



Impact of Facilitation Technique on Academic Performance of Integrated Science Students in Living Components of the Environment in Tertiary Institution in North-Central Nigeria

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Abstract

The purpose of this study was to determine the impact of facilitation technique on academic performance of integrated science students in living components of the environment in tertiary institution in North Central Nigeria. The population of the study consisted of 135 integrated science students from University of Jos in North-Central Nigeria who were also used as sample. These students were divided into two groups of experimental and control using simple random sampling technique of slip papers with numbers 1 and 2. Those who picked 1 were tagged experimental group and those with 2 were tagged control. The experimental group had 68 (35 males and 33 females) students, while the control group had 67 (35 males and 32 females) students. The instrument used for collecting the data was Living Components of the Environment Performance Test (LCEPT) developed by the researcher. The LCEPT has a reliability coefficient (r) of 0.86. The research questions were answered using mean and standard deviation, while the hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The major findings from this study showed that students taught using facilitation technique performed higher than those taught using lecture method. It also showed no gender difference in the performance of male and female students. It was recommended among others that integrated science teachers should be encouraged to use facilitation technique in teaching science concepts.

Keywords: Integrated Science, Living Components of the Environment, Facilitation Technique, Performance and Gender

Introduction

All over the globe, science education has been considered as a critical tool for effective national development. Indeed, science education is a catalyst for social, economic, personal and technological changes. This is why nations pay particular attention to the learning and teaching of science concepts, the method of teaching, and addressing misconceptions held by learners regarding science concepts (Kola, 2013). Schools, colleges, and universities have no worth without students, because students are the most essential asset for any educational institute. The social and economic development of any country is directly linked with student academic performance plays an important role in producing the best quality graduates who will become great leaders and manpower for the country thus responsible for the country's economic and social development (Bulus, Mohammed, Andy & Abdulmalik, 2017).

Integrated Science Education is a course offered in Tertiary Instructions. At the primary and Junior secondary schools' level, it is called Basic

Science and Technology. Integrated Science occupies an important position in the tertiary school curriculum/programme because of its importance as the basic foundation for other science courses. In Nigeria, the Integrated Science curriculum is designed to enhance students' investigation into natural phenomena, to deepen students' understanding and interest in sciences and to encourage students' ability to apply scientific knowledge to everyday life (Federal Republic of Nigeria (FRN, 2013). One of the courses offered in Integrated Science biology and one of the branches is Ecology, which deals with living components of the environment. This deals with the relationships and interactions between organism and their environment. Living components of the environment have many useful applications aimed at maintaining a healthier and more productive biosphere for life of humans and other living organisms. According to Okoli and Okeke (2018), living components of the environment which is a topic in ecology provides knowledge and understanding of the mechanism of change brought



about by the interaction of living things and the effect they have on their external environment.

Cycles in nature as a course in integrated science in universities in Nigeria include biological, chemical, physical, geographical, and geological cycles, energy/tropic level and living components of the environment among others. Living components of the environment are aspects that students find difficult to understand (Avwiri, 2013). Therefore, there is a need to provide a teaching method that may be appropriate to teaching living components of the environment.

One of the most common methods of teaching science in Nigerian Universities is the lecture method which according to Obeka (2010) is a method of teaching that emphasized talk and chalk in the teaching of science subjects. It is been observed by the writer that more than 80% of scientific information and principles are delivered as lectures. Muoneme (2015) observed that the use of lecture methods of teaching in science leads to rote learning, which consequently leads to missing essential parts of science learning. However, this method of teaching should not be totally discouraged, but there is a need to improve, supplement, enrich and if possible, replace it for effective teaching and learning of integrated science with the use of facilitation technique.

Facilitation technique according to Mbanefo (2015) is a method of teaching enabling students to discover how much knowledge they already have, contribute to their own future learning and explore their potentials. It is a process of sharing ideas. The learning is experiential and environment conducted in a group setting. It involves creating an environment conducive for learning, experimentation and exploration/discovery. Experiential learning is learning from experiences and reflecting on what has been learnt. It is participatory and everybody in the class has something to contribute (Abonyi, 2013). All the methods of teaching science can be applied through facilitation technique to get a good result. Mbanefo (2015) further added that the job of a facilitator is to help manage the process of information exchange. The teacher guides and assists the students to acquire scientific skills of observing, recording, asking questions participating in group, making discoveries and conclusion. The teacher who is the facilitator helps the students to focus their energy on the tasks, suggests methods and procedures

and periodically summarizes the group consensus on ideas/knowledge/knowledge gain.

Recent advances in the areas of science and technology have made integrated science a central focus where human activities that lead to protecting living components of the environment are understood through science literacy. This will help solve global problems such as environmental pollution, ecosystem and conservation. Science literacy is therefore relevant in view of the above global issues. Therefore, to be able to handle global problems, a multidisciplinary and interdisciplinary approach this focuses on the learners' inquiry is required. Therefore, the integrated science teachers are expected to select and use appropriate instructional media during lesson presentations (Muoneme, Usman, Amea & Obeka, 2017) in Muoneme (2015) and Taylor (2009).

The main objective of this study was to examine the impact of facilitation technique on integrated science students' performance in living components of the environment among integrated science students in tertiary institutions in North-Central Nigeria.

Research Questions

The following research questions were raised for the study.

1. What is the difference in the performance mean scores of integrated science students taught living components of the environment using facilitation technique and those taught with lecture method?
2. What is the difference in performance mean scores of male and female integrated science students taught living components of the environment using facilitation technique?

Hypotheses

The following hypotheses were postulated and tested at 0.05 level of significance.

1. There is no significant difference in the performance mean scores of integrated science students taught living components of the environment using facilitation technique and those taught using lecture method.
2. There is no significant difference in the performance mean scores of male and female integrated science students taught living components of the environment using facilitation techniques.



Method

This study adopted the quasi-experimental pre-test post-test none equivalent control group research design. The target population of the study was 135 (70 males and 65 females) 400 level integrated science students from the Department of Science and Technology Education, University of Jos. The whole 135 (70 males, 65 females) students were used as a sample for the study. The students were divided into two groups through the use of simple random sampling technique of slips of papers which were numbered 1 and 2 respectively and folded. Each student was asked to pick a piece each. Those whose papers have 1 written on them were tagged as experimental group and those with 2 on their papers were tagged control group. The experimental group had 68 (35 males and 33 females) students while the control group had 67 (35 males and 32 females) students. Two research questions and two hypotheses guided the study.

The instrument for collecting the data was living components of the environment performance test (LCEPT) developed by the researcher. The LCEPT consisted of two sections, namely, section A and B. Section A was on personal data consisting group and gender while section B consisted of 40 multiple choice items adapted from past questions being moderated by the researcher into objectives form and integrated science textbooks. Each item was assigned two (2) marks. The total score was 80 marks. The LCEPT had questions on the following concepts taught habitat, environment, community, population, ecosystem biotic and abiotic factors, producers, decomposers, adaptation factors and climatic factors. The items were constructed and validated by the researcher. The draft instrument was presented to two experts in biology education and one expert in the test and measurement unit Department of Science and Technology Education and Department of Educational Foundation respectively from University of Jos for perusal and comments. The reliability index of the instrument (LCEPT) was established using Kuder-Richardson formula (KR-21) and 0.86 was obtained through part-time integrated science students who were taught the same concepts. Pretest was administered to both the experimental and control groups. The teaching of living components of the environment in both the experimental and control groups commenced and lasted for six weeks. The researcher taught the experiment group using facilitation techniques. The students were allowed to

discuss among themselves and answer the questions posed by the teacher which was meant to lead them to observe and as well as discuss their individual or groups experienced/knowledge gained. The control group were taught the same concepts using the lecture method by another teacher who was employed as a research assistant. The experimental and control groups were assigned two separate classes to avoid extraneous variables. At the end of the sixth week, the posttest was administered to both the experimental and control groups by the researcher. The two research questions were answered using mean and standard deviation while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA).

Results

The results are presented in the tables according to research questions and hypotheses that guided the study.

Research questions

Table 1: Performance Mean Scores of Integrated Science Students

Group	N	Pre-test		Post-test		Mean gain score
		X	SD	X	SD	
Facilitation techniques	68	1.55	0.65	2.56	0.66	1.01
Lecture Method	67	1.51	0.63	2.24	0.96	0.73

Note: N = Number of students, SD₁ = Standard deviation for pre-test and SD₂ = Student deviation for post-test.

The result in Table 1 showed that integrated science students taught living components of the environment using facilitation technique had a performance mean gain score of 1.01 while those taught using the lecture method had a performance mean gain score of 0.73. This indicated that students taught with facilitation technique had higher performance mean score than those taught using the lecture method.

Tables 2: Performance Mean Scores of Male and Female Science Students

Group	N	Pre-test		Post-test		Mean gain score
		X ₁	SD ₁	X ₂	SD ₂	
Male	35	1.11	0.14	1.84	0.11	0.173
Female	33	1.91	0.66	2.96	0.61	1.05



The result in table 2 indicated that female students had a higher performance mean score of 1.05 while the male students had a performance mean gain score

of 0.73. This showed that female students had higher performance mean scores than male students.

Ho1, Table 3: Analysis of Covariance of Integrated Science Students' Performance Mean Scores

Sources of variation	Sum of squares	Df	Mean square	F-cal	Sig
Corrected model	30.339	3	10.113	38.304	.000
Intercept	430.050	1	430.050	1628.871	.000
Method	2.875	1	2.875	10.493	.001
Gender	2.852	1	27.852	10.493	.101
Method x Gender	2.585	1	2.585	9.789	.202
ERROR	65.182	80	97.041		
Total	522.504	82			
Corrected total	50.404	79			

The result in Table 3 revealed that there is a significant main effect for mode of instruction on the performance mean scores of integrated science students with $F(1,79) = 10.888, P < 0.000$. The hypothesis was rejected indicating that there was a

significant difference in the performance mean scores of integrated science students taught living components of the environment using facilitation techniques and those taught using lecture method.

Ho2, Table 4: Analysis of Covariance of Male and Females Integrated Science Students

Sources of variation	Sum of squares	Df	Mean square	F-cal	Sig
Covariate	405.191	1	405.191	1.178	0.28
Main effects					
Gender	1615.870	1	1615.870	4.699	0.32
Error	42.300.532	123	343.911		
Corrected total	57.808.122	125			

The result in Table 4 showed that the computed value is 0.032 for gender. This value is less than 0.05 alpha level. Therefore, the null hypothesis could not be rejected. This indicated that there is a significant difference in the performance means scores of male and female integrated science students in favour of the female.

Discussion

The findings of the result in table 8 showed that 8 integrated science students taught living components of the environment using facilitation techniques had higher performance mean scores than those taught using lecture method. This is further confirmed in table 3 where the p-value 0.000 is less than 0.05 level of significant. This finding agreed with the findings of Muoneme (2015) Abonyi (2013) and Obeka (2010) who reported on their various studies on the impact of enriching lecture method with multimedia-board on secondary schools

students' academic achievement and interest in evolution concepts, ethno-science, and sustainable education for Africa and effect of inquiry and demonstration methods on students achievement and retention in some environmental education concepts respectively reported that students exposed to treatment performed higher than those not exposed to treatment. The finding also supported the assertion made by Okoli and Okeke (2018) who conducted a similar study on effect of problem-solving instructional technique on students' performance reported that when students are taught with the right instructional method, they always perform higher than those taught with lecture method. That is, the appropriate instructional strategy applied always enhances students' performance in science subjects.

The findings in table 2 showed that female integrated science students had a higher performance mean score than the male students when exposed to facilitation technique. This is further confirmed with



the result in table 4 which reported a significant difference in the performance mean scores of male and female integrated science students in favour of the females. This is in agreement with the findings of Bulus, Mohammed, Andy and Abdulmalik (2017), who conducted a study on the influence of five attitude sub-scale on students' academic performance found out that female students performed higher than male students. This showed that the instructional approach had no gender bias. This study disagreed with the findings of Muoneme, Usman, Bawa and Obeka who found no gender difference the performance of students exposed to animation and interactive board technique instructional strategy. On the contrary view, Avriri conducted a study on conceptional change in science teaching reported that male students performed higher than their female counterparts in science subjects.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Facilitation technique in teaching and learning should be encouraged by the Head of Department, Science Technology Education in the tertiary institution for use by integrated science teachers for teaching living components of the environment.
2. Teachers should be encouraged to allow the students to participate in the teaching-learning process. The strategy to be employed should be students participatory/student centered.
3. Seminars, workshops and conferences should be organized and sponsored for integrated science teachers so as to impact the necessary skills in the lives of the students for sustainable national development.
4. Teachers should employ the facilitation technique in teaching and learning of integrated science and other science related courses.

Conclusion

In conclusion, the findings of the study have shown that academic performance in living components of the environment can be enhanced by the use of facilitation technique. This was evident from the significant differences recoded between

those taught with facilitation technique and those taught with lecture method.

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