



EFFECT OF COLLABORATIVE INSTRUCTIONAL STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' PERFORMANCE IN BIOLOGY IN BENUE STATE, NIGERIA

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Abstract

The study examined the effect of Collaborative Instructional Strategy (CIS) on senior secondary school students' performance in Biology in Benue State, Nigeria using a pre-test-post-test quasi-experimental design. The sample was drawn from 301 government grant-aided secondary schools, with 16,322 senior secondary school II students. Multistage sampling was employed to select 366 students from 2 schools per zone within the three zones (A, B, C). Two schools per zone each were used for experimental and control groups. Two research questions guided the study and two null hypotheses were tested at a 0.05 significance level. Data were collected using the Students Biology Performance Test (SBPT). The SBPT was validated with a reliability index of 0.85 through Kuder-Richardson formula 20. Mean and standard deviation were used to answer the research questions while Analysis of Co-variance (ANCOVA) was used to test the null hypotheses. Results showed that CIS significantly improved students' performance compared to Lecture Method (LM). Additionally, there was no gender-based difference in mean performance scores among students taught using CIS. It was recommended among others that training should be organised on the use of CIS for secondary school Biology teachers for effective teaching and learning of the subject.

Key words: Biology, Students' Performance, Collaborative Instruction Strategy and Gender.

Introduction

The quality of education especially in science and technology given to the citizenry has effect on the growth and development of every nation. One of the fundamental issues in Nigeria today is the determination of how effective science is, at all the levels of education. Science, being an activity-based subject, needs practical activities regularly for

the ultimate achievement and attainment of the goals of science and science education as outlined clearly in the National Policy of Education (FRN, 2014). The Federal Republic of Nigeria in her National Policy of Education (FRN, 2014) emphasized the teaching and learning of science at all levels of educational system across the country.

Biology is one of the major subjects in Nigerian school curriculum because it is the science of life. According to NCTE (2020), the philosophy behind the subject is to produce knowledgeable, highly motivated, professional and effective teachers of Biology who will be able to develop in students an appreciation and understanding of biological process and principles. Teaching provides an avenue for teachers to showcase their skills and knowledge of subject matter to the students. Teaching according to Agbulu (2013), is a systematic presentation of facts, skills, ideas and techniques to students. The teacher often engages in relevant instructional strategy in teaching. Instructional strategy is the strategy of organizing the instructional content and materials, mode of presentation to the students which specify the activities of the teacher and students in order to attain the stated objective (Adejoh & Apochi, 2013). Instructional strategy thus, enables learners to acquire good knowledge of subject matters.

Students' performance in the classroom are highly dependent on the teaching method. Saunders (2014) opined that "the pedagogical pattern of the teacher is very important to the students' academic achievement, and it can greatly impact on the way a student views a particular subject and even education as a whole. In recent times, there have been reports that the academic achievement of students has been below expectation (Animasahun, 2014)

Collaborative teaching involves a group of students working together to solve problems and complete a task. Chang, Yan and Lu (2022) stressed that collaborative learning signifies specific group learning in which students work together. In addition to maintaining their

individual contributions to their groups, students work together with other group members to achieve a common goal. Ogundola (2014) emphasized that unless the teacher stimulates students' interest in learning, students' achievement will be minimal. The issue of gender is also a very important issue in the teaching and learning of Biology. Onyi and Nwafor (2022) affirmed that when students were taught using collaborative teaching technique, gender had no significant effect on their achievement. However, Aniodoh and Egbo (2013) discovered that female students outperformed their male counterparts while Ezeudu and Obi (2013) found that male students outscored female students in chemistry. These controversial findings call for more research; hence, the inclusion of gender as a moderator variable in this study.

The knowledge of Biology as an essential subject provides learners a solid foundation for various fields such as genetics, biochemistry, physiology, ecology. Biology entails the study of various disciplines such as Botany, Zoology, Biochemistry, Plant and Animal Physiology and Anatomy, and Genetics (Prerna, 2016). According to Uzoechi and Adejoh (2014), any nation that neglects the teaching and learning of science in her schools does so at the risk of remaining underdeveloped. In spite of the importance of science noted above, the achievement of students in Biology at senior secondary school level has been consistently poor over the years. For example, the West African Examination Council (WAEC) Annual report shows that less than 50% of candidates passed Biology at credit level and above since 2017-2023. According to Abimbola (2015). Learners find it difficult to understand many biological concepts due to the use of



conventional teaching strategy. Similarly, Coley (2015) affirmed that the use of conventional teaching strategy makes learners unable to link what they had already known before they enter the classroom to the new knowledge to be gained after instruction which contributes to students' poor achievements in science subjects such as Biology. Both agreed that the prevailing teaching practices do not actively involve the learners in the learning process and seem to deprive the learners of taking charge of their learning thus affecting their performances in examinations. This calls for the need to investigate the use of collaborative instructional strategy which is one of the contemporary teaching methods that could help to increase students' performance in Biology concepts.

Statement of the Problem

There is growing concern among science educators and other stake holders about the poor performance in Biology as reported in WASSCE Chief Examiners Reports (2017-2023) showed that the performance of students in biology were generally poor. Biology like other science subjects cannot be taught in abstract, students need to conduct themselves in a group and exchange ideas on any given concept in collaborative situation for them to understand better. Several instructional strategies have been used by other researchers to advance students' learning in biology. In spite of the efforts being made by scholars, there is still poor performance in biology in Benue State. It is in view of this, that this study investigated the effect of Collaborative Instructional Strategy (CIS) on senior secondary school students' performance in

Biology in Benue State, Nigeria was undertaken.

Purpose of the Study

The main purpose of the study was to investigate the effect of collaborative instructional strategy (CIS) on senior secondary school students' performance in Biology in Benue State, Nigeria. The specific objectives were to:

1. determine the effect of collaborative instructional strategy on students' performance scores in Biology and
2. determine the effect of collaborative instructional strategy on male and female students' performance scores in Biology.

Research Questions

The study was guided by the following research questions

1. What is the difference between the mean performance scores of students taught Biology using collaborative instructional strategy and those taught using lecture strategy?
2. What is the difference between the mean performance scores of male and female students taught Biology using collaborative strategy?

Hypotheses

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

1. There is no significant difference between the mean performance scores of students taught Biology using collaborative instructional strategy and those taught using lecture strategy.
2. There is no significant difference between the mean performance scores of male and

female students taught Biology using collaborative strategy.

Methodology

A quasi experimental design of non-equivalent pre-test, protest control group was adopted. Students Biology Performance Test (SBPT) was developed by the researcher to determine students' performance in Biology before treatment and after exposure to teaching using the collaborative strategy. It was administered to 366 students drawn using multi-stage sampling from 16,322 population of Senior Secondary School II students.

The researchers devised a set of 30 multiple-choice questions for the study, focusing on challenging biology topics such as osmosis and diffusion, cell structure and function, and genetics, which are known to impede student performance. Both the experimental and control groups underwent pre-test and post-test assessments using this instrument. Validation of the instrument (SBPT) was conducted by three experts in measurement and evaluation, and biology education at the Department of Science Education, Federal University, Lokoja, achieving a reliability score of 0.87 using the Kuder-Richardson formula. Regular biology teachers from sampled schools were trained to

serve as research assistants, with those in the experimental group receiving training in collaborative instructional strategies while those in the control group continued with lecture methods. Modifications were made as needed, and the research assistants implemented the strategies in their lesson plans following training, which lasted one week. Pretesting using SBPT was conducted before the start of the six-week experiment. Instruction was provided for five weeks, followed by a post-test in the sixth week. Pre- and post-test data from both groups were combined for analysis using SPSS Version 25. Mean and standard deviation were used for descriptive analysis of the research questions, while Analysis of Covariance (ANCOVA) was employed to test hypotheses one and two, with a significance level set at 0.05. ANCOVA was chosen to account for initial group differences and to mitigate any pre-existing imbalances among students, with pre-test scores serving as covariates for post-test scores.

Results

Research Question One

What is the mean performance scores of the students taught Biology using collaborative instructional strategy of teaching and those taught using lecture strategy?

Table 1: Mean Performance Scores and Standard Deviation of Students Taught Biology with Collaborative Instructional Strategy and Those Taught with Traditional Lecture Strategy

Groups	n	Pre-test		Post-test	
		Mean	SD	Mean	SD
Lecture Method	184	58.18	8.204	54.09	9.331
Collaborative Method	181	58.71	9.064	65.94	7.952
Mean Diff.		0.53		11.85	
N Total	365				



The comparative analysis of the mean performance scores of the students taught Biology using collaborative instructional strategy of teaching and those taught using Lecture method is presented in Table 1. The result showed that in the pre-test, the control group (lecture method) had a mean score of 58.18 and standard deviation of 8.204, while the experiment group (Collaborative Instructional Strategy) had a mean score of 58.71 and standard deviation of 9.064. The mean score difference between the two groups is 0.53 and this shows that both groups had about the same level of entry behaviour or quality. The result also showed that in the

post-test, the control group had a mean score of 54.09 and standard deviation of 9.331, while the experimental group had a mean score of 65.94 and standard deviation of 7.952. The mean score difference between the two groups is 11.85 and this shows that the experimental group had a higher mean performance score.

Research Question Two

What are the mean performance scores of the male and female students taught Biology using collaborative instructional strategy of teaching?

Table 2: Mean Performance Scores and Standard Deviation of Male and Female Students Taught Biology with Collaborative Instructional Strategy

Groups	N	Pre-test		Post-test	
		Mean	SD	Mean	SD
Male	98	62.42	7.376	66.38	8.191
Female	83	53.32	8.597	65.29	7.599
Mean Diff.		9.1		1.09	
N Total	181				

The result of mean performance scores of the male and female students taught Biology using collaborative instructional strategy of teaching is shown in Table 2. The result showed that in the pre-test, the male students had a mean score of 7.38, while the female students had a mean score of 8.60. The mean score difference between the two groups is 11.85 and this shows that both groups were at different cognitive level before the application of treatment. The post-test result showed that the male students had a mean score of 8.19,

while their female counterpart had a mean 7.60. The mean score difference between the two groups is 1.09 and this shows that both groups were almost at the same cognitive level after the application of treatment.

Hypothesis One

There is no significant difference between the mean performance scores of students taught Biology using collaborative teaching method and those taught using lecture strategy.

Table 3: Analysis of Covariance of Academic Performance Scores of Students Taught Biology with Collaborative Instructional Strategy and those Taught with Lecture Strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	13911.983 ^a	2	6955.991	92.723	.000
Intercept	24980.293	1	24980.293	332.987	.000
Pre-test	222.518	1	222.518	2.966	.086
Groups	13569.239	1	13569.239	180.878	.000
Error	29032.276	387	75.019		
Total	1441789.000	390			
Corrected Total	42944.259	389			

The result of the two-way ANCOVA in Table 3 shows p-value of 0.00 which is lower than the 0.05 level of significance. This shows that there is a statistically significant difference in the mean performance scores of students taught Biology using collaborative instructional strategy and those taught using traditional teaching methods. Therefore, the

null hypothesis of no significant difference is rejected.

Hypothesis Two

There is no significant difference between the mean performance scores of male and female students taught Biology using collaborative strategy.

Table 4: Analysis of Covariance of Academic Performance Scores of Male and Female Students taught Biology with Collaborative Instructional Strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	141.703 ^a	2	70.851	1.122	.328
Intercept	12787.290	1	12787.290	202.468	.000
PreTestExp	87.312	1	87.312	1.382	.241
Gender	3.178	1	3.178	.050	.823
Error	11873.544	188	63.157		
Total	842428.000	191			
Corrected Total	12015.246	190			

The result of the two-way ANCOVA in Table 4 shows p-value of 0.823 which is higher than the 0.05 level of significance. This implies that there is no statistically significant difference in the mean performance scores of male and female students taught Biology using Collaborative Instructional Strategy.

Therefore, the null hypothesis of no significant difference was not rejected

Discussion

The findings of the study revealed that a significant change was found in the academic achievement scores of students taught Biology using collaborative instructional strategy and



those taught using the lecture method of teaching. The students taught using collaborative instructional strategy of teaching performed better than those taught using lecture strategy. This implies that collaborative instructional strategy is a more efficient way of teaching Biology than the lecture teaching method. The finding is in agreement with Abimbola (2015) who stated that students find it difficult to understand many biological concepts due to the use of conventional strategies on the part of teachers. This finding also aligns with Ali, Ahmad and Hussain (2021), whose studies revealed that collaborative instructional strategy enhanced students' achievement compared to the conventional method of teaching.

It was found by the study that male students performed better than the female students although the difference was not statistically significant. This finding is in agreement with Ezeudu and Obi (2013), who found that male students outscored female students in chemistry. The finding also corroborates with the findings of Okoli and Ekebosi (2019), who found that employing a collaborative instructional strategy, there was no significant effect of gender on student achievement. The similarity of the finding could be due to the effectiveness of collaborative teaching strategy in offering opportunity to students regardless of gender to share ideas while engaging actively and collaboratively in learning tasks.

Conclusion

It can be concluded that the method employed in teaching Biology has significant effect on students' performances as both male and

female students gained significantly when taught using collaborative instructional strategy of teaching. Therefore, it is concluded that collaborative instructional strategy is an effective strategy of teaching especially in Biology

Recommendations

Based on the findings of the study, the following recommendations were made:

The Collaborative instructional strategy should be employed in teaching Biology at the secondary school level, trainings on the use of collaborative teaching strategy should be organised for Biology teachers and Students should be helped to develop the culture of employing collaborative strategy in teaching the subject.

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