



Effects of Field-Trip and Inquiry-Based Instructions on Interest among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria

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Abstract

This study sought to find out the “Effects of Fieldtrip and Inquiry-Based Instructions on Interest among Secondary School Biology Students in Lere Education Zone, Kaduna, Nigeria”. The study adopted a pretest-posttest quasi-experimental, control-group design. The population comprised all 1979 senior secondary school Biology students in Lere zone. A sample consisting of 163 students randomly selected from three coeducational schools in Lere Education Zone participated in the study. The experimental group A, having 55 students and group B, having 56 students, were taught Ecology concepts using Fieldtrip and inquiry-based instruction, respectively while the control group having 52 students were taught using lecture method. One validated instrument called Students' Ecology Concept Interest Questionnaire (SECIQ) with $r=0.72$ was used to gather data. Two objectives, research questions, and Null Hypotheses guided the research. The hypotheses were tested at $p \leq 0.05$ level of significance. Non-parametric comparisons were applied to post-test mean ranks. Statistics revealed that a significant difference existed in interest shown by SSS Students when they are taught using fieldtrip, inquiry and lecture teaching methods in favor of the experimental groups. Based on the findings, the following recommendations were made; the use of field-study and inquiry-based instruction should be encouraged among teachers of Biology to boost student's interest; Fieldtrip and Inquiry-based Instruction should also be encouraged to promote the learning of Biology by both male and female students.

Keywords: effect, field trip, inquiry-based learning, instructions, interest, biology

1 Introduction

Science, as a concept, is a process geared towards problem-solving in order to enhance the living standard of man. Shaibu (2014) defines science as a complex human activity that leads to the production of a body of universal statements called laws, theories or hypotheses, which serve to explain the observable behaviour of the universe or part of it, which, in themselves, have predictive characteristics. Sanusi (2019) has observed that the economic and political strength of a nation is always assessed in terms of its achievements in science and technology. Usman (2021) posits that people live in a world where science and technology have become integral parts of human culture, and any country that overlooks this significant truism does so at the risk of remaining backwards in an advancing world. Hence, Omiko (2020) concluded that no nation can make appreciable progress in terms of development without a correct scientific base. This is why the National Policy on Education (FRN, 2013) emphasised the provision of science education at all levels of education in Nigeria. According to Rao (2017), science is the system of knowing the universe through data collected by observation, communication, and controlled experimentation.

Biology is one of the science subjects that occupies a significant position in the senior secondary school curricula. Umoh (2020) defines Biology as a branch of science that is concerned with the characteristics and behavior of organisms, how species and individuals come into existence, and the interaction they have with their environment. Biology plays a vital role in providing knowledge of relevant concepts about living things and developing scientific skills and attitudes. Ibrahim (2022) further stated that Biology is a subject specifically designed to provide students with skills and attitudes of caring about themselves, other organisms and the environment. Ghumdia (2017) stipulates that when the knowledge of Biology is acquired and applied in any society, it can bring about rapid and sustainable national development. To further emphasise its significance, Abubakar (2017) and Flowers (2018) have observed that Biology, as a discipline, has contributed

tremendously to the financial, physical and aesthetic benefits of humanity and to national building. The areas of contributions of Biology include but not limited to, the followings: Medicine, Aquaculture, Crime detection, Forestry, Genetic Engineering, Parasitology, Biochemistry, Physiology, Ecology, Genetics and Molecular Biology has made Biology subject to become a central focus in most human activities including solutions to the problem of food security, environmental pollution, population explosion, radiation, disease, health, hygiene, family life, poverty eradication, management and conservation of natural resources as well as Biotechnology and ethics. Andrew (2023) stated that ecology is concerned with the Biology of groups of organisms with functional processes on land in the oceans and in fresh water. Ecology deals with the interaction of organisms and their natural environment and needs to be taught with an appropriate method or strategy of teaching that requires direct observation of organisms in their natural habitat. These organisms may be within or far away from the school environment. Danjuma, Olajide and Obeka (2018) observed that teaching ecology at secondary schools in Nigeria has not been very impressive due to poor teaching instructional strategies used. Gali (2018) stated that the poor teaching strategies employed by a number of teachers affect the interest of the students in the subject. Dallatu (2019) observed that teaching Biology using teacher-centred strategies, such as the lecture method, does not boost the interest of the learners to participate fully in the classroom activities.

A field trip is a teaching method that involves taking students outside the classroom to make relevant observations about living things in their natural habitat. It could be in a nearby school farm, national park, zoo, industry, forest or game reserve. Danjuma (2021) sees field-trip as an important component of science teaching. In addition, Andrew (2023) see field-trip as an outdoor type of laboratory activity or fieldwork or learning exercise undertaken by teachers and students in certain aspects of a subject, to give students the opportunity to acquire relevant knowledge of the organism in the natural habitat. In addition, Aliyu (2018) observed that Field-trip is taking students out of the classroom to places where they can see concrete illustrations of classroom theories. It also offers direct observation and interpretation in their natural environment. Another method that involves the learners in active learning is the Inquiry-based. Danjuma (2017) identified Inquiry as a teaching and learning method that provides learners with motivation to learn and develop skills to be successful throughout life. Danjuma (2021) further explained that students benefit by learning science through authentic investigations similar to those conducted by professional scientists. In theory, with the placement of science in a context through Inquiry-based instruction, teachers and students begin to develop their approach to science, and this investigative learning leads to better understanding. Inquiry-based teaching, according to Shanmugavelu, Parasuraman, Ariffin, Kannan & Vadivelu (2020), is a teaching method in which the learner, with minimal guidance from the teacher, seeks to discover and create answers to a recognised problem through diligent search. Inquiry is a term used in science teaching that refers to a way of questioning, seeking knowledge or information or finding out about a phenomenon. Obeka (2010), however, added that the use of this method aids the student to learn not only concepts and principles but self-direction, responsibility and social communication. He further stated that it is a highly interactive step-by-step approach which involves students at all levels of discussion. It is also the way people learn when they are left alone. Okoye, Momoh, Aigbomain, and Okecha (2018) observed that in Biology, it is possible for the Inquiry-based method of teaching to enhance students' interest.

Danjuma (2021) defined interest as an individual's desire, power and tendency to act in a particular way. Danjuma and Andrew (2024) also described interest as being a psychological state and predisposition to reengage particular disciplinary content over time that develops through the interaction of the person and his or her environment. Danjuma, Olajide and Obeka (2018) opined that once interest is maintained, repeated engagement can be either self-initiated or promoted by the environment thereby leading to the development of an emerging and a well-developed individual interest. Renninger (2016) added that the interest of a student could be generated during the teaching and learning process. This study seeks to establish whether field trips and Inquiry-Based Instruction could enhance students' interest of Biology concepts among males and female or not. Gender refers to the socially and culturally constructed characteristics and roles which are ascribed to males and females in a society. Studies of Adesoji (2018), Danjuma and Andrew (2024) on the effects of instructional strategies on students' interest in science suggest that there is a relationship between gender and teaching approaches. Differences in the interest of both male and female students in science subjects when exposed to the Field trip and Inquiry-based instruction were reported by Ahmad (2014) to be insignificant. However, research findings of Chukwuka (2019) revealed consistent differences between the interests of male and female learners in favour of female students. The reasons researchers attribute to gender-related differences in interest between male and female learners include the innovative nature of the instructional strategy used, students' cognitive ability levels, psychological and socio-cultural factors (Okeke, 2019). It will therefore be interesting to find out if there may be a link between Field-trip, Inquiry-based instruction and gender-related differences in interest between male and female learners. Therefore, the study investigated the Effects of Field-trip and Inquiry-based Instruction on Interest among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria.

1.1 Objectives of the Study

The study has the following objectives, which are to:

1. find out the effect of Field trip and Inquiry-based Instructions on students' Interest in ecology.
2. find out the effects of Field trip and Inquiry-based Instructions on Interest in ecology based on gender.

1.2 Research Questions

The following research questions are set to guide the study;

1. What is the difference between the interest level mean rank among students taught using Field-trip and Inquiry-based Instruction and those taught using the Lecture Method?
2. What is the difference between the interest level in ecology mean rank among male and female students taught ecology using Field-trip and Inquiry-based instruction?

1.3 Null Hypotheses

This study has the following Null Hypotheses:

H₀₁: There is no significant difference between the interest level mean rank among students taught ecology using Field-trip and Inquiry-based Instruction and those taught using the Lecture Method

H₀₂: There is no significant difference between the interest level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instruction.

1.4 Scope of the Study

This study seeks to investigate the Effects of Field-trip and Inquiry-based Instructions on Interest in Lere Education Zone. Senior Secondary II Students in three Secondary Schools in Lere Education Zone participated in the study. The reason for not using S.S I and S.S. III is because S.S I are just coming to the school and so they are not too familiar with the subject while S.S. III are busy preparing for their final year examinations; S.S. II students were selected to participate because they are more stable receiving their lessons without much distractions.

2 Materials and Methods

2.1 Research Design

The research design employed for this study was pretest, posttest quasi-experimental control group design. The experimental group I (EG₁) was taught ecology using field-trip method and experimental group II (EG₂) was taught ecology using inquiry-based method while the control group was taught using lecture method. The three groups were of the same equivalence based on the pretest results. Both the experimental and control groups were taught for a period of six weeks. Thereafter, a post-test (O₂) was administered to determine the impact of field-trip and inquiry-based instructional methods on students' interest in the concepts taught.

2.2 Population of the Study

The population for this study consisted of all SS II Biology students in the coeducational Government Senior Secondary School Students in Lere Educational Zone. Their total number was 1979 students; 1269 male and 711 female.

2.3 Sample and Sampling Technique

From the twenty-two (22) public schools form the area of the study, six schools were randomly selected as the target population. The six schools were subjected to a pre-test and the results obtained were subjected to statistical analysis using

ANOVA and Scheffe's test for homogeneity of mean. Three schools were chosen whose performance did not significantly differ, these schools were GSS Yarkasuwa (Snr), GSS Damakasuwa (Snr) and GSS Saminaka (Snr). Since the research requires two experimental groups and one control group, simple random technique of balloting was used to assign the three groups into experimental and control groups respectively. Intact class was used in each of the three schools selected, GSS Yarkasuwa (Snr) comprising of fifty-five (55) participants were assigned the experimental group I, GSS Damakasuwa (Snr) comprising of fifty-six (56) subjects were assigned the experimental group 2 and GSS Saminaka (Snr) comprising of fifty-two (52) subjects were assigned to the control group. A sample size of one hundred and sixty-three (163) participants from the three intact classes was considered appropriate for experimental research of this nature in line with the recommendation of Sambo (2008) that a minimum of 30 subjects is viable for experimental study. The details of the sample for the study are presented in Table 1

Table 1

Sample for the Study

S/No	Type	School	Boys	Girls	Total
1	EG 1	A	34	21	55
2	EG 2	B	31	25	56
3	CG	C	29	23	52
Total			94	69	163

2.4 Instrumentation

The instrument that was used for the study is the Student Ecology Concept Interest Questionnaire (SECIQ).

Student Ecology Concept Interest Questionnaire (SECIQ). This was adapted from Muoneme (2015), and the instrument consists of twenty-five (25) items. The instrument was used to determine the interest level of subjects in ecology concepts. For the purpose of this research, the instrument was marked according to the ranking of the 25 items; each item is ranked 1-5, making a total of 125 marks. The Instrument was given to experts who are Ph.D holders with a minimum rank of senior lecturers in the Department of Science Education, Department of Biological Sciences and Psychology Department, Ahmadu Bello University, Zaria. A pilot test was conducted involving students of Government Secondary School Ramin Kura, which was part of the study population but not part of the sample schools. The twenty-five (25) item instruments on Students Ecology Concept Interest Questionnaire. The pilot testing was conducted to determine the reliability of the Student Ecology Concept Interest Questionnaire (SECIQ). The reliability coefficient of the Student Ecology Concept Interest Questionnaire (SECIQ) was obtained using Cronbach's Alpha method and was found to be 0.72

2.5 Intervention Procedure

The two groups were taught the ecology concept using different strategies; experimental group one was taught using field-trip instruction, and experimental group two was taught using Inquiry-based instruction. Student Ecology Concept Interest Questionnaire (SECIQ) was used for both pre-test and post-test. Experimental groups 1 and 2 were taught ecology concepts using field trips and inquiry-based instruction involving the learners to foster their interaction with the environment, and the teacher, while the control group were exposed to the same concept using lecture method.

2.6 Data Analysis

The null hypotheses are restated here along with the appropriate statistical tools to be used in testing them. The statistical tools include descriptive statistics, mainly mean, standard deviation and frequency, used to answer the research questions and inferential statistics were used to test the null hypotheses at $P \leq 0.05$ level of significance.

3 Results

3.1 Research Question One

What is the difference between the Interests level mean rank among students taught using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?

Table 2a

Mean Rank Test Difference in the Interest Level by SSS Students in Experimental A, B and Control Group

Groups	N	Mean Rank	Mean Rank Difference
Experimental A	55	108.14	77.63
Experimental B	56	104.14	73.63
Control Group	52	30.51	

Table 2a revealed that differences exist between the mean Interest scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Methods. Their computed mean rank interest scores are 108.14, 104.14 and 30.51 for students exposed to Field-Trip, inquiry-based, and lecture methods, respectively. When the difference between their interest rates was computed, it was found to be 77.63 and 73.63 in favour of the experimental groups. This clearly showed that students exposed to field trips and inquiry-based, i.e experimental group A and B showed more interest in Biology than the control group. To check for significant difference, a null hypothesis was tested and presented in Table 2b

3.2 Hypothesis One

H₀₁: There is no significant difference between the interest level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using the lecture method

Table 2b:

Summary of Kruskal-Wallis on Difference Between the Interest level of Students taught Ecology using Field-Trip, Inquiry-Based Instruction and those Taught using Lecture Method

Groups	N	Mean Rank	df	p-value	R
Field-trip	55	108.14	2	0.001	S
Inquiry-based	56	104.14	30.51		
Lecture	52				

Significant at alpha $P \leq 0.05$ Level

The outcome of the non-parametric test of Kruskal Wallis test showed that a significant difference exists between the mean Interest level of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Methods. This is because the calculated p-value of 0.001 is lower than the 0.05 alpha level of significance. Their computed Mean Rank Interest scores are 108.14, 104.14 and 30.51 by students exposed to Field-trip, Inquiry based and lecture method respectively. This shows that the two experimental groups of Field-trip and Inquiry-based have significantly higher Mean rank interest scores than those in lecture method. Therefore, the null hypothesis which state that There is no significant difference between the mean Interest scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Methods, is hereby rejected.

3.3 Research Question Two

What is the difference between the Interests level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions?

Table 3a

Mean Rank Test Difference Between the Interest Level of Male and Female Students in Experimental Group A and B

Groups	Gender	N	Mean	Rank	Mean D.
Experimental A	Male	34	61.19		1.40
	Female	21	59.79		
Experimental B	Male	31	57.63		1.29
	Female	25	58.92		

Table 3a indicates that there is no remarkable difference between the mean Interest level of male and female students taught ecology using Field-trip and Inquiry-based Instruction in experimental group A and B respectively. Their Mean rank Interest scores are 61.19, 59.79 and 57.63 58.92 by male and Female for the experimental group A and B respectively. The mean difference between the mean scores of male and female students in experimental group A was 1.40 while that of the experimental group B was 1.29. To check for significant difference, a null hypothesis was tested and presented in Table 3b

3.4 Hypothesis Two

H₀₂: There is no significant difference between the Interests level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Table 3b

Summary of Kruskal-Wallis on Difference Between the Interest level of Male and Female Students Taught Ecology using Field-Trip and Inquiry-Based Instruction

Groups	Gender	N	Mean	Rank	df	p-value	R
Field-Study	Male	34	61.19		3	.543	NS
	Female	21	59.79				
Inquiry-based	Male	31	57.63				
	Female	25	58.92				

Significant at alpha $P \leq 0.05$

Results in Table 3b showed that there is no significant difference between the mean Interest scores of male and female students taught ecology concept using Field-trip and Inquiry-based Instruction. This is because the calculated p-value of 0.543 is greater than the 0.05 alpha level of significance. Therefore, the null hypothesis, which states that there is no significant difference between the mean Interest scores of male and female students taught ecology concepts using Field-trip and Inquiry-based Instruction, is hereby retained.

4 Discussion of Results

The result of hypothesis one tested a significant difference in the interest level in ecology by SSS students when exposed to Field-study, Inquiry-based instructions and lecture methods. It was observed that students taught using Field-trip and Inquiry-based instruction had more interest towards Biology than those taught Biology using the lecture method. This indicated that the use of Field-trip and Inquiry-based instruction enhanced/boosted students' interest towards learning Biology. Increased interest towards learning Biology recorded could be due to the use of Field-trip and Inquiry-based instructions and the general fun experienced during the lesson when Field-trip and Inquiry-based instructions were used. This supports the findings of Yakubu (2016), who observed that the effects of field-based teaching strategy raise the level of concentration and enhance learning because it is fun. Furthermore, other reasons that could be adduced to be behind enhancement and boosting of student's interest when taught with field-based could be that students who learned with field-based method were more attentive and engaged in learning, participated more actively in the classroom, interacted much more with the teacher, their peers. The result disagreed with the findings of Nwokolo (2018), who stated no significant difference in the interest shown when learners are exposed to Inquiry-based and those taught using lecture method.

Hypothesis two showed that there was no significant difference between the mean Interest level of male and female students taught ecology using Field-trip and Inquiry-based Instructions hence both male and female students show equal interest

toward learning of Biology when exposed to Field-trip and inquiry-based instructions thus the two teaching methods are gender friendly. The result agrees with the findings of Nwokolo (2018) who state no significant difference in the interest shown by male and female students after exposure to experimental A and B. The finding is also in line with the studies of Muoneme (2015) who investigated the 'Impact of Enriched-Lecture Method with Interactive Multimedia Board on Academic Achievement and Interest of Students in Evolution Concepts and the findings revealed no significant difference in the interest shown by male and female students.

5 Conclusion

On the basis of the findings from this study, the following general conclusions could be deduced:

1. Field-trip and Inquiry-based Instructions has the potential of enhancing students interest of ecology concepts.
2. Field-trip and Inquiry-based Instructions enhanced interest equally well in both Male and female students in ecology.

6 Recommendations

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

1. Biology teachers should integrate field-trips into their instructional practices by organizing visits to botanical gardens, farms, wildlife reserves, research institutes, museums, rivers, forests, and other relevant ecological sites. Such experiences help students connect biological concepts with real-life situations, thereby increasing their interest and engagement.
2. Teachers should adopt inquiry-based instructional strategies as a regular teaching approach by encouraging students to ask questions, formulate hypotheses, conduct investigations, collect and analyze data, and draw evidence-based conclusions. This promotes curiosity, critical thinking, and sustained interest in Biology.
3. Teachers should combine field-trips with inquiry-based learning activities by providing students with investigative tasks before, during, and after field excursions. Students can complete observation guides, collect specimens (where appropriate), record field data, and present their findings in class to reinforce learning.
4. Lesson plans should include learner-centred activities such as group investigations, project-based learning, experiments, field observations, and classroom discussions instead of relying predominantly on lecture methods. These strategies encourage active participation and improve students' interest.

7 Declaration

Ethical Statements: Ethical principles were strictly observed throughout the conduct of this study. Permission to conduct the research was obtained from the relevant educational authorities and the principals of the selected secondary schools in Lere Education Zone, Kaduna State, Nigeria. The purpose, procedures, potential benefits, and nature of participation in the study were explained clearly to the school authorities, participating students, and, where applicable, their parents or guardians before data collection commenced. Participation in the study was voluntary, and students were informed that they had the right to decline participation or withdraw from the study at any time without penalty or adverse consequences. Appropriate informed consent and student assent procedures were followed in accordance with institutional and educational research requirements. The identities and personal information of the participants were kept confidential. No names or other personally identifying information were included in the research instruments, data analysis, or publication of the findings. Participants were identified using codes, and the data collected were used strictly for academic and research purposes. The research findings were reported in aggregate form so that individual students or schools could not be identified. Particular attention was given to the welfare and safety of the students during the intervention, especially during the field-trip activities. Field-trip locations and activities were selected based on their educational relevance and safety. Students were appropriately supervised by the researchers and teachers, and reasonable measures were taken to minimise risks, accidents, or discomfort during outdoor activities. Students were not required to participate in activities considered unsafe or beyond their physical capacity.

The study did not involve any procedure intended to cause physical, psychological, social, or academic harm to the participants. The instructional interventions were integrated into normal Biology teaching activities, and the control group continued to receive instruction through the conventional lecture method. The administration of the Student Ecology Concept Interest Questionnaire (SECIQ) was conducted in a manner that protected participants' privacy and did not interfere unnecessarily with their academic activities. All data obtained from the study were securely handled and accessed only for purposes related to the research. The researchers also maintained academic integrity by reporting the findings accurately and objectively, without fabrication, falsification, or inappropriate manipulation of data. The study was conducted in accordance with accepted principles of research ethics involving human participants.

Conflict of Interest: The authors declare no financial, commercial or other relationships that could be construed as a potential conflict of interest.

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Data Availability Statement: The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

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