EFFECTS OF OUTDOOR ACTIVITIES AND GENDER ON STUDENTS' ENVIRONMENTAL KNOWLEDGE IN BIOLOGY

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Abstract

The research work was embarked upon with the purpose of finding out the effect of outdoor activities and gender on secondary school students' environmental knowledge .The study was carried out on 240 senior secondary school II students from four schools in two local government areas of Ibadan in Oyo State using a pre-test, post-test control group, quasi experimental design.

The purposive sampling technique was used to assign the schools to experimental and control groups for the study. Two out of the four schools were assigned as experimental group and two as control group. Intact classes were used.

The instruments used comprises Students' Test of Environmental Concept Knowledge in Biology (STECKB) with KR-21 of 0.8, instructional guide for teaching with outdoor activities, instructional guide for teaching with conventional method, evaluation sheet for assessing the teachers.

Data analysis was done using descriptive statistics (mean and standard deviation) and inferential statistics (Analysis of Covariance - ANCOVA).

The main effect of gender on students environmental knowledge was significant (F=4.482 P<05).

The result of this study has shown the need for curriculum planners to include outdoor activity as one of the methods required in the

curriculum, especially the student/teacher activities to bring about effective impartation of knowledge.

It also established the fact that gender had a great impact in the learning of science since the males have proved to be more predisposed to learning than the female.

Introduction

From time immemorial, the major focus of man has always been on the environment for sustenance and survival. From the agrarian period up to the industrial and now the revolutionary periods, man's attention on the environment in order to harness the resources for survival and sustenance/development has increased tremendously. In fact, without the environment, life would have been empty. Unfortunately, this same environment on which man depends solely for life is being depleted from day to day and despite the awareness that is being propagated towards sustaining the environment, the attitude of man has not changed towards the environment.

The interaction between man and environment is seriously threatening the earth's carrying capacity for the sustenance of life (Rim-Rukeh, 2007). The interaction with the environment, coupled with man's nonchalant attitude to the environment, has resulted in the deteriorating state of the environment (Ogunbiyi, 2007). Activities of man, such as crude oil exploration, emission of dangerous gases from mining operations, fumes from exhaust pipes of automobiles and industrial machines, the exploitation of forest for economic tree and animals, as well as the exploitation of the rivers for fishes, and various forms of soil erosion, all contribute to environmental degradation (Ajitoni, 2005).

The interaction of man and his environment has resulted in the imbalance within the ecosystem. The imbalance is manifested in various environmental problems like air pollution, water pollution and land pollution, oil spillage, gas flaring, desertification, flooding, soil erosion, bush burning and indiscriminate waste disposal (Ogunbiyi, 2007). The rate of environmental deterioration has gone so far as affecting the climate with resultant effects on ways of life, survival and health of man.

According to Ogunbiyi (2007), the Nigerian environment continues to face series of environmental problems which can be

attributed to various factors, prominent among which are: low level of awareness about the consequences of our actions on the environment, our poverty level, and the adoption of non-sustainable modes of development. This has called for radical solutions such as the need for conservation, preservation, environmental awareness, environmental knowledge, environmental attitude (ethics) and environmental skills for sustenance of the present environment.

The senior secondary school Biology curriculum designed for the current 6-3-3-4 system of education in Nigeria is expected to prepare students to attain:

i) adequate laboratory and field skills in Biology;
ii) meaningful and relevant knowledge in Biology;
iii) ability to apply acquired scientific knowledge to everyday life in matters of personal and community health, and agriculture; and
iv) reasonable and functional scientific attitude (FME 1985).

In order to attain these objectives, activity-based strategies were recommended.

In response to the need for Environmental Education in our formal education system towards the creation of an environmentally literate citizenry, curriculum development efforts in form of infusion into the existing curriculum have been made (Olagunju, 1998) and are still going on in several other disciplines (Ogunleye, 2002). Efforts at improving Environmental Education learning strategies such as the use of full and quasi participatory learning (Ajitoni, 2005), use of video drama by Aremu and John (2005), and outdoor educational activities in primary schools by Olatundun (2008) have also been made. Globally, the use of outdoor and indoor activities has been identified as best for imparting environmental attitude into learners. Such activities can be conveyed using both verbal and non-verbal strategies in problem solving approach (UNESCO-UNEP, 1990; Olagunju , 2005).

It has also been revealed in research by Okeke (2001) as cited by Aremu and John (2005) review of some studies with the conclusion that gender differences do exist in students' achievement in science. This has been corroborated by Olatundun (2008) in which he found that gender has a great impact on environmental education among primary school pupils acquisition of knowledge.

Statement of the Problem

The problem this study seeks to address, therefore, is to investigate the effect of outdoor activities on secondary school students' environmental knowledge, attitude and problem-solving skills. It is to reveal how outdoor activities could bring about functional and holistic environmental education and an all-round national development and systemic change.

The study further seeks to examine the effects of gender and school location on subjects' knowledge of environmental issues and concepts.

Hypotheses

The following null hypotheses were tested at 0.05 levels of significance.

Ho 1: **There is no significant main effect of outdoor activities on students' environmental knowledge.**

Ho 2: There is no significant main effect of gender on students' environmental knowledge.

Research Methodology

This study adopted a pre-test, post-test control group, quasi experimental design to determine the effect of outdoor educational activities on secondary school students' environmental knowledge, attitude and skills in Ibadan metropolis, Nigeria.

The study also made use of a 2x2x2 factorial matrix which is represented below.

Table 1: The 2x2x2 factorial matrix

Treatment	School Location	Gender	
		Male	Female
Experimental	Rural		
	Urban		
Control	Rural		
	Urban		

The following variables were in the study:

Independent Variable /Treatment

- Outdoor educational activities
- Conventional teaching method/lecture method

Dependent Variables

- Knowledge of environmental concepts

Moderator Variables

- Gender (Male and Female)
- School location

The researcher selected 240 Senior Secondary School Two (2) students (SS II) from four purposively selected secondary schools in urban and rural areas of Akinyele and Ibadan North Local Government Areas of Oyo State.

The purposive sampling technique was used to assign the schools to experimental and control groups for the study. This was done to ensure that the schools to be used do not fall majorly in either the rural or the urban areas. Two out of the four schools were assigned as experimental group and two as control group. Intact classes were used. The Biology teachers of the schools were included in the study

Instruments

Four instruments were designed and used by the researcher in this study. These are:

(a) Students' Test of Environmental Concept Knowledge in Biology (STECKB)
(b) Instructional Guide for Teaching with Outdoor Activities(IGTOA)
(c) Instructional Guide for Teaching with Conventional Method (IGTCM)
(d) Evaluation Sheet for Assessing Teachers

Students' Test of Environmental Concept Knowledge in Biology (STECKB):

This is an instrument consisting of twenty multiple choice objective test items. Each item has four options (A-D) and was designed to test the level of acquisition of knowledge in Environmental Education concepts and students application of knowledge attained in their everyday life. It is also designed to know how well students can express their understanding to the Environmental Education concepts in relation to their personal and societal needs. The instrument covered topics such as environment, natural resources, conservation, pollution, solid wastes, erosion, desertification, deforestation, etc. This test was trial-

tested to ensure its reliability using Kuder Richardson formula (KR_{21}). The reliability co-efficient of the test was calculated as 0.80.

Evaluation Sheet for Assessing Teachers (ESAT):
This instrument was designed to be used in evaluating the teachers' effective use of the instructional guides during the teaching process. It shows their presentation of concepts, mastery of the topics, use of materials and activities as directed and how effective their presentation will be for the mastery of concepts by the students.

Procedure for Data Collection
In carrying out this research, the plan of work was as follows:
1 - 2 weeks _____ Training of teachers/scrutiny
1 week _____ Pre – test
8 weeks _____ Treatment
1 week _____ Post test
Total = 12 weeks

Training of Teachers
The researcher took time to train the teachers in the use of the teacher's guide provided so as to have uniformity. The areas of disparity of ideas were discussed and the reason why the guide should be used as expected was explained. The teachers were trained to teach with the Instructional Guides (IGTOA) in Experimental Groups.

Pre – Test
The instruments (STECKB) were administered to the students to test their level of understanding and acquisition of knowledge of environmental education concepts in Biology so as to be able to compare the effect of the treatment on them.

Treatment
The students were subjected to the conventional method of teaching and the outdoor activities by their Biology Teachers. The conventional method involves the use of lecture method and various teaching materials such as charts, pictures, etc. while the experimental group used both the lecture methods alongside with charts, pictures and the

field trips to enhance their understanding of the concepts that were being taught to them.

Post-Test

The tests were administered on the subjects after the various treatments with the help of their Biology teachers in the school. The students' scripts were collected and marked. The scores were used to determine the extent of the effect of outdoor educational activities of students' acquisition of knowledge in Environmental Education.

Procedure for Data Analysis

Data collected were analyzed using descriptive statistics such as frequency counts, means, percentages and standard deviation and inferential statistics such as Analysis of Covariance (ANCOVA). The hypotheses were tested at 0.05 levels of significance. Multiple Classification Analysis (MCA) was also used to determine the magnitude of the differences of the various groups.

Result

The result of this study and the summary in the tables are hereby presented in this chapter using the research hypotheses as guide.

Table 2 below presents the descriptive statistics of students with respect to environmental knowledge. It comprises the mean score, standard deviation and numbers of students involved in the research. A detailed study of the table reveals that in knowledge acquisition, the mean score of the rural experimental group was less than that of the urban group. This may be due to availability of more resources and the qualification/ levels and exposure of the teachers. Also, the performance of the male students as revealed in the total mean score was better than that of their female counterpart.

However, there was the need for further statistical clarification using the Analysis of Covariance - an inferential statistical method - to test the hypotheses in order to show if the differences in the mean scores were significant or not. It was also used to make up for the initial differences that may exist between the groups since intact classes were used.

TABLE 2: *Descriptive Statistics of Post- Test Environmental Knowledge according to Treatment, Gender and School Location*

						Mean	Std. Deviation	N
	Experimental	Gender	Male	Location	Urban	*13.08*	*2.701*	*24*
					Rural	*9.14*	*2.748*	*29*
					Total	*10.92*	*3.350*	*53*
			Female	Location	Urban	*11.83*	*2.710*	*36*
					Rural	*9.35*	*2.627*	*31*
					Total	*10.69*	*2.930*	*67*
			Total	Location	Urban	*12.33*	*2.754*	*60*
					Rural	*9.25*	*2.666*	*60*
					Total	*10.79*	*3.111*	*120*
	Treatment Control	Gender	Male	Location	Urban	*12.71*	*3.494*	*35*
					Rural	*10.00*	*3.375*	*24*
					Total	*11.61*	*3.672*	*59*
			Female	Location	Urban	*10.72*	*2.909*	*25*
					Rural	*9.56*	*3.093*	*36*
					Total	*10.03*	*3.049*	*61*
			Total	Location	Urban	*11.88*	*3.385*	*60*
					Rural	*9.73*	*3.188*	*60*
					Total	*10.81*	*3.448*	*120*
	Total	Gender	Male	Location	Urban	*12.86*	*3.176*	*59*
					Rural	*9.53*	*3.048*	*53*
					Total	*11.29*	*3.525*	*112*
			Female	Location	Urban	*11.38*	*2.823*	*61*
					Rural	*9.46*	*2.867*	*67*
					Total	*10.38*	*2.993*	*128*
			Total	Location	Urban	*12.11*	*3.081*	*120*
					Rural	*9.49*	*2.936*	*120*
					Total	*10.80*	*3.277*	*240*

Ho1: There is no significant main effect of outdoor activities on students' environmental knowledge.

TABLE 3**:** *Summary of 2x2x2 Analysis of Covariance (ANCOVA) of Post-Test Environmental Knowledge according to Treatment, Gender and School Location*

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
	Corrected Model	*510.156*[a]	*8*	*63.769*	*7.164*	*.000**
	Intercept	*1526.209*	*1*	*1526.209*	*171.455*	*.000**
	KNOW_PRE	*2.206*	*1*	*2.206*	*.248*	*.619*
	TREATMENT	*.787*	*1*	*.787*	*.088*	*.766*
	GENDER	*39.893*	*1*	*39.893*	*4.482*	*.035**
	LOCATION	*307.076*	*1*	*307.076*	*34.497*	*.000**
	TREATMENT * GENDER	*5.407*	*1*	*5.407*	*.607*	*.437*
	LOCATION					
	GENDER * LOCATION	*32.661*	*1*	*32.661*	*3.669*	*.057*
	TREATMENT * GENDER * LOCATION	*.012*	*1*	*.012*	*.001*	*.970*
	Error	*2056.244*	*231*	*8.901*		
	Total	*30560.000*	*240*			
	Corrected Total	*2566.400*	*239*			

The result of 2x2x2 Analysis of Covariance (ANCOVA) as presented in Table 3 reveals that there was no significant main effect of outdoor activities on student environment knowledge (F=0.088 .P>0.05).The

hypothesis was therefore not rejected. Although the experimental group performed better with the use of outdoor activities, the difference when compared with the control group was not significant. This was subjected to further tests using the Multiple Classification Analysis as shown in table 4 below.

Table 4: Multiple Classification Analysis (MCA) on Post-Test Environmental Knowledge by Treatment, Gender and School Location. Grand Mean = 10.80

Treatment +category		N	Adjusted for Factors and Covariates	Unadjusted	Adjusted for factors and Covariates	Eta	unadjusted	Beta
Treatment	Outdoor activities	120	10.79	10.82	-0.008	0.003	.018	.006
	Conventional method	120	10.81	10.78	0.008		-0.018	
Gender	Male	112	11.29	11.19	0.486	0.139	0.394	0.113
	Female	128	10.38	10.46	-0.425		-0.344	
Location	Urban	120	12.11	12.02	1.308	0.400	1.225	0.375
	Rural	120	9.49	9.58	-1.308		-1.225	

The Multiple Classification Analysis (MCA) as presented in Table 4 reveals the performance of each group. It shows that the experimental group performed better (X= 10.82) than the control group (X=10.78). Although the treatment has a positive effect, it was not significant.

Ho2: There is no significant main effect of gender on students' environmental knowledge**.**

Table 3 shows that the main effect of gender on students environmental knowledge was significant (F=4.482 P<05). Therefore, Ho2 was rejected. That is, there was a significant difference in the environmental knowledge scores of male and female students. Table 4 shows that the male students had higher environmental knowledge mean score (x= 11.29 SD.3.525) than their female counterpart with mean score (x=10.38 SD =2.993). The male students are therefore better in acquisition of environmental knowledge than their female counterparts. Findings in Table 4 further support this and also show that gender accounted for 1.3% of the total variance in students' environmental knowledge score as given by the Beta value of 0.113.

The results of the data analyzed reveal that outdoor educational activities had positive effects on the students' knowledge. Although it was not significant. This, in a way, was in the line with the findings of Olatundun (2008), Bookies (2004), Martin (2002), Stine (1997), and Knapp (1996).

Gender was investigated to know the effect it has on students' environmental knowledge. The result of findings of analysis of data revealed that there was a significant main effect of gender on students' environmental knowledge. The male students performed better than their female counterparts. This is in line with the findings of Gifford (1983), Have and Shayar (1981), Okpala and Onocha (1988) that showed a significant gender group difference (in favour of the boys). This is opposed to the findings of Ogunleye (2002) and Olatundun (2008) whose researches revealed a significant gender group difference (in favour of the girls).

This finding further lends credence to the fact that the boys are more predisposed to the learning of science-oriented subjects/topics than the girls.

The outdoor activity was seen to be effective in achieving this. Thus for students, it is expected they make maximum use of outdoor activities as an opportunity to improve upon their learning.

The following recommendation for Curriculum Planners shows that there is the need for curriculum planners to include outdoor activity as one of the methods required in the curriculum, especially the student/teacher activities, to bring about effective impartation of knowledge. Furthermore, the need to decongest the Biology curriculum which is already overloaded to give enough time for outdoor activities should to be looked into. This will make the method have more significant effect on students' knowledge.

It also established the fact that gender had a great impact in the learning of science since the males have proved to be more predisposed to learning than the females.

References

Ajitoni, S.O. (2005): Effects of full and quasi participatory learning strategies on senior secondary pupils' environmental knowledge and attitude in Kwara State Nigeria. *An unpublished Ph.D Thesis, Department of Teacher Education, University of Ibadan.*

Akubuilo, D.U. (2004): The Effects of Problem Solving Instructional Strategies on Students' Achievement and Retention in Biology with Respect to Location in Enugu State. *Journal of the Science Teachers Association of Nigeria* 39 (1& 2): 94-100.

Aremu, A. and John, A. (2005): Gender implications of the use of video drama in environmental education. *Issues in language, communication and education. A book in honour of Caroline A. Okedara. Dada A.* Akinbade and O.O. Kolawole, Eds. Ibadan: Constellation books, Pg. 342-352.

Ogunbiyi, J.O. (2007): Effects of Value Clarification Strategy on In-Service Teachers' Environmental Knowledge and Attitude in Selected Secondary Schools in Abeokuta, Ogun State. *African Journal of Educational Research* 11(1&2): 10-14.

Ogunleye, B.O. (2002): Evaluation of the Environmental Aspect of the Senior Secondary School Chemistry Curriculum in Ibadan. An unpublished PhD Thesis Department of Teacher Education, University of Ibadan.

Olagunju, A.M. (2005): Teachers' attitude to, and extent of utilization of verbal and non-verbal strategies for effective communication of environmental concepts in Biology.

Issues *in language, communication and education. A book in honour of Caroline A. Okedara. Dada A*. Abimbade and O.O. Kolawole. Eds. Ibadan: constellation books chapter 27: 353-371.

Olatundun, S.A. (2008): Impact of Outdoor Educational Activities on Pupils' Environmental Knowledge and Attitude in Selected Primary Schools in Ibadan, Nigeria. An unpublished PhD Thesis. Department of Teacher Education, University of Ibadan.

Rim-Rukeh, A. (2007): Environmental Education Curriculum for Secondary Schools in Nigeria: Suggestive Approaches for its Implementation. *Asaba Journal of Educational Studies* 2(2): 117-121 published by Federal College Education (Technical), Asaba, Delta State, Nigeria.

UNESCO-UNEP (1990): *International Environmental Education Programme on Environmental Education*: 1-21

Wikipedia – Constructivist teaching method. Retrieved May 11 2009 from http://en.wikipedia.org/wiki/constructivist_teaching_methods.