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An Examination of the Extent to which School Outdoor Activities could Enhance Senior Secondary Two Students' Achievement in Ecology

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Abstract

This study examined the extent to which school outdoor activities could enhance senior secondary (SS) two students' achievement in ecology. Non randomized pre test post test control group Quasi-experimental design was adopted. A sample of 160 SS II students from 4 co- educational schools in Jalingo metropolis, Taraba State Nigeria was used. A 40 item instrument called Ecology Achievement Test (EAT) developed by the researchers with reliability co-efficient of 0.95 using Kunder- Richardson formula 21 was used for data collection. The schools were grouped into 2; the experimental group was taught using school outdoor activities while the control group was taught using lecture method. Intact classes were used in all the schools. Students were pre tested, treated for 6 weeks and Post tested. Data collected were analysed using mean, standard deviation to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The result shows that there was a statistically significant difference between the mean achievement scores of students taught using outdoor activities and those taught using lecture method. There was no statistically significant difference between the mean achievement scores of boys and girls exposed to school outdoor activities. Similarly, there was no statistically significant interaction effect of method of teaching and students gender on their achievement in ecology. . It was recommended among others that teachers should use school outdoor activities strategy in teaching ecological concepts in biology and seminars, workshop, conferences, in-service trainings, annual teachers vacation courses and refresher courses should be organized to train them.

Keywords: Ecology achievement, Outdoor activity, Field trip, Gender, Ecological concept.

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1. Introduction

Biology is derived from two Greek words "bios" meaning life and "logos" meaning to study. The existence of man and the thought of himself and environment (plants and animals) led to the study of life (Biology). The importance of biology cannot be overemphasized. Biology and other sciences aim at improving the survival of life. Biology is one of the core subjects in Senior Secondary Schools in Nigeria. The study of biology enables one to become more aware of one's changing environment, explore it better and become adapted to it. In the same vein, Abu (1998) pointed out that Biology is one of the most important science subjects for creating self awareness in the individual to contribute one's quota more effectively and meaningfully.

Biology as a science also involves the use of process skills and different approaches to bring about meaningful achievement in the learners; however, maximum achievement is not yet attained. Alarming dismay still continue from Examination Councils as the West African Examination Council (WAEC), Institution of higher learning, also from Federal and State government Concerning the poor performance in Sciences particularly Biology. The statement becomes more evident when we look at the records of the West African Examination Council (WAEC) result from 2000 to 2010 where performance of students was shown in Table 1.

Table-1. Performance of Students in Biology Showing Percentage Passes at Credit Level (A1-C6) and of Failure in WAEC from 2000-2010 In Nigeria

Year	Total Sat	% Pass at Credit Level	% of Failure
2000	620,291	19.30	26.61
2001	995,345	23.20	25.45
2002	1047,235	31.39	28.37
2003	931,219	43.15	33.25
2004	838,945	30.83	34.68
2005	1072,607	35.74	32.18
2006	1152,043	49.23	22.96
2007	1245,315	36.44	25.11
2008	12,59965	33.59	38.42
2009	1340,206	28.59	35.17
2010	1300,418	49.65	22.86

Source: WAEC's Performance Statistics.

Table 1 reveals that although biology has the highest enrolment relative to other science subjects, it records a very poor performance at Senior School Certificate Examination. This poor performance by students is not in keeping with the aims and objectives of education in Nigeria which states that education should aim at helping the child acquire appropriate skills, abilities and competencies both mental and physical as equipment for the individual to live in and contributes to the development of his society (Federal Republic of Nigerian (FRN), 2004). Student exhibit poor attitude towards practical work and their performance in science (Orokpo, 2006).

Furthermore it has been established that, the persistent poor achievement of students in biology specifically in ecological concepts at senior school certificate examination (WAEC, 1999-2008) leaves one in doubt about the effectiveness of the teaching methods such as lectures or demonstration method popularly used by the biology teachers for teaching the subject. The poor performance in biology was traced to past ecology WAEC questions according to the chief examiner's report of 1999, 2003, 2004, 2006, 2007, and 2008. Although educators have advocated the use of some of the innovative strategies which include cooperative learning, problem solving and constructivism (Achor *et al.*, 2014) in teaching biology, in the same view, the researcher observed that school outdoor activities could be one of the innovative strategies to improve students' achievement in ecological studies.

Biology is a natural Science subject which studies living organisms and how they interact with each other and their environment. It examines the structure, function, growth, origin, evolution and distribution of things. Also, it classifies and describes organisms, their functions and how species come into existence. Therefore, it can hardly be studied only in the classroom settings effectively as many species are found in their natural habitat outside the classroom.Knowledge of biology is therefore a requirement in all countries due to its applications in real life situations. Some of the applications include the manufacturing of food and drugs, in genetic experimentation and engineering, ecological impact of modern technology and global warming among others (Alsop and Hicks, 2001; Minishi *et al.*, 2004).

Education outside the classroom could help students to understand and appreciate application of learning concepts in real life as described by school curriculum. It encompasses field trips and searching for insects in the school garden, excursion to national parks, game reserves, zoos, visiting museum, lagoons, as well as indoor activities like observing stock control in a local shop. The education and skills committee of the House of Common of the United Kingdom in 2005 reported that, outdoor education brings history and art to life, develops social skills and clearly enhances geography and science, biology inclusive.

There is much anecdotal evidence about benefits of school outdoor education experiences. For example, some teachers often speak of their understanding of learnt concepts when they embark on field trip. Besides, it could be documented that outdoor education might have a demonstrable long term effect on behaviour or educational achievement of students. It could also be observed that if teachers expose students to school outdoor activities, much could be achieved.

Outdoor activities simply encompass all academically related activities outside of the classroom undertaken by the teacher and the learners. This includes educational excursion, field trips and any organized walk to study nature. Field trip is the most prominent is an excursion taken outside the classroom for the purpose of making relevant observations and also for obtaining some specific information. It could be in a nearby school farm, far away national park, zoo, industry, forest or game reserve. It is an important component of teaching that, if properly planned, it could afford the students the opportunity to become actively engaged in observing, collecting, classifying, and

improving on their abilities. It could also help students to establish relationship between different concepts and experiences. In biology there is a lot to do with living organisms and their environment. Field trip makes what is learnt in laboratory more concrete. This is because through the process, one gains experience, and acquires first hand information on learning concepts. School outdoor activity deals with living organisms in their natural habitats.

However, it could be observed that, these rich activities of exposing students to teaching and learning has been relegated to the background right from the curriculum development stage. Besides, members of the public i.e. parents and other stakeholders in the educational sector often wonder if biology education is gender biased. Therefore, this study will also take into consideration gender issues to ascertain the effect of outdoor activities on male and female students' achievement in biology. Many studies have pointed out that gender is a relevant factor in academic achievement of students while other have found that no difference exist between the sexes in this area (Usman, 2000; Bichi, 2002). These inconsistencies are part of what prompted this study to find out whether there is a difference in the achievement in biology between male and female students.

1.1. Statement of the Problem

Students' achievement in Biology has consistently been low as confirmed by WAEC (2004-2008). As such, parents, teachers and other stakeholders are worried over the abysmal achievement of students in Biology inspite of its importance. Parents, government, organization including educational institution are not satisfied with the students' achievement in the Senior Secondary Certificate Examination (SSCE) results. Almost the whole blame of students' poor performance is laid on the shoulder of teachers who can hardly escape it.

The WAEC (2008-2010) outlined the weaknesses of the candidates in area of poor handwriting, poor spelling of technical terms, not conforming to size specifications, *poor grasp of ecological concepts*. It was suggested that there are various ways of overcoming these weaknesses among which is exposure of students to frequent practical classes and activities, teacher should endeavour to complete the syllabus before the examination and use of innovative approaches in teaching ecological concepts.

Many scholars have faulted the low achievement of students in biology on the method and strategy adopted in teaching biology which is predominantly lecture method. They have on the other hand advocated the use of other techniques. This notwithstanding, records available show lack of strenuous efforts aimed at determining the desirability of the use of school outdoor activities as a technique in teaching and learning of ecology to enhance achievement in ecology. It is also a source of worry that there is virtually nothing to show how such efforts of school outdoor activities on learners vary due to gender. For instance, do boys do better than the girls when taught using school outdoor activities strategy? The issue of sex and achievement in science is an important area that has involved a lot of researches and available results have not yielded conclusive trend in performance (Bilesanmi-Awodeni, 2002).

Therefore, the problem of the study posed as a question is, "what is the effect of school outdoor activities on senior secondary two students' achievement in ecology in Jalingo metropolis of Taraba State Nigeria?"

1.2. Research Questions

The following research questions were addressed:

1. To what extent does the effect of school outdoor activity and conventional methodon mean achievement scores of Senior Secondary two Students in ecology differ?
2. To what extent is the effect of School outdoor activity on male and female students' mean achievement in senior secondary ecology different?

1.3. Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

HO_1: There is no statistically significant difference in the mean achievement scores of Senior Secondary two Students exposed to school outdoor activities and those that were exposed to conventional method in ecology.

HO_2: There is no statistically significant difference in the mean achievement score of boys and girls exposed to school outdoor activities in ecology.

HO_3: There is no statistically significant interaction effect of method of teaching and students' gender on their achievement in ecology.

2. Materials and Methods

2.1. Design

The design that was used in this study was Quasi-experimental type. A non-randomized pretest-post test control group design was used because the researcher used intact classes. However, assignment of participating classes to experimental and control group was randomized. Ali (2006) stated that Quasi-experimental design is a school-friendly type of design without any disruption to the school class structure or time table of academic event. He further maintains that Quasi-experimental design is used when respondents are pretested and the randomization of respondents in a study is not feasible.

2.2. Population, Sample and Sampling

The study area has 13 coeducational government approved senior secondary schools which have been presenting students for SSCE over five years. The SS2 students' population was 1,227. A sample of 160 students of SSII was drawn from 13 Co-educational Secondary schools in Jalingo Metropolis of Taraba State. Out of 4 schools used, 2 schools were assigned to experimental and the other 2 were assigned to control group using hat and draw technique.

2.3. Instrumentation

The instrument used in this study istheEcology Achievement Test (EAT). EAT comprises two sections A and B. Section A requires the demographic data of the respondents e.g. name of school, sex and class. Section B contains 40 items multiple choice biology (of ecology content) test with four options (A-D) in which the respondents were to study carefully to choose the most appropriate answer by ticking the letter bearing the correct option.

Lesson plan for teaching with outdoor activities and Conventional Method, Ecology Achievement Test (EAT) constructed by the researchers were presented to three experts in science education and one expert in test and measurement for validation. The validators were asked to study the instruments and judge whether or not the instruments measure correctly what they were supposed to measure. Also, other useful comments, observations and contributions were properly taken. The experts used the following criteria; difficulty level, correctness and the appropriateness of test items based on content and concepts coverage, checking test items against West African School Certificate Syllabus in biology and the current ordinary level biology text book. The expert with test and measurement background ensured that the language and design of the question elicited the required response. Their inputs and corrections were used to review both the lesson plans and EAT.

The instrument was pilot tested in two schools different from sampled schools of the study area. One of the two schools was exposed to school outdoor activities teaching strategy and the other one to conventional teaching strategy. One intact class from each of the two schools was used for the pilot study. Before the treatment, a pre-test was given to the students, the treatment lasted for six weeks and after the treatment, a post-test was also administered in each of the two schools. The reliability coefficient of EAT was calculated using Kuder-Richardson K-R_{21} to be 0.95, this shows a measure of high reliability of the instrument. This is consistent with Sowell and Casey (1982) who stated that the minimum requirement for a reliability coefficient of achievement test should be 0.80 while Ali (2006) puts the minimum requirement for reliability coefficient for achievement test to be 0.75.

2.4. Method of Data Collection

Four experienced teachers who are holders of B.Sc. (Ed) Biology were assigned to teach the experimental and control groups. The four teachers selected to teach the students have been teaching biology in the senior secondary school for a minimum of 5 years. They were trained by the researcher for three days before the commencement of the experiment. Two of the research assistants used school outdoor activities instructional strategy to teach in the experimental class and the other two assistants used the conventional approach to teach in the control class for six weeks. After assigning the classes of the various schools to the experimental and control groups, prior to the exercise, the instrument (EAT) were administered as pre-treatment test. This was followed by six weeks treatment. The items of the pre-test were reshuffled to form post-test in order to avoid students getting familiar with the test instrument thereby introducing error into the study. In order to avoid hawthorn's effect, the researcher did not do the teaching himself, however to ensure uniformity of instructions, the researcher developed lesson plan for both the experimental and control groups. To minimize pre-test sensitization, the researcher retrieved all the copies of the instrument from both students and teachers after the pre-test to avoid students using them for revising before post-test.

The training package was developed by the researchers to serve as a guide. Each research assistants taught in the school using the assigned method. In the outdoor activities for example, the student were prepared for outdoor activities and walk round the school compound, nearby Nukkai ponds, school farm. Activities sheets containing questions were giving to each student and research assistants supervised or guided the students while outdoor activities was on. Various plants species such as flowering plants, fruits, vegetables, forage crops and animals e.g. lizard, frog, pond skater, birds, insects, water bug etc. were studied. Assignment was given to the students after each study in the outdoor activities. Two research assistants were made to make one presentation based on each strategy before the researcher and other research assistants for criticism.

In the conventional method, students remained in their intact class and the teacher used instructional materials such as charts showing pictures of organisms to be studied and taught the ecological concepts. Specimens of plants and animals were used as teaching aids during the lecture method. Two research assistants were made to make one presentation based on each strategy before the researchers and other research assistants for criticism. The teachers adhered strictly to the lesson plan. The researchers monitored the teaching during the conduct of the study to ensure uniformity of the instrument as used by the trained teachers.

2.5. Method of Data Analysis

The statistical tools that were used in the analysis of data were mean and standard deviation to answer all research questions and analysis of covariance (ANCOVA) to test all the hypotheses at 0.05 level of significance. The choice of ANCOVA was based on the fact that the study employs Quasi-experimental design which involves the comparison of the mean of the two or more groups namely experimental and control groups using pretest result as covariate for the post test and to take care of the initial difference.

3. Results

3.1. Research Questions

Research Question One: To what extent does the effect of school outdoor activity and conventional method on mean achievement scores of senior secondary two students in ecology differ?

Data answering research question one are in Table 2.

Table-2. Means and standard deviations of scores for experimental and control groups' Pre test and Post test in Ecology

Strategy	N	Pre Text Mean	Standard Dev	Post Test Mean	Standard Dev	Mean gain
Outdoor Activities	72	14.00	3.639	27.53	0.070	13.53
Conventional Strategy	88	12.50	3.907	20.53	2.722	7.81
Mean difference	-	-	-	-	-	5.72

Table 2 shows that the mean gain scores of the experimental and control groups between pretest and post test were 13.53 and 7.81 respectively while their standard deviation were 0.070 and 2.72 respectively. The difference in the mean achievement score between outdoor activities and conventional method is 5.72 in favour of outdoor activities. The scores of conventional method are less homogeneous or more heterogeneous than those of outdoor activities. Hence, research question one could be answered that outdoor activities has more positive effect on students' mean achievement than those of conventional method. However to determine whether or not the difference is significant, hypothesis 1 was further tested.

Research Question Two: To what extent does the effect of school outdoor activity on male and female students' mean achievement scores in ecology differ?

Data answering research question three are in Table 3

Table-3. Analysis of data on students mean and standard deviation score for male and female students exposed to outdoor activity in Ecology

Gender	N	Pre Text Mean	Standard Dev	Post Test Mean	Standard Dev	Mean gain
Male	41	13.53	4.108	27.07	0.04	13.54
Female	31	14.19	2.960	28.13	0.23	13.94
Mean difference	-	-	-	-	-	0.04

Table 3 indicates that the mean achievement scores of male students taught using outdoor activities strategy is 13.22 while those of female students is 13.94. The scores of female students taught using school outdoor activity are more heterogeneous than those of the male students. As such, the research question three could be answered that outdoor activities has more positive effect on female mean achievement than their male counterparts. However, to ascertain whether the mean difference is significant or not would be shown in the hypothesis.

HO_1: There is no statistically significant difference in the mean achievement scores of senior secondary two students exposed to school outdoor activities and those that were exposed to conventional method in ecology.

This null hypothesis was tested using the result of the analysis of data as presented in Table 4.

Table-4. Analysis of covariance ANCOVA tests of between subject's effects for experimental and control groups' mean scores in ecology.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2167.264[a]	4	541.816	18.161	.000
Intercept	6836.648	1	6836.648	229.158	.000
Pre Test	.648	1	.648	.022	.883
Method	2016.793	1	2016.793	67.601	.000
Gender	85.926	1	85.926	2.880	.092
Method * Gender	6.918	1	6.918	.232	.631
Error	4624.230	155	29.834		
Total	95575.000	160			
Corrected Total	6791.494	159			

a. R Squared = .319 (Adjusted R Squared = .302)

In Table 4 the result reveals that there is a significant difference in the mean achievement scores of senior secondary two students exposed to school outdoor activities and those that are exposed to convectional method in ecology, $F_{1, 159} = 67.601$, $p = 0.000 < 0.05$. Therefore the null hypothesis which states that there is no statistically significant difference in the mean achievement scores of senior secondary two students exposed to school outdoor activities and those that are exposed to conventional method in ecology is rejected. This means that the experimental group means score is significantly higher in achievement test than the control group means score.

HO_3: There is no statistically significant difference in the mean achievement scores of male and female students exposed to school outdoor activities in ecology.

Table-5. Analysis of Covariance (ANCOVA) of the mean achievement scores of boys and girls exposed to school outdoor activities in ecology.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	22.002[a]	2	11.001	.861	.427
Intercept	3233.656	1	3233.656	252.990	.000
PreTest	2.322	1	2.322	.182	.671
Gender	19.013	1	19.013	1.488	.227
Error	881.943	69	12.782		
Total	55464.000	72			
Corrected Total	903.944	71			

a. R Squared = .024 (Adjusted R Squared = -.004)

In Table 5, the result shows that there is no significant difference between the mean achievement scores of males and female students exposed to school outdoor activities ($F_{1, 71} = 1.48$, $p = 0.23 > 0.05$). Hence the null hypothesis which states that there is no statistically significant difference in the mean achievement scores of male and female students exposed to school outdoor activities in ecology is not rejected.

HO_5: There is no statistically significant interaction effect of method of teaching and students gender on their achievement in ecology.

From Table 4 the result shows that there is no significant interaction effect of method of teaching and student's gender on their retention is ecology, $F_{1, 159} = 0.232$, $p = 0.631 < 0.05$. Therefore the null hypothesis which states that there is no statistically significant interaction effect of method of teaching and students gender on their achievement in ecology is not rejected.

4. Discussion of Findings

One of the findings of this study is that there was a significant difference between the mean achievement scores of senior secondary two students exposed to school outdoor activities and those that were exposed to conventional method. The difference shows that outdoor activity has more positive effect on mean achievement in ecology. This finding is consistent with a related field of discipline where Ajaja (2010) carried out a study to determine the effect of field experience on student's knowledge of process of science and biology achievement using experimental 2*2 pretest and post test control group design. An analysis of covariance showed a significant difference in process of science test scores between students exposed to field trip experiment and those who were not exposed. This result agrees with Allen (2007) who said that the most effective way of learning is through participation and calls on education to make a special effort on create opportunities for children to participate in their learning. The result obtained in this study could be attributed to active participation by the learners in addition to concrete visible objects seen on site which could help them to remember what is learnt during examination.

The finding of the study also revealed that there was no significant difference in the mean achievement scores of male and female students exposed to school outdoor activities. This finding is consistent with Duru (2012) who carried out a study on gender sensitization strategies (GSS) and investigated their benefits in enhancing gender equity among biology students and also the effect of these GSS on student's achievement in biology in senior secondary school two. The result showed that there was no significant difference in the achievement of boys and girls taught by male and female teachers to GSS. However the finding of Bilesanmi-Awodeni (2002) reveals that the issue of sex and achievement in science is an important area that has involved a lot of research, available result have not yielded a conclusive trend in performance.

It was equally found that there was no significant interaction effect of method of teaching and students gender on their achievement in ecology. By implication, when outdoor activity is used as a teaching strategy, interaction between it and gender do not have appreciable effect on the students' achievement. This makes the use of this method in coeducational institution possible.

5. Conclusion

From the study, school outdoor activity was found to have positive effect on senior secondary two students' achievement irrespective of gender in ecology than those of conventional method. This has implication for the adoption of outdoor activities to teach ecology in biology subject in senior secondary schools within the State.

6. Recommendations

Based on the findings of the study, the following recommendations were made.

1. Biology teachers should be trained on the use and importance of outdoor activity in teaching ecological concepts in biology. This training should be done through organising seminars, workshops, conferences, in-service training, annual teacher's vacation course and refresher courses. This will equip them with workable and functional methods of teaching biology that will not only improve on student's achievement but also boost application of biology knowledge on practical situation.
2. Faculties of Education in Nigerian Universities as well as schools of Education, Colleges of Education should include the outdoor activities as teaching strategies in their teacher training programme and as discussion during workshops and seminars organised for teachers and professionals.
3. Since gender difference is not significant in the study it means that the method could deliberately be used to help eliminate the hitherto gender difference in science teaching and learning.

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