

AN INVESTIGATION OF THE EFFECTIVENESS OF FIELDTRIPS ON ACADEMIC ACHIEVEMENT OF BASIC SCIENCE STUDENTS IN LAGOS STATE

JAMES TIMOTHY PhD AND APATA F.S. PhD

ABSTRACT

This study investigated the effectiveness of field trips on academic performance of basic science students in Lagos State. A total of four Research questions and four null hypotheses were formulated and tested at 0.05 level of significant. The population comprised of all the basic science students in all the twenty public junior secondary schools in Surulere Local Government Area of Lagos State out of which two co-educational schools were randomly selected using balloting system. The research design was a pre-test, post-test experimental control group design. There were two research instruments. These were Achievement Test in Basic Science (ATBS) and Attitudinal Questionnaire in Basic Science (AQBS). The data collected from the study were processed and analyzed using frequency counts and percentages while the four hypotheses were analyzed using Analysis of covariance (ANCOVA). The result of the hypotheses revealed that field trip strategy was found to be more effective in improving the academic achievement of basic science students. It was therefore recommended that field trip strategy of teaching should be emphasized and collaborated with other methods of teaching science.

Introduction

The importance which Nigeria gives to the study of science is reflected in section 7 of the National Policy on Education (NPE, 2004). In the policy, government emphasizes the teaching and learning of science processes and principles leading to the fundamental and applied researches in the sciences at all levels of education in Nigeria. This in turn will produce scientists and technologist for National development.

Section 5, sub section 22 of the policy also stated that the broad goals of secondary education shall be to “prepare individuals for useful living within the society by providing trained manpower in the applied science, technology and commerce at sub-professional grades”. The extent to which this had been realized in our secondary schools has been of great concern for educationist and researchers.

It is obvious to all and sundry that the importance of scientific knowledge in the technological development of a nation cannot be over-emphasized. Thus, in order to reap maximum benefit from the development of any country, it is necessary that efforts be made to lay the foundation of technological development through effective teaching and learning of science, technology and mathematics in our schools (Nwachukwu, 2009).

Stakeholders in pedagogy of teaching are under pressure to develop and implement new and innovative approaches to learning of science, technology and mathematics (STM) (Knapp, 2000).

However, research works by prominent scholars have revealed that some conventional methods of teaching in secondary schools employed by science teachers lack firsthand experience and engagement on the part of the learners (Skam, 2007, Pickens and Etick,

2009). In other words, students are not provided with multiple experiences in the natural settings. According to Edu, Ayang and Idoka (2012), majority of students view science as something that is unexciting and boring. This could probably be the reason why most science students especially at middle school level show a decrease in interest in science classroom (Pedretti, 2004).

Achibong (1997) found that field trips give students hands-on experiences which they would not be able to have in the classroom or even in the laboratory. Bowker (2004), in his study concluded that many classroom teachers supported the fact that “experiential” learning outside the traditional classroom offers a valuable addition to the students learning experience and are more effective than context related learning alone. Kelly (2000) asserted that out of school experiences allowed students to develop meaningful understanding of science concepts. In addition it gives students the opportunity to use metacognitive reflection of what they have learnt in the classroom.

Beedie (2000) proposed seven distinct motivations for field trips namely:

1. to expose students to new experiences
2. to foster students interest and motivation
3. to provide a change in the learning environment of students
4. to promote long life learning
5. to promote social interactions among students
6. to increase intrinsic motivation in students; and
7. to provide an overall learning in the learners (i.e. affective, psychomotor and cognitive)

According to Ogwu (2005) students who fully participated in field activities, exhibit collaborative behaviours, provide constructive feedback, and cooperate with their groups have a higher likelihood of receiving higher test scores and course grades at the end of the semester.

Furthermore, curriculum context of Basic science (formerly integrated science) is a fusion of all the major science subjects such as physics, chemistry, biology, geography, agricultural science to mention but a few at the junior secondary school level. The researchers are of the view that probably the method of teaching basic science could be responsible for students lack of interest in the basic science classroom. It is against this background that this research work is aimed at comparing the efficacy of field trips and conventional method of teaching science concepts in Basic science in the junior secondary schools in Lagos State.

Research Questions

1. Do basic science students that participated in field trip performed better than those taught using conventional method of teaching
-

2. Are the attitudes of students who participated in the field trip more favorable towards the topic water pollution and Water Treatment Procedure than those taught using the conventional method of teaching?
3. Do male basic science students who participated in field trip on water pollution and water treatment procedure perform better than their male counterparts?
4. Do attitudes of male students more favorable than female students towards water pollution and water treatment procedure before and after the treatment?

Research Hypotheses

1. There is no significant difference in the academic achievement of basic science students taught using field trip and those taught using conventional method
2. There is no significant difference in terms of gender in the academic achievement of basic science students taught using field trip and those taught using conventional method.
3. There is no significant difference in the attitudinal change of basic science students taught using field trip and those taught using conventional method
4. There is no significant difference between gender in the attitudinal change of basic science students taught using field trip and those taught using conventional method.

Methodology

Population and sampling technique

The population for this study comprised of all the basic science students in all the junior secondary schools in Surulere Local Government area of Lagos State which is made up of about twenty public secondary schools. The researcher randomly selected two co-educational junior secondary schools using balloting system. The schools were Surulere Junior Secondary School and Community Grammar School, Surulere. The two schools were equivalent in terms of academic and environment. One of the schools was designated experimental group where field trip was used while the other one was the control group where the normal conventional method of teaching was used. Again fifty (50) students were randomly selected from each of the schools (using balloting technique) which formed the subjects for this study. This gave a total of One hundred students which form the samples for this study. Random sampling was used to select the samples so as to give each of the students in the class the opportunity to be selected.

Design and Instrumentation

This study used a pre-test, post test experimental control group design. The pre-test was given to all the subjects in the two groups, then treatment was given for two weeks and this was followed by the post-test. The topic- Water pollution and water treatment procedure, was picked from the Basic Science syllabus for JSS. 3. The Experimental group was taken on field trip to Surulere Water treatment plant, twice in a week for two weeks. Each trip lasted

for two hours. The control group was taught the same topic but using the conventional lecture method of teaching and demonstration, for two weeks. There were two research instruments used for this study. The first was Achievement Test in Basic Science (ATBS) while the second was Attitudinal Questionnaire in Basic Science (AQBS). The ATBS is made up of 30 test items of multiple choice questions drawn from the topic-Water pollution and water treatment procedure extracted from Basic three science syllabus.

The AQBS is made up of 27 item questionnaire patterned towards Likert Scale Attitudinal measurement scale made up of four options namely Strongly Agree, Agree, Disagree and Strongly Disagree. Both the ATBS and AQBS were given to three senior lecturers in science education unit of the University of Lagos for content validity. The suggestions and recommendations made by the valuator were used to review the instruments before administering. The two instruments were subjected to reliability test using split-half method. The reliability for ATBS was 0.73 while that of AQBS was 0.69 which implies that both instruments were reliable.

Data Analysis, Results and Discussions

The data collected from the study were processed and analysed using frequency counts and percentages. Again the hypotheses were analysed using Analysis of Covariance (ANCOVA) where pre-tests served as covariates of the post test.

Research question 1

Do basic science students that participated in field trip performed better than those taught using conventional method of teaching?

Table 1: Pre-test and post-test mean scores of students achievement for both the experimental and the control groups.

Treatment	N	Pretest		Posttest		Mean Gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Experimental	50	9.88	3.127	16.40	2.306	6.52
Control	50	9.36	2.609	13.88	2.067	4.52

Table 1 shows the pre Test and post Test scores of students, achievement of both the experimental and the control groups. It was revealed from the table that the mean pretest scores of students in the experimental group is 9.88 and post test means score is 16.40 with a mean gain of 6.52. The mean pretest scores of the control group is 9.36 and post test means score of 13.88 with a mean gain of 4.52 since the mean gain of the experimental group is greater than the mean gain of the control group, it therefore indicate that the subjects in the experimental group performed better than those in the control group. Thus answering the first research question.

Research Question 2

Are the attitudes of students who participated in the field trip more favorable towards the topic water pollution and water treatment procedure than those taught using the conventional method of teaching?

Table 2: Pre-test and posttest mean scores of students attitudes towards basic science

Treatment	N	Pretest		Posttest		Mean Gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Field trip	50	71.24	16.84	85.42	17.707	14.18
Conventional	50	36.29	17.683	44.35	18.534	8.06

Table 2 reveals that the mean pre-attitude score of the experimental group is 71.24 and post-attitude means score is 85.42 with a mean gain of 14.18. The pre-attitude mean score of the control group is 36.29 and post-attitude mean score is 44.35 with a mean gain of 8.06. This therefore suggests that the mean gain of attitude scores of the experimental group was higher than those of the control group. It can therefore be deduced from this result that the experimental group had more favorable attitudes towards basic science than the control group.

Research Question 3

Do male basic science students who participated in field trip on water pollution and water treatment procedure perform better than their male counterparts?

Table 3: Pre-test and post test scores of students achievement by gender

Treatment	N	Pretest		Posttest		Mean Gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Male	67	9.54	2.607	14.94	2.443	5.40
Female	33	9.79	3.398	15.55	2.728	5.76

The male pre-test mean scores in table 3 is 9.54 and post test mean score is 14.94. For female students, the pre-test mean score is 9.79 and post test mean score is 15.55. The female students mean gain of 5.76 was higher than those of males with a mean gain of 5.40. As a result of this, female students performed better than their male counterparts and this answered research question three.

Request Question 4

Do attitudes of male students more favorable than female students towards water pollution and water treatment procedure before and after the treatment?

Table 4: Pre-test and post test mean scores of students attitudes towards basic science by gender

Treatment	N	Pretest		Posttest		Mean Gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Male	67	70.75	19.186	85.52	19.212	14.77
Female	33	74.27	2.071	90.18	15.418	15.91

From the table 4, the mean pre-attitude score of male students is 70.75 and post attitude score is 85.52 with a mean gain of 14.77. For female students, the pre-attitude mean store score is 74.27 and post attitude mean score is 90.18 with a mean gain of 15.91. It is deduced that the female students had more favourable attitudes towards basic science than their male counterparts before and after treatment.

Hypothesis Testing

A total of four null hypotheses were tested. The hypotheses were testing the effects of field trips on students academic achievement and attitudes towards chemistry. The subjects were grouped into experimental and control groups. The data analyses to test each hypothesis were as follows:

Hypothesis one

There is no significant difference in the academic performance of basic science student taught using field trip and those taught using the conventional teaching method

Table 5: Analysis of covariance (ANCOVA) on the effect of treatment and gender on students academic performance in Basic science.

Source	Type III Sum of Squares	DF	Mean Square	F-ratio	Significance of F	Eta Square
Corrected model	195.455	8	24.432	5.001	0.0000	0.305
Intercept	1883.080	1	1883.080	385.438	0.0000	0.809
Pre-achievement	15.688	1	15.683	3.211	0.076	0.034
Treatment	54.283	1	54.283	11.11	0.001	0.109
Gender	0.137	1	0.37	0.028	0.868	0.000

R squared = .305 (Adjusted R squared = .244)

Hypothesis one involved a test of difference between the experimental and control groups in terms of academic achievement in basic science. Analysis of covariance was used to compare the achievement data of the two groups. The pre-test was used as covariate of post test. The result of the analysis shows that after adjustment of the covariate, pre test scores for the experiment group indicating the main effect of treatment was 11.111 $P < 0.05$ was significant. The partial Eta squared estimated was 0.109. This implies that treatment accounted for 10.9 percent of the variance observed in the post test achievement scores. Therefore hypothesis one is hereby rejected.

Hypothesis 2

There is no significant difference in the academic performance of basic science student based on gender using field trip and conventional teaching method.

Considering the adjustment for the covariate in Table 5 above, the main effect of gender on students academic achievement was 0.028; $P > 0.05$. This implies that P value of 0.868 is greater than 0.05 alpha level hence it is not significant. This implies that there is no significant effect of gender on students achievement hence hypothesis Two is hereby retained. Again the result of the partial Eta squared estimation was 0.000 which means that gender accounted for zero percent of variance observed in the post test achievement score. Its contribution is highly insignificance.

Hypothesis 3

There is no significant difference in the attitudinal change of basic science students taught using field trip and those taught using the conventional teaching method.

Table 6: Analysis of covariance (ANCOVA) showing effects of treatment on students attitudes towards basic science

Source	Type III Sum of Squares	DF	Mean Square	F-ratio	Significance of F	Eta Square
Corrected model	24911.799	8	3113.974	190.263	0.000	0.944
Intercept	360.099	1	860.099	52.552	0.000	0.366
Pre-achievement	192611.500	1	19264.500	1177.058	0.000	0.928
Treatment	57.954	1	57.954	3.541	0.043	0.037
Gender	36.669	1	36.669	2.240	0.138	0.024

The hypothesis was aimed at investigating the effects of field trips on students attitudes towards basic science. The results as stated in Table 6 shows that the main effect of treatment on students attitudes towards basic science is 3.541 ($P < 0.05$). The p value of 0.043 was less than 0.05. It then means that there is significant effect of the treatment on the attitudinal change of the students towards basic sciences. Therefore, hypothesis three is hereby rejected.

Hypothesis 4

There is no significant difference in the attitudinal change of basic science student based on gender using field trip and conventional teaching method.

The main objective here was to determine whether students' gender will bring about differential attitudinal change towards basic science between male and female students. The pre-attitudinal scores was used as covariate of the post attitudinal scores. Having considered the adjustment of the covariate, the pre-attitudinal scores is 2.240; ($P > 0.05$) p value was 0.138 which is greater than 0.05 alpha level. It can therefore be concluded that there is no significant main effect of gender on students attitudes towards basic science. Thus the null hypothesis was retained.

Findings of the Study

The findings of this study can be summarised as follows

1. Basic Science students that participated in the field trip performed better than those taught using conventional method
2. There was no significant difference in terms of gender in the academic achievement of basic science students taught using field trip and those taught using conventional method
3. There was significant difference in the attitudinal change of basic science students taught using field trip and those taught using conventional method
4. There was no significant difference in the attitudinal change of basic science student based on gender using field trip and conventional teaching method.

DISCUSSION

The major aim of this study was to investigate the effects of field trips on student's academic achievement and attitude towards basic science. In this study four null hypotheses were tested. The results of hypothesis one revealed statistical differences between experimental and control groups in terms of performance in basic science in the junior secondary schools. The findings led to the rejection of hypothesis one. It was established from the results that the experimental group performed better than the control group in terms of achievement in basic science. The differential performance may be as a result of student's exposure to field trip. In addition the result of testing hypothesis three revealed that students had greater favourable attitudes towards basic science after exposure to field trip. The findings in hypotheses one and three supported the findings of Boozdogan (2007) and Michie (1998) where they revealed in their separate findings that field trips enhance students understanding of the processes involved in science and that it also improves students attitudes towards science. Several authors have also confirmed the efficacy of field trip in enhancing meaningful learning of science subjects (Knapp and Barrie, 2001, Tenonbaum , *et al*, 2004).

This study is also in line with the findings of Fox and Auramides (2007) where they concluded that interactive learning provided by field trips helps students change their negative attitudes towards the learning of science.

The result of analysis of hypotheses two and four showed no significant difference between male and female students. In terms of achievement and attitudinal change in basic science respectively when exposed to treatment. In other words, gender does not have any influence on the achievement and attitudinal changes of the subjects after exposure to field trips. This findings draw support from the study of Jacobs, Lanaz, Osgood, Eccles and Wigfield (2002) who found no gender difference in achievement in mathematics and science among boys and girls. Contrary to the above findings, Friba (2003) have found significant gender group difference in favour of boys in science examinations. Adeoye (2000) has also concluded that female students achieved better than male when test items are based on concepts that required medium numerical ability while the reverse was the case when the test was based on concepts that required high numerical ability.

Conclusion and Implication

The results of findings from this study have revealed the efficacy of field trip over other methods and strategies of teaching science. Most importantly the finding of this research supports previous study by Baratey and Packer (2002) that out of school activities can provide a certain level of increase in students interest in science and can facilitate the development of students problem solving skills.

The result of this study have implications for improvement of science teaching and learning in Nigeria in particular and Africa as a whole. Field trip has been found in this study to be effective in enhancing academic achievement and favorable attitudes towards basic science. Research finding have also shown that conventional method of teaching science is characterized mainly of lecture method in most of our schools. This method of teaching deprive science students of first hand experience of concepts in science and meaningful learning is not achieved. (James, 2000; Cook 2001, Knapp and Barrie 2001).

However, findings from this study have revealed that field trips in combination with traditional method of teaching can greatly improve the academic achievement of students and positive attitudes toward basic science.

Recommendations

From the result of the study the following recommendations are made.

1. Emphasis should be placed on teaching for meaningful learning with the use of appropriate methods rather than teaching for memorization of facts. Field trips as found in this study is an effective methods of boosting academic performance and interest in students
2. Government and curriculum planners should incorporate field trips into the curricular of science subjects at all levels of our educational system
3. It is the recommendation of the research that despite the limitations and obstacles encountered in conducting field trips, teacher should endeavor to adopt field trips method in combination with the conventional method of teaching as much as possible for improved teaching and learning and better performance of students in science subjects.

References

- Achibong, A. U. (1997). The relative effectiveness of activity –based approved and lecture method on the cognitive achievement of Integrated Science. *Journal of Science Teachers Association of Nigeria*, 32 (1&2): 25-28.
- Baratay, & Packer J. (2002). *Nature based excursion. School students perceptions of learning environments. International Research in Geography and Environmental Education*. 11 (3): 218 – 236.
- Beedie, P. (2000). Teaching outdoor education in an urban Environment. *British Journal of Physical Education*. 29 (4): 18 – 20
- Bowker, R. (2004). Children’s perceptions of plants following their visit to the EDEN project. *Journal of Research in Science and Technological Education*, 22 (2): 227 – 243
- Boozdogam, A. E. & Yakin, N. (2007). Determining the influence of a science Exhibition centre Training programme on Elementary pupils interest and Achievement in Science *EJMSTE*, 5 (1): 27 – 34
- Cook, L. (2001). Differential social and political influences on girls and boys through education out of doors in the United Kingdom. *Journal of Adventure Education and outdoor learning*, 1 (2): 43 – 52.
- Cooper, G. (2000). Opportunities for outdoor education in the New National Curriculum; *Horizons*, 9 (2): 26 – 29.
- Edu, D. O.; Ayang, E. E. & idaka, I. (2012). evaluation of Instructional methods and Aptitude effects on the psychomotor performance in Basic Electricity Among Technical students in Southern Educational Zone, Cross River State, Nigeria. *American International Journal of Contemporary Research*, 2 (2):117-123.
- Eriba, J. O. (2003). Gender difference in Achievement in calculating reacting Masses from chemical equations among secondary students in Makurdi Metropolis. *Journal of Science Education and Technology*, 12 (1): 59 – 64.
- Fox, P. and Avromides, E. (2003). An Evaluation of an outdoor education programme for students, with emotional and behavioural difficulties, *Journal of Emotional and Behaviour Difficulties*, 8 (4): 267 – 282
- Jacob, J. E.; Lama, S; Osgood, D. W., Eccles, J. S. & Wigfield, A. (2002). Changes in childrens self competence across grades one through twelve. *Child Development*. 73 (2): 509 – 527.
-

- James, T. (2000). Effects of combining reflective writing with concept mapping and lecture method on pre-service NCE Teachers Attitudes and Achievement in Biology. An Unpublished PhD Thesis Faculty of Education. Ahmadu Bello University, Zaria
- Knapp, D; & Barrie, E. U. (2001). Content evaluation of an environmental science field trip. *Journal of science education and technology*, 10 (4): 351 – 357.
- Knapp, D. (2000). Memorable experiences of science field trip. *School Science and Mathematics*, II (2): 65 – 71.
- Kelly, J. (2000). Rethinking the elementary science methods course. A case for content, pedagogy and informal science Education *International Journal of Science Education*, 22 (7): 755 – 777.
- Melber, L. H. & Abraham L. M. (2008). Beyond the classroom. Linking with informal education. *Science Activities*, 36 (2): 3 -4.
- Michie, M. (1998). Factors influencing secondary teachers to organize and conduct field trips. *Australian Science Teachers Journal*, 44 (4): 43 -50.
- Nwachukwu, C. (2009). The relevance of science, Technology and mathematics Education (STME) to development of entrepreneurial skills. Proceedings of the 50th Annual Conference of STAN, 312 – 326
- Ogwu, J. O. (2005). The Effects of field trip instructional strategies on senior Secondary Students Achievement in Ecological concepts in Ndokwa East L.G.A. of Delta State. Unpublished M.Sc. (Ed) Thesis University of Uyo.
- Omosewo, E. O. (2000). A survey of resources for teaching senior secondary school Physics in Ilorin West LGA of Kwara state Nigeria. *Nigeria Journal of Education and Technology*, 1(1): 71-78.
- Pedretti, E. G. (2004). Perspectives on learning through research on critical issues. Science centre exhibitions *Science Education*, 88(1): 34 – 47.
- Tenenbaum, H. R. G.; Rappolt – Schlichmann & Zanger, U. V. (2004). Childrens learning about water in a museum and in the classroom. *Early Children Research Quarterly*, 19: 40 – 58.