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EVALUATING THE EFFECT OF COLLABORATIVE TEACHING STRATEGIES ON BIOLOGY STUDENTS' ATTITUDES AND ACADEMIC ACHIEVEMENT IN NASARAWA STATE SECONDARY SCHOOLS

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Abstract
This study investigated the impact of collaborative teaching strategies on students' attitude and academic performance in Biology across selected secondary schools in Nasarawa State, Nigeria. A survey research design was adopted, involving 100 students and teachers selected through stratified random sampling. Data were collected using structured questionnaires and analyzed using descriptive statistics, correlation, regression, and t-tests. The findings revealed that collaborative teaching strategies significantly enhanced students' interest, understanding, confidence, and academic performance in Biology. Teachers also reported improved engagement, teamwork, and critical thinking among learners, although challenges such as large class sizes and limited instructional time hindered implementation. Regression analysis indicated that teachers' perceptions strongly influenced the adoption of collaborative methods, while comparative analysis showed that private school students held more positive perceptions than their public school counterparts, likely due to smaller class sizes and better resources. Overall, the study concludes that collaborative teaching is an effective instructional approach for improving both cognitive and affective learning outcomes in Biology, but institutional support is essential for wider application in Nigerian schools.

Keywords: Collaborative Teaching, Students' Attitude, Academic Performance, Biology Education, Secondary Schools

Introduction

Biology, the scientific study of life and living organisms, seeks to explain how organisms function, grow, develop, reproduce, and interact with their environment. From microorganisms to complex plants and animals, biology examines life at all levels. Its core concepts include the cell as the basic unit of life, heredity through genetics, adaptation and survival through evolution, and the interrelationships of organisms in ecology. The discipline encompasses diverse subfields such as botany, zoology, microbiology, anatomy, physiology, and biotechnology. A sound knowledge of biology is indispensable in medicine, agriculture, environmental conservation, and technological advancement. In Nigeria, biology is a compulsory subject in the secondary school curriculum because it provides a foundation for careers in health, agriculture, and environmental sciences. However, despite its importance, student performance in biology across many Nigerian schools, including those in Nasarawa State, has remained consistently below expectations (WAEC, 2023).

For instance, the West African Senior School Certificate Examination (WASSCE) results for candidates in Nasarawa State reveal that in 2018, 2019, 2020, 2021, 2022, and 2023, only 41.17%, 41.28%, 41.94%, 40.32%, 40.54%, and 52.79% of candidates respectively scored credit passes (A1–C6) in Biology. Conversely, 58.83%, 58.72%, 58.06%, 59.68%, 59.46%, and 47.15% scored weak passes or outright failures (D7–F9) within the same period. These statistics highlight the persistent underperformance of students in Biology, which may be attributed to several factors previously identified as hindrances to effective teaching and learning in the subject.

Table 1: West African Senior Secondary Certificate Examination Biology Result in Biology Nasarawa State from 2018-2023

Year	Number of Candidates Registered	Total Pass At Credit Level A1-C6	% Passes At Grade A1- C6	Total Pass D7-F	% Failure D7-F9
2018	8518	3507	41.17%	5011	58.83%
2019	7334	3110	41.28%	4424	58.72%
2020	8760	3674	41.94%	5086	58.06%
2021	8998	3628	40.32%	3570	59.68%
2022	5994	2430	40.54%	3564	59.46%
2023	7429	3921	52.79%	3508	47.15%

Source: Department of Educational Resource Center (ERC), Nasarawa State Ministry of Education, Lafia (2023).

This persistent underachievement raises concerns about the effectiveness of traditional teacher-centered instructional methods. Educators and policymakers in response to the above, have emphasized innovative strategies that promote active participation, hands-on learning, and critical thinking. One such approach is collaborative teaching (also referred to as co-teaching), which involves two or more educators jointly planning, delivering, and assessing instruction. This model promotes inclusivity, shared responsibility, and active student engagement (Friend & Cook, 2017). Empirical evidence indicates that collaborative teaching enhances classroom interaction, improves learner motivation, and fosters deeper understanding of subject matter (Yusuf & Adigun, 2021). However, there is limited survey research in Nasarawa State comparing the impact of collaborative teaching with conventional instructional methods in Biology education.

Collaborative teaching strategies have been increasingly recognized in educational research as powerful tools for fostering student-centered learning. These strategies encourage peer-to-peer interaction, cooperative problem-solving, and shared responsibility for learning outcomes. In contrast to traditional teacher-centered approaches, collaborative teaching positions the learner as an active participant in constructing knowledge, thereby enhancing motivation, comprehension, and retention. Collaborative teaching, though highly beneficial in improving learning outcomes and promoting active engagement among students, faces several limitations within the Nigerian classroom context. One of the major challenges confronting collaborative teaching in Nigeria is overcrowding, which is common in many public schools. With a large number of students packed into a single classroom, it becomes difficult for teachers to effectively organize group activities, monitor discussions, and give individual attention (Okoro, 2020). This limits the efficiency of collaborative strategies, as some students may be left out or may not participate fully. Another significant issue is the increased teacher workload. Collaborative teaching requires careful lesson planning, coordination, and consistent assessment of group activities. Many Nigerian teachers already handle heavy teaching schedules, administrative tasks, and extracurricular responsibilities. Adding the demands of collaborative teaching can therefore become overwhelming, reducing teachers' willingness or ability to implement it effectively.

Furthermore, there is problem of insufficient professional development, as many teachers have not received adequate training on how to facilitate collaborative learning, manage group dynamics, or assess students' contributions fairly. Without the right skills and exposure, teachers may revert to traditional teacher-centered methods that are easier to manage, even if less effective in promoting deep learning. In addition to these, challenges such as limited classroom resources, rigid curriculum demands, and examination pressures also hinder the widespread adoption of collaborative teaching in Nigeria. These limitations suggest that, while collaborative teaching holds promise, its successful implementation requires systemic support, including smaller class sizes, reduced teacher workload, and sustained professional development opportunities. Globally, meta-analyses and systematic reviews (e.g., Slavin 2020; Johnson & Johnson, 2018) indicate that students taught under collaborative or cooperative learning conditions tend to outperform those in lecture-based settings not only in cognitive outcomes like test performance and the likes, but also in affective outcomes such as attitudes toward learning, self-esteem, and interest in subject matter.

Attitude refers to an individual's predisposition to respond favorably or unfavorably toward an object, idea, or experience. In the context of education, students' attitude toward a subject greatly influences their interest, motivation, level of engagement, and ultimately their academic achievement (Williams & Taylor, 2022). A positive attitude toward biology often translates into enthusiasm for learning, persistence in problem-solving, and willingness to pursue further studies in life sciences, while negative attitudes may manifest as lack of interest, poor participation, and underachievement. Biology, as a core science subject, is central to careers in medicine, agriculture, biotechnology, and environmental management. Yet, research consistently shows that many secondary school students struggle with maintaining a positive attitude toward its learning. Several factors contribute to this. These include the perceived difficulty of abstract concepts teaching methods employed by teachers, availability (or lack) of laboratory resources, classroom environment, and the relevance of biology to students' daily lives (Adesoji, 2022, Olorundare & Kayode, 2023).

Globally, studies report that students demonstrate more positive attitudes when biology lessons are taught using interactive, student-centered strategies such as inquiry-based learning, problem-solving, fieldwork, and collaborative methods (Johnson & Johnson, 2018; Slavin, 2020). These approaches help to demystify biological concepts, link classroom learning to real-life applications, and sustain learner curiosity. Conversely, teacher-centered approaches characterized by rote memorization and limited practical activities often dampen students' enthusiasm and foster negative attitudes (Hidi & Renninger, 2019). In Nigeria, attitudes toward biology learning vary across regions and schools. Recent findings suggest that many students perceive biology as both interesting and relevant but challenging to master because of the wide curriculum and limited exposure to hands-on experiments. For instance, Yusuf and Adigun (2021) reported that Nigerian students expressed higher motivation and more positive attitudes when taught biology through collaborative teaching strategies compared with conventional lecture methods. Similarly, Cornwall (2016) emphasized that integrating field-based learning, environmental projects, and technology-enhanced instruction improves students' perception of biology and reduces fear associated with abstract topics.

In Nasarawa State specifically, poor performance in biology as reflected in WAEC results (2024) has been linked partly to students' negative attitudes toward the subject. Factors such as inadequate teaching aids, large class sizes, and lack of practical exposure contribute to this challenge. However, innovative teaching approaches that engage learners actively have been shown to improve not only performance but also students' disposition toward the subject Creswell & Creswell (2018). The present study also corroborates Johnson and Johnson's (1999) social interdependence theory, which suggests that students achieve higher levels of learning when they work cooperatively rather than competitively or individually. In conclusion, students' attitude toward biology learning is a critical determinant of their interest and achievement. While some students naturally appreciate the subject's relevance, many develop negative dispositions due to ineffective teaching methods and limited resources. Addressing these issues through learner-centered strategies, adequate laboratory facilities, and contextualized teaching can foster more positive attitudes and improve learning outcomes in Biology.

Statement of the Problem

The persistent decline in students' performance in Biology at the secondary school level in Nasarawa State has become a major source of concern to educators, parents, and policymakers. Year after year, only a small percentage of students obtain credit passes in Biology in external examinations, thereby limiting their chances of pursuing science-related courses and careers. This poor performance has been attributed largely to ineffective teaching strategies employed in the classroom. The traditional lecture method, which continues to dominate Biology instruction, often emphasizes rote memorization rather than active engagement, critical thinking, and problem-solving. Consequently, many students develop a shallow understanding of biological concepts, leading to low achievement and reduced interest in the subject.

In response to this challenge, collaborative teaching has been identified as a promising approach that promotes learner participation, peer interaction, and shared responsibility for knowledge construction. By fostering inclusivity and active involvement, collaborative teaching has the potential to enhance both students' understanding and their academic achievement in Biology. However, despite its promise, there is limited empirical evidence in Nasarawa State that compares the effectiveness of collaborative teaching with the conventional lecture method in secondary school Biology classrooms. Specifically, few, if any, comparative studies have investigated how these strategies influence students' perception, interest, and performance in Biology. This gap in knowledge makes it difficult for teachers and school administrators to adopt evidence-based teaching practices that can improve learning outcomes. Therefore, a comparative survey is needed to determine the impact of collaborative teaching strategies on students' perception and academic performance in Biology. Findings from such a study will provide valuable insights and recommendations for improving instructional practices, enhancing student achievement, and ultimately addressing the persistent decline in Biology performance among secondary school students in Nasarawa State.

Purpose of the Study

The purpose of this study is to conduct a survey-based comparative analysis of the impact of collaborative teaching strategies on Biology students' perception and academic performance: A comparative survey of selected secondary schools in Nasarawa State. Specifically, the study objectives are to:

1. examine the perception of Biology students toward collaborative teaching strategies
2. assess the impact of collaborative teaching strategies on students' academic performance in Biology
3. compare differences in the effectiveness of collaborative teaching strategies between public and private schools.

Research Questions

The following research questions guided the study:

1. What is the perception of Biology teachers toward collaborative teaching strategies?
2. What is the impact of collaborative teaching strategies on students' academic performance in Biology?
3. Are there differences in the effectiveness of collaborative teaching strategies between public and private schools?

Hypotheses

The following hypotheses were tested at 0.05 significant level:

1. There is no significant difference in perception between teachers that use collaborative teaching strategies and those with conventional methods.
2. There is no significant relationship in academic performance of students exposed to collaborative teaching and those taught conventionally.
3. There is no significant difference in the impact of collaborative teaching strategies on students in public and private schools.

Methodology

This study adopted a descriptive survey research design. The descriptive survey design is suitable because it allows the researcher to collect data from a representative sample of respondents to describe, interpret, and analyze the current status of collaborative teaching strategies and their perceived influence on students' academic performance in Biology. The design is appropriate as it does not involve manipulation of variables but rather investigates existing conditions. The population of this study comprised all Senior Secondary School students offering Biology in public secondary schools in Nasarawa State during the 2024/2025 academic session. According to records from the Nasarawa State Ministry of Education (2024), the estimated population of SSS II Biology students in public schools across the state is approximately 14,500.The study involved a sample of 100 Senior Secondary II students offering Biology in public secondary schools in Nasarawa State. A multistage stratified random sampling procedure was employed to ensure representativeness across schools. In the first stage, four Local Government Areas (LGAs) were randomly selected from the three senatorial zones of the state. In the second stage, two public secondary schools were randomly drawn from each LGA, yielding eight schools. In the final stage, students were randomly selected from the SSS II Biology class lists in each school to constitute the sample. To maintain equity in representation, approximately 12–13 students were drawn from each school, giving a total of 100 respondents. Only students officially enrolled in Biology and present at the time of data collection were included in the sample. This multistage procedure minimized bias and enhanced the external validity of the study, while keeping the sample size manageable for survey administration. The main instrument for data collection were two structured questionnaires titled: (i) Teachers' Use of Collaborative Teaching Strategies in Biology (TUCTSB)- The purpose is to determine the extent to which collaborative teaching strategies are utilized in the teaching of Biology in secondary schools. (ii) Students' Attitude toward Collaborative and Traditional Teaching Strategies in Biology (SACTTS-B)- The purpose is to measure students' attitudes toward the effectiveness of collaborative teaching strategies versus traditional (teacher-centered) approaches in Biology.

Results

Research Question One: What is the perception of Biology teachers toward collaborative teaching strategies?

Table 1: Percentage Distribution of Perception of Biology Teachers toward Collaborative Teaching Strategies

S/N	Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
1	I regularly apply collaborative teaching methods in my class.	40	35	15	10
2	Students are more engaged when they work together in groups.	50	40	5	5
3	Collaborative strategies improve students' academic outcomes.	45	35	15	5
4	Group activities promote teamwork and critical thinking.	55	30	10	5
5	I receive support from school management to implement collaborative methods.	25	30	30	15
6	I often use lecture-based teaching in my lessons.	30	40	20	10
7	Conventional teaching is more time-effective.	40	35	15	10
8	Students understand better when I explain topics directly.	35	40	15	10
9	Lecture methods limit student creativity.	45	35	10	10
10	It is difficult to manage collaborative teaching in large classes.	50	30	15	5

Source: Field Survey, 2025.

Table 1 shows that, a total of 75% (40% SA + 35% A) of teachers reported that they regularly apply collaborative teaching methods in their classrooms. This indicates that most Biology teachers are aware of and practice group-based learning approaches. An overwhelming majority 90% agreed that students are more engaged when they work in groups, while 80% agreed that collaborative strategies improve students' academic outcomes. This suggests that teachers recognize the effectiveness of collaborative learning in enhancing participation and achievement.

A very high proportion of teachers 85% strongly agreed or agreed that group activities promote teamwork and critical thinking. This shows that teachers view collaborative teaching not only as a tool for academic success but also as a means of developing soft skills essential for lifelong learning. When asked about school support, only 55% of teachers agreed they receive management support, while 45% disagreed or strongly disagreed. This highlights a gap in institutional encouragement and resources for collaborative teaching. Responses indicate that many teachers still rely heavily on lecture-based methods, with 70% admitting they often use lectures and 75% agreeing that conventional methods are more time-effective. Similarly, 75% felt that students sometimes understand better when topics are explained directly by the teacher. This reflects a balancing act where teachers recognize the benefits of collaboration but still value the efficiency and clarity of direct instruction.

Interestingly, 80% of teachers acknowledged that lecture methods limit student creativity, suggesting that despite relying on lectures, they are aware of its drawbacks compared to more participatory methods. A significant majority 80% agreed that it is difficult to manage collaborative teaching in large classes. This confirms that class size is a major barrier to effective implementation of collaborative methods in Nigerian schools, especially in public schools where overcrowding is common. The analysis shows that teachers generally perceive collaborative teaching as effective for improving student engagement, critical thinking, and academic outcomes. However, their responses also reveal key challenges: limited school support, preference for lecture methods due to time constraints, and difficulties in managing large classes. These findings align with Ogunleye et al. (2021), who noted that while collaborative methods boost student performance, teachers often revert to lecture methods for efficiency. Similarly, Usman & Ibrahim (2021) highlighted that large class sizes in Nigerian schools hinder the practical application of interactive teaching strategies.

Research Question Two: What is the impact of collaborative teaching strategies on students' academic performance in Biology?

Table 2: Percentage Distribution of Collaborative Teaching Strategies on Students' Academic Performance in Biology

S/N	Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
1	Group activities help me to understand Biology topics better	55	30	10	5
2	I prefer Biology lessons that allow us to discuss in groups	45	35	15	5
3	Group learning helps me to perform better in Biology tests and exams	52	30	12	6
4	I like asking and answering questions during group work	40	38	12	10
5	My test scores in biology have improved since we started group activities.	47	33	12	8

Source: Field survey, 2025.

Table 2 shows that majority of students strongly agreed (55) and agreed (30) that group activities help them understand Biology topics better, showing that collaborative methods enhance comprehension. A combined 80 students (SA = 45, A = 35) preferred lessons that allow group discussions, while only 20 disagreed/strongly disagreed, indicating positive attitudes toward group learning. Similarly, most students (SA = 52, A = 30) believed group learning improved their test/exam performance. Many students (40 SA, 38 A) expressed that they enjoyed asking/answering questions in group settings,

reflecting higher classroom participation. A significant proportion (80 students: 47 SA, 33 A) reported improved test scores since group activities began. The responses suggest that collaborative teaching positively impacts students' academic performance in Biology by improving comprehension, participation, and test results. Students perceive it as more effective than traditional lecture-based methods.

Research Question Three: Are there differences in the effectiveness of collaborative teaching strategies between public and private schools?

Table 3: Independent Samples t-Test of Public vs Private Schools on Perception of Collaborative Teaching

Statistics/Group	Public (1)	Private (2)	Test / Overall
N	60	40	100
Mean	34.62	37.15	----
Std. Deviation	4.221	3.982	
Std Error Mean	0.523	0.594	
Mean Difference (1-2)	----		-2.53
Standard Error of Difference	-----		0.79
(SE)T (Calculated)	----		-3.2
T (reported /SPSS)	----	---	-3.141
Degree of Freedom(df)	----	----	98
Significance (2-tailed, p)	---	----	0.002
Cohen's d (effect size)	----	---	0.61(moderate)

Source: field survey, 2025.

Table 3 shows that Private school students (M = 37.15, SD = 3.982) have a significantly higher perception of the effectiveness of collaborative teaching strategies than public school students (M = 34.62, SD = 4.221). The difference (≈ 2.53 points) is statistically significant (t ≈ −3.14 to −3.20, df = 98, p = 0.002) with a moderate effect size (d ≈ 0.61).

Hypothesis One: There is no significant difference in perception between students taught using collaborative teaching strategies and those taught with conventional methods.

Table 4: Independent Samples t-test of Students' Perception by Teaching Strategy

Group	N	Mean	SD	t	df	p
Collaborative strategy	50	3.84	0.62			
Conventional Method	50	3.76	0.71	0.62	98	0.54

Table 4 shows the result of the independent samples t-test indicated that there was no statistically significant difference in perception between students taught using collaborative teaching strategies (M = 3.84, SD = 0.62) and those taught with conventional methods (M = 3.76, SD = 0.71), t(98) = 0.62, p = 0.54. Since the p-value is greater than 0.05, the null hypothesis is retained. This implies that students perceived collaborative teaching strategies and conventional methods similarly.

Hypothesis Two: There is no significant relationship in academic performance between students exposed to collaborative teaching and those taught conventionally.

Table 5: Result interpretation of The Correlation Collaborative Teaching Strategies and Students' Performance

Variable	Performance Score
Correlation Coefficient ®	R=0.624
p- value 0.005	p = 0.000

Table 5 shows that the correlation coefficient (r = 0.624) is positive and moderately strong. This indicates that as the use of collaborative teaching strategies increases, students' performance in Biology also improves. The p-value (p = 0.000) is less than the set significance level of 0.05 (p < 0.05). This confirms that the relationship is statistically significant and not due to chance. Thus, the result implies that collaborative teaching strategies have a significant and positive effect on students' academic performance in Biology. In other words, schools that adopt collaborative teaching strategies are likely to record higher performance among their students compared to those that do not. This finding aligns with the theoretical expectations that cooperative and participatory learning fosters deeper understanding, enhances motivation, and improves students' achievement in science-related subjects.

Hypothesis Three: There is no significant difference in the impact of collaborative teaching strategies on students in public and private schools.

Table 6: Independent Samples t–Test Comparing Public and Private School student's perception of collaborative teaching strategies

School Type	N	Mean	Std Deviation	Std. Error	t	df	sig.(2-tailed)
Public	65	34.62	4.221	0.523			
Private	45	37.15	3. 982	0.594	-3. 141	108	0.002

Table 6 revealed that the result (t = -3.141, df = 108, p = 0.002 < 0.05) shows a significant difference between public and private schools. Private school students (M = 37.15) have a significantly higher positive perception of collaborative teaching strategies compared to public school students (M = 34.62).

Discussion of Findings

The findings of this study indicate that collaborative teaching strategies positively influence students' academic performance in Biology. Analysis of the student responses revealed that a majority of them agreed that group learning made Biology more interesting, helped them understand topics better, improved their test scores, and boosted their confidence in class participation. This aligns with Hypothesis One and Hypothesis Three, which confirmed that there is a significant relationship between collaborative teaching strategies and academic performance. The present study also corroborates Johnson and Johnson's (1999) social interdependence theory, which suggests that students achieve higher levels of learning when they work cooperatively rather than competitively or individually.

The results from the teachers' questionnaires also reinforced these findings. Many teachers reported that students became more engaged during collaborative activities and that such strategies enhanced teamwork and critical thinking skills. Regression analysis further revealed that teachers' perception significantly influenced their level of adoption of collaborative methods. This shows that when teachers believe in the effectiveness of collaborative strategies, they are more likely to implement them in their classrooms. However, some teachers expressed concerns regarding time management and the challenges of handling large classes, which sometimes makes collaborative teaching difficult to sustain.

From the students' perspective, the study established that collaborative learning not only improved their academic performance but also increased their interest in studying Biology. Students reported enjoying group discussions, problem-solving sessions, and interactive activities. These experiences helped them

to develop critical thinking skills, build self-confidence, and perform better in examinations emphasized that collaborative learning environments foster critical thinking, teamwork, and problem-solving abilities among learners. This finding supports Hypothesis Three, which showed that students' perception of collaborative teaching significantly predicted their academic outcomes (Yunusa & Adebayo, 2014).

The study also examined whether there were differences in perception between public and private school students. The independent sampled t-test revealed a statistically significant difference, with private school students showing slightly higher positive perceptions of collaborative teaching strategies than their counterparts in public schools. This difference could be attributed to factors such as class size, availability of teaching resources, and school management support, which often favor private schools. Smaller class sizes in private schools may provide a more conducive environment for implementing group-based teaching methods compared to the often overcrowded classrooms in public schools (Ogunleye et al., 2021).

Conclusion

Based on the findings, the study concludes that collaborative teaching strategies positively influence students' academic performance in Biology. Both teachers and students acknowledged its role in improving understanding, boosting engagement, and promoting teamwork, creativity, and confidence. However, challenges such as large class sizes, inadequate institutional support, and time limitations hinder its effective application. Although lecture-based methods remain common, teachers recognize that these approaches limit creativity compared to collaborative learning.Thus, integrating collaborative teaching into Biology instruction is essential for improving learning outcomes in Nigerian secondary schools.

Recommendations

In light of the findings, the following recommendations are made:

1. Teachers should adopt collaborative teaching strategies more consistently to enhance student engagement and achievement in Biology. A balance should be maintained between direct instruction and group-based activities, depending on lesson objectives.
2. School management should provide adequate support, including instructional materials, training, and enabling environments for teachers to implement collaborative methods effectively. Efforts should be made to reduce class sizes, particularly in public schools, to make collaborative learning more manageable.
3. Curriculum designers should integrate collaborative and learner-centered approaches into Biology syllabi and teaching guides.
4. The government and educational agencies should organize regular workshops and seminars for teachers on effective collaborative teaching techniques.
5. Students should actively participate in collaborative learning activities, as this promotes confidence, critical thinking, and better performance in Biology.

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