



doi:10.5281/zenodo.14934009

Effects Of Ecological Field-Trip And Guided-Discovery Strategies On Secondary School Students' Interest In Biology In Taraba State, Nigeria

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ABSTRACT

This study examined the effects of ecological field trip and guided discovery strategies on secondary school students' interest in biology in Taraba state, Nigeria. Three research questions and three hypotheses guided the study. The study adopted a quasi-experimental design of pre-test, post-test non-equivalent groups. The population of the study comprised 2,066 Secondary School Two (SS II) students in all the 53 public schools in Jalingo Education Zone of Taraba State. The sample consists of 486 students: 221 males and 265 females drawn from 6 secondary schools in the zone. Biology Students' Interest Scale Questionnaire (BSISQ) was used for data collection. The instrument was validated by three experts from the Department of Science Education and Measurement and Evaluation unit from Faculty of Education, Taraba State University Jalingo. The reliability index of 0.75 was obtained for BSISQ using the Cronbach alpha method. Mean and standard deviation were used to answer research questions while Analysis of Variance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings revealed a significant difference on students' interest between ecological field trip and guided discovery in favour of ecological field trip. Additionally, it was found that no statistically significant difference exists between the mean interest ratings of male and female students taught biology using ecological field trip and guided discovery strategies. It was concluded that ecological field trip is a good way for students to learn biology as it first improves their interest which is crucial in the learning process. It was recommended that teachers of biology should utilize both strategies to bridge gender differences with respect to students' interest.

Keywords; Ecological, Field Trip, Guided Discovery and Interest

INTRODUCTION

Science Education is the type of education that helps learners to value the environment and to become useful to themselves and the society. According to Fina (2015), the Nigerian child is introduced to science during the Basic Education, program of primary education (Primary 1-6, Upper Basic 1-3) because this level will enable the child (learner) to develop an interest in science, learn science, practice science and contribute effectively to the scientific and technological development of the nation. The foundation of science is presented to the learner earlier in life so that science subjects will not sound strange to the

learner at the secondary school level. An ecological field trip is defined as an experiential learning activity that takes students into natural environments to observe ecological processes and interact with ecosystems directly. These trips are designed to deepen understanding of ecological relationships, biodiversity, and environmental stewardship in real-world settings, thus enhancing student engagement and retention of knowledge (Tal & Morag, 2009). Field trips have been shown to significantly increase student engagement and interest. In a broader sense, Behrendt and Franklin (2014) described field trips as structured learning experiences that make abstract ecological concepts more accessible. Their research suggests that students who engage in outdoor ecological activities are generally more motivated and find it easier to retain information compared to those taught solely through in-class instruction. This finding supports the idea that interactive, field-based learning activities can make learning more enjoyable and immersive, thus increasing student enthusiasm for ecology. Njoku and Mgbomo (2021) and Egwu & Okigbo (2021) describe field trips as outdoor exercises that allow students to engage with real-life examples of academic material, which is especially effective in Biology and Ecology education. Such learning exercises help bridge theoretical and practical understanding, making concepts more relatable by directly observing the natural environment.

Interest is a vital aspect of the teaching and learning process because the learners' interest is an essential factor in inculcating the right knowledge, skills, values, and morals that the curriculum seeks to attain. It helps in sustaining concentration, purpose, commitment, and cooperation with the teacher in the learning process. Danjuma (2015) stated that interest helps in sustaining concentration, purpose, and commitment to learning and cooperation with the teacher in the learning process. Interest is an important variable that triggers learners towards learning. When one becomes interested in an activity, one is likely to succumb to that activity. Research suggests that students' interest in science significantly impacts their academic performance and engagement. Hulleman and Harackiewicz (2019) found that students with a high interest in science subjects show greater commitment and effort, often resulting in higher achievement. This heightened interest in science can foster continuous learning, especially when teaching methods are able to maintain students' curiosity and engagement in the subject (Sadler et al., 2014).

Research has also shown that student interest significantly impacts enrollment and performance in science subjects, often hindered by teaching methods that do not fully engage students. Ali et al. (2014) discussed the effects of engaging instructional styles on students' interest in science, finding that teaching methods can be instrumental in influencing students' perceptions and commitment to science courses. The finding agrees with Denen and Isah (2015) that field-trip instructional strategy is more effective in enhancing students' interest in ecological concepts. Ukor and Abduljabbar (2017) argued that "Field Instructional Strategy (FIS) is more effective in enhancing students' interest in ecological concepts". Itodo and Emmanuel (2019) affirmed that "students taught Biology in the experimental group significantly increased in interest scores than those taught via the conventional method". However, the finding disagrees with Bileya, and Achor (2021) that there was no statistically significant difference between the mean interest scores of students taught physics using CMS and those taught using GDM. Similarly, research by Yusuf and Ayodele (2018) emphasizes that a lack of stimulating teaching approaches is often linked to low enrollment in science subjects, especially in Biology, where students' engagement is critical to their choice to pursue science fields. To achieve the objectives of science education, strategies that will arouse students' interest in Biology were considered. The student-activity-based mode of teaching strategies has been recommended by the Federal Republic of Nigeria (FRN, 2014). Among these strategies are; ecological field trips and guided discovery strategies.

The discovery strategy is a student-centered strategy in which the learner uses his mental process to mediate or find out things for himself. In guided discovery, the teacher provides the setting, the structure, and the materials and guides students to discover answers to problems. The teachers' role in guided discovery is to serve as facilitators of learning in which students are encouraged to be responsible, and autonomous and construct their understanding of each concept (Olorode, 2016). The teacher guides the students in their learning tasks by asking them thought-provoking questions that would assist them in generating their correct ideas of the subject matter.

Persistent poor students' performance in Biology at the Secondary School Certificate (SSCE) level the West African Examination Council [WAEC] Chief Examiner's Reports from 2018 to 2019 show students' deteriorating performances in Biology at the School Certificate Examination level, indicating that a lack of understanding of fundamental concepts of Biology contributed to the alarming poor performance of students in biology examinations, which in most cases is linked to their interest and possibly the effect of gender in the subject matter. Given these awful problems, the quest for an appropriate alternative to teaching becomes extremely important which has imposed the need to introduce teaching strategies such as the ecological field trip and guided discovery strategies, to find out whether these instructional strategies could motivate and arouse students' interest, in Biology irrespective of gender.

Purpose of the Study

The purpose of this study is to investigate the effects of ecological field trip and guided discovery instructional strategies on secondary school students' interest, in biology in Taraba State, Nigeria. Specifically, the study intends to:

- i) Ascertain the interest ratings of students taught biology using the ecological field trip instructional strategy and those taught the same concept using the guided discovery instructional strategy.
- ii) Determine the difference between the interest ratings of male and female students taught biology using an ecological field trip instructional strategy.
- iii) Ascertain difference in the interest rating of male and female students taught biology using guided discovery instructional strategy.

Research Questions

The following questions were raised to guide the study;

- i. What will be the difference in the mean interest ratings of students taught biology using the ecological field trip instructional strategy and those taught the same concept using the guided discovery instructional strategy?
- ii. What will be the difference in the mean interest ratings of male and female students taught biology using an ecological field trip instructional strategy?
- iii. What will be the difference in the mean interest ratings of male and female students taught biology using the guided discovery instructional strategy?

Hypotheses

The following null hypotheses were formulated and tested at a 0.05 level of significance

4. There is no statistically significant difference in the mean interest ratings of students taught biology using the ecological field trip instructional strategy compared to their counterparts taught the same concepts using the guided discovery instructional strategy.
5. There is no statistically significant difference in the mean interest rating of male and female students taught biology using guided discovery instructional strategy.
6. There is no statistically significant difference in the mean interest ratings of male and female students taught biology using ecological field trip instructional strategy.

MATERIALS AND METHODS

A quasi-experimental design of pre-test, post-test, non-equivalent group was adopted for the study. The choice of the quasi-experimental design is based on the fact that intact classes were used as the study sought to establish cause-effect relationship of ecological field trip and guided discovery on students' interest in biology. The study was conducted in Jalingo Education Zone in Taraba State, Nigeria. Jalingo Education Zone is one of the educational zones in the state and includes 53 co-educational secondary schools with a Senior Secondary student population of 2,066. The study population comprises all 2,066 Secondary School Two (SS 2) students taking biology across the 53 co-educational secondary schools in Jalingo Education Zone of Taraba State during the 2023/2024 academic session (Taraba State Post Primary School Management Board, TSPPSMB). From this number, 1,091 were male students and 975 female students. The study sample consisted of 486 SS 2 Biology students from Jalingo Education Zone

in Taraba State, comprising 261 males and 225 females. The sample was drawn from six schools using a multistage sampling technique, involving random selection at multiple stages to ensure a representative distribution of participants. At the first stage, Jalingo Education Zone was selected from ten education zones through random sampling of hat and draw method. Two co-educational schools were randomly selected from each of three local government areas in Jalingo Education Zone (Jalingo, Ardo-kola and Lau). The six sampled schools were grouped into two. Three schools were assigned experimental group 1 (ecological field trip while the remaining other were assigned experimental group 2 (Guided discovery strategies). The Biology Students' Interest Scale Questionnaire (BSISQ) was used for data collection. The interest scale test consists of 20 items on a four-point Likert scale (Strongly Agree, Agree, Disagree, and Strongly Disagree). BSISQ was validated by three experts from the Faculty of Education Taraba State University Jalingo, Nigeria. These experts were senior lecturers: two in Science Education (Biology) and one in measurement and evaluation. The experts assessed the instrument in terms of general content relevance, validity, clarity and simplicity of language. Their suggestions and corrections were implemented. In a pilot testing, forty (40) copies of BSISQ were administered to students in Zing Education Zone which was not part of the study area. The data obtained was used in calculating the reliability of the BSISQ. Cronbach alpha coefficient was used to compute the reliability and an index of 0.75 was found suggesting that the instrument is suitable for the study. The BSISQ was administered to the experimental group 1 and experimental group 2 as pre-tests by the researcher through the research assistants a week before the actual treatment to determine the level of students' interest in Biology. The researcher selected six research assistants who were biology teachers with B. Ed. and B. Sc. Ed. Graduates from the sampled schools and trained them for one week. Six schools were selected, three schools were assigned to experimental group 1 (Ecological field-trip) and the other three were assigned experimental group two (Guided discovery strategy). The treatment period lasted for four weeks. Then at the end of the treatment section, the biology students scale questionnaire was administered to all the treatment groups as a post-test. Mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses. All the hypotheses were tested at 0.05 level of significance. The use of ANCOVA statistics in data analysis was to take care of initial group differences.

RESULTS

Research Question One: *What is the difference in the mean interest ratings of students taught biology using ecological field trip and those taught same concept using guided discovery strategy?*

Table 1: Mean Interest Ratings of Students taught Biology using Ecological Fieldtrip and Guided Discovery Strategy

Strategies		PreBSIQS	PostBSIQS	Mean gain
Ecological Field trip	Mean	2.04	2.95	0.91
	N	237	237	
	Std. Deviation	0.17	0.17	
Guided discovery strategy	Mean	2.08	2.60	0.52
	N	249	249	
	Std. Deviation	0.43	0.54	
Difference				0.39

Table 1 shows that the mean pre-test interest ratings of students taught biology using ecological field trip is 2.04 with a standard deviation of 0.17 and 2.95 with a standard deviation of 0.17 in post-test. The table further shows that the mean interest ratings of students taught biology using guided discovery strategy is 2.08 with a standard deviation of 0.43 in pre-test and 2.60 with a standard deviation of 0.54 in post-test. The mean gain in interest ratings of students taught biology using ecological fieldtrip is 0.91 and that of guided discovery strategy is 0.52. The difference in the mean interest ratings of students taught biology

using ecological field trip and those taught same concepts with their counterpart using guided discovery strategy is 0.39.

Research Question Two: *What is the difference in the mean interest ratings of male and female students taught biology using ecological field trip?*

Table 2: Mean Interest Ratings of Male and Female Students taught Biology using Ecological Field Trip

Gender		PreBSIQS	PostBSIQS	Mean gain
Male	Mean	2.04	2.94	0.90
	N	141	141	
	Std. Deviation	0.17	0.13	
Female	Mean	2.06	2.95	0.89
	N	96	96	
	Std. Deviation	0.11	0.17	
Difference				0.01

Table 2 shows that the mean interest ratings of male students taught biology using ecological field trip is 2.04 with a standard deviation of 0.17 in pre-test and 2.94 with a standard deviation of 0.13 in post-test. The table further shows that the mean interest ratings of female students taught biology using ecological fieldtrip is 2.06 with a standard deviation of 0.11 in pre-test and 2.95 with a standard deviation of 0.17 in post-test. The mean gain in interest ratings of male students taught biology using ecological fieldtrip is 0.90 and that of female students is 0.89. The difference in the mean interest ratings of male and female students taught biology using ecological field trip is 0.01.

Research Question Three: *What is the difference in the mean interest ratings of male and female students taught biology using guided discovery strategy?*

Table 3: Mean Interest Ratings of Male and Female Students taught Biology using Guided Discovery Strategy

Gender		PreBSIQS	PostBSIQS	Mean gain
Male	Mean	2.07	2.57	0.50
	N	120	120	
	Std. Deviation	0.42	0.28	
Female	Mean	2.04	2.57	0.53
	N	129	129	
	Std. Deviation	0.41	0.27	
Difference				0.03

Table 3 shows that the mean interest ratings of male students taught biology using guided discovery strategy is 2.07 with a standard deviation of 0.42 in pre-test and 2.57 with a standard deviation of 0.28 in post-test. The table further shows that the mean interest ratings of female students taught biology using guided discovery strategy is 2.04 with a standard deviation of 0.41 in pre-test and 2.57 with a standard deviation of 0.27 in post-test. The mean gain in interest ratings of male students taught biology using guided discovery strategy is 0.50 and that of female students is 0.53. The difference in the mean interest ratings of male and female students taught biology using guided discovery strategy is 0.03.

HO1: There is no significant difference in the mean interest ratings of students taught biology using the ecological field trip instructional strategy compared to their counterparts taught the same concepts using the guided discovery instructional strategy.

Table 4: ANCOVA of Interest Ratings of Students taught Biology using Ecological Field trip and Guided Discovery Method

Dependent Variable: PostBSIQS

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	14.736 ^a	2	7.368	44.108	.000	.154	
Intercept	91.367	1	91.367	546.962	.000	.531	
PreBSIQS	.020	1	.020	.121	.728	.000	
Strategies	14.731	1	14.731	88.183	.000	.154	
Error	80.683	483	.167				
Total	3836.257	486					
Corrected Total	95.419	485					

a. R Squared = .154 (Adjusted R Squared = .151)

Table 4 shows that $F(1,483) = 88.183$; $p = 0.000 < 0.05$. Thus, the null hypothesis is rejected. This implies that there is a statistically significant difference in the mean interest ratings of students who taught biology using ecological field trips compared to their counterparts who taught the same concepts using the guided discovery method.

HO2: There is no statistically significant difference in the mean interest rating of male and female students taught biology using guided discovery instructional strategy

Table 5: ANCOVA of Interest Rating of Male and Female Students taught Biology using Ecological Field Trip

Dependent Variable: PostBSIQSg

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	6.815 ^a	2	3.407	3990.997	.000	.972	
Intercept	40.802	1	40.802	47790.100	.000	.995	
PreBSIQSg	6.815	1	6.815	7981.984	.000	.972	
Gender EFT	.001	1	.001	1.444	.231	.006	
Error	.200	234	.001				
Total	2071.277	237					
Corrected Total	7.015	236					

a. R Squared = .972 (Adjusted R Squared = .971)

Table 5 shows that $F(1, 234) = 1.444$; $p = 0.231 > 0.05$. Thus, the null hypothesis is not rejected. This implies that there is no statistically significant difference in the mean interest rating of male and female students taught biology using ecological field trip.

HO2: There is no statistically significant difference in the mean interest rating of male and female students taught biology using guided discovery strategy

Table 6: ANCOVA of Interest Ratings of Male and Female Students taught Biology using Guided Discovery strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.920 ^a	2	.460	6.306	.002	.049
Intercept	79.158	1	79.158	1084.812	.000	.815
PreBISIQSe	.920	1	.920	12.611	.000	.049
Gender GDS	1.257E-5	1	1.257	.013	.990	.000
Error	17.950	246	.073			
Total	1670.025	249				
Corrected Total	18.871	248				

a. R Squared = .049 (Adjusted R Squared = .041)

Table 6 shows that $F(1, 246) = 0.013$; $p = 0.990 > 0.05$. Thus, the null hypothesis is not rejected. This implies that there is no statistically significant difference in the mean interest rating of male and female students taught biology using guided discovery strategy.

DISCUSSION OF FINDINGS

Findings of the study on interest between the two groups revealed that students from the ecological field trip group significantly acquired higher interest than students in the guided discovery. Apparently, this could mean students hardly go out for field trip exercises and upon experiencing it; their interest level got a significant raise. It is logical that students enjoy engaging and learning from things that are novel. Having been used to staying in the class and the teacher dictating, learning from their environment through field trip significantly impacted their interest in biology. This significant effect of ecological field trip on students' interest agrees with the findings of Ukor and Abduljabbar (2017) who found that field trip strategy is more effective in enhancing students' interest in ecological concepts. Similarly, it further agrees with Oka and Samuel (2020) and Eriba (2019) who established that ecological field trip is significantly potent in boosting students' interest, especially, in comparison with conventional strategies which always confines the students to the four walls of the classroom. However, the finding disagrees with Nurhayani et al. (2020) who found that guided discovery learning can be applied to optimize students' interest. It also disagrees with Yusuf (2020) who observed that there is a significant impact of guided discovery in enhancing students' interest.

For students in the ecological field trip group, the findings revealed no significant difference in male and female students' interest. This implies that gender does not affect the enhancement of students' interest. This is consistent with Todo and Emmanuel (2019) who established no significant difference in the mean interest scores of male and female students in biology upon exposure to field trip method. In the same vein, the finding is concordant with Ugwu (2023) who found that although male students gained more interest than female students but the difference is not significant. Female students are increasingly participating in scientific activities and the gender difference that generally clouds science learning is being eliminated. The equal opportunity given to male and female students to learn biology through field trips could be responsible for this observation.

The findings also revealed that gender did not significantly have any effect on the mean interest of students who were taught biological concepts using the guided discovery instructional strategy. Similar finding was reported in Jacob (2024) that no significant difference exists between male and female students' interest when taught through guided discovery. The finding also agrees with Bileya and Achor (2021) who found no significant difference in interest of male and female students in guided discovery. Concerns about gender in science learning have always been on how the female students can level up with their male counterparts. Teachers' choice of strategies and other classroom practices have been

tailored to realizing this objective. It is therefore not farfetched gender difference was found not to be significant in both groups. Both male and female students acquire the same level of interest when they learn using field trip or guided discovery instructional strategies.

CONCLUSION

It is evident from the findings of the study that the use of ecological field trip could provide a good way for students to learn biology as the strategy arouses students' interest. This spells that students should regularly be taken out for ecological field trip as doing this boosts their interest and makes them excited and practice biology more. Additionally, before effective learning occurs, students must be interested. Similarly, guided discovery and ecological field trip are potent strategies which can go a long way in arousing the interest of students irrespective of gender. With these strategies, biology teachers now have options of ameliorating gender differences in their classroom.

RECOMMENDATIONS

The following recommendation resulted from the finding of the study:

1. Biology teachers in schools looking to upscale students' interest in biology are encouraged to use ecological field trip in teaching ecological concepts in biology.
2. Ecological field trip could be used in situations where gender differences in students' interest in learning biology need to be bridged since the method was found to impact both genders accordingly
3. Guided discovery strategy was also found not to be gender discriminative; biology teachers in the secondary schools should be encouraged to use it to enhance students' interest, in biology.

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