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EDITORIAL

Journal of Science Education and Research (JSER) is a peer-reviewed published Bimonthly. It aimed at advancing knowledge and professionalism in all aspects of educational research, including but not limited to innovations in science education, educational technology, guidance and counselling psychology, childhood studies and early years, curriculum studies, evaluation, vocational training, planning, policy, pedagogy, human kinetics, health education and so on. JSER publish different types of research outputs including monographs, field articles, brief notes, comments on published articles and book reviews.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Patrick C. Igbojinwaekwu
Editor-in-Chief

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**EFFECT OF VIRTUAL FIELD TRIP METHOD ON ACADEMIC
ACHIEVEMENT OF COLLEGE OF EDUCATION STUDENTS IN
ECOLOGICAL CONCEPTS IN ANAMBRA STATE**

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Abstract

The study examined the effect of virtual field trip method on the academic achievement of college of education students in ecological concept in Anambra State. Three research questions and three null hypotheses guided the study. The researcher adopted the quasi- experimental design (using the pre-test, post-test non-randomized control group design.). The population for the study comprises all the 82 NCE year I students in government owned colleges of education in Anambra state. No sample was selected and the entire population for this study was used for the experiment. The instrument for the study is the Ecology Achievement Test (EAT). The instrument was validated by three experts, with reliability coefficient of 0.83 established using KR-20. Data collected was analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA). The findings of the study revealed that students taught ecological concepts using virtual field trip method (VFTM) achieved higher than their counterparts taught with the conventional lecture method, which proved statistically significant when tested. On gender, the study also revealed that VFTM favoured males more than the females, although the difference was not statistically significant. Based on the findings, the study concluded that VFTM is an innovative approach that can enhance students' academic achievement in ecological concepts, irrespective of gender and recommended among others that ecology lecturers should adopt VFTM while planning their lessons to enhance students' interaction with each other and the learning materials to facilitate effective learning.

Keywords: Academic achievement, Virtual field trip method (VFTM)

Introduction

Biology is the science of life concerned with the characteristics of living things, their forms, functions and relationship with one another and with their environment. It is a basic knowledge that biology is a prerequisite for studying a number of disciplines such as medicine, agriculture, pharmacy, microbiology, biochemistry and psychology among others (Oka & Samuel, 2020). Nwuba, Egwu and Osuafor (2022) noted that biology plays a vital role in the economic development of a nation as reports recorded in the field of biochemistry, physiology, ecology, genetics and molecular biology, have made the subject a central focus in 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 benefits of the subject (Biology) to both individual and societal development, the Federal Government of Nigeria, in the National Policy on Education (FRN, 2014), made biology a core science subject at the senior secondary school level. The objectives of biology Programme are: 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 (FRN, 2014).

There are different strategies and methods adopted in teaching different biological concepts, one of which is field trip method which is mostly applied to concepts such as conservation of natural resources, ecology, plants adaptation among others. Concepts on conservation is one of the abstract aspects in biology but can be more meaningful if students are given the opportunity to engage with the environment through learning (Bagiwa, 2023). Nevertheless, from the above objectives, an outdoor strategy such as field trip has been recommended by the Federal Ministry of Education (FME, 2014) for its implementation and the accomplishment of biology objectives in the secondary schools in Nigeria. Field trip is an excursion taken outside the classroom for the purpose of making relevant observations and also for obtaining some specific information. Field trip is a teaching strategy in biology which is done by taking students out to the field to provide first-hand experience of organisms in their natural environment (Amosa, Ogunlade & Atobalete, 2015; Zumyil, 2019). Amosa, Ogunlade and Atobatele (2015), stated that the use of field trip in teaching and learning helps to bring about effective and efficient learning.

Virtual field trips may comprise images, animations, audios and videos. With the advancements in technology over the years, we now have alternative options for traditional field trips. Also, Opalewski and O’Leary (2019) in their study found that, many cultural institutions utilize technology to provide distance learning opportunities or virtual field trips for students. When used effectively, technology can open students to new experiences and places and many of the obstacles that teachers face with the usual field trip no longer apply (Cassady cited in Bagiwa, 2023). Teachers do not need to worry about money, getting permission, scheduling chaperones, taking medical risks, or skipping important classroom instruction time. Thus, when traditional field trips are not possible, virtual field trips offer a viable alternative for ease of learning biology concept. Operationally, a virtual field trip (VFT) is a guided exploration through the World Wide Web that organizes a collection of pre-screened, thematically based web pages into a structured online learning experience.

Nonetheless, 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 only conventional method that is, lecture method (Etobro & Fabinu, 2017). This method of teaching is one in which the teacher assumes the major role of the instructor while the students only listen and takes notes during the lesson. However, despite the fact that lecture method is a long existing method of teaching, student still tend to perform poorly in their academic achievement in ecological concepts. There are different ways of dealing with the concepts effectively. For instance, this study focused on areas like succession, biotic interactions, energy transfer in the eco-system. It examined the academic achievement of students in relation with the teaching method used.

Academic achievement refers to a student’s success in meeting short or long-term goals in education. Academic achievement means completing secondary school or earning a higher certificate. It is the extent to which a learner is profiting or has profited from instructions in a given area of learning (Nwuba & Osuafor, 2021). This is reflected by the extent to which skill or knowledge has been imparted in the learner. Academic achievement is knowledge acquired and skills developed in school subjects, which is generally indicated by marks obtained in tests in an annual examination (Owenvbiugie & Iyoha, 2017). According to Akunne and Anyanmene (2021a), students’ academic achievement is described as the ability to study and remember subject content and being able to communicate such knowledge orally or in written form even in an examination condition. Nevertheless, student’s academic achievement and retention in

biology concepts could be enhance through the application of student-centred teaching methods, and their achievement could differ with respect to gender. Gender inequality in education has remained a perennial problem of global scope (UNESCO, 2004). Gender refers to the roles and relationships between men and women in a given context (Akper, Gire & Orshi, 2014).

To buttress on existing studies on virtual filed trip, Zumyil (2019) investigated the effects of computer simulation and field trip instructional strategies on students' achievement and interest in ecology in Plateau Central Education Zone. The results of the study indicated that the use of computer simulation and field trip instructional strategies enhanced students' interest and achievement in Ecology. Despite the existing studies conducted by scholars, there still lie the issue of fluctuating academic achievements of colleges of education students in ecology. This worrisome state informs the present study to determine the effect of virtual field trip method (VFTM) on the achievement and retention of ecological concepts by colleges of education students in Anambra State.

Statement of the Problem

Biology has distinctly contributed more to the objectives of general education. Despite the importance of Biology to the human anatomical development of the nation, a general review of students' academic achievement in examinations revealed a disturbing situation as observed wherein students are seen to perform poorly in biology examinations in colleges of education, and Anambra State as a geographical area has reported a constant decline. This decline in the academic achievement observed among students offering ecology recorded in the examination and records unit of the Federal colleges of education (technical) Umunze in Anambra State is increasing at a very significant rate and constitute a problem for the course lecturers and parents. However, it is not clear and is yet to be established, the causative factors affecting students' academic achievement in ecology which could most likely be due to the method employed in teaching ecology. This is a worrisome state which has prevailed despite the importance of ecology to human existence and Biology in general and efforts made by the federal government through the ministry of education, most students in colleges of education still record poor academic achievement and low retention level in ecology as a course. This has continued unabated and results in an unsatisfactory state of affairs. Hence, this study examined the effect of virtual field trip method on achievement of colleges of education students in ecological concepts in Anambra State.

Purpose of the study

The purpose of the study is to examine the effect of virtual field trip method (VFTM) on academic achievement of College of education students in ecological concepts in Anambra State. This study specifically examined;

1. Difference between the mean achievement scores of students taught ecological concepts using virtual field trip method (VFTM) and that of those taught using lecture method.
2. Difference between the mean achievement scores of male and female students taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method.
3. Interaction effect of teaching methods and gender on academic achievement of college of education students in ecological concepts.

Research Questions

The following research questions guided the study;

1. What is the difference in the mean achievement scores of students in college of education taught Ecological concept using virtual field trip method (VFTM) and those taught using lecture method?
2. What is the difference in the mean achievement scores of male and female students in college of education taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method?

Hypotheses

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

1. There is no significant difference in the mean achievement scores of students in college of education taught ecological concept using virtual field trip method (VFTM) and those taught using lecture method.
2. There is no significant difference in the mean achievement scores of male and female students in college of education taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method.
3. There is no significant interaction effect of teaching method and gender on academic achievement of college of education students' in ecological concepts.

Methodology

The design of the study was quasi- experimental design. Specifically, pretest posttest non-randomized control group design. The area of the study is Anambra State. Anambra State is located in the South East Geo-Political Zone of Nigeria. The state capital is Awka and its major commercial cities are Onitsha, Nnewi and Awka. The population for the study comprised of all the 82 NCE year I students (26 males and 56 females) offering ecology in government owned colleges of education in Anambra state. There are two government owned colleges of education in the state. The Federal College of Education, (Technical) Umuze has 32 year I biology students (19 male, 13 female) which was the experimental/treatment group. While the Nwafor Orizu College of Education (Nsugbe) has 50 NCE year 1 biology students (17 male and 33 female) which was the control group. The entire population for this study was used for the experiment. This is due to the manageable size of the population.

The instrument for the study is the Ecology Achievement Test (EAT). It is made up of two sections –A and B. Section A of the instrument was designed to elicit information on the students' bio-data such as school name and gender. Section B of the instrument is made up of multiple-choice objective questions. Specifically, the instrument for data collection was made up of 50 multiple choice objective questions with options from A-D. The instrument for data collection, the lesson plans for the study alongside the purpose of the study, research questions and hypotheses, were validated by three experts. One of these experts were from the Department of Science Education and one from Measurement and Evaluation unit in the Department of Educational Foundations in the Faculty of Education, one from the Department of Botany, Faculty of Physical Sciences all from Nnamdi Azikiwe University, Awka. The reliability of the instrument (EAT) was conducted using a single method administration. This was done in Enugu State College of Education (Technical), Enugu State. One intact class from the school with a population of 30 year I students offering biology education was used. Scores from the EAT were used to estimate the reliability co-efficient of the instrument using Kuder-Richardson Formula 20 (KR-20) which yielded a reliability coefficient of 0.83. The choice of KR-20 was to measure internal consistency of multiple-choice items (Dichotomously scored items).

The research ran on a nine-weeks duration (six weeks for the pretest and posttest, and after three weeks, the retention test was administered). The EAT was administered to the research subjects on three occasions as pre-test, post-test and retention test (with the questions and the options reshuffled after post-test). In the analysis of data, data

was analyzed with respect to the research questions posed and the formulated hypotheses for the study. Specifically, mean and standard deviation was used to answer the research questions while the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The reason for the use of ANCOVA is to help remove the initial group difference that may have existed between the experimental and control groups subjects. The p-value was compared with alpha level ($\alpha = 0.05$) for appropriate decisions on the null hypotheses tested: reject null hypothesis if P-value is less than 0.05, otherwise, do not reject the null hypothesis.

The researcher first visited the two schools sampled for the study and obtained permission from the school management to use NCE I students and their lecturers as research assistants for this research. Specifically, the experimental procedure of this study involved two stages—briefing of the biology education lecturers as research assistants for the study and the treatment procedure. The experimental group lecturer was briefed on the following techniques assertive questioning, instructional scaffolding, collaborative learning, self-evaluation and oral discourse; while the control group teacher employed memorizing, narrating, reciting, memorizing, planned repetition and questioning.

The study involved two groups of subjects namely, the virtual filed trip teaching method (experimental group) and the conventional method (CM) group. The VFT group formed the experimental group while the CM groups are the control group. The briefing exercised lasted for one week on the topics involved as stated in the study schedule and manual.

Week one and two: On the first day of the experiment, the test instrument Ecology Achievement Test (EAT) was administered to both groups (experimental and control groups). The scores obtained from the pre-test were recorded.

Week Three: Plant Succession: plant succession in selected habitats, consequences of population changes on the eco-system.

Week Four: Biotic interactions: Symbiosis, commensalism, predation, parasitism, competition, Saprophytism, epiphytism, phoresis

Week Five: Energy and material relations of organism, concept of biological productivity, energy transfer, trophic interactions, method of expressing trophic interactions.

Week Six: Revision and Post-test.

Control of the Extraneous Variables

1. Teacher Variable.

To control the teacher variable, the biology lecturers were briefed and used as research assistants instead of the researcher. This was to enable the researcher become ‘invisible’ in the process. To assist the teacher, the researcher prepared the lesson plan and ensured that the teachers master them properly before the main exercise.

2. Hawthorne effect

The Hawthorne effect is described as a change in behavior of an individual which results from his awareness of being observed. The research subjects might apply elements of faking if they have an idea they are being subjected to research experiment, therefore researcher briefed and used their Ecology course lecturer for the study.

3. Participants’ interactions

To solve the problem of possible class interaction, one intact class was used from the two schools. Also, the sampled schools were farther away from each other.

Results

Research Question 1: What is the difference in the mean achievement scores of students in college of education taught Ecological concept using virtual field trip method (VFTM) and those taught using lecture method?

Table 1: Mean achievement scores of students in college of education taught Ecological concept using virtual field trip method (VFTM) and those taught using lecture method.

Groups			N	Pre-test		Post test		Mean gain
				Mean	SD	Mean	SD	
Virtual	field	trip	32	43.28	8.96	57.72	7.11	14.44
(VFTM)								
Lecture method (LM)			50	41.92	9.77	43.72	9.61	1.8
Mean difference				1.36		14.00		12.64

Results in Table 1 reveals that the students taught ecology using virtual field trip method (VFTM) had pre-test mean achievement score of 43.28 and post-test mean achievement score of 57.72 with gained mean achievement score of 14.44, while those taught with lecture method has pre-test mean achievement score of 41.92 and post-test mean score of 43.71 with gained mean 1.8. Students taught ecology using VFTM had a less spread of scores in the post-test (7.11) than those in the lecture group (9.61) indicating that students taught using VFTM had a more homogeneous score in their

post-test. The difference between the mean gained achievement scores of the students in both groups is 12.64 in favour of virtual field trip method (VFTM).

Research Question 2: What is the difference in the mean achievement scores of male and female students in college of education taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method?

Table 2: Mean achievement scores of male and female students in college of education taught Ecological concept using virtual field trip method (VFTM) and those taught using lecture method.

Gender	N	Pre-test		Post test		Mean gain
		Mean	SD	Mean	SD	
Male	36	44.92	8.93	53.44	10.36	8.52
Female	46	40.52	9.56	45.85	10.53	5.33
Mean difference		4.4		7.59		3.19

Table 2 reveals that the male students taught ecology using virtual field trip method (VFTM) had pre-test mean achievement score of 44.92 and post-test mean achievement score of 53.44 with a gain in mean scores of 8.52 while the female students have pre-test mean interest score of 40.52 and post-test mean achievement score of 45.85 with a gain in mean scores of 5.33. There was a higher spread of scores among the male students in the post-test (8.52) than among the females (5.33) indicating that the female students had a more homogeneous score in the post-test. The difference between the mean gain achievement score of the male and female students is 3.19 in favour of the males.

H0₁: There is no significant difference in the mean achievement scores of students in college of education taught ecological concept using virtual field trip method (VFTM) and those taught using lecture method.

Table 3: ANCOVA Test of Significance of Difference between the Mean Achievement Scores of Students taught ecological concepts using virtual field trip method and lecture method.

Source	SS	df	Mean Square	F	Sig.	Decision
Corrected Model	4260.889 ^a	3	1420.296	19.589	.000	
Intercept	187635.793	1	187635.793	2587.912	.000	
Teaching_Methods	3047.648	1	3047.648	42.034	.000	Sig.
Gender	418.946	1	418.946	5.778	.019	Sig.
Teaching_Methods * Gender	63.691	1	63.691	.878	.352	Not sig.
Error	5655.367	78	72.505			
Total	208271.000	82				
Corrected Total	9916.256	81				

Table 3 shows that there is a significant main effect of the treatment (virtual field trip method) on students' achievement in ecology $F(3, 78) = 42.034$, $P = 0.00 < 0.05$. Therefore, the null hypothesis is rejected meaning that there is a significant difference in the mean achievement scores of ecology students in college of education taught ecological concept using virtual field trip method (VFTM) and those taught using lecture method in favour of VFTM.

H0₂: There is no significant difference in the mean achievement scores of male and female students in college of education taught ecological concepts using VFTM and those taught using lecture method.

Table 3 also shows that there is no significant main effect of gender on students' achievement in ecology $F(1, 78) = 0.878$, $P = 0.352 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant difference in the mean achievement scores of male and female ecology students in college of education taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method.

H0₃: There is no significant interaction effect of teaching method and gender on college of education students' academic achievement in ecological concepts.

Table 3 further shows that there is no significant interaction of teaching methods and gender on students' achievement in Basic Science $F(3, 82) = 0.878$, $P = 0.352 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant interaction effect of teaching method and gender on college of education students' academic achievement in ecological concepts.

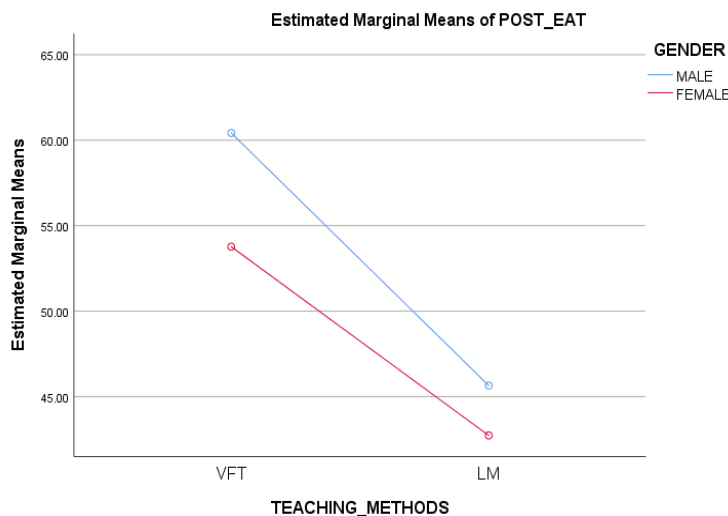


Figure 1: Plot of interaction effect of teaching methods and gender on students' achievement in ecological concepts.

The plot of interaction effect of teaching method and gender on students' achievement in ecological concepts is not significant and ordinal. This shows that effect of the instructional approaches did not change when gender was put into consideration. Thus, the methods are not gender biased with respect to achievement.

Discussion

The study found that students taught ecology using virtual field trip method (VFTM) had pre-test mean achievement score of 43.28 and post-test mean achievement score of 57.72 with gained mean achievement score of 14.44, while those taught with lecture method has pre-test mean achievement score of 41.92 and post-test mean score of 43.71 with gained mean 1.8. This study conforms with Setiawati and Wibowo (2023) who found that student motivation in the experimental class increased by 56.48% from the initial score of 60.48 before treatment and increased to 94.64 after treatment; Social studies learning outcomes rose 107.50% from a score of 40.48 before treatment and

rose to 84 after treatment. The study further aligns with Nwankwo (2020) who found that virtual field trip as well as physical field trip had significant effects on the academic achievement of the students in social studies.

In the same vein, male students taught ecology using virtual field trip method (VFTM) had pre-test mean achievement score of 44.92 and post-test mean achievement score of 53.44 with a gain in mean scores of 8.52 while the female students have pre-test mean interest score of 40.52 and post-test mean achievement score of 45.85 with a gain in mean scores of 5.33. This disagrees with Owodunni and Ogundola (2013) who revealed that the mean score of boys was higher than the mean score of girls taught electronic works trade using reflective inquiry instructional technique, but the mean score of girls was higher than that of the boys in the test for retention of learning.

The corresponding hypothesis found that there is a significant difference in the mean achievement scores of ecology students in college of education taught ecological concept using virtual field trip method (VFTM) and those taught using lecture method in favour of VFTM. Similarly, there is a significant difference in the mean achievement scores of male and female ecology students in college of education taught ecological concepts using virtual field trip method (VFTM) and those taught using lecture method. It is in further agreement with Obadiora (2016) who found that there is a significant difference in the effectiveness of virtual field trip and real field trip on students' knowledge in Social Studies in favour of virtual field trip. It further aligns with Lawal (2023) who found that: significant differences exist between the performance of students taught using virtual field trip strategy and those exposed to traditional field trip strategy.

Conclusion

The study concluded that the adoption of virtual field trip method (VFTM) is an effective way of improving ecology students' achievement in ecological, although in some case gender of the students could be a factor. Because of the outcome of the study is clear to say that VFTM is gender friendly as it promotes college students' achievement of ecological concepts. Although lecture method cannot be underrated as it also promotes the teaching and learning of other concepts.

Recommendations

The following recommendations were made in the light of the findings of this study:

1. Since the findings of this study found that virtual field trip is effective, ecology lecturers should adopt VFTM while planning their lessons to enhance students' interaction with each other and the learning materials to facilitate effective learning and retention.
2. Since there is a significant difference in the mean achievement scores of male and female students in college of education taught ecological concepts using virtual field trip method (VFTM). Curriculum planners should suggest the integration of VFTM as an innovative teaching strategy in planning ecological concept curriculum.

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