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Full Length Research Paper

Assessment of junior high school students' awareness of climate change and sustainable development in central region, Ghana

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ABSTRACT

The study investigated the extent to which students of 13 Junior High Schools (JHS) in Twifu Praso district and Cape Coast metropolis in the Central Region of Ghana were aware of issues related to climate change and sustainable development. It adopted the descriptive survey design and employed the purposive sampling technique to select 400 final year research participants to respond to questionnaire items based on their school curriculum. The analysis was however based on valid responses of 367 respondents. There was a statistical significant difference in the awareness of climate change between students in rural and urban schools. However, students' awareness of climate change and sustainable development was generally low. Also, there was no difference found in the students' awareness of sustainable development. The age of students had no significant influence on their performance in climate change and sustainable development test. Implications of these findings were discussed and it was suggested that climate change units be included in the teaching syllabuses/curricular and teachers should give more attention to the prescribed units of the text books.

Key words: climate change, sustainable development, junior high school curriculum, awareness, Ghana.

INTRODUCTION

Climate change is one of the greatest threats facing humankind today. This is because it has a lot of implications for the survival of man. As an ecological being, man needs a conducive environment for effective and fruitful living. The IGAD Climate Prediction and Applications Centre (ICPAC) points out that "we must adapt or die" (Ogallo, 2009). It is primarily for this reason that the challenge of climate change adaptation is no longer a question of 'if', but that of 'how' countries should adapt. If there can be effective adaptation to the complex global challenges climate change brings, then we need to critically examine the nature of the school curriculum with a view to determining how best the learning experiences and others meet current needs. If they fall short, then the need will arise for the creation of new curricula, new teaching methods, new pedagogies and structures suitable for building the necessary capacities for climate

change. There will be the need to adopt well-coordinated and collaborative efforts to galvanise adhoc response activities at individual and institutional levels across Africa. These would not only be in line, but most importantly be guided by the Bonn Declaration (2009) which among other things indicated that education for sustainable development is setting a new direction for education and learning for all and based on values, principles and practices necessary to respond effectively to current and future challenges.

Climate Change

Climate change is a continuous rapid and prolonged alteration of climate in one direction; it is the variation in global or regional climates over time. It reflects changes

in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth (e.g. volcanoes), or external forces (e.g. variation in sunlight intensity or, more recently, human activities). Used in the context of environmental policy, climate change refers to only the changes in modern climate, including the rise and in average surface temperature known as global warming (UNFCCC, 2004).

In some cases, the term is also used with a presumption of human causation, as in the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC uses "climate variability" for non-human caused variations. Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. The Intergovernmental Panel on Climate Change (IPCC) concludes that most of the observed temperature increases since the middle of the 20th century was caused by increasing concentrations of greenhouse gases resulting from human activity such as fossil fuel burning and deforestation. The IPCC also concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial time to 1950 and had a small cooling effect afterward. These basic conclusions have been endorsed by more than 40 scientific societies and all Academies of Science of the major industrialized countries (Bruckschen, Oesmanna andViezer, 1999).

Eboh (2009 p. 11) agreeing with the Intergovernmental Panel on Climate Change (IPCC), explained climate change as 'statistically significant variations that persist for an extended period, typically decades or longer'. It is made up of discrepancies in the occurrence and magnitude of sporadic weather events and concomitant rise in world mean surface temperature. Anyadike (2009, p. 17) points out that a situation in which a change continues in one direction at a rapid rate and for an unusually long period of time is known as climate change. The changes are however cyclical or largely unnoticed, except by climatologists'. Today, climate change is a global phenomenon which has multiple impacts on man and his environment.

There is debate as to whether climate change is man-caused, nature-caused or man and nature-caused. There are two major categories of causes of climate change: human activities and natural phenomena. Human activities include pollution from industrial processes and agricultural practices which directly influence the climate of the earth such as (bush burning, deforestation, desertification, burning of fossil fuels such as coal, oil and gas). These fuels contain carbon which is emitted as carbon dioxide (CO₂) gas. These are significant potential factors in climate change. For Ozor (2009), climate change is attributed to natural variability and human activity on the environment. Climate change can be regarded as a change of climate attributed directly or

indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Factors which can shape climate are often called climate forcing. They include such processes as variations in solar radiation, deviations in the Earth's orbit, mountain-building, continental drift, and changes in greenhouse gases namely CO₂, CFC and SO₂ concentration. Over time, an increase in atmospheric greenhouse gas concentrations could lead to changes in temperature, precipitation and sea level and in the frequency and intensity of extreme events (UNFCCC, 2004). Spencer (2009) was part of the debate as to what is responsible for climate change and his position is that it is natural and not man made. To him, the natural phenomena that contribute to climate change include solar output, variations in the Earth's orbit, (orbital variations), volcanism, ocean variations, etc

Nwafor (2008) observed that since 1850, the first date from which there was a consistent accurate measurement, the earth's average temperature had risen by 0.76°C, and that the temperature had increased by almost 0.8°C worldwide. He added that since reliable records began, eleven (11) of the twelve (12) warmest years worldwide occurred between 1995 and 2006. The impact of the rising temperatures can be seen in the melting ice in the Arctic Sea, rain and snowfall patterns, droughts and heat waves, and the intensity of tropical cyclones (European Commission, 2007). On longer time scales, alterations to ocean processes play a key role in redistributing heat by carrying out a very slow and extremely deep movement of water, and the long-term redistribution of heat in the world's oceans. According to US Geological survey, however estimates are that human activities generate more than 130 times the amount of carbon dioxide emitted by volcanoes (Wignall, 2001).

It has been firmly established that human inhabitants of the earth are altering the climate through global warming as a result of greenhouse gas emissions (Pender, 2008). He posits that climate change in the next hundred years will be significant and by the year 2100 between 1.8 °C and 4 °C rise in average global temperature will be experienced, although it could possibly be as high as 6.4 °C. Aliyu (2009) wrote that climate change would constrain the ability of developing countries to attain their poverty reduction and sustainable development objectives under the United Nations Millennium Development Goals (MDGs).

Generally, the following are some of the effects of climate change:

- Food production will be particularly sensitive to climate change, because crop yields depend directly on climatic conditions (temperature and rainfall patterns), and could lead to reduction in food yields.

- Tropical cyclones will become stronger, with faster wind speeds increasing the amount of damage they cause.
- Floods will become more common due to changing rainfall patterns and glacier melt in the summer.
- Sea level rise could inundate large areas of low lying countries.
- The changing climate may indirectly cause misery by increasing the incidence of disease and conflict.
- Biological diversity, the source of enormous environmental, economic, and cultural value will be threatened by climate change.

The implications of these effects of climate change are that there must be some intervention strategies to combat the situation. In Eurobarometer (2009) study sponsored by the European Commission, it came out that at country level; more than six out of ten Europeans (62%) considered the issue of climate change as critical. In this study, more than eight in ten of Cypriot (81%) citizens and more than seven in ten of Greek (74%), Slovak (72%), Swedish (72%) and Danish (71%) respondents indicated that fighting climate change could have a positive impact on the European economy (Eurobarometer, 2009). One of the strategies would be to create awareness of climate change to sensitise people on the effects of their agricultural, economic, industrial activities and their concomitant effects on the climate. Another way is by integrating climate and climate change issues in the school curriculum.

Sustainable Development

The concept of sustainable development was first discussed at the UN Conference on the Human Environment in Stockholm in 1972. During this conference the international community considered global environment and development needs. Subsequently in 1983, the United Nations Commission on Environment and Development (Brundtland Commission) was formed to address the growing concern about climate change, especially with respect to the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development. Twenty years after Stockholm, the first-ever United Nations Conference on Environment and Development was held in June 1992. This event marked a very important landmark in the history of sustainable development and concern for the environment. Rio +5 occurred in 1997 in New York which evaluated progress

since 1992. Rio +10 occurred in 2002 in Johannesburg, South Africa. Sustainable development was acknowledged as a key element of the international agenda and was broadened and strengthened through the linkage of poverty, the environment and the use of natural resources.

The United Nations Conference on Sustainable Development (UNCSD) will take place in Brazil on June, 2012 to mark the 20th anniversary of the 1992 United Nations Conference on Environment and Development (UNCED), in Rio de Janeiro, and the 10th anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg. This conference is to secure renewed political commitment for sustainable development, assess the progress to date and the remaining gaps in the implementation of the outcomes of the major summits on sustainable development, and address new and emerging challenges.

The foregoing underscores the importance the concept of sustainable development has assumed and represented in the contemporary face of environmental policy making. Sustainable development is one of the twentieth century's powerful concepts and paralleling the lure of democracy. Lafferty (1998, p. 265) observed that the term has become today's 'rhetorical talisman'. Education for sustainable development enables all pupils including those with special educational needs and disabilities to develop the awareness, skills, understanding and values to participate in decisions about the way we do things. Individually and collectively, both locally and globally, it will improve the quality of life now without damaging the planet for the future. There are opportunities for pupils to develop their understanding of sustainable development within the school curriculum in particular, with their work in Geography; Science; and Personal, Social and Health education (PSHE) and citizenship (Durango Foundation for Educational Excellence, 1999).

Junior High Curriculum and the Teaching Syllabus

Wheeler (1978) explains curriculum as a sequence of potential experiences set up in schools for the purpose of disciplining children and youths in group ways of thinking and acting. This implies that curriculum is planned and arranged in such a way that simpler things come before more complex ones. The curriculum of any school consists of all the experiences that a school may select and consistently organize for the purpose of bringing about changes in the behaviours of the learners and as a means of developing the personality of the individuals. It is the total experience involving the school in the process of educating young people. It includes the teacher, subjects, content, method of teaching and evaluation as well as the physical and psychological dimensions of the experience (Offorma, 2002). Curriculum may be seen as

a document, plan or blue print for instructional guide used for teaching and learning to bring about positive and desirable learner behaviour change. As indicated by (Offorma, 2006) it seeks to translate the hopes of society in which they function into concrete reality.

Summers and Kruger (2003) conducted a research with the aim of portraying some key aspects of the processes through which a group of primary school teachers translated a theoretical view of education for sustainable development (ESD) into pupil learning. The study answered research questions on how primary school teachers translate conceptual dimensions of sustainable development into classroom teaching and what sustainable development learning might 'look like' in children of primary school age. Data were obtained largely through interviews of teachers and pupils both before and after teaching. It was found that the teachers saw human action as central to sustainable development education and that a child's understanding of his personal obligation to dispose of litter includes elements of hygiene and his sharing of this responsibility with others. A child of 6years old simple awareness that fossil fuels will 'burn away and won't exist' developed to include the concept of both finite and alternative energy sources and the meaning of 'renewable'. A year 3 child's view of future depletion of resources was similarly enhanced to include ideas about renewable and non-renewable resources, while a year 5 child, who initially thought only in terms of forest fires affecting tigers, developed more sophisticated ideas about the impact of human beings on tiger populations.

The study by Summers and Kruger (2003) further revealed that the effect of changes in understanding or awareness was a broadening of the child's viewpoint and often an improvement in the child's vocabulary. As a result of the teaching, erroneous ideas might be replaced with correct ones. Thus, a six- year old child who formerly thought of rainforest species as few in number and not specific to that particular environment came to appreciate their vast diversity; a Year 3 child who thought all nature reserves were basically the same and untouched by human hand later understood their diversity and the need for management of them; another Year 3 child's initially naive ideas about living things as a mere source of food to be cared for by nurturing them at home were replaced by an understanding of the need to conserve endangered species for the benefit of future generations; a Year 5 child initially showed a naïve certainty about human overuse of water resources causing extinction of species but this was later replaced with a more cautious attitude which looked for early symptoms of population decline. Similarly, persons with special educational needs and /or disabilities will value the importance of relating positively to the environment and not littering about.

Firth and Winter (2007) conducted a qualitative research aimed at constructing education for sustainable

development (ESD). This case study research investigated how four student teachers taking part in a one-year teacher education programme in a university in England (Post Graduate Certificate in Education (PGCE)) translate their knowledge, experiences and beliefs about ESD into classroom practice in the context of the Geography National Curriculum and ESD policies in secondary schools. The researchers critically analysed curriculum materials used by three student teachers to explore the potential for ethical and political engagement with ESD awareness. The research revealed some of the ethical and political dilemmas faced by student teachers who, as committed environmentalists, struggle to resolve the tensions between the constraints of policy, school culture, school teaching materials and their own values and enthusiasms.

School Curriculum on Climate Change and Sustainable Development

Ozor (2009) conducted a research aimed at influencing curriculum development and awareness of climate change issues at the University of Nigeria, Nsukka and its environs. It had the purpose of creating awareness and better understanding of the issues of climate change in the area and kick start the process of curriculum development, improved teaching, learning and research in the area of climate change adaptation. Multi stakeholder dialogue meetings and workshop was held at the UNN with over 320 participants drawn from among academics, policy makers, private sector and the civil society organizations.

Results showed that climate change has a disproportionate impact on the poorest countries, who have contributed the least to the problem (IPCC, 2007). It came out of the study that Africa, for instance, accounts for less than 4 percent of global emissions, yet its 850 million inhabitants are the most vulnerable to climate change impacts. Africa is also amongst the continents with the least intellectual, institutional and technological capability to address the climate challenge. It has been perceived throughout the world, that Higher Education plays a critical role in preparing and providing leadership to meet these challenges and to stimulate sustainable development (Bloom, Canning and Chan, 2005).

Among the recommendations made was that climate change issues should be infused into the curricula of universities as a matter of urgency (Chakeredza, Temu, Yaye, Mukungwa and Saka, 2009). There is need for evidence based scientific data on African experiences to be infused into the curricula to serve the African specific problems. The suggested areas of emphasis include agricultural sciences, biological sciences and social sciences. It was pointed out that the implementation of adaptive measures is essential in order to address the projected consequences while reducing the severity of

the impacts through mitigation measures.

From the perspectives of the current study, curriculum was conceived as the document, plan or blue print used as instructional guide. The Junior High School curriculum in Ghana is designed by the Curriculum Research and Development Division (CRDD) of the Ministry of Education (MOE). The curriculum makes no distinction between what pupils in regular schools and special schools have to study. The subjects listed in the JHS curriculum with topics relevant to climate change and sustainable development are Social Studies and Integrated Science. It therefore means that on issues about climate change and sustainable development, children with and without special educational needs are required to have awareness in the areas.

Awareness of climate change and sustainable development among JHS students and Gender

The Centre for African Wetlands, University of Ghana, Legon (2009), reported low levels of awareness and poor understanding of climate change risks, combined with significant awareness gaps about climate change processes, adaptation and mitigation, particularly in the developing world of which Ghana is no exception. Report of EPA Ghana (2005) on the climate change education and awareness indicated that 50% of the respondents between 30 and 50 years were aware of the level of climate change in Ghana. However generally, most respondents complained of requisite awareness and materials needed for education, training and awareness creation. The Junior High Schools' social studies and integrated science textbooks though have elements of climate; climate change and sustainable development have not been emphasised.

Climate change responses cannot be effective unless the different needs of women and men are taken into consideration particularly as poor women with limited or no access to community resources become more vulnerable to its effects (Aguilar, 2009) .

THE STATEMENT

There has been increasing concern in recent years about climate change and sustainable development in Africa and the world as a whole. Existing literatures are rich with studies on climate change and sustainable development in the world. Nonetheless, there appears to be scarcity of research on the curriculum and students' awareness of climate change and sustainable development in Ghana. In Ghana, the Curriculum Research and Development Division (CRDD) of the Ministry of Education (MOE), is responsible for designing the national curriculum for Junior High School Teaching Syllabi. Since climate change and sustainable development are issues that are

often dealt with in Social Studies and Integrated Science, an assumption is made that the CRDD will give them equal attention. There is however uncertainty as to how much of the curriculum they include on climate change and sustainable development in the teaching syllabus. Besides, literature is scarce on the level of students' awareness as far as issues on climate change and sustainable development are concerned. Does the school curriculum of the Junior High Schools cater adequately for issues on climate change and sustainable development? Are students aware of what climate change and sustainable development are? These are the issues answers were solicited for as a result of the relevance of knowledge of climate change and sustainable development to life skills especially for Junior High School products,.

RESEARCH QUESTIONS

The study was guided by four main research questions and four hypotheses. The research questions were:

To what extent does the curriculum content of Junior High Schools of Ghana cover climate change?

To what extent does the curriculum content of Junior High Schools of Ghana provide for sustainable development?

What is the level of awareness of Junior High School students in the Central Region of Ghana on climate change?

What is the level of awareness of Junior High school students of Ghana on sustainable development?

HYPOTHESES

The hypotheses were:

Ho: There is no statistical significant difference in the level of awareness of climate change between students in rural and urban junior high schools.

Ho: There is no statistical significant difference in the age of respondents and level of awareness of climate change.

Ho: There is no statistical significant difference in the level of awareness of sustainable development between students in rural and urban junior high schools.

Ho: There is no statistical significant difference in the age of respondents and level of awareness of sustainable development.

THE METHODOLOGY

Research design

The descriptive survey research design was used in the study. As indicated by Cohen, Manion and Morrison

(2007), the descriptive design identifies the opinions people hold about certain phenomena. In this study, the phenomena were identified as climate change and sustainable development.

Target population

The target population was composed basically of all Junior High School (JHS) Basic 9 students in two (Twifu Praso district and Cape Coast metropolis) of the 17 political divisions purposively selected from the Central Region of Ghana. The focus on pupils in Basic 9 was based solely on the assumption that basic education is terminal for some proportion of the population. It was deemed necessary to find out the extent to which the Junior High School curriculum in Ghana provided for the acquisition of knowledge, skills and attitudes on climate change and sustainable development. Most importantly, having studied for three years, the pupils would have been sufficiently exposed to issues about climate change and sustainable development to make it possible for them to respond appropriately to questionnaire items.

At the time of the study, the 17 divisions were made up of 11 Districts, 6 Municipalities and a Metropolis. Public Schools Enrolment figures obtained from the Central Regional Education Office revealed that in the 2011 academic year, there were 15,022 Junior High School students in the Twifu Praso district and Cape Coast metropolis. The proportion in Basic 9 was unknown but conservatively, one-third of this figure was assumed. This gave a population of roughly 5,007 students.

Sample and sampling techniques

In making a decision on the sample size, we were guided by Cohen, Manion and Morrison (2007) sample size determination formula which should be '357' at 5% confidence level (p. 104). However, anticipating that some of the questionnaire instruments could not be retrieved, we decided to increase the number to 400 and to evenly distribute them (i.e. 200 each) to the two selected divisions using the proportional sampling technique.

In selecting the research participants, we took into account the class sizes of rural and urban classrooms typical of most Ghanaian schools. It is common knowledge that most urban schools in Ghana have large class sizes, while the rural have low. Thirteen schools made up of 5 urban and 8 rural were randomly selected while the purposive technique was used in selecting all the students from the 13 schools.

Instrumentation

In order to obtain empirical data on the extent to which the students were aware of climate change and

sustainable development, a test of the awareness of climate change and sustainable development was developed and validated for use in the study. Test items ranging in difficulty level from 0.15 to 1.00 were included in the final test after pilot-test among Basic 9 students of University of Cape Coast Junior High School. The choice of the University of Cape Coast Junior School was rooted in the fact that it shared similar characteristics as those selected for the study. Besides, all the Basic Schools in the country use the same National Curriculum designed by the Curriculum Research and Development Division (CRDD) of the Ghana Education Service (GES). The content validity of the test items was established by use of the Junior High School curriculum, recommended textbooks and past questions.

The Cronbach alpha reliability was 0.75

In order to ensure that no particular pupil was disadvantaged, research data was collected barely a week before the pupils wrote their Basic Education Certificate Examination (BECE). All teaching activity had ended and students were to write their examinations. The instruments were administered in 13 Junior High Schools in rural and urban communities of the Central Region and data collected were subjected to statistical analysis to answer research questions and test hypotheses.

Out of the 400 questionnaires distributed, a total of 367 valid responses were obtained at the end of the data collection exercises. This gave a return rate of 91.75% which was good enough to determine the awareness of the phenomena under study.

Results

Analysed data for answering each research question and testing the hypothesis are presented in this section.

Research Question 1: To what extent does the curriculum content of Junior High Schools of Ghana cover climate change?

The contents of the Junior High School (JHS) Teaching Syllabi for Social Studies and Integrated Science issued by the Curriculum Research and Development Division (CRDD) of the Ghana Education Service (GES) of the Ministry of Education (MOE) were analysed. Comparing the extent of coverage of climate change in the two disciplines, it was found that the Integrated Science syllabus contained more information on climate change than that of Social Studies. In the Integrated Science subject, the climate change was 23.4%, however the coverage was about 16% in the Social Studies syllabus (Table 1).

Research Question 2: To what extent does the curriculum content of Junior High Schools of Ghana provide for sustainable development?

A further analysis of the curriculum contents also revealed the attention given to sustainable development. As the results of the summary of Table 2 show, 48% of the Social Studies contents exposed JHS students to sustainable development. This is distributed between classes 1, 2 and 3 in different proportions with JHS 1 having the largest content percentage coverage and JHS 2, the least.

The total percentage coverage for the Integrated Science was 4.3%. In JHS 1 and JHS 2 the percentage coverage of the curriculum was nil. It was only in JHS 3 that 2(15.4%) topics focused on sustainable development. The social Studies syllabus therefore had more information on sustainable development than the Integrated Science.

Research question 3: What is the level of awareness of Junior High School students in the Central Region of Ghana on climate change?

Table 3 is the summary of students' awareness of issues related to climate change. The obtainable score for the test was 24 marks. The maximum score was 18 and the minimum 3. The mean performance was 9.16 with standard deviation of 2.63. The skewness of 0.172 shows that, the majority of the students performed at the lower end of the score.

Null Hypothesis 1: There is no statistical significant difference in the level of awareness of climate change between students in rural and urban Junior High Schools. The scores from rural and urban settings were subjected to t-Test and the results are presented on Table 4.

In Table 4, a statistical significant difference is observed in the awareness of climate change between rural and urban Junior High School students. The statistics reveal that students from urban schools performed better (with a mean of 9.7) than those in the rural (who had a mean of 8.55). It therefore meant that school location may be a factor influencing students' awareness of climate change.

Null Hypothesis 2: There is no statistical significant difference in the age of respondents and level of awareness of climate change.

The Table 5 shows the summary of the mean scores of old and young students. The statistics reveal that younger students aged 15 years and below performed significantly better (with a mean of 9.57) than their older counterparts (who were older than 15 years) who's mean score was 8.58 and a Student's t-Test of 2.01.

Research Question 4: What is the level of awareness of Junior High school students of Ghana in sustainable development?

Table 6 provides statistics of students' awareness of sustainable development. It shows that the mean performance of JHS students on test of sustainable development was 4.23 with a standard deviation of 1.63.

Null Hypothesis 3: There is no statistical significant difference in the level of awareness of sustainable development between students in rural and urban Junior High Schools.

With respect to differences in sustainable development, the statistics of Table 7 show that between students in rural and urban Junior High Schools, there is no statistical significant difference in the students' level of awareness.

Null Hypothesis 4: There is no statistical significant difference in the age of respondents and awareness of sustainable development

Table 8 shows that at the 0.05 level, there is no significant difference in the awareness of sustainable development between young and old students of Junior High Schools in the Central Region of Ghana. The statistics show that the mean performances of the students were 4.44 and 4.14, and standard deviations 1.70 and 1.59 for the young and old students, respectively, at the 0.05 level of significance. Age therefore appears not to have any influence on students' awareness of sustainable development.

DISCUSSION

The study explored the awareness pupils in Junior High Schools in the Central Region of Ghana have on climate change and sustainable development. It also found out through content analysis of the Junior High School curriculum how much information the syllabi of the Social Studies and Integrated Science subjects contained on climate change and sustainable development. The study was based on the premise that for African countries to develop in a sustainable manner, they need to confront climate change by knowledge, skills and attitude-based approaches that, for modern times, could best be achieved by formal education.

The study has revealed the extent to which students in the Junior High School in the Central Region of Ghana have about climate change and sustainable development. It has provided information on the curriculum coverage and the level of awareness.

It came out from the findings that in both the Social Studies and Integrated Science syllabi less topics were devoted to the concepts of 'climate change' and 'sustainable development'. The Social Studies Teaching

Table 1. Summary of climate change in the JHS Social Studies and Integrated Science Syllabi

Class	Social Studies			Integrated Science		
	Total Number of Units	Number of Units on Climate Change	Percentage of Coverage	Total Number of Units	Number of Units on Climate Change	Percentage of Coverage
JHS 1	9	1	11.0	15	6	40.0
JHS 2	10	2	20.0	19	3	15.8
JHS 3	6	1	16.7	13	2	15.4
Total	25	4	47.7	47	11	51.2

Table 2. Summary of sustainable development in the Social Studies and Integrated Science JHS Syllabi

Class	Social Studies			Integrated Science		
	Total Number of Units	Number of Units on Climate Change	Percentage of Coverage	Total Number of Units	Number of Units on Climate Change	Percentage of Coverage
JHS 1	9	5	55.6	15	0	-
JHS 2	10	4	40.0	19	0	-
JHS 3	6	3	50.0	13	2	15.4
Total	25	12	155.6	47	2	15.4

Table 3. Descriptive Statistics on Awareness of Climate Change

Score	N	Min	Max	Mean	SD	Skewness	Kurtosis
Score for CC	367	3	18	9.16	2.63	.172	-.030

NB: CC means Climate Change

Table 4. Summary of t-Test on knowledge of climate change for rural and urban students

School location	N	Mean	Std. Dev.	t-Test	Significance
Rural	172	8.55	2.555	-4.26	.000
Urban	195	9.70	2.578		

Table 5. Summary of t-Test on age of respondents and awareness of climate change

Age of students	N	Mean	Std. Dev	t-Test	significance
Young (15 years and below)	118	9.57	2.66	2.01	.044
Old (above 15 years)	246	8.58	2.60		

Table 6. Descriptive Statistics on Sustainable Development

Score	N	Min	Max	Mean	SD	Skewness	Kurtosis
Sustainable development	367	0	9	4.23	1.632	.189	.116

Syllabus content units on sustainable development were more than that of Integrated Science. However, the proportion of JHS Teaching Syllabus devoted to climate alone was less than twenty percent and as observed earlier, no mention was made of climate change.

Climate change is now a reality and Ozor's (2009) recommendations for the inclusion of climate change

issues in the curricula of universities as a matter of urgency (Chakeredza et al., 2009) should be embraced at all educational levels especially at the Junior High School and taken with seriousness. The impact of climate change is generally conceived as a global phenomenon as attested to by the Eurobarometer (2009). If pupils are exposed to the dangers of climate change early enough,

Table 7. Summary of t-Test on awareness of sustainable development for rural and urban students

School Location	N	Mean	Std. Dev	t-Test	Sig.
Rural	172	4.10	1.58	-1.371	.171
Urban	195	4.34	1.68		

Table 8. Summary of t-Test on age of respondents and knowledge of sustainable development

Age of students	N	Mean	Std. Dev.	t-Test	Sig.
Young (15 years and below)	118	4.44	1.70	1.63	.103
Old (above 15 years)	246	4.14	1.59		

it helps them to develop positive attitude towards the environment (Summers and Kruger, 2003) and to reduce the hazards associated with climate change. Introducing more units on climate change to the Teaching Syllabuses in both Social Studies and Integrated Science will have far-reaching effects as observed by Summers and Kruger's (2003).

The difference noticed in the number of units on climate change and sustainable development appeared to be a matter of structure since in Ghana, the Social Studies discipline tends to embrace such subjects as Economics, Commerce and Geography at the Senior High School level. On the other hand, climate change units are related to such science subjects as Physics, Biology and Chemistry.

Having less topics on climate change and sustainable development in the Social Studies and Integrated Science syllabi at the Junior High School level is not good enough at this level of the pupils' development especially as the world strives to attain the Millennium Development Goals (MDGs). The tendency is for the teacher to overlook that aspect because it is not listed. Graduates of Junior High Schools may therefore finish their basic education and yet lack a balanced understanding of climate change concepts and principles.

It was further revealed that students from urban Junior High Schools had a better performance on the climate change sub-test with a mean of 9.7 compared to 8.55 scored by students in rural Junior High Schools. There may be cause for students in junior high schools sampled from the urban centres which are coincidentally coastal communities to be more knowledgeable in climate change than those in rural schools located in the hinterland. School location may therefore be a factor influencing knowledge of climate change.

Though a significant difference was observed in the knowledge of climate change between students from rural and urban Junior High Schools, their mean performance was however lower than half the maximum score for this test which is 22 marks. This implies that the general level of knowledge of climate change demonstrated by the sampled students is low. On the

other hand however, no significant difference was observed in the knowledge of sustainable development between Junior High School students in rural and urban centres. Students in both rural and urban centres are exposed to the same curriculum contents and this could account for the comparable levels of their performance.

Undoubtedly, the early years are critical to learning in spite of the findings not supporting differences between the knowledge of sustainable development demonstrated by younger and older students.

CONCLUSION

The issue of climate change and sustainable development has attracted global attention. As the world strives to attain the Millennium Development Goals (MMDGs) by the year 2015, it may be necessary to increase the content of climate change and sustainable development in the school curriculum particularly at the Basic School level. Since they fall short, there is the urgent need to add to the learning experiences as well as identifying new teaching methods and pedagogies and structures suitable for building the necessary capacities for climate change and sustainable development. The awareness of the effects of climate change will help all students including persons with special educational needs and disabilities to develop positive attitude towards their environment. The onus is on the Curriculum Research and Development Division (CRDD) of the Ghana Education Service (GES) to as a matter of urgency include topics on climate change and sustainable development in the JHS syllabi in relevant disciplines. Priority attention should be given to Aguilar's (2009) recommendations to state institutions. We reiterate her advice that governments should take action at regional, national, and local levels, including translating international agreements into domestic policy.

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