



Effectiveness of Cooperative Learning Strategy on Academic Performance and Retention in Biology Among Secondary School Student in Katsina Metropolis

Aisha Abdul Rashid¹, Dr. Jamilu Muhammad², and Dr. Aminu Salisu Tsauri³

Umaru Musa Yar'adua University Katsina State, Nigeria

Abstract— This paper examines the impact of a cooperative learning technique on secondary school students' academic performance and retention in biology in Katsina Metropolis. The study used a pretest-posttest research design, and a questionnaire was used as the data gathering tool. Three hundred and fifty (350) secondary school students were chosen as the study's sample using proportionate stratified random sampling. Biology Performance Tests (BPT) and Biology Interest Questionnaires (BIQ) were designed and employed, with reliability coefficients of 0.678 and 0.685, respectively. To answer the study questions, the statistical technique used for data analysis descriptive statistics (mean, standard deviation, and mean rank). The study's findings led to the conclusion that students taught biology using a cooperative learning strategy outperformed their peers taught using a lecture method. It was suggested that the cooperative strategy be implemented into the teaching and learning of Biology at the Senior Secondary School level (JS 4&5) in order to facilitate and reduce the chances of widespread failure in the senior secondary certificate examination.

Keywords— Cooperative Learning, Strategy, Academic Performance, Biology.

INTRODUCTION

Education is a tool for attaining a nation's goals. Education is a human learning process in which knowledge is transmitted, faculties are exercised, and skills are developed. Education is a systematic process through which a child or an adult gets knowledge, experience, skill, and a sound attitude; it civilizes, refines, cultures, and educates a person, as well as a civilized and socialized society (Parankimalil, 2012). Similarly, education is a lifetime process that transforms an individual's life from that of a helpless and autonomous creature to that of a self-reliant, sensible, and skilled human who can contribute to the growth of society. According to Nigeria's national education policy (2016), education is a superior tool for the nation's social and economic regeneration. It went on to say that non-governmental organizations, communities, and people, as well as the government, have all contributed to education in Nigeria. Thus, education is a crucial weapon for every nation's greatly desired social, political, economic, cultural, scientific, and technical advancement.

Furthermore, science is a structured body of knowledge comprised of concepts, laws, hypotheses, and generalizations (Salami and Ogedengbe, 2022). Science is divided into two parts: product (knowledge) and process (methods). Science, according to Onah in Salami, Isah, and Ogedengbe, (2022), is the foundation upon which any nation can be formed. This indicates that no country can be globally recognized unless its scientific achievements

are discussed. As a result, scientific knowledge is a path to a higher quality of life. So, well-taught science can foster our interest and ability to solve issues. Science education, on the other hand, is a branch of education focused with developing a scientifically literate society. However, science education has long been acknowledged as a prerequisite for technological advancement. Secondary school science disciplines in Nigeria include chemistry, physics, agriculture, and biology, among others.

As a result, Biology is an important science topic and a prerequisite for future study in a variety of science-related professional courses such as medicine, agriculture, pharmacy, and nursing. Biology identifies and explains organisms, their functions, how species evolve, and their interactions with their natural environment. Botany, anatomy, zoology, histology, physiology, cytology, ecology, and virology are all sub-disciplines of biology. According to the national policy on education, the main goal of teaching biology is to provide students with: adequate laboratory techniques/field skills in biology, meaning and relevant knowledge in biology, the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture, and a reasonable and functional scientific attitude. 2013 (Federal Republic of Nigeria). Biology can be taught in a variety of ways in senior secondary schools. The issue under discussion determines the suitability of a given approach, and it works in conjunction with other components of learning to improve students' understanding and exam performance (Ibemenji, Sunday, Chijioke, 2019).

Cooperative learning is a student-centered, instructor-facilitated instructional technique in which a small group of students is in charge of their individual learning as well as the learning of the entire group (Har, 2013). It is an instructional method in which teachers organize students into small groups who work together to study academic content and achieve a common objective. The teacher is in charge of maintaining and controlling the learning environment, designing learning activities and social interactions, and organizing work teams. Every student participates in the team in this strategy, and there is cooperation among team members as well as collective effort, which enhances subject matter understanding (Ibemenji, Sunday, Chijioke, 2019).

Meanwhile, it is generally established that science topics, particularly Biology, are busy with problem solving activities; cooperative learning strategies assist students in solving difficulties collaboratively, which may lead to optimal academic success. To support this, it is also vital to understand that academic performance is the ability to assess what a person has accomplished after participating in an educational program. According to Aniaku (2012), Campbell defined academic accomplishment as the result of a teaching and learning process. Similarly, Adeyemi in Aniaku (2012) defined academic performance as a student's scholastic position at a given time that states individuals' intellectual ability and can be quantified by grades earned from examinations or ongoing assessments (tests or quizzes). Academic performance is the effectiveness and improvement of pupils toward certain goals set up to be attained, and it leads to learner retention ability.

STATEMENT OF THE PROBLEM

It is depressing to see Biology's repeated failure among high school pupils, considering its importance in country formation. The West African Examination Council (WAEC) reported on students' performance in science

disciplines in Nigeria, revealing inadequate academic accomplishment in biology and other science topics (WAEC; Chief Examiners report 2018-2020). The harsh performance casts question on the effectiveness of the educational approaches commonly used by biology teachers for topic teaching and learning. This troubling performance could be attributed to biology teachers' failure to use appropriate methodology in handling biology teaching, or it could be attributed to students' lack of interest, or it could be attributed to insufficient laboratories that will support good teaching and learning of the subject. The purpose of this article is to look at the impact of cooperative learning strategies on academic performance and retention in biology among secondary school students in Katsina Metropolis.

RESEARCH OBJECTIVES

The study answer was guided by the following objectives:

1. To examine the difference between the academic performances of students taught biology using cooperative learning strategy and those taught using lecture method.
2. To find out the difference between the academic performance of male and female students taught biology using cooperative learning strategy.
3. To find out the difference between the retention ability of students taught biology using cooperative learning strategy and those taught using lecture method.

RESEARCH QUESTIONS

The study answers the following questions:

1. What is the difference between the mean performance scores of students taught Biology using Cooperative Learning Strategy and those taught using lecture method?
2. What is the difference between the mean Performance scores of male and female students taught Biology using Cooperative Learning Strategy?
3. What is the difference between the mean retention ability scores of students taught Biology using Cooperative Learning Strategy and those taught using lecture Method?

LITERATURE REVIEW

Ekeanyanwu (2021) investigated the influence of cooperative and conventional learning methodologies on academic achievement of senior secondary school pupils in the Federal Capital Territory (FCT), Abuja, Nigeria, in comparison to urban-rural school location. The study found a significant difference between urban and rural students' achievement in Biology when taught using a cooperative learning strategy, favoring urban students; and a significant difference between urban/rural students' mean achievement in Biology when taught using a conventional learning strategy, favoring urban students. It was therefore recommended, among other things, that Biology Teachers in FCT, Abuja be trained on cooperative learning operating procedures in addition to the conventional learning strategy they are used to; and students be exposed to the Jigsaw II cooperative learning strategy to engender social interaction that fosters higher academic achievement and greater retention of learned materials.

In their study of the influence of cooperative learning technique on students' academic performance in Biology in Cross River State, Nigeria, Ihejimaizu, Neji, and Agiande, (2020) their investigation found a substantial relationship between cooperative learning technique and students' academic achievement in biology. Furthermore, gender does not significantly contribute to the variation in academic performance of biology students.

Furthermore, Iheanyichukwu, Sotonade, and Omonuwa (2019) use an experimental research design to assess the influence of cooperative learning technique on SSS students. The experimental and control groups of learners were taught using cooperative and traditional learning methodologies, respectively. The study concluded that cooperative teaching and learning is more effective than traditional teaching and learning in enhancing learners' study habits.

In the spring semester of 2015-2016, Ihejimaizu, Neji, and Agiande (2020) discovered that cooperative learning had a significant effect on the academic achievement of students in mathematics studying in the 4th grade in the Battalgazi district of Malatya connected to the Ministry of National Education. Abubakar (2018), on the other hand, conducted a study to investigate the influence of cooperative learning instructional approach on the attitude and performance of SSII biology students of diverse cognitive styles in Giwa educational zone Kaduna State Nigeria. Based on the findings, it was determined that cooperative learning instructional technique improved the performance of senior secondary school students in genetics with both field dependent and independent cognitive styles. Agu and Samuel (2018), on the other hand, studied the cooperative learning (STAD) jigsaw II and TA I) techniques on students' academic achievement and retention in Basic Science and Technology students in Akwanga Local Government Area of Nassarawa state. The study's findings revealed a substantial difference in achievement and retention between students taught using STAD, Jigsaw II, TAI Cooperative learning methodologies and those taught using the traditional lecture method.

Alshammari (2015) discovered that students who were taught using the cooperative learning strategy had a greater knowledge of the topic than students who were taught using the lecture method in his study findings. Oludupe (2012), on the other hand, studied the impact of gender on junior secondary students' academic progress in basic science utilizing a cooperative teaching technique in three selected junior secondary schools in three selected Local Government Areas of Ogun State, South-West Nigeria. The study's findings revealed that there was no significant difference in academic achievement between male and female students at the pretest, posttest, and delayed posttest (retention test) levels.

METHODOLOGY

The pre-test and post-test design was used. Because it enables for the simple evaluation of an intervention administered to a group of research participants. Because the study used complete courses, there was no randomization of the subjects. There are two groups: the experimental group (EG) and the group that received the experimental therapy (X1). That is, adopting a cooperative instructional strategy to teach. According to Katsina



Zonal Education Quality Assurance (2023), the population of the study comprised of 350 senior secondary students from 30 public secondary schools delivering Biology in Katsina Metropolis.

However, the study's subjects were SS III students from several secondary schools in Katsina Metropolis. According to a survey of the Katsina Metropolis Senior Secondary School, there are four thousand two hundred and four (4204) students. The technique of proportionate stratified random sampling was used. Based on this, a total of 350 students were chosen at random from the entire school to represent the full population as the sample size.

CONCLUSIONS AND DISCUSSION

Out of the 4204 copies of the questionnaire distributed to the students, a total of 4190 (99.6%) copies were returned duly completed and found usable for this study. The data collected for this research were presented and analyzed. Mean and standard deviation were used. Below is the analysis of the responses: -

What is the difference between the mean performance scores of students taught Biology using Cooperative Learning Strategy and those taught using lecture methods?

The researcher sought to know the performance of the student with regards to teaching biology using cooperative learning strategy and those with lecture method.

Table 1: Mean and Standard Deviation of Biology Performance Score between the Cooperative Learning and Lecture Method.

Group	N	Mean	Std. Dev.	Mean difference
Cooperative Learning	52	25.60	5.751	8.14
Lecture Method	65	17.46	3.985	

Table 1 above shows that the mean score of student performance taught Biology utilizing Cooperative Learning is 25.60, with a standard deviation of 5.751, while the mean score of lecture technique is 17.46, with a standard deviation of 3.985, with an 8.14 difference between the two mean values. This meant that the Cooperative Learning Strategy had a higher mean score than the lecture technique. This study is consistent with the findings of Gregory et al. (2010), who discovered that advanced student academic performance had a strong association with cooperative learning rather than the lecture technique.

What is the difference between the mean Performance scores of male and female students taught Biology using Cooperative Learning Strategy?

The researcher sought to find out the difference between the performance of male and female students taught biology using cooperative learning strategy.



Table 2: Mean and Standard Deviation of male and female students taught Biology using Cooperative Learning Strategy.

	Gender	N	Mean	Std. Dev.	Mean difference
Cooperative Learning	Male	28	25.96	5.124	0.79
	Female	24	25.17	6.492	

The Table 2 above shows that the mean score of male students taught Biology using the Cooperative Learning technique was 25.96, with a standard deviation of 5.124, and the mean score of female students was 25.17, with a standard deviation of 6.492. The mean difference between the two mean scores is 0.79, which is only a marginal change. It is worth noting that the academic achievement of both male and female participants in this study employing the cooperative learning technique was nearly identical. However, the findings of this study contradict the findings of AbdulRahim and Al-Shakili (2005)'s study on the impact of cooperative education strategy on academic achievement and retention of information and trends of students, which revealed a significant difference in academic achievement of information between male and female in the study using cooperative and conventional methods.

What is the difference between the mean retention ability scores of students taught Biology using Cooperative Learning Strategy and those taught using lecture Method?

The researcher sought to find out the difference between mean retention ability of scores on students taught Biology using Cooperative Learning Strategy and those taught using lecture Method.

Table 3: Mean and Standard Deviation of Biology Retention Ability Score between the Cooperative Learning and Lecture Method.

Group	N	Mean	Std. Dev.	Mean difference
Cooperative Learning	52	36.15	3.816	17.63
Lecture Method	65	18.52	5.124	

Table 3 shows that the mean score of student retention ability in Cooperative Learning Strategy is 36.15, with a standard deviation of 3.816, and that it is 18.52, with a standard deviation of 5.124 in Lecture Method. The mean difference between the two means is 17.63. As a result, the mean score for the Cooperative Learning technique is greater than the mean for the Lecture Method. The study's findings demonstrated that cooperative learning approach instruction was more effective than lecture method instruction in improving students' retention ability. This finding is consistent with the findings of Odoh (2013) and Okebukola (2015), who stated that Cooperative Instructional Strategies are important tools for increasing student retention and engagement in Biology.

In general, the cooperative learning strategy had a greater impact on student academic performance; students gained the ability to learn Biology effectively using the CLS and should be retained than the lecture approach in Katsina metropolis secondary school.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the study revealed that effectiveness of using cooperative learning strategy significantly enhanced knowledge retention level of students in Biology. Also, the JS 4&5 teachers should be encourage embracing the use of cooperative learning strategies in the teaching of Biology in various secondary schools across Katsina State this will equally facilitate student's retention and minimize the massive failure in the senior secondary certificate examination.

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