EFFECT OF COLLABORATIVE STRATEGY ON PERFORMANCE AND RETENTION IN ECOLOGY CONCEPTS AMONG SENIOR SECONDARY SCHOOL STUDENTS IN ZARIA EDUCATION ZONE

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Abstract

The study investigated effect of Collaborative Strategy on AcademicPerformance and Retention in Ecology Concepts among Senior Secondary Students in Zaria, Kaduna State. Quasi experimental control design was adopted involving pre-test, post- test, Post-post-test. Two research questionsand two hypotheses was raised. The research question was answered using mean and standard deviation while the null hypotheses were analyzed using t-test statistics at p≤ 0.05 level of significance. A sample of 124 students drawn from population of 890 using simple random samplingtechniques was used for the study. The instruments used was Ecology Performance Test (EPT) which was duly validated by experts with reliability coefficient of (r) 0.85. The findings from the study revealed that Collaborative strategy enhanced students' academic performance and retention ability in ecology. Based on the findings, the study it was recommended among others that workshop, seminars and conferences should be organized for Biology teachers on the use of Collaborative Strategy in secondary schools.

Key Words: Collaborative strategy, Performance, Retention, Lecture method, Ecology Concept.

Introduction

Science is a very important aspect in the development of any nation and is regarded as instrument per excellence for solving socio-economic problems of various kinds. Learning and teaching is the concern of trained teachers. Though learning is a complex process, it can however, be defined as a change in disposition, a relatively permanent change in behavior overtime and this is brought about by experience. Learning can occur as a result of newly acquired skill, knowledge, perception, facts, principles, new information at hand e.t.c (Oyarole,2023 &Yahaya, 2023).Science has helped to meet the minimum needs of human in the society in terms of food, shelter, clothing, water, unemployment, basic education, transportation, communication and healthcare (Aladejana & Fataoba 2022). Despite the roles played by science in the society, some students still display negative attitudes towards the study of the nature of some topics in Biology (Okoye & Nwakonobi, 2011).

As a science subject, biology serves as a prerequisite to the study of medicine, pharmacy, and agriculture among others. Biology concepts according to Oyarole, (2023) can sometimes be difficult particularly when describing the ideas that are abstract or cannot be fully comprehended by learners for the first time. Research findings by Diana (2022), and the West African Examination Council (2022) have also shown that a number of concepts in biology which include ecology, evolution and genetics contain topics that pose difficulty for biology students to understand. Ecology is an aspect of the biology syllabus that senior secondary students at SS2 must study. However, it is considered as abstract in nature and difficult to understand which has resulted in poor performance among students (Ajaja, 2010).

The predominant instructional method used in teaching at all levels of education, is through the use of lecture method (Muokwe & Okeke 2021). Lecture method on the other hand has been reported by Jacob (2019) and Okeke (2021), to be passive mode of instruction. The use of lecture method entails a one-way flow of communication from the teacher to the students. It is teacher-centre or teacher dominated approach. Most of the talking is carried out by the teacher while the students remain as passive

Collaborative learning strategy according to Lashari & Umrani, (2023) provide settings where students from different background, classes, gender and ability level can learn to work in a mutually beneficial environment, which also allows students to share their differences enriching their experience. According to Lashari & Umrani, (2023) Collaborative learning instruction could enhance performance. One

of the elements of collaborative learning is positive interdependence, where students perceived that their success or failure lies within their working together as a group (Buriro et al., 2023) From a motivational perspective, Collaborative goal structure creates a situation in which the only way group members can attain their personal goals, is if the group is successful (Fayaz et al., 2023). Therefore, to attain their personal goals, students are likely to encourage members within the group to do whatever helps the group to succeed and to help one another with a group task.

Collaborative learning fosters interaction among students around appropriate tasks and increase their mastery of critical concepts (Mooman et al., 2023) When students interact with other students, they learn to explain, discuss and see each other's perspectives, which lead to a greater understanding of the materials to be learned. The struggle to resolve potential conflicts during collaborative activity results in the development of higher levels of understanding Akpan et al. (2020). The present study is poised to determine the effect of collaborative strategy on academic performance and retention in ecology concepts.

Retention of concept is an essential factor in determining students' achievement in a given task or activities carried out. When concepts are taught, the wish of the teacher is that the concepts taught should be remembered. Retention, as the name implies, is the ability to keep what is learn in memory and consequently remember them at a later time (Jacob 2021). When teaching is characterized by rote learning, meaningless memorization oR verbalism, students make ineffective learning, and the facts thus learned are not long retained, nor do they seem to have much effect in changing behaviour (Akinbobola&Folashade, 2009). However, when it is organised and meaningful in which students apply principles, solve problems and interpret experimental data, learning becomes effective and the facts thus learned are retained over time. Research studies by Ayodele (2010), Opatoye (2010) and Wale (2021) have shown that improved instructional strategies lead to improvement in the learner's achievement and retention. However, studies that have included students' retention tests have revealed the effects of teaching strategies on retention. Orji (2021) in his study showed that problem solving model enhanced students' retention of physics concepts. Yahaya (2023) also revealed in his study that the use of activity-oriented teaching strategies, like conceptual change instructional strategy, aided retention of concepts learnt among students. In collaborative learning, when students learn ideas meaningfully the knowledge seems more organize for them to retain whatever they have learn. In the present study, therefore, it is intended to

determine the impacts of collaborative strategy on achievement and retention among male and female students.

Statement of the Research Problem

Over the years, there has been an upsurge in the number of candidates sitting for public examinations such as Senior Secondary Certificate Examination (SSCE) and particularly biology papers as contained in (Table 1). This is because of the stipulation that students must offer one of the basic science subjects (Biology, Chemistry and Physics), while biology is preferred by most students. However, the results obtained by candidates have been abysmal and do not justify the popularity as observed by researchers (Yahaya,2021; Diana, 2022;Raza, 2021) The statistics of performance in Biology in the May/June Senior Secondary Certificate Examination (SSCE) from 2018-2022 revealed a poor percentage pass at credit level. The highlight of the performance is as indicated in Table 1.

Table 1: Statistics of Biology Result for May/June 2018-2022

Year	Total entry	Total pass with credits & above	%pass with credits & above	% failed
2018	745439	200723	27.8	71.2
2019	620565	119762	19.3	80.7
2020	917041	278122	30.3	69.7
2021	931219	392249	42.1	57.9
2022	838945	253 483	30.2	69.8

Source: WAEC Annual Report (2018-2022).

Research Objectives

Research Objectives of this study are to:

1. determine the effect of collaborative strategy on academic performance of students taught collaborative strategy and those taught using conventional method
2. examine effect of collaborative strategy on students retention ability of students taught ecology concept using collaborative strategy and those taught using conventional method

Research Questions

The following research questions were answered in this study

1. What is the difference between the mean performance scores of students taught ecology concept using collaborative strategy and those taught using conventional method?
2. What is the difference between the mean retention scores of students taught ecology concept using collaborative strategy and those taught using conventional method?

Research Hypotheses

The following null hypotheses were formulated and tested at $p \leq 0.05$ level of significance.

HO^1: There is no significant difference between the mean performance scores of students taught ecology concept using collaborative strategy and those taught using conventional method?

HO^2: There is no significant difference between the mean retention scores of students taught ecology concept using collaborative strategy and those taught using conventional method?

Methodology

The study adopted quasi-experimental-control group design involving pre-test, post-test and post-posttest. The study involved two groups experimental and control groups. A pretest was administered to the two groups was to determine the equivalence inability of the two groups. In this design, the experimental group was taught basic ecological concepts using Collaborative Strategy. The control group was taught using conventional method. At the end of the six weeks treatment period, a posttest was administered to both groups of students to evaluate the effectiveness of the treatment in enhancing students' academic performance in ecology. A total of 890 students comprised of 124students, simple random sampling technique was used to select students. Ecology Performance Test was the instrument used to collect data. Content validation of the Ecology Performance Test (EPT) was carried out, it showed a reliability coefficient of 0.85 which was considered reasonably reliable for this study.

Results

Research Question One: What is the difference between the mean performance scores of students taught ecology concept using collaborative strategy and those taught using conventional method?

Table 2: Means and Standard Deviation of Post-test Scores for Experimental and Control Group.

Group	N	Mean	Std. Deviation	MD
Experimental. (post-test)	61	24.28	4.18	11.77
Control (post-test)	63	12.51	2.12	

The result in Table 2. showed the mean score of the experimental group was 24.28 and a standard deviation of 4.18, while the mean score for the control group was 12.51 and a standard deviation was 2.12. The mean difference of the experimental and control group was 11.77 in favour of experimental group. This shows that the experimental group had mean score higher than control group. Which means that the effect of the treatment had impact on the experimental group?

Research Question Two: What is the difference between the mean retention scores of students taught ecology concept using collaborative strategy?

Table 3: Mean and Standard Deviation of the Experimental and Control Group

Group	N	Mean	Std. Deviation	MD
Experimental (Postposttest)	61	23.74	4.71	13.67
Control (Postposttest	63	10.06	2.21	

Result in Table 3 showed the mean scores of the experimental group was 23.74 and a standard deviation of 4.71, while the mean score for the control group was 10.06 and the standard deviation was 2.21. The mean difference of experimental and control group was 13.67 in favour of the experimental group. This proved that the experimental group had mean score higher than the control group. This implied that, the effect of the treatment had impact on the experimental group.

Testing of Hypotheses

HO[1]: There is no significant difference between the mean performance scores of students taught ecology concept using collaborative strategy and those taught using conventional method?

HO^2: There is no significant difference between the mean retention scores of students taughtecology concept using collaborative strategy and those taught using conventional method?

Table 4: t-test Analysis of Post-test Mean Scores of the Experimental and Control Group.

Group	N	$\bar{X}_1$	SD	t-CAL	DF	P	Remark
Exp.	61	24.28	4.18				
				19.86	122	0.001	Significant
Cont.	63	12.51	2.12				

Significant at p≤0.05 level

Table 4: showed p-value of 0.001 which is less than the 0.05 level of significance, indicating

that there was significant difference between the mean performance scores of students taught using collaborative Strategy and those taught using Conventional Method. Hence, the null hypothesis was rejected, implying that collaborative strategy significantly improve the performance of secondary school Biology students than Conventional Method.

Table 5: t-test Analysis of Postposttest mean score of the Experimental and Control Group

Group	N	Mean	SD	t-cal	df	P-value	Remark
Exp.	61	23.71	4.71				
				0.84	122	0.001	Significant
Cont.	63	10.06	2.12				

Significant at p≤ 0.05 level

The result in Table 5: showed p-value of 0.001 which is less than the 0.05 level of significance, indicating that there was significant difference between the mean retention scores of students taught ecology concept using collaborative Strategy and those taught the same concept using Conventional Method. Hence, the null hypothesis was rejected, implying that collaborative strategy significantly improve student's retention ability.

Discussion of Findings

The results of analysis showed that the students taught ecology concept with collaborative strategy had a higher mean score than the students taught using lecture method. This result is in agreement with the findings of Yahaya, (2023) whose works found that Think–pair-share instructional strategy enhanced students' academic performance in science subjects. The findings of this study are also in agreement with Oyarole (2023) that found the using of parralel collaborative teaching strategy results in higher achievement of students in Biology. However, the finding is not in agreement with the findings of Jacoub (2021) who found no significant difference in performance of collaborative strategy on the concept of physics education

Also, the result showed that collaborative strategy had impact on retention ability on students taught collaborative strategy, these findings agreed with the findings of Wale, (2021) who reported a significant difference in the academic achievement of girls than boys who were exposed to cooperative learning strategy. Significant difference between retention ability of Ecology concepts between students exposed to collaborative strategy and those taught using conventional method as revealed by the result of this study may be due to the fact that collaborative strategy enhanced mutual understanding among students exposed to it.

Conclusion

In the light of the findings of the study, the researchers concluded that:

a. The findings in this study revealed that collaborative learning is efficacious in improving academic performance
b. Collaborative Strategy enhanced students' retention ability in ecology concepts.

Recommendations

Based on the findings in the study, the researchers make the following recommendations.

a. Biology teachers should adopt the use of collaborative instructional strategy in teaching various concepts in Biology.
b. Seminars/Workshops should be organized for Biology teachers to appraise them with the use of collaborative learning strategy.

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