

EFFECTS OF UTILIZATION OF INSTRUTIONAL MATERIALS IN THE TEACHING OF BIOLOGY ON STUDENTS' ACHIEVEMENT

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ABSTRACT

The study investigated the effect of utilization of instructional materials in the teaching of Biology on students' achievement in senior secondary schools in Ndokwa West Local Government Area, Delta State. Two research questions guided the study and were correspondingly hypothesized and tested at 0.05 level of significance. The population of the study was 154 students and a sample size of 100 was randomly selected. The instrument used for data collection was Biology Achievement Test. The reliability was established using Kuder-Richardson formular 21 which yielded a coefficient of internal consistency of 0.79. Data was collected using a Biology Achievement Test (BAT) and analyzed using mean, standard deviation and t-test statistics. Result showed that utilization of instructional materials significantly improved student's achievement in Biology more that non-utilization of instructional material and that gender does not affect students' performance. It was thus, recommended among others that, Biology teachers should utilize instructional materials for effective teaching; and The Delta State Government should make available instructional materials for effective teaching of biology in public secondary schools.

Introduction

Biology is one of the science subjects being studied in the senior secondary schools in Nigeria. It is the science that studies life and living organisms and the relationship that exists amongst them. The Federal Government of Nigeria recognizes the study of Biology as a tool to civilization and advancement of the society. It is a necessary subject that must be passed before entering the University or other schools of higher learning for all who want to study Biology and other related sciences. Biology is taught in most schools using the lecture method,

Findings reveal decline in students' achievements, which has been attributed to the teaching of biology without instructional materials. For effective learning, instructional materials must be used in the teaching of Biology to aid understanding of biological concepts. It is worthy to note, that the learning of this subject cannot be effective without instructional materials, so as to bring about simplicity and understanding.

Literature Review

Concept of Instructional Materials

The Nigerian government at all levels over the years, placed enormous emphasis on instructional materials in shaping efforts and strategies aimed at improving students' standard of learning in the country. Instructional materials may be described as the different teaching and learning aids or apparatus, which a teacher employs during classroom teaching and learning process to facilitate understanding and the realization of the stated objectives. Instructional materials are very important in the classroom teaching-learning setting as it drives home the points and objectives of biological concepts. In education, teaching- learning are like foundation in Nation building, and Instructional materials are part of the pillars that holds the learning process to avoid collapse. Stake holders in education have written about it because of its importance. Awologu (2016) states that instructional materials help the teacher to convey the intended message effectively and meaningfully to learners, so that they can receive, understand, retain and apply experience gained to reach overall educational goal. Iheonu (2009) explained that instructional materials are objects used by teachers in passing essential facts of a lesson across to students to facilitate their understanding and appreciation of the objectives of the lesson. Encyclopedia, the free dictionary explained that instructional materials as educational resources, are used to improve students' knowledge, abilities and skills. Instructional materials are recommended for teaching Biology as they help drive the points home; biological concepts are learnt and better understood when relevant instructional materials are utilized in the teaching /learning process. Okebukola and Akinbola (2008)

discovered that instructional materials make learning effective and are major factors determining variable that control the pace of learning.

Instructional Materials for Teaching Biology

Biology as a science subject is better understood when the five sense organs are involved in the teaching / learning process. Experts in the field of curriculum and Biology Planners have recommended instructional materials for teaching various biological concepts.

These instructional materials according to Mukagihana and Nsanganwimana (2020) have been classified under three basic types: concrete objects, including objects from nature; Representatives of concrete objects and phenomena. Descriptions of such objects and phenomena using words, sentences signs, natural and artificial language.

This type of instructional materials includes such objects and phenomena as minerals, rocks, raw materials, semi-finished and manufactured articles, plants and animal specimen. Among these materials are reagents and apparatus for producing chemicals and other reagents for demonstrating and studying such reactions during laboratory session.

The second type of instructional materials are used for representation of actual objects and phenomena, which include three-dimensional materials (charts, pictures, photographs, maps, diagram and drawings). Audiovisual materials, Films, Radios and Television. These all help to acquaint students with the achievement of modern science, technology et cetera. that are accessible for direct observation. The third type of instructional materials are that of written description and they include methodological teaching aids, textbooks, laboratory manual, books for recording scientific observation et cetera. Oji and Igiri (2015) carried out research on the impact of instructional materials on academic achievement of Biology students in Yakurr Local Government Area. of Cross River State. The researcher used questionnaire to information on instructional materials utilized for teaching and learning and discovered from their responses that instructional materials make learning more effective and interesting. It is one thing to have instructional materials and another thing to be able to make proper use of them. The teacher should be able to manipulate and operate instructional materials properly so as to meet the learning need of a particular learner or group of learners they are dealing with. Instructional materials must be well arranged and systematically presented or arranged in some special way to make learning easy.

In a study carried out by Adesola et al. (2022) to determine the effect of instructional materials among high achieving biology students. The study revealed, increase in mean achievement in favour of those taught with instructional materials and a no significant difference in the mean achievement of male and female Biology students. Ehiwario et al. (2019) examined the effect of demonstration instruction method of teaching mathematics on the achievements of secondary

students in Ika South Local Government Area of Delta State. The study adopted quasi experimental design, the experimental group was taught using demonstration while the control group was taught using Lecture method. Research questions were answered using mean scores and standard deviations, while the hypothesis were tested using the t-test at 0.05 level of significance. The study revealed that there is no significant difference in the academic achievement of male and female students taught with demonstration method. The study also noted in contrast, a significant difference in the academic achievement of male and female students taught mathematics using Lecture method in favour of the male students.

Statement of the Problem

The decline in students' achievement in biology in Delta State, needs to be addressed. Despite efforts of Government to improve school structures and learning resources many students continue to struggle in understanding biology concepts, with a slightly above average 50% of students achieving a credit pass (A1 – C6) (Ojo, 2023). This has been attributed to several factors, among which is the teaching of biology without utilization of instructional materials. The study stems from the quest of researchers to find out if utilization of instructional materials in the teaching of biology will improve students' achievements in biology more than teaching biology without utilization of biology. Therefore, the statement of problem for this study is “will the teaching of biology with instructional materials improve students' achievement in biology more than the teaching of biology without utilizing instructional materials?”

Purpose of the Study

The main purpose of this study is to examine the effects of utilization of instructional materials in the teaching of Biology on students' achievement in Ndokwa West Local Government Area of Delta State. Specifically, this study sought to:

- 1 Determine the difference between the mean achievement score of students taught Biology using instructional materials and those taught without instructional materials.
- 2 Determine the effects of utilization of instructional materials on the mean achievement score of male and female Biology students.

Research Question

The following research questions were raised to guide this study.

- i) What is the difference in the mean achievement score of students taught biology with instructional materials and those taught without instructional materials?
- ii) What is the difference in the mean achievement scores of male and female Biology students taught with instructional materials

Research Hypotheses

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

HO₁: There is no significant difference in the mean achievement score of Biology students taught with instructional materials and those taught without instructional materials

HO₂: There is no significant difference in the mean achievement scores of male and female Biology students taught biology using instructional materials.

Methodology

The design adopted for this study is quasi-experimental design, with two groups (experimental and control groups). The form of quasi-experimental design, non-randomization control group, pretest, post-test design was adopted in this study to determine the effects of utilization of instructional materials in the teaching of biology on students' achievement.

The independent variable was teaching methods (with instructional materials and without instructional materials) and the intervening variable was sex (male and female)

The study population is made up of all the senior secondary school three (SSS111) Biology students in Ndokwa West Local Government Area of Delta State. four (4) secondary schools were randomly selected for this study in this Local Government Area. The target population was 514 students. The sample size of 100 SSS3 students were randomly selected from four (4) secondary schools across the Local Government Area of Ndokwa West L.G.A. in Delta State. Twenty- five (25) students selected from each of the school. four schools, two schools were used for experimental and the other two were used for control group.

The research instrument used for the study is Biology Achievement Test (BAT). This is a 50 objective question items selected by Biology experts from SSCE 2016-2020 WAEC past questions on biology. The instrument was subjected to both content and face validity by experts in the the field of Biology. The reliability of the instrument was established using the Kuder-Richardson 21 approach.

The instrument was administered to 30 students in a secondary school outside the Local Government area of the study. Data obtained was analyzed using Kuder-Richardson 21 formula and a reliability coefficient value of 0.79 was obtained.

The two groups (Experimental group and Control group) were pre-tested first week using the biology achievement questionnaires (BAT), before commencement of the treatment which lasted for six weeks. The completed questionnaires were retrieved, marked, scored and analyzed, using the SPSS statistic. After the treatment, the two groups (Experimental group and Control group) were post-tested the last week, with Biology achievement test questionnaire (BAT). The questionnaires were retrieved, marked, scored and analyzed, using SPSS statistics. The mean scores and standard deviation from the pretest and post test scores were used to answer the research questions, while the hypothesis was tested using t-test statistics at 0 .05 level significance

Results and Discussion

Research Question 1

What is the difference in the performance of students taught with instructional materials and those taught without instructional materials?

TYPE OF TEST	EXPERIMENTAL GROUP				CONTROL GROUP			
	X- Score	MD	SD	SD	X-Score	MD	SD	SD
Pretest	18.70		4.196		17.86		3.974	
		20.62		0.557		16.82		0.059
Posttest	39.32		3.639		34.68		4.033	
N	50				50			

Table 1 shows a pretest mean achievement score of 18.70 and standard deviation of 4.196, and posttest of 39.32 and a standard deviation of 3.639 for students taught biology with

instructional materials, this indicates a mean gain of 20.62, on those taught with instructional materials. A pretest means achievement score of 17.86 and a standard deviation of 3.974 and a posttest mean achievement score of 34.68 with a standard deviation of 4.033., this indicates a mean gain of 16.82 for both groups there was an in increase in the mean achievement score but more gain in the experimental group.

Research Question 2: What is the mean difference in the performance of male and female Biology students taught with instructional materials

Table 2: Descriptive statistics of mean and Standard Deviation (SD) comparing the post test mean achievement scores of Male and Female Students Taught Biology with Instructional Material.

GENDER	N	POST TEST		MD
		X	SD	
MALE	18	37.94	3.86	2.15
FEMALE	32	40.09	3.33	

Table 2 shows a mean posttest score of 37.94 with a standard deviation score of 3.86 for male students taught Biology with instructional materials, while their female counterparts had a mean posttest score of 40.09, with a standard deviation score of 3.33 and a mean difference of 2.15. This shows that female students performed slightly better than male students when taught with instructional materials.

Test of hypotheses

Testing hypothesis one (H

To find out whether there is difference in the performance of students taught with instructional materials and those taught without instructional materials, the hypothesis stated below was tested.

Ho₁: There is no significant difference in the mean achievement scores of students taught with or without instructional materials.

Table 3: Paire

independent sample t-test Comparison of Posttest Achievement Scores of Students Taught Biology with Instructional Materials and Those Taught Without Instructional Materials.

Instructional Materials	N	SD	df	t-cal	sig. (2-tailed)	Decision
Utilization	50	39.32	3.64	99	6.04	.000
Non-utilization	50	34.68	4.03			

Ho1 is rejected

Table 3. Independent Sample t-test result shows that $t(99) = 6.04$ with a p-value of 0.000 which is less than 0.05. therefore, the null hypothesis is retained.. Thus, the null hypothesis is rejected. this indicates that each of the instructional methods had a statistically significant effect on students' achievement in biology.

Hypothesis Two: There is no significant difference in the mean achievement score of male and female Biology students taught biology using instructional materials.

Table 4: Independent Sample t-test Comparison of Posttest Achievement Scores of Male and Female Students Taught Biology with Instructional Materials.

Instructional Materials	N	SD	MD	df	t-cal	sig (2-tailed)	Decision
Male	18	37.94	3.86				
			2.95	48	2.071	0.044	Ho2 is retained
Female	32	40.09	3.33				

Table 4 independent t-test showed that those taught with instructional materials, female students (F= 40.09, SD = 3.33) achieved slightly higher than their male counterparts(M = 37.94, SD = 3.86), $t(48) = 2.071, p = .044$, mean difference of 2.95 is in favour of females. There is no significant difference between the posttest mean achievement score of male and female students taught Biology using instructional materials, $t = 2.071, P(0.044) > 0.05$. Therefore, the null hypothesis is retained. . this indicates that the observed difference in the achievement scores between male and female is not statistically significant. Hence utilization of instructional material in teaching is equally effective for both male and female students in improving academic achievement in Biology.

Discussion of Findings

The finding revealed a significant difference the mean achievement scores of the students taught with instructional materials. The outcome of the analyzed data showed that the use of instructional materials in teaching biology influenced student’s academic achievement in biology more than teaching without instructional materials..

These results confirmed the views Okebukola and Akinbola (2008), that instructional material improve students’ mean score and determines the pace of learning. Ani (2006), and Oji and Igiri (2015) discovered that the use of instructional material made learning more effective, with increase in the mean scores . The findings also showed that the use of instructional materials influenced the achievement scores of females more than their male counterparts in biology. This finding contradicts the findings of Ehiwario et al (2019) and Adesola et al (2022) that discovered that instructional materials influenced the academic achievement of both male and female.

Conclusion

The findings of this study reveals that the use of instructional materials in the teaching of Biology significantly improved students' performance more than teaching without instructional materials. It also reveals that the use of instructional materials influenced the mean achievement of female students in biology more the males.

Recommendations

The following recommendations were made from the findings of the study;

1. Biology teachers should use instructional materials in teaching biology concepts in senior secondary schools,
2. stakeholders should emphasize the use of instructional material in teaching biology,
3. Private school owners and parents should provide instructional materials for learning biology
4. the Government should provide instructional materials, organize workshop to train teachers on how to use instructional materials for teaching and monitor the use of instructional materials in the teaching of Biology.
5. Further studies should be carried out to ascertain the effects the use of instructional materials on gender.

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