



## **Impact of Fieldtrip and Demonstration Instructional Strategies on Senior Secondary School Students' Achievement and Retention on Concept of Pollution in Biology, Minna, Niger State, Nigeria**

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**Abstract:** This study examines the Impact of Demonstration and Fieldtrip Instructional Strategies on Senior Secondary School Biology Student's Achievement and Retention in Edati Local Government Area of Niger State. A pre-test post-test control quasi experimental design was adopted for the study. A total of 105 (49 males and 56 females) senior secondary school I (SSI) students drawn from two (2) Senior Secondary Schools were used for the study. The students were randomly assigned to Experimental and Control Groups. Six (6) hypotheses were formulated and tested at 0.05 level of significance. The instrument used for data collection was the Biology Achievement Test (BAT) consisting of 20 multiple choice items which was developed by the researcher and validated by the experts in the field. A reliability coefficient of 0.85 was obtained using Cronbach alpha analysis and data collected were analysed. The result indicates that there was a significant difference in the mean achievement scores of students taught using Fieldtrip method and those taught using Demonstration method ( $t = 6.504$ ,  $df = 103$ ,  $p < 0.05$ ), there was a significant difference in the mean achievement scores of male and female students taught using Fieldtrip method with ( $t = 5.129$ ,  $df = 56$ ,  $p < 0.05$ ), there was a significant difference in the mean achievement scores of male and female students taught using Demonstration method with ( $t = 4.531$ ,  $df = 45$ ,  $p < 0.05$ ), there was a significant difference in the mean retention scores of students using Fieldtrip method and those taught using Demonstration method with ( $t = 3.852$ ,  $df = 103$ ,  $p < 0.05$ ), there was also a significant difference in the mean retention scores of male and female students taught with the use of Fieldtrip method with ( $t = 3.522$ ,  $df = 56$ ,  $p < 0.05$ ) and there was a significant difference in the mean retention scores of male and female students taught using Demonstration method with ( $t = 2.401$ ,  $df = 45$ ,  $p < 0.05$ ). Based on these findings, it was concluded that the use of Fieldtrip method is more effective in improving student's achievement in Biology than the use of Demonstration method. It is therefore recommended that School authority together with the school principal should encourage and give necessary support to teachers to provide and create avenue for students to embark on Fieldtrip activities for effective teaching and learning of Biology in secondary schools.

**Keywords:** Demonstration strategy, Fieldtrip strategy, student's achievement, Biology, teaching, learning and Retention

## Introduction

Science has been regarded as the bedrock of modern day technological breakthrough in that, it is the basis for all technological ideas seen in the world today. It is an organized body of knowledge directed towards resolution of human problems (Coll., France and Tailor, 2005). Nowadays, countries all over the world, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically, since the world is turning scientific and all functioning of lives depend greatly on science. Scientific enquiry is the primary process by which scientific knowledge is gained. According to Yaki (2012), Science is a dynamic human activity concerned with understanding the workings of our world. This understanding helps man to know more about the universe. The application of Science has also provided essential commodities such as drugs, clothing, fuel, food etc. In drugs, for example, we have antibiotics for infections, tranquilizers for nervous tensions, analgesic for pains etc. Therefore, the importance of science especially biology to mankind and his environment cannot be over-emphasized. Without the knowledge of science with its application, it would have been difficult for man to sight the other planets of the universe. Science comprises the basic disciplines such as Physics, Chemistry, Mathematics and Biology.

Biology as a core science subject is derived from Greek word “bios life and logia study of”. The Latin form of the term first appeared in 1736 by Swedish scientist Carl Linnaeus. It is a natural Science concerned with the study of life and living organisms, including their structure, function, growth, evolution, distribution, and taxonomy, (Magner and Lois 2002 and Larson and Edward 2016). Modern biology is a huge and extensive field, composed of many branches and sub disciplines. However, despite the broadness of the subject, there are certain general and unifying concepts within it that govern all study and research, consolidating it into single, coherent fields. In general, it recognises the cell as the basic unit of life, genes as the basic unit of heredity, and evolution as the engine that propels the synthesis and creation of new species. It is also understood today that all organisms survive by consuming and transforming energy and by regulating their internal environment to maintain a stable and vital condition. Sub disciplines of this subject are defined by the scale at which organisms are studied, the kinds of organisms studied, and methods used to study them; biochemistry examines the rudimentary chemistry of life; molecular biology studies the complex interactions among biological molecules; botany studies biology of plants; cellular biology examined the basic building-block of all life, the cell physiology examines the physical and chemical functions of tissues, organs, organ systems of an organism; evolutionary biology examines the processes that produced the diversity of life; and ecology examines how organisms interact in their environment. (Futuyma, 2005).

The importance of biology to mankind, plants and animals cannot be over-emphasised. The science of biology had been helping mankind in many ways in increasing food production, in combating diseases and in protecting and conserving the environment. Its advances in the field of food and health have resulted in high standard of living. It is crucial by improving existing varieties and developing new high-yield and disease resistant varieties of plants and animals used as food. Animals and plants breeding have advanced through selective breeding, using genetics principle, new and better varieties of rice, corn, wheat, chicken, cow and sheep (Nahle 2009).

Genes for diseases resistance and other desirable characters are introduced in plants using the techniques of genetic engineering. Poultry breeders have developed broilers for getting quick and cheap white meat. The advances in biological sciences have provided information about the causative agents of the diseases and their mode of transmission. For instance, the AIDS (Acquired Immune Deficiency Syndrome) caused HIV (Human Immune Deficiency Virus). (Nick and Tomasovic, 2004). A biologist, Edward Jenner, first developed the technique of vaccination in 1776 used for the vaccination/immunization of many diseases such as polio, whooping cough, measles and mumps etc. Teaching methods comprises the principles and methods used for instruction to be implemented by teachers to achieve the desired learning goals in students. These strategies are determined partly on subject matter to be taught and partly by the nature of the learner. For a particular teaching method to be appropriate and efficient it has to

be in relation with the characteristics of the learner and the type of learning it is supposed to bring about. Davis (2008) suggests that the design and selection of teaching methods must put into consideration not only the nature of the subject matter but also how the students learn. Several types of teaching methods can be employed in the classrooms by the teachers such as the fieldtrip/excursion method and demonstration method.

Fieldtrip or excursion is a journey by a group of people to a place away from their normal environment. The purpose of the trip is usually observation for education, non-experimental research or to provide students with outside their everyday activities, such as going camping with the teachers and classmates. The aim of this research is to observe the subjects in its natural state and possibly collects samples. Fieldtrip is done in three (3) steps which are: preparation, activities and follow-up activities. Preparation is done by both the teachers and students. Teachers take time to learn about the destination and the subjects or topics before the trip. Activities is mostly done by the students which include lecture, tours, video and demonstration while follow-up activities are general discussions that occur in the classroom once the fieldtrip is completed, (Eley, & Norton 2004).

According to Eley and Norton (2002), Demonstration method is the process of teaching through examples in class or through experiments in laboratory. For example, a science teacher may teach the students a concept by performing an experiment for students. A demonstration may be used to prove a fact through combination of visual evidence and associated learning. Demonstrations help elevate the students' interest and reinforce memory retention because they provide connections between facts and real world application of those facts.

Achievements mean something that has been done or accomplished through efforts or a result of hard work (Merriam and Webster 2009). It is the result of what an individual gain from some educational experiences. Additionally, achievement is the expectancy of finding satisfaction in mastering challenging and difficult performances, (De Cecco and Crawford, 2006). Retention means the act of retaining experiences or the condition of being retained. It also means the ability to recall or recognized what has been learned or experienced; memory, (Harper and Collins, 2014). Gender sensitive is also a moderating variable to look into. Firstly, boys always seem to perform better than girl's counterpart in biology. Reports have shown that girls shy away from topics discussed with demonstration method and participate less than the boys in class; this could be due to self-esteem at adolescence while adolescent boys gain in self-esteem. It is important to also find out if the result of demonstration and fieldtrip is truly gender sensitive.

### **Statement of the Problem**

The students' poor performance can be attributed to insufficient teaching and instructional methods employed by science teachers. The popular view in Nigeria today, is that the educational standard has fallen short of what it should be. This fall in educational standard is seen as the inability and incapability of some teachers to impart knowledge to the learners, the way they will understand and write well in examinations. Reports by examination bodies in Nigeria have revealed the persistent and endemic failure of students in both internal and external examinations especially in biology (WAEC and NECO) annual reports (2010-2016). The factors responsible for poor performance in Nigeria has been attributed to teacher's lateness to work and commitment show by teachers, absenteeism and poor attitude to work encourage laziness and contribute to poor performance among students. Several teaching methods have been used to improve students' performance in biology in Nigeria and these methods include lecture method, discussion method, play-way method, simulation and game enquiry method, expository method, constructivism method, project method, assignment method, interactive and question method etc. and yet no improvement on students' performance. The purpose of this study therefore is to investigate the impact of demonstration and fieldtrip method of instruction on senior secondary school biology student's achievement and retention in Edati Local Government Area of Niger State, Nigeria.

## Purpose of the Study

The purpose of this study is to investigate the impact of demonstration and fieldtrip method of instruction on student's achievement and retention among secondary school biology students in Edati Local Government Area. Specifically, the study has the following objectives:

1. Find out the impact of Fieldtrip method and Demonstration method on student's achievement
2. Investigate the impact of Fieldtrip method on gender achievement
3. Find out the impact of Demonstration method on gender achievement
4. Determine the impact of Fieldtrip method and Demonstration method on student's retention
5. Find out the impact of Fieldtrip method on gender retention
6. Investigate the impact of Demonstration method on gender retention.

## Research Hypotheses

**HO1:** There is no significant difference in the mean achievement scores in students taught Biology with the use of Fieldtrip method and Demonstration method.

**HO2:** There is no significant difference in the mean achievement scores of male and female students taught Biology with the use of Fieldtrip method.

**HO3:** There is no significant difference in the mean achievement scores of male and female students taught Biology with the use of Demonstration method.

**HO4:** There is no significant difference in the mean retention scores of students taught Biology with the use of Fieldtrip method and Demonstration method.

**HO5:** There is no significant difference in the mean retention scores of male and female students taught Biology with the use of Fieldtrip method.

**HO6:** There is no significant difference in the mean retention scores of male and female students taught Biology with the use of Demonstration method.

## Method

Quasi-experimental research design was adopted in conducting the study. The study involves groups of students in their intact classes assigned to experimental and control group and on the same biology concepts. The population for the study comprised of all Senior Secondary Schools in Edati Local Government Area. Two (2) schools were used totalling one thousand three hundred and five (1,305) with S.S I as a study class. The sample for the study consisted of 105 students who were captured for the two intact classes in the schools used. The schools were selected because of their co-educational nature; and were randomly assigned into experimental school and control schools. In order to achieve the aim and objectives of this research, the research instruments adopted by the researcher in gathering data for the study was Biology Achievement Test (BAT) designed by the researchers. The BAT was carefully selected from the West African Examination Council (WAEC) and National Examination Council (NECO) past examination question papers on the topics: pollution, types of pollution and sources of pollution. BAT was a Twenty (20) items of multiple choice objectives test with four (4) options A-D with the right answer attached to each item. The items were constructed base on the concept treated as the instructional objectives lessons deigned. The instrument was validated by the experts. A pilot test was carried out on the test items to ensure the reliability of the instrument; the instrument was administered to a school which was not among the sampled schools to be used for the study for pilot test. The pilot test was mainly carried out to find out how reliable the test items are for the level of the students of class under study. Similarly, to find out the suitability of the multiple choice questions and to determine if errors exist in the study, the reliability coefficient of the test instrument was determined as 0.85. BAT was administered to the students before the commencement of the experiment as pre-test. The scores obtained by the students served as pre-test scores of the experimental and control groups and their scores were analysed. After the treatment, post-test was administered to obtain achievement scores of students in each group but

the questions were reshuffled to look different from the pre-test questions used. The pre-test and post-test scores were subjected to data analysis. For scoring purpose, each of 20 items in the BAT was score one (1) mark and thereafter, the total was converted to percentage scores. It was this percentage score that was used for data analysis. Both pre-test and post test scores were correlated using mean, standard deviation and t-test statistics, and statistical package for social science (SPSS) 20.0 version was used to analysed the data obtained.

## Results

**Table 1: Summary of t-test analysis of mean Pre-test scores of Experimental and Control Groups**

Group	N	Df	Mean	SD	t-value	P-value
Experimental	58		12.24	1.559		
Groups		103			1.173 <sup>NS</sup>	0.244
Control Groups	47		11.87	1.637		

NS- Not significant at  $p > 0.05$

Table 1 shows the summary of t-test analysis of mean pre-test scores of Experimental and Control Groups. The Experimental Group has mean score of 12.24 with SD of 1.559 while the Control Group has mean score of 11.87 with SD of 1.637. With the calculated t-value of 1.173, df of 103 and p-value of 0.244; implies that the p-value is greater than the alpha value of 0.05 (i.e.  $p > 0.05$ ). It implies that there is no significant different in the mean pre-test scores of the experimental and control groups. This indicate that the experimental and control groups have the same entry behaviour as regard to their academic performance.

**HO<sub>1</sub>:** There is no significant difference in the mean Achievement scores in Students taught Biology with the use of Fieldtrip method and Demonstration method.

**Table 2: Shows the summary of t-test Analysis of Mean Achievement scores of Experimental and Control Groups.**

Group	N	Df	Mean	SD	t-value	P-value
Experimental	58		16.40	1.310		
Group		103			6.504*	0.000
Control group	47		14.51	1.600		

\*- Significant at  $p < 0.05$

Table 2 shows the summary of t-test Analysis of mean Achievement scores of Experimental and Control groups. The Experimental group has mean score of 16.40 with SD of 1.310 while the Control group has mean score of 14.51 with SD of 1.600. With the calculated t-value of 6.504, df of 103 and p-value of 0.000; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean Achievement scores of students taught Biology with the use of Fieldtrip method and those taught Biology with the use of Demonstration method. The hypothesis is therefore rejected.

**HO<sub>2</sub>:** There is no significant difference in the mean Achievement scores of Male and Female Students taught Biology with the use of Fieldtrip method.

**Table 3: Summary of t-test analysis of the mean Achievement scores of Male and Female Students taught Biology with the use of Fieldtrip method.**

Group	N	Df	Mean	SD	t-value	P-value
Male	30		17.10	1.269		
		56			5.129*	0.000
Female	28		15.64	0.870		

\*- Significant at  $p < 0.05$

Table 3 shows the summary of t-test analysis of mean achievement scores of Male and Female Students taught Biology with the use of Fieldtrip method. The Male Students has mean score of 17.10 with SD of 1.269 while the Female Students has mean score of 15.64 with SD of 0.870. With the calculated t-value of 5.129, df of 56 and p-value of 0.000; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean Achievement scores of Male and Female Students taught Biology with the use of Fieldtrip method. The hypothesis is therefore rejected.

**HO<sub>3</sub>:** There is no significant difference in the mean Achievement scores of Male and Female Students taught Biology with the use of Demonstration method.

**Table 4: Summary of t-Test Analysis of mean Achievement scores of Male and Female Students taught Biology with the use of Demonstration method.**

Group	N	Df	Mean	SD	t-value	P-value
Male students	19		15.58	1.305		
		45			4.531*	0.000
Female students	28		13.79	1.371		

\*- significant at  $p < 0.05$

Table 4 Shows the summary of t-Test Analysis of mean Achievement scores of Male and Female Students taught Biology with the use of Demonstration method. The Male students have mean score of 15.58 with SD of 1.305 while the Female Students have mean score of 13.79 with SD of 1.371. With the calculated t-value of 4.531, df of 45 and p-value of 0.000; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean achievement scores of male and female students taught biology with the use of Demonstration method. The hypothesis is therefore rejected.

**HO<sub>4</sub>:** There is no significant difference in the mean Retention scores in Students taught Biology with the use of Fieldtrip method and Demonstration method.

**Table 5: Summary of t-Test Analysis of mean Retention scores of the Experimental and Control groups**

Group	N	Df	Mean	SD	t-value	P-value
Experimental	58		16.71	1.864		
		103			3.852*	0.000
Control	47		15.17	2.160		

\*- significant at  $p < 0.05$

Table 5 shows the summary of t-Test analysis of mean Retention scores of Experimental and Control groups. The Experimental group has mean score of 16.71 with SD of 1.864 while the control group has mean score of 15.17 with SD of 2.160. With the calculated t-value of 3.852, df of 103 and p-value of 0.000; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean Retention scores of Students taught Biology with the use of Fieldtrip method and those taught Biology with the use of Demonstration method. The hypothesis is therefore rejected.

**HO<sub>5</sub>:** There is no significant difference in the mean Retention scores of Male and Female Students taught Biology with the use of Fieldtrip method.

**Table 6: Summary of t-Test analysis of mean Retention scores of Male and Female Students taught Biology with the use of Fieldtrip method.**

Group	N	Df	Mean	SD	t-value	P-value
Male	30		17.47	1.717		
		56			3.522*	0.001
Female	28		15.89	1.685		

\*- significant at  $p < 0.05$

Table 6 Shows the summary of t-Test analysis of mean Retention scores of Male and Female Students taught Biology with the use of Fieldtrip method. The Male Students has mean score of 17.47 with SD of 1.717 while the Female Students has mean score of 15.89 with SD of 1.685. With the calculated t-value of 3.522, df of 56 and p-value of 0.001; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean Achievement scores of Male and Female Students taught Biology with the use of Fieldtrip method.

**HO<sub>6</sub>:** There is no significant difference in the mean Retention scores of Male and Female Students taught Biology with the use Demonstration method.

**Table 7: Summary of t-test analysis of the mean Retention scores of Male and Female students taught Biology with the use of Demonstration method.**

Group	N	Df	Mean	SD	t-value	P-value
Male	19		16.05	2.121		
		45			2.401*	0.021
Female	28		14.57	2.008		

\*- significant at  $p < 0.05$

Table 7. Shows the summary of t-Test analysis of mean Retention scores of Male and Female Students taught Biology with the use of Demonstration method. The Male Students has mean score of 16.05 with SD of 2.121 while the Female Students has mean score of 14.57 with SD of 2.008. With the calculated t-value of 2.401, df of 45 and p-value of 0.021; implies that the p-value is less than the alpha value of 0.05 (i.e.  $p < 0.05$ ). It implies that there is significant difference in the mean Retention scores of Male and Female Students taught Biology with the use of Demonstration method. The hypothesis is therefore rejected.

## Discussion

The main objective of this research is to determine the Impact of Fieldtrip and Demonstration Instructional Strategies on Senior Secondary School Students Biology Achievement and Retention in Edati Local Government Area of Niger State. The study also examines the Impact of Fieldtrip and Demonstration method of Instruction on Gender differences of the students. The pre-test scores in table 1 shows that the control group (mean of 11.87 and standard deviation of 1.637) and experimental group (mean of 12.24 and standard deviation of 1.559) are equivalent because the p-value is greater than the alpha level of significance ( $p = 0.244$  greater than the 0.05 alpha level), this means that the experimental and control group are equal in term of entry behaviour before the application of the teaching strategies as regard their academic performance.

The result of the t-test as shown in table 2 shows that the computed t-value at  $t(103) = 6.504$  while the p-value (0.000) is less than the 0.05 alpha level of significance. The results show that the experimental group performed better than the control group. This means that the use of Fieldtrip method can enhance student's performance in Biology at the Senior Secondary School level. This finding is in line with Nworgu, (2005), London, (2005), Nwachukwu & Nwosu (2007) who noted that the experimental group performed better than the control group when Fieldtrip method of teaching was used among senior secondary school students.

The result of the t-test as shown in table 3 shows that the computed t-value at  $t(56) = 5.129$  while the p-value (0.000) is less than the 0.05 alpha level of significance. Therefore, there is a significant difference in the mean achievement scores of male and female biology students exposed to Fieldtrip method of instruction. This finding is in agreement with the findings of Gambaro (2008), Sobamowo (2006), Laleye, (2004) who noted in some of their research work that the male of the Experimental group performed better than their female in the same group.

The result of the t-test as shown in table 4 shows that the computed t-value at  $t(45) = 4.531$  while the p-value (0.000) is less than the 0.05 alpha level of significance. Therefore, there is a

significant difference in the mean achievement scores of male and female biology students exposed to Demonstration method of instruction. This finding is in line with (Hedges & Nowel, 2005), who found out that there is a significant difference in the achievement scores of male and female students.

The result of the t-test as shown in table 5 shows that the computed t-value at  $t(103) = 3.852$  while the p-value (0.000) is less than the 0.05 alpha level of significance. The results show that the experimental group performed better than the control group in terms of their retention capability. This means that the use of Fieldtrip can enhance student's performance in biology at the senior secondary school level. This result was in line with Eze (2006) who found that students exposed to Fieldtrip method of instruction achieved and retained concepts than those taught with other methods.

## Conclusion

The effective and efficient use of Fieldtrip method enhances students understanding, retention and recall. This is evident in the retention test. Therefore, the school authority together with the school principals and teachers should create an avenue for the students to embark on Fieldtrip activities for the students to see, touch and compare it to real life so as to increase their knowledge. But in absence of this, improvisation should be considered. Emphasis should therefore be laid on the use of Fieldtrip method in the teaching and learning of Biology.

## Recommendations

In view of the findings of this research work, the following recommendations were made from the study:

1. Teachers should be send on in-service training to learn the various teaching strategies for the teaching of biology in senior secondary schools.
2. School Principals ought to support and give fundamentals backing to instructors for powerful utilization of the various teaching strategies for the teaching and learning of biology in senior secondary schools.
3. There should be reinforcement of teachers dedicated to work through prize giving, scholarships and awards.

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