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The Interactive Effect of Outdoor Activities and School Location on Senior Secondary Students' Environmental Problem Solving Skills in Biology

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Abstract

The traditional lecture method adopted for teaching environmental education by teachers has been adjudged ineffective for acquiring skills in solving environmental problems. Several researches have suggested the need to employ proactive methods for enhancing positive disposition of people towards the environment. This study examined the interactive effect of outdoor activities and school location on secondary school students' environmental problem solving skills in biology. The study involved 240 Senior Secondary Two (SS II) students selected from four purposively-sampled

secondary schools in two Local Government Areas of Oyo State, Nigeria. A pre-test, post-test control group, quasi experimental design with 2x2x2 factorial matrix was used. Four instruments were used. Three hypotheses were tested at 0.05 level of significance. Data was analysed using the ANCOVA. Findings showed a significant main effect of outdoor activities on students' environmental problem solving skills [F (1,231) =33.215 P<.05] and significant main effect of school location on students' environmental problem solving skills [F (1,231) =36.230 P<.05]. There was significant interaction effect of treatment and school location on students' environmental problem solving skills [F (1,231) =3.771 P=0.05]. It is recommended that outdoor activities should be included in the Biology curriculum to bring about effective teaching of environmental education and consequently, acquisition of problem solving skills.

Key Words: outdoor activities, environmental problem solving skills, Environmental Education, school location

Introduction

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 day to day and despite the awareness that is being propagated towards sustaining the environment, the attitude of man has not really been positive towards the environment. 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. This 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).

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.

Environmentalists, educators and scientists have advocated a shift from technical and scientific solution to behavioural modification through environmental education (EE). So far, efforts geared towards sustaining the environment have included enactment and enforcement of laws and awareness through activities such as environmental sanitation. In fact, all the countries of the world are also affected by the rate of depletion of the environment which called for a Climate Change Conference in Copenhagen in December 2009 during which ways of addressing the problems were deliberated upon. Earlier, there has been a call to the need for sustaining the environment by bodies/organisations such as UNESCO, UNAIDS, WORLD BANK, etc. which brought about the introduction of environmental concepts such as pollution, conservation, natural resources, family planning, ecology, health, etc. into the school curriculum.

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 has been made (Olagunju, 1997) and is 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 (Olagunju, 2005). Despite all these, it has been observed that students acquire limited knowledge but fail to utilize it in sustaining the environment. An example, as cited by Ogunleye (2002), is the survey study conducted by Mansaray and Ajiboye in 1993 to investigate the Nigerian students' prevailing knowledge, attitude and practices in relation to environmental issues in social studies. They reported that students exhibited poor knowledge, negative attitude and harmful practices towards a healthy environment. This is also evident in observations of how students litter the environment with ice cream nylons, papers, pure water nylon, sweet wraps etc.

The formal school or education system constitutes the fundamental and universal criterion needed to achieve this worthwhile or desired behavioural change or awareness. EE requires a 'student-initiative education' in the sense that it is fundamentally problem oriented. The inadequate environmental ethics, ignorance and

inadequate environmental awareness, knowledge and skills in pupils and students in particular, can only be removed through such education (Ogueri, 2004). There is therefore the need for a methodology that will make the students functional in Environmental Education. The need of the hour is to have environmentally conscious citizens who are concerned about saving the environment from disasters. It might happen only when people are knowledgeable about their environment and associated problems; are aware of the solutions to these problems and are motivated to work for that. This naturally means change in attitude and behaviour of the public (Ahove, 2001). The more we learn the better we realize the worth of our environment.

It appears that if there is a change in approach from the usual practice of verbal instructions from textbooks to a method where the students are allowed to learn by direct contact with nature, there might be an improvement in academic performance of students in Biology (Edet & Inyang, 2008). Biology instructions ought to be carried out in a manner that students develop the higher cognitive ability (Nwachukwu and Nwosu, 2007). Secondary school students are usually receptive and strongly motivated. They are also capable of assimilating an environmental education that is: (i) value-oriented (ii) community-oriented, and (iii) concerned with human well-being (Ahove, 2001).

School location which is the area or place where the school is situated tells a lot about the availability of resources, the facilities such as laboratory and other equipment, category and qualification of the teachers in the school, the social environment existing there and many more. This in effect may eventually determine the level of knowledge acquisition and skill acquisition by the learners. However, the specific problem of teaching science in urban and rural environments and whether urban subjects perform significantly better than their rural counterparts when specific strategies are used have not been adequately investigated (Akubuilo, 2004).

The need for knowledge acquisition, attitudinal change and achievement of problem solving skills among secondary school students, especially towards the environment and environmental problems, thus forms the basis of this study.

The broad objectives of this research work are to:

1. identify if there will be any change in the environmental knowledge of secondary school students after their exposure to outdoor educational activities:
2. find out if there will be any change in the environmental problem solving skills of secondary school students after their exposure to outdoor educational activities; and

3. find out if the location of students' school will have any influence on their environmental knowledge and problem solving skills after exposure to outdoor educational activities

Statement of the Problem

Teaching science for utility is one of the goals of science education. A situation where students who are exposed to years of science instruction are still unable to tackle simple problems in their environments is highly undesirable and this occurs because such students have not grasped the vision of science application purposes (Ige, 2003). The problem this study seeks to address, therefore, is to investigate the effect of outdoor activities on secondary school students' environmental knowledge 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 effect of school location on subjects' knowledge and problem solving skills 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 problem solving skills.

Ho 2: There is no significant main effect of school location on students' environmental problem solving skills.

Ho 3: There is no significant interaction effect of outdoor activities and school location on students' environmental problem solving skills.

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 and skills in Ibadan metropolis, Nigeria.

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

Table 1: The 2x2x2 factorial matrix

Treatment	School Location	Gender	
		Male	Female
Experimental	Rural		

	Urban		
Control	Rural		
	Urban		

The following variables were used for the study:

Independent Variable /Treatment

(a) Outdoor educational activities, and (b) Conventional teaching method/lecture method

Dependent Variables

(a) students' environmental problem solving skills, and (b) Knowledge of environmental concepts

Moderator Variable - School location

The researcher selected 240 Senior Secondary School Two (SS II) students 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

The following instruments were designed and used by the researcher in this study:

(a) Students' Test of Environmental concept knowledge in Biology (STECKB)

(b) Students' Test of Environmental Problem Solving Skills (STEPSS)

(c) Instructional Guide for Teaching with Outdoor Activities(IGTOA)

(d) Instructional Guide for Teaching with Conventional Method (IGTCM)

(e) 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 and deforestation. 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.

Students' Test of Environmental Problem Solving Skills (STEPSS)

This is an instrument designed to allow students express their own solutions to problems in the school and home environment as deemed fit. It consists of two problem statements relating to environmental problems in the school and at home to which the students are expected to proffer solutions and present an outline of how they will go about solving the problems. The items were designed to test the level of the students' understanding of environmental problems and involvement in constructive thinking and activities for sustaining the environment. The reliability was tested to be 0.90.

Instructional Guide for Teaching with Outdoor Activities (IGTOA)

This is an instructional guide for teachers participating in the experimental group. It contains the statement of topic, objectives and the procedure expected to be followed by the teachers in teaching of EE concepts during outdoor activities. This was prepared and used in the training of teachers to allow for uniformity in the teaching method.

Instructional Guide for Teaching with Conventional Method (IGTCM)

This is an instructional guide for teachers participating in the classroom using the conventional method/lecture method of teaching. It contains the statement of topic, objectives, instructional materials and the procedure expected to be followed by the teachers in teaching of EE concepts in the classroom. This was prepared and used in the training of teachers to allow for uniformity in the teaching method.

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.

Result

Data collected were analysed 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. The result of this study and the summary in the tables are hereby presented using the research hypotheses as guide.

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

						Mean	Std. Dev.	N
Treatment	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
	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

Table 2 above 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.

Descriptive statistics on students' environmental problem solving skills

Table 3: Descriptive Statisics of Post- Test Environmental Problem Solving Skills according to Treatment,Gender and School Location

						Mean	Std. Dev.	N
			Male	Location	Urban	12.96	3.277	24
					Rural	9.24	3.952	29
					Total	10.92	4.080	53
			Female	Location	Urban	11.94	33.55	36
	Experimental	Gender			Rural	6.90	3.859	31
					Total	9.61	4.376	67
			Total	Location	Urban	12.35	3.334	60
					Rural	8.03	4.046	60
					Total	10.19	4.281	120
			Male	Location	Urban	9.11	4.391	35
					Rural	6.42	4.736	24
					Total	8.02	4.689	59
Treatment	Control	Gender	Female	Location	Urban	7.92	3.487	25
					Rural	5.78	3.595	36
					Total	6.66	3.678	61
			Total	Location	Urban	8.62	4.051	60
					Rural	6.03	4.063	60
					Total	7.33	4.243	120
			Male	Location	Urban	10.68	4.380	59
					Rural	7.96	4.511	53
					Total	9.39	4.627	112
			Female	Location	Urban	10.30	3.926	61
	Total	Gender			Rural	6.30	3.734	67
					Total	8.20	4.306	128
			Total	Location	Urban	10.48	4.142	120
					Rural	7.03	4.161	120
					Total	8.76	4.489	240

Table 3 presents the descriptive statistics of students with respect to environmental problem solving skills. It comprises the mean score, standard deviation and numbers of students involved in the research. A detailed study of the table revealed with respect to solving of problems related to the environment, the total mean score of the experimental group was greater than that of the control group. Also, the total mean

score of the male students was higher than that of their female counterparts. Finally, the urban students performed better than the students in the rural area. These findings were subjected to further statistical clarification which was done using the Analysis of Covariance - an inferential statistical method was used to test the hypotheses in order to show if the difference in the mean scores were significant or not. It was also used to partial out any initial differences that may exist between the groups prior to treatment so that any difference obtained in their performance could be attributed to the effectiveness of the treatment since intact classes were used.

Ho1: There is no significant main effect of outdoor activities on students' (a) environmental knowledge, and, (b) environmental problem solving skills.

Main Effect of Treatment on Students' Environmental Knowledge

Table 4: Summary of2x2x2 Analysis of Covariance (ANCOVA) of Post- Test Environmental Knowledge according to Treatment, Gender and School Location

		Type III Sum of Squares	d	Mean Square	F	Sig.
Source	Corrected Model	510.158	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	.789	.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
	TREATMENT*LOCATION	23.413	1	23.413	2.630	.106
	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			

Ho1a: *There is no significant main effect of treatment on students' environment knowledge.*

The result of 2x2x2 Analysis of Covariance (ANCOVA) as presented in Table 4 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 5 below.

Table 5: 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 5 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.

Main Effect of Treatment on Students' Environmental Problem Solving Skills

Table 6: Summary of 2x2x2 Analysis of Covariance (ANCOVA) of Post- Test Environmental Problem Solving Skills according to Treatment, Gender and School Location

		Type III Sum of Squares	d	Mean Square	F	Sig.
	Corrected Model	1375.905	8	171.988	11.549	.000*
	Intercept	4970.725	1	4970.725	333.782	.000*
	KNOW_PRE	.277	1	.277	.015	.902
	TREATMENT	494.645	1	494.645	33.215	.000*
	GENDER	95.267	1	95.267	6.397	.012*
	LOCATION	539.535	1	539.535	36.230	.000*
	TREATMENT*GENDER	8.485	1	8.485	.570	.451
Source	TREATMENT*LOCATION	56.158	1	56.158	3.711	.053*
	GENDER*LOCATION	2.023	1	2.023	.136	.713
	TREATMENT*GENDER* LOCATION	13.064	1	13.064	.877	.350
	Error	3440.078	231	14.892		
	Total	23226.000	240			
	Corrected Total	4815.983	239			

Ho1b: *There is no significant effect of outdoor activities on students' environmental problem solving skills.*

The result on Table 6 shows that there is a significant effect of outdoor activities on students' environmental problem solving achievement. ($F=33.215$, $P< 0.05$). The hypothesis was therefore rejected. This means that student exposed to outdoor activities improved in their environmental problem solving achievement ($x=10.19$, $SD=4.281$) than their counterpart ($x=7.33$ $SD=4.243$) although the level of achievement is still low which is just a bit above the average mark.

Table 7: Multiple Classification Analysis (MCA) on Post-test Environmental Problem solving Achievement by Treatment, Gender and School Location

Grand Mean = 8.76

Treatment + category		No	Adjusted for Factors and Covariates	Unadjusted	Adjusted for factors and Covariates	Eta	Unadjusted	Beta
Treatment	Outdoor activities	120	10.19	10.21	1.443	0.320	1.456	0.325
	Conventional method	120	7.33	7.30	-1.443		-1.456	
Gender	Male	112	9.39	9.39	0.635	0.132	0.614	0.128
	Female	128	8.20	8.22	-0.555		-0.537	
Location	Urban	120	10.48	10.44	1.725	0.385	1.678	0.375
	Rural	120	7.03	7.08	-1.725		-1.678	

The Multiple Classification Analysis (MCA) on Environmental Problem Solving Achievement as presented in Table 7 Shows that the experimental group performed better than (X=10.21) than the control group (X=7.30). The table further shows that the treatment contributed 10.6% to Environmental Problem Solving Achievement.

Ho2: *There is no significant main effect of school location on students' (a) environmental knowledge, and (b) environmental problem solving skills.*

Main Effect of School Location on the Students' Environmental Knowledge

Ho2a: *There is no significant effect of school location on students' environmental knowledge.*

From Table 6, the result shows that the effect of school location on students' environmental knowledge was significant (F=34.497 P<0.05). The hypothesis was therefore rejected. Table 3 showed that students in the urban area obtained higher mean score in environmental knowledge than people in the rural area. Observation from table 7 shows that school location had a Beta value of 0.375. This implies that school location accounted for14% of the variation in students' environmental knowledge.

Main effect of school location on students' environmental problem solving skills.

Ho2b: There is no significant main effect of school location on students' environmental problem solving skills.

The result of Table 6 shows that there was a significant effect of school location on students' environmental problem solving skills (F=36.230 P<O.O5). The hypothesis was therefore rejected. This shows that school location has influence on students' environmental problem solving skills. The urban students achieved more of environmental problem solving skills (x=10.48 SD=4.142) than the rural students (x=7.03 SD=4.161). Table 7 shows that school location had a Beta value of 0.375. This implies that school location accounted for 14.1% of the variation in students' environmental problem solving skills.

Ho3: *There is no significant interaction effect of outdoor activities and school location on students' (a) environmental knowledge, and (b) environmental problem solving skills.*

Interaction effect of Treatment and school location on students' environmental knowledge

Ho3a: *There is no significant interaction effect of outdoor activities and school location on students' environmental knowledge.*

Result from table 6 shows that was there no significant interaction effect of outdoor activities and school location on students' environmental knowledge (F= 2.630 P>0.05). The hypothesis was therefore not rejected.

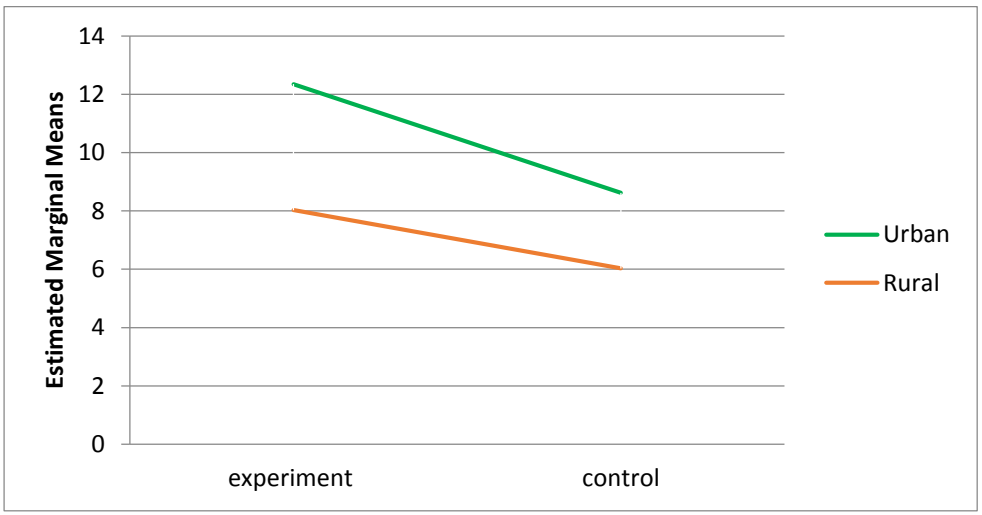
Interaction effect of Treatment and school location on students' environmental problem solving skills

Ho3b: *There is no significant interaction effect of outdoor activities and school location on students' environmental problem solving skills.*

The results of Table 6 reveals that there was a significant interaction effect of outdoor activities and school location of students' environmental problem solving skills (F=3,771 P<0.05). The hypothesis was therefore rejected.

The nature of this interaction was however determined by plotting an interaction graph of treatment by location. This is shown in figure 1below.

Fig.1: Graphical representation of the Interaction effect of Treatment and School location on students' Environmental Problem Solving Skills



This graphical representation reflects an ordinal interaction between treatment and school location. This indicates that in both urban and rural schools, the experimental group performed better than control rural group. This shows that the urban group acquires better skills in solving environmental problems than the rural group.

Discussions

Research studies previously carried out on outdoor education activities has shown it to be very effective in impartation of knowledge, attitude and skills in the life of various individuals at different educational levels varying from the primary to the tertiary level. This present study was carried out to extend the various studies carried out. The study investigated the effect of outdoor activities on secondary school students' environment knowledge, attitude and problem solving skills. It also examined the moderating influence of gender and school location on the students' environmental learning outcomes.

The students were exposed to learning through outdoor activities so that they could from their experience, construct knowledge and build up attitudes and a sense of problem solving towards the problems in their environment to make it a better place to live in.

Summary

The research work was embarked upon with the purpose of finding out the effect of outdoor activities on secondary school students' environmental knowledge, attitude and problem solving skills. It further examined the effects of gender and school

location on subjects' knowledge and problem solving skills on environmental issues and concepts.

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 instruments used comprises Students' Test of Environmental Concept Knowledge in Biology (STECKB), Students' Test of Environmental Problem Solving Skills (STEPSS), Instructional Guide for Teaching with Outdoor Activities, Instructional Guide for teaching with conventional method, Evaluation sheet for assessing the teachers. Reliability and Validation of instruments were done before they were used in the main study. Data analysis was done using descriptive statistics (mean and standard deviation) and inferential statistics (Analysis of Covariance - ANCOVA).

The summary of the result is as follows:

- There was an improvement in the environmental knowledge of students exposed to treatment; the result however showed that there was no significant main effect of treatment on students' environmental knowledge. The treatment however had a significant main effect on students' environmental problem solving skills.
- The study revealed that there was a significant main effect of school location on students' environmental knowledge and problem solving skills.
- There was no significant interaction effect of treatment and school location on students' environmental knowledge. There was a significant interaction effect of treatment and school location on environmental problem solving skills.

Implications of Findings

The study was necessitated to find a way of bringing about functional and holistic environmental education and an all-round national development and systemic change, acquisition of knowledge for utility, especially towards the environment, which has been observed to play a vital role in all facets of life.

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 and problem solving skills. Their participation and involvement in positive environmental activities will better their lives and eventually lead to societal development.

The implication for teachers, according to the findings, is that teachers in the rural schools need to improve upon their use of outdoor activities so that the impact expected will be manifested in the students.

Conclusion

Various researches about EE, either in its inclusion in curriculum (Olagunju, 1997; Ogunleye, 2002) or the strategies for teaching it in various subjects (Olatundun, 2008); Ajitoni, 2005) among others has been extensive in recent years. This study has revealed that the use of outdoor activities in teaching environmental education particularly in biology is relatively effective in bringing about improved knowledge and very effective in bringing about environmental problem solving skills in students. The location of the school has proved to have a great effect in determining the student's knowledge and problem solving skills of environmental issues and problems. Outdoor activities from this study is therefore recommended in bringing about increased knowledge and especially positive predisposition of people to and ability to solve present imminent and future problems that relate to the environment.

Recommendations

The following recommendations are made based on the findings of the study.

1. Curriculum Planners: 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 and problem solving skills. Furthermore, the need to decongest the Biology curriculum which is already overloaded to give enough time for outdoor activities needs to be looked into. This will make the method have more significant effect on students' knowledge.
2. Teachers and Students: Outdoor activities have been observed to have brought about increase in knowledge and significant change in problem solving skills by students. Therefore, outdoor activities are recommended for teaching and learning of environmental education and even ecological topics in Biology.

Limitations of the Study

The study was conducted in only Two (2) out of all the local government areas of Oyo State Nigeria. There is need to replicate the study using more schools and local government areas to have a more generalized conclusion.

Time constraint was another limiting factor. The secondary school curriculum is overloaded and so the time needed for outdoor activities was not enough for the kind of knowledge needed to be imparted to the students.

The population of students in a class to be handled by a teacher is so vast that to get information or the needed facts across during teaching requires a dedicated teacher and students that are ready to learn. Unfortunately, the achievement of students in Biology has not been impressive. Thus the major problem of teaching and studying

Biology identified among other things is that the populations of students in most cases are disproportionate to the number of teachers handling the subject (Nwachukwu & Nwosu, 2007). The overpopulated classroom can be seen here as a limiting factor to acquisition of knowledge. It is the effectiveness of the manipulations of classroom interactions that help the student to achieve more in cognitive objectives (Nwachukwu & Nwosu, 2007).

Areas for Further Studies

The following suggestions for further studies are made:

1. A replication of the study using more secondary schools in other local government areas of Oyo state or from the six geo-political zones of Nigeria to have a more valid generalization /conclusion could be made.
2. There are a lot of other moderator variables that can be considered apart from gender and school location. These include: teacher factor (experience, qualification, psychology etc); student factors (socio-economic status of parents, subject specialization, psychology, level of intelligence and exposure etc), cultural beliefs and so on.
3. The development of outdoor activities as part of the school curriculum would go a long way in ensuring the acquisition of knowledge and skills that would help in building the right personality for the environment in which we live.

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