Theme	Units	Content
2. The causes of climate change	1. Natural causes 2. Anthropogenic emissions 3. Agricultural activities like clearing, tilling 4. CO2 from industrial and steam engines 5. Increased refuse/waste dumps 6. Ocean current process 7. Gas flaring	How are we causing climate change Gases causing climate change include H_20 vapour, $C0_2$, CH_4,$N0_2$ etc. Burning fossil fuel in car, industry and homes, deforestation, burning of forests
3. The impacts of climate change	1. Melting ice and sea level rise 2. Changes in precipitation pattern 3. Impacts on organism 4. Impacts on ecosystem 4. Impacts on human health 5. Impacts on agriculture 6. Aquatic lives 7. Livestock 8. Soil	Thermal expansion, melting of land ice Stronger hurricanes, reduced rainfall, greater drought and more water Decrease in organisms Increase in ill-health related diseases and death Drought ,desertification, flooding
4. Mitigation of climate change impacts	1.Fossil fuel emission 2. Control of greenhouse gas production 3. Climate change education 4. Proper waste management (burying of wastes). 5.Bio-engineering of microbes to eliminate GHG 6. Stipulating laws and policies	Switching to low to zero carbon energy sources such as solar, wind, wave energies (renewable energies). Expanding forests and other "sinks" to remove greater amount of $C0_2$ from the atmosphere. Conversion of agricultural or forestry waste to fuel.
5. Adaptation to climate change impacts and disaster risk reduction.	1. Use of irrigation facilities 2. Practicing climate-smart agriculture 3. Filling the sky with Sulphur IV Oxide to block intense solar rays	Increase crop production using Irrigation facilities Adopt climate change sensitive crop varieties and cultivars Strengthen early warning system Adopting agro-forestry system Creating grazing areas for herdsmen Concepts of disaster preparedness How to identify risks, local threats and vulnerabilities and their relationships

Table 2. Social and Environmental Studies (Grade 7)

Theme of SES	**Unit and Page**	**Climate Change(CC) Themes found**		**Gaps and Suggestions**
		Theme	Units of CC Theme	
Theme 1	2, pg. 8	Climate change concept The impacts of CC	The climate system Changes in precipitation pattern	
Theme 2	1, pg.38	The impacts of CC	Impacts on agriculture	

Table 3. Social and Environmental Studies (Grade 8)

Theme of SES	Unit and Page	Climate change (CC) Themes found		Gaps and Suggestions
		Theme	Units of CC Theme	
Theme 2	4, pg. 40	Climate change concept	Definition of related concept	Climate
	5, pgs. 44-49 5, pgs. 50-51	Climate change concept Climate change concept The causes of climate change	Definition of related concept The climate system The climate parameters Anthropogenic emissions	Difference between weather and climate Relationship between weather and climate Temperature, humidity, wind, precipitation Burning fossil fuel in car, industry, deforestation and burning of forests or bushfires.
	6, pgs. 52 -55	The causes of climate change	Natural causes	Gases causing climate change include; water vapour. Salt water intrusion resulting from evaporation which is caused by high temperature.

Table 4. Social and Environmental Studies (Grade 9)

Theme of SES	Unit and Page	CC Theme found		Gaps/Suggestions
		Theme	Units of CC Theme	
1	1, pg. 5, 14	Climate change concept	The climate system	Land surface, hydrosphere.

Table 5. Science (Grade 7)

Theme of Science	Unit and Page	CC Theme found		Gaps/ Suggestions
		Theme	Units of CC Theme	
2	1, pg. 29	Climate change concept	The climate parameters	
3	1, pgs. 54-57	Causes of climate change	Gases causing climate change	Water vapour, $C0_2$ not well explained (could be improved upon)
4	1, pgs. 67-68, 74-75	Climate change concept	The basic science of climate change	The atmosphere not elaborate (could be improved upon)
	2, pgs. 78-79	Climate change concept	The climate system	
5	1, pgs. 87-89	Impacts of climate change	Impacts on ecosystem	Impact on ecosystem should be included.
9	1, pg. 124	Mitigation of climate change impacts	Fossil fuel emission	

Table 6. Science (Grade 8)

Theme of Science	Unit and Page	CC Theme found		Gaps/ Suggestions
		Theme	Units of CC Theme	
1	3, pg.12	Impacts of CC	Impact on ecosystem	Decrease in organism not emphasized but could be a good entry point
5	1, pgs. 41-42	Mitigation of climate change impacts	Reduction of greenhouse gas production Proper waste management	
7	1, pgs. 52-55	Impact of climate change	Impacts on human health	Impacts on human health not focused on and could be a good entry point for effects on normal functioning of human internal organs.

Table 7. Science (Grade 9)

Theme of Science	Unit and Page	CC Theme found		Gaps/Suggestions
		Theme	Units of CC Theme	
1	1, pgs. 4-9	Impact of climate change	Impacts on ecosystem	Interruption in the life cycle of organisms and adaptation to their environment missing
5	1, pgs. 55-75	Impact of climate change	Impacts on health	How climate change interrupts the normal functioning of the body system not included.
6	1, pg. 79	Mitigation of climate change impacts	Proper waste management	
6	2, pgs. 81-85	Impacts of CC	Impacts on health	Impacts of climate change on spread of diseases not found. It should be added.
7	1, pg. 89	Mitigation of climate change impacts	Controlling the production of greenhouse gases	Switching to low to zero carbon energy sources such as solar, wind, wave energies (and other renewable sources of energy) not well explained, it should be well explained.
7	1, pg. 89	Mitigation of climate change impacts	Proper waste management	Conversion of agricultural or forestry waste to fuel.

Results of the teaching methods for climate change topics are displayed below

Table 8. Mean rating of respondents on the most appropriate method for teaching the meaning

S/N	Item statement on the method	X_E	X_T	SD_E	SD_T	X_G	SD_G	t-cal	p-value
1	Teacher-centered	3.1200	3.3418	1.1299	1.03634	3.2885	1.05824	-.913	.364
2	Child-centered	4.4400	4.3924	2.71181	.83846	4.4038	.80676	.256	.799
3	Resource-based learning	4.4000	4.2658	.86603	.91580	4.2981	.90178	.647	.519
4	Lecture method	3.1600	3.5696	1.28062	1.26778	3.4712	1.27680	-1.405	.163
5	Demonstration method	4.4000	4.4051	.64550	.70745	4.4038	.69000	-.032	.975
6	Discussion method	4.6000	4.4430	.50000	.71157	4.4808	.66800	1.024	.308
7	Field trip, excursion	4.5200	4.4810	.96264	.86024	4.4904	.88125	.192	.848
8	Role play/modeling/drama	4.3200	3.9747	.98826	1.02500	4.0577	1.02234	1.480	.142
9	Project work or activity	4.3600	3.9747	.90738	1.10911	4.0673	1.07274	1.577	.118
10	Experimental/exploration	4.4800	4.1899	.58595	.96178	4.2596	.89220	1.424	.157
11	Student participation	4.6400	4.3797	.70000	.88149	4.4423	.84563	1.346	.181
12	Audio visual Video/picture	4.6400	4.4177	.63770	.85646	4.4712	.81201	1.195	.235
13	Brainstorming	4.0400	4.1013	.61101	1.03273	4.0865	.94623	-.281	.779
14	Combination of diff mtds.	4.3200	4.0506	1.02956	1.06095	4.1154	1.05488	1.114	.268

N= 104 (25 Educators and 79 Teachers).

The table 8 above shows the mean rating of respondents (Educators and Teachers) on the most appropriate method for teaching the meaning of climate change. From the above table, the weighted grand mean of both the educators and teachers ranged from 3.2885 to 4.4904. The items whose weighted grand mean was below 3.50 include teacher-centered method and lecture method. All other methods had their weighted grand mean above 3.50. Therefore, the most appropriate method for teaching the meaning of climate change include; Child-centered, resource-based learning, Demonstration method, Discussion method, Field trip, excursion and site seeing, Role play/modeling/drama, Project work or activity, Experimental/exploration and research for knowledge construction, Student participation in community, Audio visual Video/picture show, Brainstorming, Combination of different methods. The P-value of above 0.05 for all the items indicated no significant difference between the responses of the educators and teachers.

Table 9. Mean rating of respondents on the most appropriate method for teaching the causes of climate change.

S/N	Item statement on the method	X_E	SD_E	X_T	SD_T	X_G	SD_G	t-cal	p-value
1	Teacher-centered	3.5200	1.15902	3.1899	1.11028	3.2692	1.12544	1.282	.203
2	Child-centered	4.6400	.48990	4.3418	.88992	4.4135	.81979	1.597	.113
3	Resource-based learning	4.4000	.86603	4.2278	.79983	4.2692	.81528	.919	.360
4	Lecture method	3.3200	1.10755	3.6835	1.11567	3.5962	1.11929	-1.422	.158
5	Demonstration method	4.3200	.74833	4.3797	.62642	4.3654	.65445	-.396	.693
6	Discussion method	4.4800	.65320	4.3418	.78260	4.3750	.75283	.799	.426
7	Field trip, excursion and site seeing	4.6000	.57735	4.3544	1.06263	4.4135	.97154	1.103	.273
8	Role play/modeling/drama	4.3600	.75719	3.9114	1.10000	4.0192	1.04260	1.899	.060
9	Project work or activity based learning	4.5600	.50662	3.8481	1.09882	4.0192	1.03324	3.128	.002
10	Experimental/exploration and research for knowledge construction	4.5600	.50662	4.0886	1.01514	4.2019	.93870	2.230	.028
11	Student participation in community Environmental project	4.4400	.82057	4.3165	.76030	4.3462	.77296	.695	.489
12	Audio visual Video/picture show	4.5200	.65320	4.3291	.87298	4.3750	.82659	1.006	.317
13	Brainstorming	4.0400	.88882	3.9114	1.10000	3.9423	1.05045	.532	.596
14	Combination of different methods	4.4800	1.00499	4.1013	.87112	4.1923	.91457	1.825	.071

N= 104 (25 Educators and 79 Teachers).

The table 9 above shows the mean rating of respondents (Educators and Teachers) on the most appropriate method for teaching the causes of climate change. Based on the assigned real limit value for the items, a weighted grand mean (X_G) of 3.50 and above was considered as "agree" while weighted grand mean of below 3.50 was considered as "disagree". The range of the weighted grand mean of both the teachers and educators is 3.2692 to 4.3750 and items whose weighted grand mean were above 3.50 include the following; Child-centered, Resource-based learning, Lecture method, Demonstration method

Discussion method, Field trip, excursion and site seeing, Role play/modeling/drama Project work or activity based learning, Experimental/exploration and research for knowledge construction Student participation in community environmental project, Audio visual Video/picture show, Brainstorming, Combination of different methods. The P-value of above 0.05 for all the items indicated no significant difference between the responses of the educators and teachers.

Table 10. Mean rating of respondents on the most appropriate method for teaching the impacts of climate change.

S/N	Item statement on the method	X_E	SD_E	X_T	SD_T	X_G	SD_G	t-cal	P-value
1	Teacher-centered	3.4000	.95743	3.5443	1.10706	3.5096	1.07030	-.586	.559
2	Child-centered	4.6400	.48990	4.2532	.94011	4.3462	.86764	1.970	.052
3	Resource-based learning	4.4800	.77028	4.3291	.67409	4.3654	.69754	.942	.348
4	Lecture method	3.4000	1.11803	3.7089	1.07598	3.6346	1.08885	-1.239	.218
5	Demonstration method	4.2800	.89069	4.2911	.81888	4.2885	.83227	-.058	.954
6	Discussion method	4.4400	.58310	4.4177	.76137	4.4231	.71993	.134	.894
7	Field trip, excursion and site seeing	4.6800	.47610	4.4177	.74434	4.4808	.69646	1.655	.101
8	Role play/modeling/drama	4.3200	.85245	4.0253	1.02500	4.0962	.99043	1.301	.196
9	Project work or activity based learning	4.4000	.70711	3.9494	1.09660	4.0577	1.03179	1.928	.057
10	Experimental/exploration and research for knowledge construction	4.4800	.65320	4.2152	.85741	4.2788	.81796	1.418	.159
11	Student participation	4.5600	.71181	4.3291	.85817	4.3846	.82800	1.218	.226

S/N	Item statement on the method	X_E	SD_E	X_T	SD_T	X_G	SD_G	t-cal	P-value
12	Audio visual Video/picture show	4.5600	65064	. 4.4177	.81031	4.4519	.77434	.799	.426
13	Brainstorming	4.0000	.70711	3.7848	1.27773	3.8365	1.16678	.802	.424
14	Combination of different methods	3.9200	1.07703	4.0127	.99349	3.9904	1.00962	-.398	.691

N= 104 (25 Educators and 79 Teachers).

From the above table, the weighted grand mean of the items ranged from 3.5096 to 4.4519, indicating that all the items were agreed upon by both teachers and educators as being apt for teaching the impacts of climate change. The methods appropriate for teaching the impacts of climate change are; Teacher-centered, Child-centered, Resource-based learning, Lecture method, Demonstration method

Discussion method, Field trip, excursion and site seeing, Role play/modeling/drama Project work or activity based learning, Experimental/exploration and research for knowledge construction, Student participation in community environmental project, Audio visual Video/picture show, Brainstorming, Combination of different methods. The P-value of above 0.05 for all the items indicated no significant difference between the responses of the educators and teachers.

Table 11. Mean rating of respondents on the most appropriate method for teaching the mitigation of climate change.

S/N	Item statement on the method	X_E	SD_E	X_T	SD_T	X_G	SD_G	t-cal	P-value
1	Teacher-centered	2.9600	1.09848	3.6582	1.10808	3.4904	1.14056	-2.752	.007
2	Child-centered	4.6000	.50000	4.1266	1.04227	4.2404	.96033	2.187	.031
3	Resource-based learning	4.4800	.87178	4.3038	.82204	4.3462	.83340	.921	.359
4	Lecture method	3.4000	1.11803	3.8101	1.09867	3.7115	1.11192	-1.620	.108
5	Demonstration method	4.3200	.90000	4.5063	.65776	4.4615	.72303	-1.124	.263
6	Discussion method	4.6000	.57735	4.3797	.80549	4.4327	.76023	1.266	.208
7	Field trip, excursion and site seeing	4.8000	.57735	4.1013	1.19395	4.2692	1.11678	2.817	.006
8	Role play/modeling/drama	4.4400	.82057	4.0253	1.03744	4.1250	1.00182	1.824	.071
9	Project work or activity	4.3600	.95219	3.9747	1.16547	4.0673	1.12573	1.501	.137
10	Experimental/exploration	4.6000	.57735	4.1266	.92497	4.2404	.87573	2.410	.018
11	Student participation in community	4.6000	.70711	4.3418	.97252	4.4038	.91926	1.227	.223
12	Audio visual Video	4.4800	.58595	4.2785	.89065	4.3269	.82958	1.059	.292
13	Brainstorming	4.2000	.76376	3.7975	1.20235	3.894	1.12274	1.574	.119
14	Combination of different methods	4.1600	1.06771	4.0506	1.06095	4.0769	1.05841	.449	.655

N= 104 (25 Educators and 79 Teachers).

The suitable teaching methods for instruction on climate change mitigation are Teacher-centered, Child-centered, Resource-based learning, Lecture method, Demonstration method, Discussion method, Field trip, excursion and site seeing, Role play/modeling/drama Project work or activity based learning, Experimental/exploration and research for knowledge construction, Student participation in community environmental project, Audio visual Video/picture show, Brainstorming, Combination of different methods.

Table 12. Mean rating of respondents on the most appropriate method for teaching adaptation to climate change.

S/N	Item statement on the method	X_E	SD_E	X_T	SD_T	X_G	SD_G	t- cal	P-value
1	Teacher-centered	3.2400	1.05198	3.6582	1.09645	3.5577	1.09568	-1.678	.096
2	Child-centered	4.7600	.43589	4.3544	.78508	4.4519	.73577	2.460	.016
3	Resource-based learning	4.6800	.47610	4 .2532	.82382	4.3558	.77483	2.459	.016
4	Lecture method	3.5200	1.04563	3.7975	1.01754	3.7308	1.02617	-1.181	.241
5	Demonstration method	4.5600	.58310	4.3418	.76604	4.3942	.72965	1.308	.194
6	Discussion method	4.520	.65320	4.4430	.65529	4.4615	.65245	.512	.610
7	Field trip, excursion	4.6400	.63770	4.3165	.98116	4.3942	.91819	1.546	.125
8	Role play/modeling/drama	4.4000	.70711	4.0380	.97984	4.1250	.93151	1.709	.090
9	Project work or activity	4.3600	.90738	4.0759	.94424	4.1442	.93910	1.323	.189
10	Experimental/exploration	4.6000	.50000	4.1139	.94716	4.2308	.88384	2.454	.016
11	Student participation in community	4.5600	.76811	4.2911	.87928	4.3558	.85807	1.371	.173
12	Audio visual Video	4.5200	.65320	4.2278	.94665	4.2981	.89094	1.436	.154
13	Brainstorming	4.2000	.70711	3.9873	1.12653	4.0385	1.04206	.888	.376
14	Combination of different methods	4.2400	1.05198	4.0759	1.05942	4.1154	1.05488	.676	.501

N= 104 (25 Educators and 79 Teachers).

The suitable teaching methods for instruction on climate change adaptation are Teacher-centered, Child-centered, Resource-based learning, Lecture method, Demonstration method,Discussion method, Field trip, excursion and site seeing, Role play/modeling/drama Project work or activity based learning, Experimental/exploration and research for knowledge construction, Student participation in community environmental project, Audio visual Video/picture show, Brainstorming, Combination of different methods.

P-value

The P-value of all the items was obtained using the statistic generated from the software used for the data analysis. The P-value of above 0.05 for all the items indicated no significant difference between the responses of the educators and teachers.

4. Discussion

The results of the research were in consonance with the findings of (Oversby, 2015), in which innovative pedagogical methods such as provocative discussion statements, generation of questions, collaborative games which initiates engagement of learners, provoking student-relevant questions, considering instructions in the light of learners' prior knowledge and their skills of independent learning were considered the most appropriate methods for teaching climate change education. The results from tables 1, 2 and 4 showed that appropriate methods for teaching the meaning of climate change included child-centered, resource-based learning, demonstration method, discussion method, field trip, excursion and site seeing, role play/modeling/drama, project work or activity, experimental/exploration and research for knowledge construction. This is in consonance with the findings of (UNICEF, 2012) which stated that environmental projects uphold the fundamental principles that are child-based, child-involving and environmentally protective like all other activities. It is also in alignment with the findings of (UNICEF, 2012), in which the involvement of school children in climate change was advocated, especially those from marginalized communities. It supported child-based approaches, which allow conduct of research and communication of findings and ideas by students. The result of the analysis also revealed that child-centred approach and resource-based methods are the most appropriate methods for teaching the themes of climate change.

5. Conclusion

Integration of climate change education into the National curriculum of The Gambia involves a strategic process such as a careful audit of the curriculum as was carried out in the study to identify the gaps that should be filled with climate change education. In order to do this, the needs or the level of understanding of the students in relation to the subject matter to be taught should be considered which would thereafter be followed by the use of a clearly designed teaching technique as was investigated in this study. In order to effectively teach the various themes of climate change, it is essential to employ the specific methods considered appropriate for doing so. This is important due to the varying learning abilities of the students, as that would ensure that the various categories of learners are included in the learning plan through a combination of different methods for teaching climate

change topics. The learning plan hence stands a good chance of conveying climate change information effectively through the entrenchment of the phenomenon in the students for deep-rooted knowledge of its components. It will also awaken in them a vivid consciousness of the roles the environment play in their sustenance as well as their responsibilities to protect and preserve it for the coming generations.

6. Recommendations

It is recommended that all the items identified as appropriate methods for teaching climate change themes be used to teach them after inclusion in the Social and Environmental Science and General Science of the Upper Basic Curriculum, especially in The Gambia.

Other recommendations include capacity building for teachers to effectively teach the topics on climate change. In addition, discovery of and excursion to affected places e.g. coastal places of Banjul and Tanji, observation with questions and answers, debates, one on one conversation on climate change topics, group presentation and invitation of special guests.

References

Robison R. and Brooks, R.F. (200), West Africa: the climate of change Climate change impacts, awareness and preparedness across West Africa, University of Cambridge Programme for Sustainability Leadership

Adesina, F. A., & Odekunle, T. O. (2011). Climate Change and Adaptation in Nigeria : Some Background to Nigeria ' s Response - III, *15*, 146–154.

Chakeredza, S., Temu, B., Yaye, A., Makungwa, S., & Saka, D. K. (2009). Mainstreaming Climate Change into Agricultural Education : Mainstreaming Climate Change into Agricultural Education :

Ikehi, M. E., Ifeanyieze, F. O., & Ugwuoke, C. U. (2014). Integration of Climate Change into the Senior Secondary School Agricultural Science Curriculum in Nigeria, (October), 614–621.

IPCC, 2007. (2007). *Climate Change 2007: impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel. Genebra, Suíça*. https://doi.org/10.1256/004316502320517344

Kelly, A. V. (2009). The Curriculum: Theory and Practice. *SAGE Publications Ltd; Sixth Edition Edition*, 336. https://doi.org/10.1080/02615470802681344

Okoli, N. J. (2014). Teacher preparation and climate change curriculum at university level in nigeria, *2*(3), 1–8.

UNICEF. (2012). Climate Change and Environmental Education. *Child Friendly Schools Manual*, 39. Retrieved from http://www.unicef.org/publications/files/CFS_Climate_E_web.pdf

Ikehi, M. E., Ifeanyieze, F. O., & Ugwuoke, C. U. (2014). Integration of Climate Change into the Senior Secondary School Agricultural Science Curriculum in Nigeria, (October), 614–621.

IPCC, 2007. (2007). *Climate Change 2007: impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel. Genebra, Suíça*. https://doi.org/10.1256/004316502320517344

Okoli, N. J. (2014). Teacher preparation and climate change curriculum at university level in Nigeria, 2(3), 1–8.

David Smawfield, 2013. Education and Natural Disasters. 2013.

Kelly, A. V. (2009). The Curriculum: Theory and Practice. *SAGE Publications Ltd; Sixth Edition Edition*, 336. https://doi.org/10.1080/02615470802681344