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IMPACT OF FIELD TRIP INSTRUCTIONAL STRATEGY ON STUDENT'S ACADEMIC PERFORMANCE IN ECOLOGY CONCEPT IN ZARIA, KADUNA STATE, NIGERIA

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Abstract

This study examined the impact of Fieldtrip Instructional Strategy on students' academic performance in ecology concepts among senior secondary school biology students in Zaria Education Zone, Kaduna State. The study employed a quasi-experimental design with non-equivalent. Non-randomised pretest-posttest groups, comprising both experimental and control groups. A sample of 164 students was drawn from two randomly selected co-educational public secondary schools out of an eligible population of 7,097 biology students. The experimental group was instructed using the fieldtrip strategy, whereas the control group was taught using the conventional lecture method over a six-week intervention period. Data were collected using the validated Ecology Performance Test (EPT; KR-20 reliability = 0.79). Data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (independent samples t-test and ANOVA) at $\alpha \leq 0.05$. The results revealed statistically significant improvement in academic performance for the experimental group ($M = 31.22$, $SD = 1.66$) compared to the control group ($M = 20.70$, $SD = 4.00$), with $t(162) = 25.11$ and $p = 0.000$ leading to the rejection of the null hypothesis. Gender-based performance between male ($M = 33.45$) and female ($M = 32.00$) students ($p = 0.83$). The study concludes that Fieldtrip strategy is an effective and gender inclusive instructional approach that significantly enhances learning performance of biology students in the study of ecology concepts. These results concluded that Fieldtrip is a beneficial instructional strategy for improving students' learning outcomes in biology. The study recommends that the Science Teachers Association of Nigeria (STAN) should organize workshops to train teachers on the effective implementation of Fieldtrip strategy. Additionally, senior secondary school biology teachers are encouraged to adopt Fieldtrip strategy in teaching Biology among others to enhance students' academic performance in biology.

Keywords: Academic performance. Biology, Ecology, Field Trip, Senior Secondary School.

Introduction

In the contemporary world it is reality that the standard of living of a nation depends largely on the level of science and technology of that nation. There are different definitions of science by different scholars, for instance, Acharya and Pathak (2019) explained science as an intellectual activity carried out by humans, designed to discover information about the natural world in which we live and to discover the ways in which this information can be organized to benefit human race. According to Schneegans and Soete (2024), science has become such an indispensable tool that no nation, developed or developing, wishing to progress in socio-economic sphere will afford to relegate the learning of science in schools to the background. For the transfer of the scientific knowledge from one generation to another, Science Education becomes indispensable as it stands a vital position in inculcating scientific experiences into the upcoming generation of any given nation.

Biology is a science that is taught at both secondary and tertiary levels of education in Nigeria. It deals with the study of living organisms and their structures, functions, evolution, distribution, adaptation and interrelationships. The Federal Ministry of Education, in the National Policy on Education (FRN, 2013) made Biology a core science subject at Senior Secondary School (SSS). Biology is of utmost importance as it stands a pre-requisite to a number of applied sciences such as Medicines, Pharmacy, Nursing, Biochemistry, Genetics, Agricultural science among others. There is no doubt about the immense contributions of Biology to the growth and development of any given nation. Biology is divided into two main branches thus: Botany and Zoology; and consists of many other concepts such as evolution, genetics, nutrition, ecology among others.

Ecology as the central focus of this study is defined as the relationship among living organisms and with the environment in which they live. It is often described as environmental Biology. Empirical investigations have consistently shown that senior secondary school students' achievement in Biology, particularly in WAEC and NECO assessments, has been below satisfactory levels, with fluctuation and generally moderate pass rates over recent years (Okate & Kpangban, 2026; Orakwue & Okigbo, 2023). Research in this area attributes persistent weaknesses to factors such as inadequate instructional resources, dominant teacher-centered methods, and limited opportunities for practical application of concepts (Koroka *et al.*, 2023).

Academic performance is commonly conceptualized as the extent to which learners attain intended educational objectives, typically demonstrated through measurable outcomes such as test scores, examination grades, and continuous assessment results. Scholars such as Akinwumi and Falemu (2020) view academic performance as the observable demonstration of competencies acquired in specific school subjects. Similarly, Byukusenge, Nsanganwimana, and Tarmo (2024) describe academic performance as the quality of learning outcomes attained by students, as reflected in formal evaluation results. Collectively, these perspectives highlight that academic performance serves as a key benchmark for evaluating instructional effectiveness and students' mastery of subject matter.

According to Sarwono, Murtono and Widiyanto, (2020), using a teaching approach where students actively participate and the teacher assumes roles such as facilitator, mediator and assessor of learning has been proven to be highly effective in enhancing

students' abilities to apply concepts, fostering personal growth, instilling positive attitudes, motivating students and encouraging appropriate social skills within groups, field trips involves taking students outside the classroom to observe living things in their natural environments. These trips can occur in various places like school farms, national parks, zoos, industries, forests or game reserves. Yildirim (2020) regards field trips as essential components of science education. Han (2020) viewed field trips as outdoor laboratory activities, allowing both teachers and students to explore specific subjects, providing students with valuable insights into organisms within their natural habitats. Zhao, LaFemina, Carr, Sajjadi, Wallgrün, and Klippel, (2020) notes that field trips take students out of the classroom, enabling them to witness real-life examples of theoretical concepts and facilitating direct observation and interpretation in natural settings. During field trips, learners engage in basic scientific skills such as observation, identification, classification, and manipulation of substances and organisms in their natural surroundings. However, if field trips are not feasible, the inquiry-based method can be employed as an alternative outdoor or indoor teaching approach, it is crucial to consider this approach when designing instructions for teaching Biology.

Ecology and Evolution are often perceived by secondary school students as abstract, theoretical, and cognitively demanding because they require systems thinking, interpretation of environmental data, and understanding of long-term biological processes (Offor, Gumus, & Bubou, 2024). When such topics are delivered predominantly through conventional lecture methods, students may develop misconceptions and negative attitudes toward the subject. To address these challenges, the adoption of experiential and student-centered instructional strategies becomes imperative. Fieldtrip instruction provides authentic learning environments where students can directly observe ecological systems, species interactions, biodiversity patterns, and environmental adaptations in real-life contexts. Several Researches like that of Ganajová, Orosová, Sotáková, and Letošníková, (2025), has shown that inquiry based and field based science instruction significantly improves students' engagement, conceptual understanding and attitudes toward science by bridging the gap between theoretical classroom instruction and real-world application, Fieldtrip activities enhance retention, critical thinking and scientific process skills. Fieldtrip experiences promote collaborative learning, problem solving and first hand investigation which are essential competencies for effective Biology learning at the senior secondary level. Orakwue and Okigbo (2023) reported that by transforming learners from passive recipients of information into active participants in scientific exploration, such approaches not only improve academic performance but also cultivate sustained interest and positive attitudes toward biology as a dynamic and relevant discipline among students regardless of gender.

Gender difference is a significant factor that has been observed to impact academic performance, leading to ongoing debates among researchers without a consensus on its effects. Gender disparities persist within biology education, reflecting broader societal inequalities that impact participation and achievement. Research reveals varying enrollment rates, academic performance, and career aspirations between male and female students, with females often exhibiting lower confidence in their scientific abilities and expressing reduced interest in pursuing biology-related careers (Moote, Archer, DeWitt & MacLeod, 2020). Moreover, Almasri, *et*

al., (2021) opined that under representation of women and minorities among biology faculty members and researchers further worsen these disparities biased teaching practices and curriculum content as opined by Cwik & Singh, (2024) which can reinforce gender stereotypes, perpetuating inequalities within educational settings. Additionally, institutional barriers such as limited mentorship opportunities and gender-based discrimination hinder the advancement of women and minorities in biology academia (Rayner & Papakonstantinou, 2020). Therefore, this study investigated the effect of Fieldtrip strategy on Academic Performance in Ecology concepts among Secondary School Students in Zaria Education Zone, Kaduna state, Nigeria.

Theoretical Framework

This study is hinged on Kolb's (1983) experiential learning theory on fieldtrip. According to Kolb (1983) experiential learning is authentic, first hand and sensorybased learning. Experiential activities explore, touch, listen to, watch, move things, dissemble and reassemble. Learning consists of grasping an experience and then transforming it into an application or result. Kolb (1983) described experiential learning using a spiraling four step cycle. A student has an experience. Reflection occurs as the student talks about the experience and abstraction occurs as the student thinks about the experience. The student plans a new experience to test the new ideas, and the new experience takes place and the cycle continues. Each time a cycle is completed, some learning has taken place. Although experiential learning appears to be simple, there are factors to be considered. The learning process is not instant. Time is required to analyze and then synthesize. a concept that accommodates into an already established knowledge pool. Experiential learning is not one dimensional. A learned concept will integrate with all previous knowledge. This theory posits that learning occurs through direct experience and reflection. During a field trip, students could directly interact with the subject matter in a real-world setting, which allows them to form new observations and concepts. Students can learn faster during the field trip because they see practically what they are being taught and therefore

develop good attitude towards learning. As such, this study investigated the effect of Field trip strategy on Academic Performance in Ecology concepts among Secondary School Students in Zaria Education Zone, Kaduna state, Nigeria.

Statement of the Problem

Persistent low performance in Biology has attracted considerable scholarly attention. Multiple interacting factors have been identified as contributors to this trend. Adelana *et al.* (2023) stated that students' lack of interest, low academic self-concept and negative attitudes toward the subject Akinbadewa and Sofowora (2020) attribute weak academic outcomes partly to the continued reliance on ineffective and teacher-centered instructional methods that limit student engagement and active participation. In a similar vein, Adonu, Nwagbo, Ugwuanyi, and Okeke (2021) argue that teachers' instructional strategies, classroom attitudes, and alignment with students' preferred learning styles significantly influence achievement levels in science subjects. The inherent nature of certain Biology concepts compounds the challenge. Topics such as Genetics, Evolution, Ecology, and Cell Physiology as stated by Adelana *et al.*, (2023) are often perceived as abstract, complex, and conceptually demanding, making them difficult for students to comprehend when taught without adequate instructional support. The situation is worsened by the inadequate provision and ineffective utilization of instructional materials, as well as limited opportunities for practical and laboratory-based experiences that are essential for fostering scientific skills, positive attitudes, and improved academic performance.

The consistent underperformance of students in Biology has raised concerns among parents and education stakeholders. Chief Examiners' Reports (WAEC, 2023) on senior secondary school students' academic performance in Biology from 2015-2024, have consistently indicated below average results. Table 1 contains a description of WAEC Biology results for ten years in Kaduna State.

Table 1 Students' WAEC Results in Biology (2015 - 2024) in Kaduna State.

Year	Total sat	Number with A1-C6	% A1-C6	Number with D7-F9	% D7-F9
2015	1,340,489	383,112	28.58	957,377	71.42
2016	1,300,630	645,633	49.64	654,997	50.36
2017	1,505,409	579,432	38.49	925,977	61.51
2018	1,646,225	587,044	35.66	1,059,181	64.34
2019	1,698,187	564,138	33.22	1,134,049	66.78
2020	1,692,535	529,425	31.28	1,163,110	68.72
2021	1,701,048	508,613	29.90	1,192,435	70.10
2022	1,804,048	604,000	29.98	1,200,048	70.12
2023	1,238,300	413,221	33.27	825,079	66.63
2024	1,240,800	407,112	31.13	713,211	68.67

Source: Zonal Education Quality Assurance, Zaria (2024)

Table 1 shows students result in WAEC/SSCE Biology over ten years under review. Percentage of pass for Biology in the state has never been up to 50% pass. In other words, about 71% of the candidates could not pass Biology at credit level to meet the

minimum requirements for admission into higher institutions. Most of these problems may be rooted in the method of instruction employed by the teachers which perhaps greatly affect the students' performance. Mahmud *et al.*, (2022) reported that this low performance can be attributed to various factors, including inadequate teaching methods, lack of interest, in adequate teaching

facilities among others which persistently influenced students' performance towards science subjects.

Objectives of the Study

The objectives of this study are to:

1. determine the impact of Fieldtrip Instructional Strategy on the academic performance of students in Ecology concepts among Senior Secondary II students in Zaria Education Zone.
2. determine the effect of Fieldtrip Strategy on academic performance of male and female students in Ecology concepts

Research Questions

The study sought to provide answers to the following questions.

1. What is the difference between the mean academic performance scores of students taught ecology concepts using Fieldtrip Strategy and those taught using Conventional Method?
2. What is the difference between the mean academic performance scores of male and female students taught ecology concepts using Fieldtrip Strategy?

Null Hypotheses

The following null hypotheses were formulated and tested at $\alpha \leq 0.05$ level of significance:

H₀₁: There is no significant difference between the mean academic performance scores of SSII students taught ecology using Fieldtrip strategy and their counterparts taught using Conventional Method.

H₀₂: There is no significant difference between the mean performance score of male and female SSII students taught ecology using Fieldtrip strategy.

Methodology

This study adopted quasi-experimental of pre-test and post-test control group design. Experimental group (EG) was exposed to experimental treatment (X1) and was taught using Fieldtrip strategy while the control group (CG) was taught using Conventional Method (X0). This design was adopted based on Sambo (2008) who describes this design as one that offers numerous advantages. The design also is in agreement with Kerlinger (1975) and Sambo (2008) for use in research, as it revealed whether or not a particular instructional strategy is superior to the other and it can be used to find out difference in the group involve in the study. In the Experimental Group (EG), the concept of Ecology was taught using Fieldtrip strategy (X1) over a period of six (6) weeks, aligned with the SS2 Biology curriculum and scheme of work. On the other hand, the Control Group (CG) was instructed in the same concept using the Conventional Method (Xo) over the same duration. After the treatment period, a post-test

(O2) was administered to both groups to assess the impact of the two instructional strategies on students' academic performance (AP) in Ecology.

The population of this study comprised all senior secondary biology students in Co-educational Schools across the 30 public senior secondary schools in Zaria Education Zone with a total population of 7097 students. Of this population, 4015 were males 3082 were females. From the entire population of the 30 Co-educational public schools in Zaria Education Zone, 20 schools were purposively selected based on gender. The four schools were selected using simple random sampling through balloting method. The four schools selected were pretested using Ecology Performance Test (EPT) so as to determine their academic equivalent or comparability level of each sampled school selected. The results obtained was subjected to Analysis of Variance (ANOVA) at $\alpha \leq 0.05$ to see whether there is a significant difference in the score of the performance of the four schools, the result from ANOVA showed that significance difference does exist among the four schools, the result was subjected to scheffe's test where two schools with no significance difference were selected. Simple random sampling technique was used to select the two schools; the first school selected was the Experimental Group (EG) while the second was assigned as the Control Group (CG).

The Ecology Performance Test (EPT) was subjected to validation processes involving experts in the field. The Ecology Performance Test (EPT) was pilot tested at one of the schools within the study's population but not part of the sample. Following pilot testing, the collected data was subjected to statistical analysis to assess the instruments' reliability coefficients. The results from EPT were analysed using Pearson Product Moment Correlation Statistics through SPSS Package version 20.0. The analysis indicated a reliability coefficient of ($r=0.79$) indicating a strong positive relationship between the first and the final results.

Results

The data collected from the study using Ecology Performance Test (EPT) were analysed. The two research questions raised were answered using descriptive statistics of mean, mean rank, and standard deviation, while the null hypotheses were analysed using inferential statistics.

Answering Research Questions and Testing Null Hypotheses

Research Question One: What is the difference between the mean academic performance scores of students taught ecology concepts using Field-trip strategy and those taught using conventional method?

To answer research question one, mean and standard deviation of posttest scores generated from Ecology Performance Test was used. Summary of the analysis is presented in Table 2

Table 2: Mean and Standard Deviation for Pretest and Posttest Scores of Experimental and Control Groups

Group	n	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Difference
Experimental	79	13.54	1.10	31.22	1.66	17.68
Control	85	13.51	1.09	20.70	4.00	7.19

As shown in Table 2, the experimental group had a pretest mean score of $M = 13.54$, $SD = 1.10$, while the control group had $M = 13.51$, $SD = 1.09$, indicating that both groups were equivalent in

their prior knowledge before the intervention. Following the six-week instruction, the experimental group achieved a posttest mean of $M = 31.22$, $SD = 1.66$, compared to $M = 20.70$, $SD = 4.00$ for the control group. The mean difference between pretest and

posttest scores was 17.68 for the experimental group and 7.19 for the control group. These results suggest that the Field-Trip instructional strategy was highly effective in enhancing students' academic performance in Ecology, as students exposed to this strategy demonstrated an improvement over those taught using the conventional method. To find out whether significant difference exist or not, null hypothesis one was tested.

Hypothesis One: There is no significant difference between the mean academic performance score of SSII Biology students taught Ecology concepts using Field-trip strategy and their counterparts taught using Conventional method. Null hypothesis one was tested using independent sample t-test. To test the null hypothesis 1, the posttest scores of Biology students obtained from Ecology Performance Test (EPT), were subjected to independent sample t-test statistics. The summary of the analysis is presented in Table 3

Table 3: Summary of Independent Samples t-Test for Pretest and Posttest Scores of Experimental and Control Groups

Group	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Difference	df	t-cal	p	Remark
Experimental	79	13.54	1.10	31.22	1.66	17.68	162	25.11	0.000	Sig
Control	85	13.51	1.09	20.70	4.00	7.19				

Significant at $\alpha < 0.05$ level

The result of the independent t-test analysis presented in Table 3 above showed the result of the t- test analysis of the performance scores of the Experimental and the Control groups. The result revealed α value of 0.000, which is lower than the $\alpha < 0.05$ at a degree of freedom (df) of 162 with t-calculated of 25.11. Therefore, the null hypothesis which stated that, there is no significant difference between the mean academic performance

score of SS II Biology students taught ecology concepts using Field-trip strategy and those taught using conventional methods is therefore rejected.

Research Question Two: What is the difference between the mean academic performance score of male and female students taught Ecology concepts Concept using Field-trip strategy? The data used is indicated in Table 4

Table 4: Mean, Standard Deviation Statistics of Posttest scores for Male and Female Students in Experimental Group

Gender	N	Mean	Std.D	Mean difference
Male	48	33.45	1.41	
				1.45
Female	31	32.00	1.43	

The data presented in Table 4 indicates that in the mean academic performance scores of male and female students in experimental group are 33.45 and 32.00 with a mean difference of 1.45. This implies that both male and female students taught ecology concepts using Field-trip strategy have nearly equal mean academic performance score. To test whether the difference is significant or not, null hypothesis two was tested.

Hypothesis Two: There is no significant difference between the mean academic performance score of male and female senior secondary students taught ecology concepts Concept using Field-trip strategy. The data used for the analysis were the number of male and female students as shown in table 5

Table 5: Summary of Independent Sample t-test of Mean Posttest Scores for Male and Female in Experimental Group.

Gender	N	Mean	STD	Mean diff.	Df	t-cal.	p	Remark
Male	48	33.45	1.41					
				1.45	77	1.13	0.83	NS
Female	31	32.00	1.43					

Significant at $\alpha \leq 0.05$ level of significance.

The results obtained from the independent t-test statistics presented in Table 5 shows that there is no significant difference between the mean academic performance scores of male and female students in the experimental group. This lack of significance is attributed to the computed p-value of 0.83, which is greater than the $\alpha \leq 0.05$, with a degree of freedom (df) of 77 and t-calculated value of 1.13. This shows that, there is no significant difference in the mean academic performance scores of male and female students in the experimental group. This implies that both male and female students in the experimental group had nearly equal mean academic performance score and that Field-trip strategy is gender friendly. As a result, the null hypothesis, which states that; there is

no significant difference in the mean academic performance scores of male and female senior secondary students taught ecology concepts using Field-trip strategy, is hereby retained.

Discussion of Findings

This study investigated the effect of Field-trip Strategy on academic Performance in Ecology concepts among Biology students in Zaria Education Zone, Kaduna State, Nigeria. There were two null hypotheses tested, and findings are discussed as follows:

The results revealed that significant difference exists between the mean academic performance scores of students in the experimental and control groups. Therefore, Field-trip strategy was found to be

more effective in improving students' academic performance than conventional method. The finding of this study was similar with that of Abu (2023) who reported that Field-trip strategy was shown to be more effective than the traditional method in improving academic performance. The finding also in agreement with that of Okereke (2023), Oka, Usman, and Samuel (2020), Egwu and Ebele (2021), Njoku and Mgbomo, (2021) also recorded that student taught using Field-trip strategy perform better than those obtained by their peers in the traditional group.

Results shows no significant difference between the mean academic performance scores of male and female senior secondary biology students taught ecology concepts using Field-trip strategy. This showed that Field-trip strategy is gender friendly. This finding agrees with Njoku and Mgbomo, (2021), Egwu and Okigbo (2021), who revealed that gender had no significant effect on students' performance in teaching and learning of ecology concepts when exposed to Fieldtrip strategy. However, the finding disagrees with that of Oladayo (2021) who found significant difference in the scientific level of female learners of secondary school students. Also, it disagrees with Zumyil and Antip (2022) who revealed that males significantly higher than females in Ecology concepts.

Conclusions

The following conclusions were made based on the study:

- i. Academic performance of students was enhanced when taught ecology concepts using Fieldtrip strategy.
- ii. Academic performance of male and female students taught ecology concepts using Fieldtrip strategy was not affected by gender.
- iii. The use of Fieldtrip strategy is gender friendly as it enhances academic performance of both genders.

Recommendations

Based on the findings and conclusions reached in the study, the following recommendations were made:

- i. The Kaduna State Ministry of Education in collaboration with the National Union of Teachers (NUT) should organize training, seminars and retraining workshops for biology teachers in secondary schools on the use of Fieldtrip strategy to improve the performance of students.
- ii. Professional Associations like the Science Teachers Association of Nigeria (STAN) and research centers such as Nigerian Educational and Research Development Council (NERDC) should incorporate Fieldtrip strategy in their science curricula.

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