NIGERIAN JOURNAL
OF
CURRICULUM STUDIES

VOL. 20. NO. 4 2013

JOURNAL OF CURRICULUM ORGANIZATION OF NIGERIA (CON)

ISSN: 0189-9465

PRIMARY SCHOOL LEAVERS' AWARENESS OF CLIMATE CHANGE IN DELTA STATE: IMPLICATIONS FOR SCIENCE CURRICULUM DEVELOPMENT

By
Dr. Moemeke, Clara Dumebi,
Department of Curriculum Studies and Educational Technology,
College of Education, Agbor

and

Nwabuwe, Henrietta Ifeanyichukwu,
Department of Early Childhood Care Education,
College of Education, Agbor

Abstract
The study investigated the awareness level of primary school science learners on climate change. The purpose was to determine the awareness level of children at that level of education of global issues that have implications for their future. A total of six hundred and thirty-two pupils from seventeen primary schools were randomly sampled for the study. Iwo research questions and three null hypotheses were tested in the study. A 28-item Knowledge of climate change assessment inventory (KCCAI) constructed by the researchers was used to collect data. The result showed a very low level of awareness of the learners on the concept. T-tests also showed a significant difference in the awareness level of boys and girls and between pupils from urban and rural schools. It was concluded that the present curriculum in use in primary schools is deficient in its content of contemporary concepts such as climate change and makes a case for its inclusion in that level of education. The importance of this in nurturing a positive attitude towards the environment in primary school children was emphasized.

Introduction
There has been an increasing emphasis on the need for a sound foundation as a bedrock for success in any endeavour. As the cradle of education of the child, the primary education of any country or nation has huge implications for the quality of education at other levels, determines the success of education as well as provides the necessary impetus for further academic and professional growth of the learner. The primary level of education (made up of the Lower and Middle Basi Education levels) is the segment of schooling for children from 5 to 12 years of age. During this period trained teachers in content and pedagogy to guide these young learners in their path toward knowledge acquisition
The introduction of primary science into the curriculum of primary schools stems from advocacies that have continued to change as societies developed. According

to Harlen (1998), the impetus for the inclusion of science into primary school curriculum followed concern for the improvement of science and technology education in Western countries. This concern led to a series of curriculum initiatives such as the Biological Science Curriculum Study (BSCS) and Physical Sciences Study Committee (PSSC) among others. Prior to 1961, school science was in the form of Nature study (Harlen, 1998; Omoifo,2012), until the advent of the pamphlet titled “Science in Primary School” in the UK and the consequent establishment of a primary school subcommittee of the Ministry of Education and a release of Policy Statement of Science teaching in Primary Schools. This initiative was followed subsequently by Several research projects aimed at improving science teaching at the primary level of education

In Nigeria, the story is not different. The first attempt at introducing science into primary schools was under the initiative of the African Primary Science Programme (APSP) in 1965 in Kano (Urevbu 2001; Urevbu and Omoifo, 2011) with the objective of introducing modem methods and materials for teaching science in primary schools as well as establish a network of locally manned and controlled science centers for its continued development (Omoifo, 2012). Science at that time was in form of Nature Studies which later transformed into Primary Science in the old curriculum. At this time, the Junior Secondary School had Integrated Science. The seeming lack of relationship between Primary Science and Integrated Science that the learner will eventually learn at the Junior secondary level as well as the desire to integrate science and technology resulted in the restructuring of the curriculum giving rise to what is today called "Basic Science and Technology" in the NERDC formulated Basic Education curriculum in 2008. The inclusion of science into the curriculum of primary schools in Nigeria thus a move towards laying a sound basis for scientific and reflective thinking as well as developing the child's ability to adapt to the changing environment as aimed by the National Policy on Education (FGN, 2007) section 4, No 18b&e.

In order to achieve these goals, there is a need for a restructuring of the curriculum of the primary level of education to include contemporary scientific and environmental issues that may affect human adaptability and well-being. As noted by Asoegwu (2010), creating awareness of problems and issues of the environment and developing competencies to think and act globally in the light of the present challenges, fall under the prerogatives of Science Education at all levels.

Literature has also shown that learning concepts in science are not only domain-specific but also situational. The environment of the learner may impinge on his ability as well as the ease with which he understands some concepts. The environment in this sense refers to his human, physical, and psychological surroundings. Most children begin their lives in a rural setting where they experience and interact with nature. It is expected that such children will decipher

and recognize changes in their physical environment than urban children living in more artificial and human-influenced environments. The extent to which this awareness level varies within the sexes also needs to be understood at that level of education. These dimensions of their study will offer insight into the possible influence of location and sex on children's learning of science concepts.

Concept of Climate Change

The climate of a place refers to the average weather condition of a place or area taken for 30 year period. It is not the same as weather as often misconstrued since the weather is the atmospheric condition of a place. The abstractness of the concept of climate makes it one of the difficult concepts to elucidate in science classes for beginners. Climate change refers thus to drastic changes in the environmental conditions of a place due to changes that occur in the biosphere. These climate changes are consequences of gradual increase in the temperature of the earth (global warming) which in turn leads to changes in rainfall patterns and the concomitant rise in sea level, changes in wildlife distribution patterns, variations in human life patterns, variations in plant and forest distribution and the water cycle in mature. Apart from the above, several other environmental challenges are posed due to appreciable changes in the conditions of the environment. The increase in the earth's temperature results from the uncontrolled introduction of certain gases (CO, NO, water vapour H2O, and CH, methane) and the depletion of the Ozone layer (a natural protective gaseous shield in the stratosphere layer of the atmosphere) which absorb harmful ultraviolet rays from reaching the earth's surface in lethal quantity have been blamed for the observable climatic changes which the earth is experiencing. These changes are mostly consequences of man's actions such as pollution, industrialization, deforestation, and desertification amongst others. While some of these problems can be locally perceived and ameliorated, some are global and difficult to conceptualize and elucidate.

Today's primary school children are going into an environment that poses severe challenges to their very existence and well-being. They will be required to take and make decisions about environmental issues in the near future. It is thus imperative that they become aware of as well as develop an understanding of the phenomena that hold great implications for their very existence. Appreciating the cause, consequences, and corrections of attitudes towards the environment will be of importance to society especially in maintaining a sustainable environment (Francis, Boyes, Qualter, & Stanisstreet, 1993).

Teaching children about climate change presents some difficulties as some of the associated concepts are not only abstract but global. The teacher of primary science will therefore have to contend with such pedagogic and conceptual problems as

- Difficulty in the accessibility of experiential knowledge about the phenomenon as most of the associated concepts such as global

warming, ozone layer depletion, and greenhouse effect are abstract and difficult to demonstrate or observe (Boyes and Stanis street,1990)

- Dependence on secondary sources of information. Misconceptions may arise from information gathered by learners from informal sources which may present non-science views about the phenomenon (Francis et al 1993; Omoifo, 2012).
- Similarity in the contextual meaning of modern environmental concepts associated with climate change.
- Intangibility of the phenomenon and the relative difficulty that it poses for concrete operational learners to grasp.

It is in the light of these perceived difficulties that this study is undertaken to determine primary school learners' knowledge and awareness level about climate change and associated challenges so that the curricula could be modified if necessary to help them develop skills, attitudes, and motivation necessary for making an informed decision as well as taking responsible actions towards environmental sustainability (Oviahon and Igudia,2011).

Conceptual Change Approach to Science Teaching

In order to teach science concepts to the understanding of children and to bring about change in their cognition, teachers must understand the rationale for doing so along with various arguments for incorporating science into the primary school curriculum. These rationales are articulated by Harlen (1993)as follows

Science can help children to think in a logical way about everyday events and in solving problems. Such intellectual skills will be valuable to them wherever they live and whatever they do.

Science and technology can help to improve the quality of life of people through social interactions. Science and technology are socially useful activities with which young children should become familiar.

As the world is becoming increasingly more scientifically and technologically oriented, it is important that future citizens should be equipped to live in it.

Science well taught can promote children's intellectual development.

Science can positively assist children in other subject areas, especially language, and mathematics.

Primary school is terminal for many children in many countries and this is the only opportunity they have to explore their environment logically and systematically.

For knowledge to be useable in different contexts it must be acquired at the understanding level. In other words, it must be "transformed, applied in other contexts and in various ways such as predictions, explanation and making connections one thing, with another" (Harlen, 1993, 1988). In Linn's (1998:199) explanation, knowledge linking to prior experience is in line with the constructivist view about learning and marks the beginning of the learning

process. Within this process, some linked ideas could be rejected when tested against background knowledge. It is the process of testing and consequent change of ideas that is called learning. Learning new ideas that have been tested and changed severally to fit into the experience of the learner is what Hewson, Beeth, and Thorley(1998) called "conceptual change". In their explanation, learning by conceptual change is “an active, interactive, connective process requiring change of different kinds such as addition, linkage, rearrange, rearrangement and exchange". This idea has also been explicated by other researchers (Linn, 1998; Harlen, 1998; Moemeke, 2010 and 2012). However certain issues about the attainment of conceptual change in learners have been condensed by Hewson Beeth and Thorley (1998) after critically reviewing views on conceptual change in science learning.

Some of them are:
That learner's knowledge prior to instruction is important for the attainment of conceptual change.
Conflicts which learners experience while learning science are essential in recognizing their own conceptions as well as a foundation for future learning.
There is a need to understand how learners' conceptions originate; either as they make sense of their environment, scientifically developed in a social context, or from non-science environments/contexts. This is very essential to African science learners whose non-science views have been found to impinge on the learning of some Western Science concepts (Omoifo, 2012).

Most ideas about climate change held by primary school children originate from non-science fora. The abstractness of the concept makes it highly prone to misconceptions and alternative conceptions. Children of non-western origin encounter superstitions which they pick up as they grow in their communities. These hamper or affect the way and ease with which such science concepts are learned. For primary science teachers to teach for conceptual change; patterns that do not completely negate the original conception but which bring about a shift through understanding need to be adopted.

The teacher should begin by exploring the ideas held by learners about weather and climate in an open classroom discourse. By doing this, other children not only become aware of various other views about the concept but also of the striking differences between them. This will ignite the need for harmony of views among the learners. For learners to change their previously held views therefore, they must seek and weigh the evidence provided by both their peers and the teacher’s support of their contributed ideas and only accept or reject them on the basis of plausibility. his follows the idea that existing knowledge is consequential in the way people learn (Hewson, Beeth and Thorley, 1998; Smith, Blakeslee, and Anderson, 1993). Literature suggests an array of ways of exploring learners’ understanding and ideas such as pre-instructional quizzes (Minstell, 1982), hypothetic-predictive exercise (Moemeke, 2006) small group posters and

debates, questioning techniques, verbal explanations and predictions (Smith, Blakeslee and Anderson, 993).

Teaching for conceptual change also requires a focus on the development of meta-cognitive skills. Gunston (1991) asserts that for an individual to achieve conceptual change, he must first become meta-cognitive. This, he explained is a process by which a learner recognizes his or her existing ideas, evaluates them, and decides whether to remonstrate them on the basis of dissatisfaction with evidence or accept them on the basis of fruitfulness. Literature has suggested many strategies for helping students achieve meta-cognition. They include:

- Asking students to consider their own recorded responses either by grouping similar responses so that learners point out similarities in the statements (Trumper, 1991) or by use of small groups which later dissolve into whole class discussions (Jimene Alexander, 1992) to point out inconsistencies in students' answers in relation to scientific ideas.
- Encouraging discussion of an analogous situation so as to bridge between students' intuitive understandings and accepted theories(Hewson, et a11998).
- Use of direct questioning to enable learners to reflect on their experiences during a lesson and what they think about the lesson.

This study is thus an attempt to identify the present awareness level of primary school children about a nagging issue in our world today so as enable decisions about curriculum innovation in climate change at that level of education.

The following research questions were formulated to guide the study.

What views about climate change are held by primary school pupils in Delta State?

Is there any difference in the views held by urban and rural pupils about climate change?

Is there any difference in the views held by male and female pupils about climate change?

The study tested the following null hypotheses:

There is no significant difference in the views held by urban and rural pre-secondary school learners about climate change.

There is no significant difference in the views of male and female pupils about climate change.

Method

The study is a descriptive survey in which information was gathered from primary five pupils of seventeen public and private primary schools in Delta North senatorial district of Delta State. The aim was to assess the correctness and

awareness level of pupils' knowledge and understanding of climate change both at the local and global levels of perception.

Six hundred and thirty-two (632) pupils (consisting of 382 boys and 250 girls) were randomly selected from the seventeen primary schools out of which seven are located in rural and ten in urban areas. Of the 638 pupils used in the study, 172 (112 boys and 60 girls) came from primary schools in rural areas. The percentage of pupils sampled in each school depends on the total population of pupils in primary five (Basic 5) in the school. Primary (Basic 5) five was chosen for the study because most pupils exit from primary school in primary five while only a few pupils proceed to primary six. Also, schools strive to complete the primary school curriculum in primary five to enable their pupils to face the terminal First School Leaving Certificate Examination at that level.

A 28-item "Knowledge of Climate Change Assessment Inventory" (KCCAI) constructed by the researchers was used to elicit pupils' responses and formed the basis on which awareness and appropriateness of pupils' views of climate change were assessed. The items on the inventory were grouped into five sub-headings which are

Understanding of the meaning of climate change
Causes of climate change
Effect of climate change on the environment and life
Human activities that have influences on environmental conditions
Developing environmentally friendly habits

Each sub-heading had at least five statements about climate change. Respondents were instructed to tick (✓)the statements that they consider correct or agree with and mark (x)against the ones considered incorrect or to which they disagree. The instrument was validated by a Science Educator and two Basic Science and Technology (BST) teachers as appropriate for the pupil in terms of language, ability, and scope covered by the items. The researcher and the BST teachers were however on the ground to guide the pupils in the filling of the inventory. Their liability of the instrument was found by KR formula-21 to be 0.68. Acceptable (good) level of awareness was taken to be a correct tick in 13 and above (45%) out of the 28 items.

Results

Table 1: Frequency and Percentage of Views of Primary Five Pupils about Climate Change

S/n	Group	Sex	Urban (%)	Rural (5%)	Urban (%)	Rural (%)
	View held		**Correct**		**Incorrect**	
1	Meaning of climate change	Boys Girls Total	105(16.6) 61(9.7) 166(26.3)	43(6.8%) 21(3.3) 64 (10.1)	165(26.1) 129(20.4) 294(46.5)	69(10.9) 39(6.2) 108(17.1)

2	Causes of change	Boys Girls Total	110(17.4) 52(8.2) 162(25.6)	40(6.3) 20(3.1) 60(9.4)	160(25.3) 138(21.8) 298(47.1)	72(11.4) 40(6.3) 112(17.7)
3	Effects of Climate Change	Boys Girls Total	130(20.5) 54 (8.5) 184(29.1)	52(8.2) 22(3.4) 74(11.7)	140(22.1) 136 (21.5) 276(43.6)	60(9.4) 38(6.0) 98 (15.5)
4	Human influence	Boys Girls Total	124(19.6) 72(11.3) 196 (31.0)	26(4.1) 25(3.9) 51(8.0)	146(23.1) 118(18.6) 264(41.7)	86(13.6) 32(5.0) 118(18.6)
5	Habits for Sustainable Environment	Boys Girls Total	126(19.9) 66(10.4) 192(30.3)	51(8.0) 124(19.6) 268(42.4)	144(22.7) 124(19.6) 268(42.4)	61(9.6) 36(5.6) 107(16.9)

From table 1 above,166 urban pupils (105 boys and 61 girls) representing 26.3% of the sample demonstrated correct views about the meaning of climate change against 64 rural pupils (43 boys and 21 girls) representing 10.1% of the sample. On the other hand, 294 urban and 108 rural pupils showed evidence of incorrect views of the meaning of climate change. On causes of climate change, 162(25.6%) Urban and 60(9.4%) rural pupils possess correct views as against 298 (47.1%) and 112 (17.7%) urban and rural pupils respectively. On the effects of climate change category, 258 (40.8%) consisting of 139 urban boys, 54 urban girls,52 rural boys, and 22 rural school girls actually demonstrated correct views on the effects of climate change on the environment while 246(39%) made up of 124 urban and 26 rural boys as well as 72 urban and 25 rural girls demonstrated correct views on the influence of human activities on climate change. On the last subscale (Habits for sustainable environment), 192(30.3%) urban and 268(42.4%)rural pupils showed that they understand some habits necessary for maintaining a sustainable environment.

Table 2: t-test of significance of the difference in the views of pupils of different location and sex

	N	**Mean**	**SD**	**df**	**Cal. t – value**	**Table t-value**	**Sig. T**
Urban	460	180	2.0	630	2.87	1.960	0.00*
Rural	172	64.8	2.4				
Male	382	159.4	2.0	630	660.9	1.96	0.00*
Female	250	83.4	1.7				

Significant at $p \leq 05$

Table 2 showed a significant difference (t=2.87df 630) at 0.00 level and as such significance at 0.05 level of significance. This means that the pupils differ significantly on the basis of location. The null hypothesis 1 is therefore rejected. This means that urban and rural pupils differ significantly in their views (mean = 180 for urban and 64.8 for rural) about climate change. Table 2 also showed a t-value of 660.9 at df 630 in the views about climate change held by males and females in the sample. This is significant at 0.00 alpha level and as such significant at the 0.05 level of significance chosen for the study. Null hypothesis 2which states that there is a significant difference in the views of boys and girls on climate change is therefore rejected. This is evident in the means of the two groups (means =159.4, and 83.4 for boys and girls respectively).

This study found that primary school pupils have poor views about climate change which develop as a result of a lack of knowledge of the concept. Only about 38.7% of the sample demonstrated awareness of climate change and issues related to it. The researchers feel that the high number of pupils who are ignorant of the concept or hold incorrect views indicates that the present primary school science curriculum did not cater to such current issues as climate change which is a recent global phenomenon. Contrary to expectation, 73.5% of the pupils who demonstrated awareness of climate change and hold correct views about it were from urban schools. This may be attributed to knowledge acquired outside the classroom due to exposure to films, the internet and news items from where such knowledge is made available from time to time. The influence of Television programmes in expanding the knowledge of young people cannot the overemphasized. The parental or home socio-economic background of a learner may determine the opportunity to acquire knowledge from other sources such as newspapers, telecasts, etc which in this study may not have availed themselves of such extra background or commonplace knowledge which may be found useful during discourses. These also explain the significance of the difference between urban and rural pupils in the sample as demonstrated also by the high difference in their means (119.2). Noteworthy in this study is the fact that more pupils from rural schools held correct views about habits for a sustainable environment. This might be as a result of their close contact with the environment and possible knowledge of some traditional practices in local communities for maintaining their natural environments.

Another finding of this study is the significance of the difference between the views of the boys and girls in the sample in favour of boys (Means=159.4 and 83.4 for boys and girls respectively). This is explained since boys are known to be more explorative of their environment and are more likely to understand issues about it than girls who suffer more parental restrictions and sex role stereotyping in the African traditional context. This is instructive as it implicates the high gender sensitivity of today's science classroom. Creating a gender-friendly

classroom devoid of any form of sex role and in which interaction, discourse, collaboration, and exploration are encouraged is strategic to promoting gender equity, harmony, and learning together in the science classroom.

Recommendations and Conclusion

It is possible that some of the teachers who teach primary science do not possess enough scientific knowledge about these contemporary events as to help the pupils extend their knowledge of what is happening in the world around them. This calls for frequent conferences, seminars and workshops for primary science teachers to sensitize them as well as disseminate research, findings to them.

The existence of disparity in science knowledge between boys and girls in science has further been exposed. The need for the removal of all forms of gender stereotypes both in the science classroom and at home is further stressed.

The poor awareness level of primary school pupils on such issues that affect them both locally and globally needs to be addressed. The need for provision of science books and science fiction to primary school children will help them develop broad views and understanding of some contemporary climate issues that pose challenges to them.

The primary school children used in this study fall within Piaget's concrete operational stage of development. The ability of such children to learn abstract science concepts has been seriously questioned by science educators. However, it is also known that studies have documented improvement in children's learning of such concepts if adequate domain-specific knowledge and scaffolding. There is a need for primary school teachers to explore proactive ways of teaching such abstract concepts to learners of that age and ability. The primary school pupils in this study lacked the necessary knowledge about recent environmental happenings and challenges in their world. This is unconnected with the poor state of school libraries and the global information system available to children particularly those in rural settings. The implication is that children do not have adequate opportunities to gather the information that increases their knowledge and shapes their views about contemporary issues such as climate change that are not conspicuously captured by their school curricula. This study has also shown that the present curriculum of primary schools needs to be revised to include present-day discourses such a climate change, global warming, greenhouse effect, pollution, degradation, etc in the official curriculum even at the very elementary level.

References

Asoegwu, A. O. (2010). Issues and challenges in Environmental Education in Nigerian Education in the 21st century. In Iloputaife, E. C, Maduewesi, B.U.J. and Igbo, R.O. (eds). *Issues and challenges in Nigerian Education in the 21st century* (224-243). Onitsha, West, and Solomon Corporate Ideas Ltd.

Federal Government of Nigeria, (2004). National Policy on Education, Lagos, NERDC press. Francis, C., Boye, S., Equalter, A., and Stanisstreet, M. (1990). The misconception of land and conservation: A study of pupils' meanings of these terms. School Science Review, 72 51-57.

Gunstone, B. J. (1991). Thinking about Sound: Children's changing conceptions. Qualitative studies in Education,4,203-214

Harlen,W. (1998).Teaching for understanding in Pre-secondary Science. In Fraser, B. J and Tobin, K. G (eds). International handbook of science Education (1,199. 218). London, Kluwer Academic Publishers.

Hewson, P. W.; Beeth, M. E. and Thorley, N. R. (1998), Teaching for Conceptual change in B Fraser and K.G Tobin (eds) International handbook of Science Education (1:199.218). London, Kluwer Academic publishers

Jimenez-Alexander, M. P. (1992). Thinking about theories or thinking with theories? Classroom studies with natural selection. International Journal of Science Education 14,51-61

Linn, M. C. (1998).The impact of Technology on science instructions: Historical Trends and Current Opportunities. In B.J Fraser and K.G Tobin (eds) International Handbook of Science Education.1:265-292.London, Kluwer Academic Publishers.

Minstrel, J. (1982). Explaining the “at rest" condition of an object. Physics Teacher (20)10-14.

Moemeke, C. D (2011). Using ICT tools in minimizing cognitive conflicts in the Learning of science concepts: Implication for quality teaching paradigm. Proceedings of Annual International Conference of Faculty of Education, Delta State University, Abraka.

Moemeke, C. D. (2011). Quality science teaching perspectives for the development of metacognitive skills by learners. In Egbule, J. E., Tabotndip, J. E., and Aboho, D. A (eds). Refocusing Education in Nigeria in the 21" Century (212-233). Onitsha. West and Solomon Publishing Coy Ltd.

Moemeke, C. D. (2006). Effect of the Learning Cycle and Expository Instructional Approaches on Students’ Learning Outcome in Senior Secondary School Biology. Unpublished Ph.D. Thesis submitted to Faculty of Education, University of Benin, Nigeria.

Omoifo, C. N. (2012). Dance of the limits-Reversing the trends in science Education in Nigeria 124th inaugural Lecture, University of Benin, Benin City.

Oviaghon, C. O. and Igudia, E. O. (2011). Re-focusing Environmental Education in Nigeria secondary school curriculum. In Nwadiani. M. and Ogonor, B. O (eds) Strengthening and Re-focusing Education in Nigeria. A book of readings of Faculty of Education, University of Benin, Benin-city.

Smith, E. L., Blakeslee, T. D., and Anderson, C. W. (1993). Teaching strategies associated with conceptual change learning in science. Journal of

Research In Science Teaching (30), 111-126
Trumper, R. (1991). Being constructive: An alternative approach to the teaching Of the energy concept-part 2. International Journal of Science Education(13),1- 10
Urevbu, A. O. (2001).Curriculum Studies. Lagos, Juland Publishers.
Urevbu, A. O. and Omoifo, C. N.(2011). Depictions of philosophy and history of science in curriculum texts in secondary schools in Nigeria: Rebranding Nigerian Educational system. In Kola, A. and Bolupe, A. (eds) Rebranding Nigerian Educational system. Section six, chapter 34,466-505.