



FIELD TRIP'S EFFECT ON STUDENTS' ACADEMIC PERFORMANCE IN SECONDARY SCHOOL BIOLOGY, MAKURDI, BENUE STATE

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Abstract

Field trip's effect on students' academic performance in secondary school Biology, Makurdi, Benue State was studied using a pretest post-test quasi experimental control research design. Two research questions and two hypotheses guided the study. The population comprised 1,989 SS2 Biology students in the 22 government secondary schools. A sample of 67 SS2 students was selected through multistage sampling from two co-educational schools. Intact classes were randomly assigned to experimental group taught with field trip instruction (n=32) and control group taught with Teacher Demonstration Method (n=35). Data were collected using a 50-item Biology Performance Test (BPT) with reliability coefficient of 0.82. Two research questions were answered using mean and standard deviation, while two null hypotheses were tested at 0.05 level of significance using ANCOVA. Findings revealed that students taught Biology using field trip instruction had a higher mean gain score of 17.97 compared to 0.75 for those taught with Teacher Demonstration Method. ANCOVA showed a statistically significant difference in performance, $F(1, 64) = 185.617, p < .05$, with a large effect size of .744. Regarding gender, female students had a mean gain of 18.55 while males had 15.67, but ANCOVA showed no significant difference, $F(1, 31) = 1.849, p = .184 > .05$. It was concluded that field trip instruction significantly enhances students' academic performance in Biology and is effective for both male and female students. Therefore, it was recommended that Biology teachers should integrate field trips into instruction, and relevant authorities should provide necessary support for its implementation.

Keywords: Field Trip, Biology, Academic Performance, and Gender.

Introduction

Education is fundamentally about creating all-round meaningful learning experiences that enhance students' knowledge and skills acquisition which could be reflected in their academic

performance (Ayua, 2017; Deway, 2019; Eriba & Ayua, 2025; Kolb, 2020). In the teaching and learning of Biology, which is essentially the study of life and living organisms, practical and experiential learning approaches have become

increasingly important in facilitating students' comprehension of complex biological concepts. Among these approaches, field trip could be one of the constructivists' pedagogical strategies that may bridge the gap between theoretical classroom instruction and real-world application of biological principles.

Science is the body of knowledge and processes studied for the possibilities it offers for the development and advancement of technology. It is the branch of knowledge empirically acquired through observation, experimentation, test and logical analysis. Science is a systematic enterprise that builds and organizes knowledge in the form of testable, verifiable and falsifiable explanations and predictions about the universe or natural world's resources. Science Education refers to the systematic teaching and learning of science concepts, principles, skills, and attitudes aimed at developing scientific literacy and problem-solving abilities (Ayua & Terhemba, 2026; Ayua et al, 2026). It involves the instruction of science subjects such as Biology, Chemistry, and Physics at various levels of education. The goal of science education is to enable learners to understand scientific knowledge, acquire process skills, develop positive scientific attitudes, and apply scientific principles to address personal and societal challenges (Federal Ministry of Education - FME, 2020; Ayua, 2019; Ayua & Dajuma, 2019). According to the National Research Council (2012) defined science education as teaching and learning about the natural world, including the physical sciences, earth sciences, Engineering, Technology, Mathematics, and life science sciences including Biology.

Biology plays a vital role in the economic development of a nation. This is because Ajaja, (2021) stated that recent advances recorded in the field of

Biochemistry, Physiology, Ecology, Genetics and Molecular Biology, have made the subject a central focus in the most human activities including solutions to the problem of food scarcity, pollution, population explosion, radiation, disease, health, hygiene, family life, poverty eradication, management and conservation of natural resources as well as biotechnology and ethics. Due to immense benefit of the subject (Biology) to both individual and societal development, Biology is regarded as a core science subject at the senior secondary school (SSS) level in Nigeria (FME, 2020). The objectives of Biology programme are to ensure: Adequate laboratory and field skills in Biology; meaningful and relevant knowledge in Biology; ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture; Reasonable functional scientific attitudes and Emphasis of content and context of the syllabus is placed on: field studies, guided-discovery/Biology as inquiry (FME, 2020).

Thus, from the above objectives, an outdoor strategy such as field trip has been recommended by FME for its implementation for the accomplishment of Biology objectives in the secondary school in Nigeria. However, despite the recommendation on field trip as a strategy for teaching Biology, many Biology teachers in the various secondary schools still teach Biology concepts using non-constructivists' teaching methods. There are different branches or concept of Biology and there is a different way of dealing with them effectively. For instance, there is anatomy and physiology, genetics, evolution, nervous co-ordination, among others, much of which can be taught effectively by demonstration, discovery, lecture method, activity based in the class room and/ or indoor laboratory. Good as these objectives are they cannot be



achieved with conventional teaching method, except innovative teaching methods such as guided enquiry, questioning, creative exploration and field trip.

Field trip, defined as educational excursions that take students outside the traditional classroom environment to observe, explore, and interact with natural phenomena in their authentic settings, have been recognized as powerful tools for enhancing students learning outcomes (Behrendt & Franklin, 2014). Experiential learning at formal and informal field trip venues increases student interest, knowledge, and motivation (Behrendt & Franklin, 2014). Although some survey studies indicate that 54% of teachers believe that field trip contributes to the academic performance of their students while 53% posit that excursions are complementary to the lessons and activities in curricula (Behrendt & Franklin, 2014; Student & Youth Travel Association, 2016), they are experimental. This seemingly growing recognition of field trip's educational values has prompted increased scholarly attention to their impact of students' academic performance, particularly in science subject like Biology at the secondary education level in Nigeria and hence the need for this quasi-experimental study amidst observed low performance in the subject.

Academic performance is the measurement of students' achievement across various academic subjects. Lamas (2015) defines academic performance as the level of knowledge or competence a student demonstrates after undergoing structured educational activities or training. While some researchers equate academic achievement with students' grades (Brookhart et al., 2016), others take a

broader view. To Zheng and Mustapha (2022), academic performance encompasses not only school grades but also the development of students' knowledge, skills, and literacy across various domains. More narrowly, academic performance is often measured through standardized examinations or assessments conducted at different stages of a student's educational journey. These achievement indicators reflect the degree to which students have achieved instructional objectives within formal learning environments such as schools, colleges, and universities. In science education, academic performance is particularly influenced by instructional methods and learning resources. For example, Ayua and Tartenger (2020) found that the Science-Technology-Society strategy significantly improved performance in Basic Science among upper-basic school students in Makurdi metropolis. Similarly, Ayua (2021) reported that the use of teacher-learner improvised materials enhanced performance in Basic Science among mixed-ability middle-basic school pupils. Furthermore, Ayau et al. (2023) established that ethno-science teaching improved performance among upper Basic Science students with diverse reasoning abilities in Makurdi, Benue State. At the tertiary level, Ayua (2020) noted that admission placement also influences interest and performance among Integrated Science undergraduates. This could be why Adane (2013) and Crone et al. (as cited in Emilio, 2020), emphasized that academic performance is the outcome of a complex interplay of various factors: including student-related and school-related variables. Specifically, school-related factors such as the quality of teaching, the learning environment, and the availability of

infrastructure and instructional resources play a critical role in shaping students' outcomes.

Gender has been described as a cultural construct reflecting the social positions and expectations that a society attaches to being male or female. According to Okeke (2017), gender is a social or cultural determinant that varies across places and cultures. It is not universal, unlike biological sex which is innate and universal. Gender refers to the socially and culturally constructed roles, behaviours, and expectations attributed to males and females, and it influences learners' attitudes, self-efficacy, interest, and participation in science education. Gender differences in science education denote observable variations between male and female students in access to, engagement with, and benefits derived from science learning experiences (Ayua et al., 2025; Ayua et al., 2026). These differences may manifest in areas such as laboratory participation, field experiences, academic performances, and science career aspirations. In the context of this study, gender refers specifically to differences between male and female secondary school Biology students in Makurdi, Benue State, regarding participation in field trips and the influence of field trip experiences on academic performance in Biology.

This study is anchored on David Kolb's (2021) Experiential Learning Theory, which provides a fundamental framework for understanding field trip effectiveness. Kolb proposed that learning constitutes a cyclical process involving four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The theory agrees that Students apply newly formed concepts to new situations, test hypotheses, solve problems, or conduct follow-up investigations. Post-field-trip activities

might include designing experiments, creating models, or applying principles to different ecosystems, completing the learning cycle and preparing for new concrete experiences (Kolb, 2021).

In response to review of the previous empirical studies, Prokop et al. (2019) conducted a quasi-experimental study with 119 Slovak students examining field trip' effect on plant knowledge and environmental attitudes. The findings revealed that the field trip group demonstrated significantly higher plant knowledge and more positive environment attitudes as compared to controls measured two weeks post-intervention. Greene et al. (2014) employed a large-scale randomized controlled trial with 11,000 students examining cultural institution field-strip educational impacts. Students randomly assign to field trip conditions showed improved knowledge retention, critical thinking, and historical empathy as compared to controls. Randler et al. (2019) examined zoo field trip' effect on 58 German students' learning about bird diversity an adaptation. Both groups showed significant knowledge gain from pre-test to post-test but the worksheet group demonstrated superior retention at follow-up assessment two months later. The researcher concluded that structured activities enhance encoding and facilitated long term retention beyond the engagement benefits of guided tour alone. Uzezi and Zainab (2017) investigated the effect of field trip on Biology students' academic achievement in Niger State, Nigeria. Result from Biology Achievement Tests administered post-intervention showed that the experimental group significantly outperformed the control group.

The reviewed studies are related to this current study on field trip and academic performance. However, this study is



different from the previous empirical studies due to differences in geographical locations, populations, sample sizes and cultural differences. That is why this study seeks to determine effect of field trip instruction on Biology students' academic performance in Makurdi Local Government, Benue State.

Gender-wise, Almasri study in 2022 evaluated the attitudes and academic performance of male and female students in various learning environments based on e-learning and in-classroom learning modalities, collaborative learning, and conventional learning pedagogies. In a Kuwaiti undergraduate Biology course, Almasri investigated the results of mixed- and single-gender grouping. 1375 Biology students of the public university were allocated into 12 learning environments at random. Results showed that in single-gender classrooms as opposed to classes with mixed genders, females performed better in Biology in conventional learning and collaborative sections; overall, there was a noticeable disparity in academic success between males and females. The effective teaching approach should be explored in order to enhance both boys' and girls' motivation for learning. In an effort to equalize access to education to both male and female students, various remedies including the use of innovative and captivating instructional approaches in the teaching and learning have been proposed. Experiential learning was used in the current study to establish if the gender gaps could be addressed between boys and girls in schools to provide equal opportunities for learning. Experiential learning approach emphasizes on learning by doing and reflecting on doing (Okuakaji & Sukolatambaya, 2020). Experiential

learning approach is a form of experience-based learning where learners make meaning of the actual experience. The process of experiential learning encompasses a variety of processes that give students a hands-on, group-based, and reflective learning experience that aids in their full acquisition of new knowledge and skills (Morris, 2020). According to Kolb & Kolb (2017), one develops knowledge in ELA by transforming their own experiences. A learning experience is not simply something that happens; it is a planned activity with a purpose and the learners confirm the purpose. According to Kolb and Kolb, experience-based learning is inductive, learner-centred, and activity-focused. Experiential learning involves the process of making sense of self-concrete experience, which lessens reliance on teachers.

Statement of the Problem

Biology has been reported as one subject in senior secondary school curriculum that students find it difficult to answer questions as they perform poorly in questions bothering on biological concepts as confirmed by WAEC Chief Examiner's reports from 2019 to 2024. The persistent poor performance in biological concept among others leaves no doubt about the ineffectiveness of the teaching method used by Biology teachers for teaching these concepts. It is against this backdrop that this study is necessitated to investigate the effect of field trip on Biology students' academic performance in Makurdi Local Government with the stated objectives:

1. To ascertain the effect of field trip instruction on Biology students' academic performance.

2. To determine the effect of field trip instruction on academic performance of male and female Biology students.

Research Questions

The following questions guided the study:

1. What is the mean difference in the academic performance of students taught Biology using field trip and those taught using Teacher Demonstration Method?
2. What is the mean difference in the academic performance of male and female students taught Biology using field trip instruction?

Hypotheses

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

1. There is no significant difference in the mean academic performance of students taught Biology using field trip and those taught using Teacher Demonstration Method?
2. There is no significant difference in the mean academic performance of male and female students taught Biology using field trip instruction?

Method

This study adopted a pretest post-test quasi-experimental control research design. The quasi-experimental design is a research methodology that lies between the rigor of a true experimental method (true experimental design includes random assignment to at least one control and one experimental/interventional group) and the flexibility of observational studies (Maciejewski, 2020). The population of the study consisted of all the 1,989 SS2 Biology students in the 22 government secondary

schools in Makurdi Local Government. A sample of 67 SS2 Biology students was selected from the population using multistage sampling procedure. Firstly, purposive Sampling: two co-educational public secondary schools with similar facilities and academic characteristics were selected. Secondly, Random Sampling: in each school, intact classes were randomly selected and assign to experimental and control groups to avoid disruption to school timetables. Thirdly, Stratified Sampling (Gender): To answer research questions on gender differences, the sample included male and female students in proportion to their population. Biology performance Test (BPT) was used for data collection, it consisted of 50 multiple choice questions drawn from SS2 topics on ecology, classification, and environmental Biology. BPT was validated by 2 experts in Biology and Mathematics/Statistics education. BPT was tested on 20 Biology students which were not part of the main sample selected for the study. The trial-test scores collected were computed using Kuder-Richadson Formula 20, which yielded a reliability index of 0.82 and deemed adequately valid. Mean and standard deviations were used to answer research questions while analysis of covariant was used to test hypotheses at 0.5 level of significance.

Results

The results of the study are presented in accordance with the research questions and hypotheses as follows:

Research Question One: What is the mean difference in the academic performance of students taught Biology using field trip and those taught using Teacher Demonstration Method?

Table 1: Mean and Standard Deviation of Students' Academic Performance Taught Biology using Field Trip and those taught using Teacher Demonstration Method

Method	Sample (n)	Pre-CMD		Post- CMD		Gain
		Mean	St. D	Mean	SD	
Field Trip	32	24.97	6.51	42.94	3.46	17.97
Teacher Demonstration Method	35	25.11	6.16	25.86	6.86	0.75
Difference		0.14		17.08		17.22

In Table 1, the mean scores show clear differences between the two instructional methods: Field Trip Group present pre-test mean = 24.97, post-test mean = 42.94 and mean gain score = 17.97. Teacher Demonstration Method Group shows pre-test mean = 25.11, post-test mean = 25.86 and mean gain score = 0.75. At the pre-test level, both groups had nearly identical mean scores (difference = 0.14), indicating that the students had similar academic ability before the treatment. However, at the post-test level, the Field Trip group recorded a much higher mean score (42.94) compared to the Teacher Demonstration group (25.86), resulting in a substantial mean difference of 17.08. Looking at the mean gain scores, students taught using field trip improved by

17.97 points, while those taught using the Teacher Demonstration Method improved by only 0.75 points. This yields a mean gain difference of 17.22 in favour of the Field Trip method. The findings indicate that field trip had a greater positive effect on students' academic performance in Biology compared to the Teacher Demonstration Method. Students exposed to field trip demonstrated markedly higher improvement, suggesting that experiential learning enhances understanding more effectively than traditional demonstration methods.

Research Question Two: What is the mean difference in the academic performance of male and female students taught Biology using field trip instruction?

Table 2: Mean and Standard Deviation of Academic Performance of Male and Female Students taught Biology using Field Trip Instruction

Gender	Sample (n)	Pre-CMD		Post- CMD		Gain
		Mean	St. D	Mean	SD	
Male	12	26.08	5.74	41.75	2.96	15.67
Female	22	24.59	6.76	43.14	4.02	18.55
Difference		1.49		1.39		2.88

Table 2 present the mean scores for male and female students as follows: Male Students shows pre-test mean = 26.08, post-test mean = 41.75 and mean gain score =

15.67. While female students show pre-test mean = 24.59, post-test mean = 43.14 and mean gain score = 18.55. At the pre-test stage, male students had a slightly higher

mean score (26.08) than female students (24.59), with a mean difference of 1.49, indicating that males initially performed a bit better. However, at the post-test stage, female students outperformed male students, with a mean score of 43.14 compared to 41.75 for males. This gives a mean difference of 1.39 in favour of female students. Considering the mean gain scores, female students showed greater improvement (18.55) than male students (15.67), resulting in a mean gain difference of 2.88. Although male students started slightly ahead at the pre-test level, female

students demonstrated greater improvement and achieved higher academic performance after being taught using field trip. This suggests that field trip instruction was effective for both genders but had a more pronounced positive impact on female students' learning outcomes in Biology.

Hypothesis One: There is no significant difference in the mean academic performance of students taught Biology using field trip and those taught using Teacher Demonstration Method?

Table 3: ANCOVA Summary of Students' Academic Performance Based on Teaching Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5158.276 ^a	2	2579.138	97.631	.000	.753
Intercept	2679.833	1	2679.833	101.442	.000	.613
Pretest	281.452	1	281.452	10.654	.002	.143
Teaching Method	4903.506	1	4903.506	185.617	.000	.744
Error	1690.709	64	26.417			
Total	84369.000	67				
Corrected Total	6848.985	66				

The ANCOVA results in Table 3 provide evidence on whether the teaching methods significantly influenced students' academic performance after controlling for pretest scores. The effect of Teaching Method has shown $F(1, 64) = 185.617$, $p = .000 < 0.05$ and partial eta squared = 0.744. Since the p-value (0.000) is less than the 0.05 level of significance, the null hypothesis is rejected. This result indicates that there is a statistically significant difference in the mean academic performance of students

taught using field trip and those taught using the Teacher Demonstration Method, even after adjusting for pretest differences. The Partial Eta Squared value of 0.744 shows a very large effect size, meaning that the teaching method accounts for a substantial proportion (74.4%) of the variation in students' academic performance.

Hypothesis Two: There is no significant difference in the mean academic performance of male and female students taught Biology using field trip instruction?

Table 4: ANCOVA Summary of Students' Academic Performance Based on Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	75.699 ^a	2	37.850	3.137	.057	.168	
Intercept	2645.894	1	2645.894	219.274	.000	.876	
Pretest Gender	60.775	1	60.775	5.037	.032	.140	
Gender	22.315	1	22.315	1.849	.184	.056	
Error	374.065	31	12.067				
Total	62288.000	34					
Corrected Total	449.765	33					

The ANCOVA results examine whether gender has a significant effect on students' academic performance after controlling for pretest scores. The effect of Gender shows $F(1, 31) = 1.849$, $p = .184 < 0.05$ and partial eta squared = .056. Since the p-value (.184) is greater than the 0.05 level of significance, the null hypothesis is not rejected. This result indicates that there is no statistically significant difference in the mean academic performance of male and female students taught Biology using field trip instruction. The partial eta squared value for gender (.056) suggests a small effect size, meaning gender contributed minimally to differences in performance. The null hypothesis is retained. Therefore, gender does not significantly influence students' academic performance when taught Biology using field trip. Both male and female students benefited similarly from the instructional method.

Discussion of Finding

As concerns the effect of Field Trip Instruction on Students' Academic Performance in Biology, the finding of this study revealed that field trip instruction had a significant positive effect on the academic performance of SS2 Biology students in Makurdi. Students taught using field trip recorded a mean gain of 17.97 compared to 0.75 for those taught with the

Teacher Demonstration Method. The ANCOVA result further confirmed this difference to be statistically significant, $F(1, 64) = 185.617$, $p < 0.05$, with a very large effect size of 0.744, indicating that teaching method accounted for 74.4% of the variation in performance. This result aligns with Kolb's (2021) Experiential Learning Theory, which posits that concrete experiences such as field trips facilitate deeper understanding through reflection and application. It also corroborates previous studies by Uzezi and Zainab (2017) and Prokop et al. (2019), who reported superior knowledge acquisition and retention among students exposed to field-based learning. The substantial improvement observed in the field trip group suggests that taking students outside the classroom to interact with real biological phenomena enhances conceptual understanding, makes abstract concepts tangible, and increases retention. This supports the FME (2020) recommendation that field studies should be emphasized in Biology teaching to achieve curriculum objectives. Thus, field trip is an effective constructivist strategy for improving academic performance in secondary school Biology.

With respect to the effect of Field Trip Instruction on Academic Performance

of Male and Female Biology Students, the finding of this study showed that although both male and female students benefited from field trip instruction, female students demonstrated slightly higher mean gain scores (18.55) than male students (15.67). However, the ANCOVA result indicated no statistically significant difference in the academic performance of male and female students taught Biology using field trip, $F(1, 31) = 1.849$, $p = .184 > 0.05$, with a small effect size of 0.056. This implies that gender did not significantly influence students' performance when exposed to field trip instruction. The result suggests that field trip provides an inclusive learning environment that minimizes gender-based disparities in science education by offering equal opportunities for participation, observation, and hands-on experience. This finding contrasts with Almasri (2022), who reported gender differences in Biology performance under conventional and collaborative settings, but supports the view that experiential approaches can bridge gender gaps by reducing reliance on teacher-directed instruction and promoting active engagement for all learners (Morris, 2020; Okuakaji & Sukolatambaya, 2020). Therefore, field trip instruction is gender-neutral in its impact and can be adopted to promote equitable academic outcomes in Biology among male and female students in Makurdi.

Conclusion

Founded on the findings, this study concludes that field trip instruction significantly enhances the academic performance of SS2 Biology students in Makurdi, Benue State, more effectively than the Teacher Demonstration Method. The study further concludes that field trip instruction is gender-neutral, as both male and female students benefited similarly with no statistically significant difference in performance between the two groups. Thus,

experiential learning through field trips provides an inclusive and effective approach for teaching Biology concepts.

Recommendations

From the results of this study, the following recommendations are made:

1. Curriculum Implementation: Biology teachers in secondary schools should integrate field trips into the teaching of Biology to bridge the gap between theory and practice and improve students' academic performance.
2. Teacher Training and Support: The Ministry of Education and school authorities should organize workshops and provide funding, logistics, and instructional materials to support teachers in planning and executing meaningful field trips.
3. Policy Adoption: The Federal Ministry of Education should enforce the recommendation on field studies in the Biology curriculum and encourage schools to make field trips a regular component of Biology instruction.
4. Gender-Inclusive Practice: Since field trip benefits both male and female students equally, teachers should ensure equal participation of all students in field trip activities to promote equitable learning outcomes in Biology.

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