



COLLABORATIVE INSTRUCTIONAL STRATEGY AND STUDENTS' PERFORMANCE IN BIOLOGY IN EKITI STATE SECONDARY SCHOOLS

BY

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Abstract

This study investigated the effect of collaborative instructional strategy on performance of secondary school students in Biology in Ekiti State. The study adopted a two group quasi-experimental research design of pre-test, post-test and control group design. The population for this study comprised all Senior Secondary Two (SS II) students of Ekiti State, using multistage sampling procedure. The sample used was made up of 190 SS II students sampling procedure the sample used for the study was selected and it consisted of 190 SS II students found in the intact classes of the selected schools. The instrument used in this study was an adapted Biology Performance Test (BPT). The reliability of the instrument (BPT) was determined using test re-test method and a reliability coefficient of 0.87 was obtained. The data collected were analyzed using descriptive and inferential statistics. Findings revealed that students taught using collaborative instructional learning strategy demonstrated significantly better performance in Biology compared to those taught using conventional teaching method. Furthermore, the study found no interactive effect of treatment on students' performance based on gender, suggesting that the strategy was beneficial across different student demographics and learning environments. It is recommended that; the teachers should incorporate collaborative instructional learning strategy into their instructional methods to enhance student engagement, comprehension, and problem solving skills. Policymakers should provide adequate resources, infrastructure, and support to facilitate the successful adoption of collaborative learning in secondary schools, particularly in rural areas.

Keywords: collaboration, collaborative instructional strategies, performance, gender, Biology students

Introduction

Biology as a science subject is fundamental to industrialisation and economy in many aspects of life especially in biochemistry, pharmacy, medicine, nursing, and environmental sciences; where the subject forms the foundational knowledge and skills that can assist man and society immensely as it has a wide range of effects on living things, including maintaining the necessary standard of living for both plants and animals (Uqwadu & Joda, 2015).

The scientific curriculum places a strong emphasis on Biology as a subject (FRN, 2018). This is due to the fact that Biology is life sciences that focus on the structure, function, growth, evolution, distribution, identification, and taxonomy of living things. Man will be able to comprehend the variety of living forms, conservation, and sustainable

use of natural resources through the study of Biology. Every year, despite Biology's enormous contribution to a country's economic growth and development and the efforts made by stakeholders to significantly improve student performance, students continue to perform appallingly in Biology (Joda & Mohammed, 2017; Joda, 2018). This raises questions about the causes of this, including teacher strategies, instructional materials, student-teacher ratios, learning environments, and motivation.

As a result of the abysmal students' results in the senior secondary certificate examination over the years, which could be as a result of the current approaches used by Biology instructors. Additionally, certain Biology topics are considered difficult by secondary school students. Collaborative

learning strategy and other forms of creative, inventive, and interactive instruction can captivate students and help them better understand difficult ideas in foundational courses like Biology, which is essential for achieving success in the classroom. It is also unproductive to only present ideas to students without actively engaging them. Collaborative learning involves interactions between students and teachers; as the students interact with each other within each group. Teachers as a knowledge facilitator and instructor assigns tasks to the students and explains difficult concepts. The teacher's job as a facilitator is to arrange the classroom so that students can collaborate. Considering students' individual variations, teacher arranges the students in a diverse manner. Each group rotates its leadership position as instructed by the facilitator. Every student is welcome to contribute to the discussion and ask questions if necessary. The group can get together to collaborate if there is a personal problem (Monoranjana, 2016). For instance, if a student is struggling with a work, he can use the group leader to get in touch with other members of the group to ask for help in their free time. Without thier teacher's intervention, students might collaborate to solve the particular problem or difficulties. Collaborative learning strategy improve students' performance and cause a positive change in their attitudes towards the subject. Each student is assessed, and the average score for the group is calculated.

According to Umar (2019), collaborative strategy is the most popular and usual teaching strategy compared to traditional teaching methods since it fosters the teaching and learning process more. Collaborative learning teams are reported to achieve higher-level thinking and retain information for longer periods of time than the students working alone (Maxwell, 2015). The material shared is preserved in long-term memory, and the group typically learns through conversation, concept clarification, and appraisal of one another's views. According to research by Chianson, Kurumeh, and Obinda (2016), students who collaborated on computational issues scored much higher than those who worked alone, while students who performed worse improved when they worked in diverse

groups. Students who collaborate in groups also typically exhibit higher levels of intrinsic motivation, intellectual curiosity, empathy, and psychological well-being.

Gender is a sociocultural construct that assigns duties and characteristics to sex, such as male and female. Over the years, scholars have focused on gender inequalities. It has been one of the obvious elements affecting pupils' performance and attitudes. In terms of attitudes and academic achievement, Biology is frequently seen as a subject where male students excel. According to Scafidi and Bui (2018), there is no discernible difference between male and female students' grades or performance.

Male and female students typically perform differently academically, and Popoola (2017) suggests that this difference may be due to the students' attitudes. This suggests that male and female students' attitudes, drive, and methods of learning may have distinct effects on their academic performance. Additionally, it has been noted that when exposed to collaborative learning during Biology classes, female students outperformed male students (Gambari, 2014). Gambari (2014) claims that a particular teaching strategy has an effect on both male and female Biology students' performance. In Biology classes, female students did better than their male peers when they were in collaborative learning contexts. In the context of Biology education, collaborative learning may be especially helpful for female students since it places a strong emphasis on cooperation, group discussions, and peer-to-peer relationships. However, Sidhu (2015) discovered gender disparities that favoured male pupils. The information supplied does not specify the precise rationale behind this preference. It does, however, suggest that male students may perform better than their female counterparts under specific circumstances or instructional strategies. Male and female students exposed to contextual learning strategies did not significantly differ in their performance, according to Gambari and Yussuf (2017).

Statement of the Problem

Since Biology is a practical subject, it must be taught in a way that encourages active

student participation in the teaching and learning process. Despite the importance of Biology, students' performance in the subject has consistently fallen short of expectations on both external (WASSCE and NECO) and terminal school exam (Adeleye & Omotayo, 2020). Researcher observed that Biology teacher are accustomed to traditional chalk-and-talk teaching methods such teacher-centered, competitive, individualistic, and low-profit methods. It has been noted that some Biology instructors forbid their students from interacting and exchanging views. Parents, stakeholders, and science education experts are increasingly concerned about children's performance fluctuations. Students' varying Biology performance may be a result of the instructional methods used by Biology instructors. Although the lecture method of teaching Biology concepts may have the benefit of providing a lot of information that can be used to cover the extensive syllabus in a short amount of time, it may also hinder students' learning processes because learning is an active process that involves more than just listening to the teacher. It has also been noted that pupils' gender may play a role in their inability to grasp certain Biology concepts. It is anticipated that the application of collaborative teaching techniques will likely have a favourable impact on the Biology students' performance.

Purpose of the Study

This study examined how collaborative teaching methods affect secondary school Biology students' academic performance in Ekiti State.

Research Question

A research question was raised to guide the study

1. What is the performance of students in Biology before and after the treatment?

Research Hypotheses

At the 0.05 threshold of significance, the following null hypotheses was formulated in this study

1. There is no significant difference in the students' performance in the

experimental and the control group before treatment.

2. There is no significant difference in the students' performance in the experimental and the control group after treatment.
3. There is no significant difference in the performance of male and female students exposed to collaborative instructional strategy.

Methodology

The research employed in this study was a quasi-experimental of pretest, posttest and control group design. This allows for the evaluation of causality, provides a basis for comparison, addresses internal validity concerns, considers practical and ethical considerations, and enhances the generalisability of the research findings in the context of educational research. A pre-test was administered in order to determine the homogeneity of the groups. 190 SS I1 students from the intact classes of the chosen schools made up the study's sample. The sample was chosen using a multistage sampling procedure. The researcher constructed an instrument called the Biology Performance Test (BPT); it has two sections; A and B. The instrument was validated by experts in Biology Education, Tests and Measurement from the Department of Science Education, and two seasoned Biology instructors who are WAEC/NECO examiners. The test re-test method was used to ascertain the BPT dependability. In order to do this, a pilot research was conducted in public secondary schools that were not part of the sampling area. 20 SSII Biology students were given the test twice over the course of two weeks. The reliability coefficient of 0.87 was obtained when Pearson's Product Moment Correlation Analysis was used.

Results

Research Questions

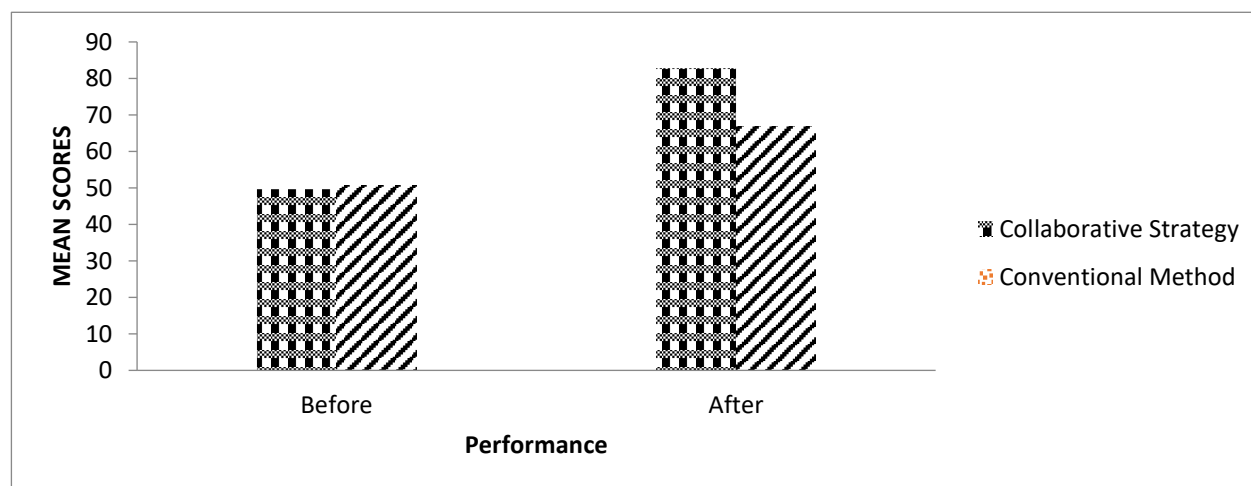
1. What is the performance of students in Biology before and after the treatment?

Table 1: Average and standard deviation of the students' Biology performance before and after the intervention

Variable	N	Before		After		Mean Difference
		Mean	S.D	Mean	S.D	
Collaborative Strategy	101	49.63	6.61	82.84	8.64	33.21
Conventional Method	89	50.55	8.74	66.82	8.41	16.27

Table 1 shows that, when compared to the conventional approach, the experimental group using the collaborative teaching model significantly improved. Students who were taught utilising the collaborative instructional technique had a mean score of 49.63 (S.D = 6.61) prior to the treatment, which rose to 82.84 (S.D = 8.64) following the treatment, yielding a mean difference of 33.21. Students who were taught using the

traditional approach, on the other hand, had a mean score of 50.55 (S.D = 8.74) prior to the therapy, which increased to 66.82 (S.D = 8.41) following it, with a mean difference of 16.27. These findings imply that, as compared to the traditional teaching approach, the collaborative instructional strategy improved students' performance in Biology. Figure 1 below provides more illustration of this:



Hypothesis 1: There is no significant difference in the students' performance in the experimental and the control group before treatment

Table 2: t-test on the experimental and control groups of students prior to treatment

Variable	N	Mean	S.D	df	t	p
Experimental Control	101	49.63	6.61	188		0.821
Conventional Group	89	50.55	8.74			

$P < 0.05$

Table 2 showed that $t = 0.821$; $p = 0.413 > 0.05$. The null hypothesis was not rejected since the p-value was higher than 0.05. This suggests that prior to the invention students' performance in the experimental and control groups did not differ significantly. This implies that both groups are homogeneous, which

means that prior to the intervention their baseline performance was similar.

Hypothesis 2: There is no significant difference in the students' performance in the experimental and the control group after treatment.

Table 3: *t*-test analysis of the performance of students in the experimental group and control group after treatment

Variable	N	Mean	S.D	df	t	p
Experimental Control	101	82.84		8.64		
				188	12.92	0.00
Control Group	89	66.82		8.41		

P<0.05

Table 3, $t = 12.92$; $p = 0.00 < 0.05$. The null hypothesis was disproved since the p-value was less than 0.05. This suggests that following the treatment, there was a notable difference in the performance of the experimental and control groups, suggesting that the collaborative instructional strategy

outperformed the traditional approach in raising biology students' scores.

Hypothesis 3: The performance of male and female students exposed to collaborative instructional strategies does not significantly differ.

Table 4: *t*-test analysis of male and female students exposed to collaborative instructional strategy.

Variable	N	Mean	S.D	df	t	p
Male	64	83.14	8.44			
				99		0.52
Female	37	82.19	9.17			

P<0.05

Table 4 showed that $t = 0.52$; $p = 0.603 > 0.05$. The null hypothesis was not rejected since the p-value was greater than 0.05. This suggests that the collaborative educational technique was equally beneficial for both genders because there was no significant difference in the performance of male and female students exposed to it.

Discussion

The finding of the study revealed that students taught using the collaborative instructional strategy showed a greater improvement in Biology performance compared to those taught with the conventional method. This finding is in consonance with the finding of Adeyemi (2018) which reveals that students exposed to collaborative instructional strategies demonstrated higher academic achievement

than their counterparts taught using traditional methods. The finding is also corroborated by Olagunju and Ogunleye (2020), who found that collaborative learning significantly enhances students' engagement, comprehension, and retention in science subjects. Similarly, the study aligns with the finding of Yusuf and Akinpelu (2019) which established that students taught Biology using collaborative learning strategies exhibited better conceptual understanding and problem-solving skills than those taught through conventional teaching approaches. However, the finding contradicts the finding of the study of Nwosu and Alade (2017) that no significant difference exists in students' academic performance when exposed to collaborative instructional strategy compared to the conventional method. Their study suggested that factors such as teacher effectiveness and students' learning styles play

a more crucial role in academic achievement than the instructional strategy employed.

The finding of the study revealed that there was no significant difference in the performance of male and female students exposed to the collaborative strategy, indicating that the strategy was equally effective for both genders. This finding aligns that study of Adeyemo and Olagunju (2019) that collaborative learning approaches provided equal learning opportunities for both male and female students, leading to comparable academic performance. Similarly, the finding is corroborated by that of Yusuf and Bello (2021) that gender had no significant effect on students' achievement when exposed to student-centered learning methods. In consonance with this, Oyetunde and Ajibola (2022) concluded that collaborative instructional strategies promote inclusive learning, ensuring that both male and female students benefit equally in science education. The finding contradicts the finding from the study of Eze and Okafor (2020), that male students performed significantly better than their female counterparts when exposed to collaborative instructional strategies. Their study suggested that differences in participation levels and confidence in problem-solving activities could account for the disparity. Similarly, the study of Balogun and Adekunle (2018) found that female students exhibited lower engagement in group discussions, which negatively impacted their performance compared to male students which also aligns with that of the study. These conflicting findings highlight the need for further research into how gender dynamics influence the effectiveness of collaborative learning strategies in different educational settings.

Conclusion

It was concluded that collaborative instructional strategy significantly improved students' performance in Biology. There was no significant effect of gender on the performance of students, suggesting the strategy benefits all students equally.

Recommendations

Based on the findings of this study, the following recommendations were made.

1. Teachers should adopt collaborative instructional strategies to enhance students' engagement, comprehension, and problem-solving skills, particularly in science subjects like Biology.
2. Schools should provide training for teachers on effectively implementing collaborative instructional methods, ensuring they can facilitate group activities and maximize student participation.
3. Policymakers and educators should consider factors such as classroom size, resource availability, and student motivation when implementing collaborative instructional strategy to ensure its effectiveness across diverse educational settings.

REFERENCES

- Adeleye, A.M., and Omotayo, K.A. (2020). Effects of Spaced Learning and Blended Learning on Senior Secondary School Students' Interest in Biology in Ekiti State. *Euro Afro Studies International Journal*. 1(2), 11-22.
- Adeyemi, T. (2018). The effectiveness of collaborative learning strategies in enhancing student achievement. *International Journal of Pedagogical Studies*, 10(1), 34-49.
- Adeyemo, K., & Olagunju, M. (2019). Gender differences in academic achievement: The role of collaborative learning strategies. *Nigerian Journal of Educational Development*, 18(1), 78-92.
- Balogun, T., & Adekunle, J. (2018). Examining gender participation in collaborative learning: Effects on student achievement. *Journal of Gender and Education*, 14(2), 55-67.
- Chianson, M. M... Kurumeh, M.S. & Obinda, J. A. (2016). Effect of cooperative learning strategy on students retention in circle geometry in secondary school in Benue State. *America Journal of Scientific and Industrial Research*, 3(1), 90-98.
- Eze, M., & Okafor, N. (2020). Gender disparities in collaborative learning



- effectiveness. *West African Journal of Gender Studies*, 13(1), 45-59.
- FRN, (2018). National Curriculum for science secondary school Biology. Lagos: Government press.
- Gambari, I. A. & Yusuf M. O. (2017). Effects of three cooperative learning strategies on the performance of secondary school student in physics. *Bulgarian Journal of Science Education*, 23 (3)
- Gambari. I. A. (2014). Effect of computer-supported cooperative learning strategies on the performance of senior secondary students in physics, in Minna, Nigeria (Unpublished Ph, D Thesis). University of Florin, florin, Nigeria.
- Joda, F. M. & Mohamed, A. A. (2017). Effect of Guided Inquiry teaching method on senior secondary school Biology students Academic Performance and Retention in Yola Education Zone, Adamawa State, Nigeria. *Multidisciplinary Journal of Science, Technology and Vocational Education*, 5(1), 89-96.
- Joda, F. M. (2018). Effect of concept mapping teaching approach on senior secondary school Biology students Performance in Biology in Adamawa State, Nigeria. *Jigawa Journal of Multi-disciplinary Studies (JJMS)*, 1(1), 140-147.
- Maxwell E. U. (2015). Comparative effects of scaffolding and collaborative instructional approaches on secondary school students' psychomotor performance in basic electronics in North- Central Nigeria. *IOSR Journal of Engineering*, 5 (6), 23-31.
- Nwosu, P., & Alade, T. (2017). Evaluating the impact of collaborative learning: An empirical study. *Journal of Educational Research and Development*, 9(2), 123-138.
- Olagunju, A., & Ogunleye, K. (2020). Enhancing student engagement through collaborative learning: A case study in science education. *International Journal of Science Teaching*, 17(4), 200-215.
- Oyetunde, O., & Ajibola, F. (2022). Promoting inclusivity through collaborative instructional strategies. *West African Journal of Educational Practice*, 16(4), 58-72.
- Popoola, A. A. (2017). Diversity, equity and mathematics learning: consideration of literacy approach. Literacy and reading in Nigeria. *Journal of Reading Association of Nigeria (RAN)* 14 (1), 178-184.
- Scafidi. T. & Bui, K. (2010). Gender similarities in mathematics performance from middle school through high school. *Journal of Instructional Psychology*, 37 (3), 252-255.
- Sidhu, K. S. (2015). *The teaching of Mathematics*. Sterling Publishers Private Limited: New Delhi.
- Ugwuadu, O. R & Joda, F. M. (2015). Reality of teaching Biology in Secondary Schools in Adamawa State, Nigeria. *Educational Forum A Journal of Institute of Education, Ahmadu Bello University Zaria*, 24(1), 59 75.
- Yusuf, R., & Akinpelu, D. (2019). Conceptual understanding and problem-solving skills in Biology: The impact of collaborative learning. *Nigerian Journal of Science Education*, 12(4), 44-59.
- Yusuf, S., & Bello, K. (2021). The role of gender in student-centered learning methodologies. *International Journal of Gender and Education*, 19(2), 93-106.