

Impact of Team-Teaching Strategy on Academic Performance and Retention of Biology Concepts among Secondary School Students in Effutu Municipality.

¹Prisca Lovia Acquah

Graduate Student, Department of Biology, University of Education, Winneba

Orcid ID: <https://orcid.org/0009-0003-3927-843X>

Corresponding author: priscaloviacquah@gmail.com

Abstract. This study examined the impact of team-teaching on academic achievement and retention of biology students in the first year of Winneba Senior High School, Effutu Municipality, Ghana. The reasons for this study were persistent low performance in biology, especially on complex concepts such as the mammalian system, and the need to explore more effective methods of teaching beyond the traditional lecture. A quasi-experimental research design was used, with a sample of 150 SHS 1 biology students selected via stratified random sampling. The sample was divided into experimental and control groups, which were taught using team and conventional single-teacher methods, respectively. The Biology Achievement and Retention Test (BART) was employed to collect data, administered as a pre-test, post-test, and delayed retention test. The instrument was validated by experts and pilot tested, yielding a Cronbach's alpha reliability coefficient of 0.78. Descriptive statistics and independent-samples t-tests were used to analyse the data at the 0.05 significance level. The results indicated that students taught using team teaching outperformed their counterparts, with the experimental group achieving a significantly higher mean score ($M = 15.31$) than the control group ($M = 10.56$). Additionally, the experimental group scored significantly higher on retention of biology concepts ($M = 14.01$) than the control group ($M = 8.27$). The study found that team teaching is a more effective instructional method than the traditional lecture approach for improving academic achievement and long-term retention of biology among SHS biology students. It is recommended that biology teachers and education policymakers encourage the incorporation of team-teaching approaches into biology instruction to enhance learning outcomes.

Keywords: *Team Teaching, Academic Performance, Knowledge Retention, Biology Education. Experimental group*

1. Introduction and Background

Education is the basis of national development, equipping individuals with the knowledge, skills, and competencies needed to make a difference in society. Instructional approaches used in the classroom directly shape the quality of education a nation offers, as they determine the degree of student comprehension, academic performance, and knowledge retention (Anaeto, et al., 2016). The quality of education is especially important in science

education, as scientific literacy is key to a country's development, health, and technological progress. Biology, as one of the most important science subjects, occupies an irreplaceable place in the school curriculum, providing students with a basic understanding of living organisms, ecosystems, disease prevention, and biotechnology that is important not only in real life but also in higher education (Okenyi, 2022).

Although the importance of biology education is widely recognised, the performance of students in the subject at the secondary school level in Sub-Saharan Africa, including Ghana, remains a longstanding cause of concern. Reports published by the West African Examinations Council (WAEC, 2015-2020) record low academic performance in biology annually, particularly in concepts that require abstract thought, critical thinking, and the practical application of theoretical knowledge to real-life scenarios. This wider national pattern is replicated in Ghana, where students in the Effutu Municipality show difficulties in learning complex biological concepts and in retaining that knowledge over the long term. These challenges are compounded by the continued dominance of the traditional single-teacher model, in which one teacher plans, delivers, and assesses all classroom instruction. Although common, this approach is largely lecture-driven and teacher-centred, offering students minimal opportunity to engage actively, ask meaningful questions, or interact with complex subject matter in a deep way (Behlol, 2020; Noreen & Rana, 2019).

These shortcomings of traditional, unidirectional instruction have compelled educational researchers and practitioners to seek more cooperative, student-centred alternatives, among which team teaching has attracted growing scholarly attention as a strategy for improving academic performance and knowledge retention in science education. Despite this growing international and Nigerian evidence base, there remains a notable lack of empirical research examining the effects of team teaching within the Ghanaian secondary school system, and in the Effutu Municipality specifically. It is this gap in the literature that motivates the present study.

This research, therefore, sets out to examine the role of team-teaching strategy in the academic performance and retention of biology concepts among secondary school students in the Effutu Municipality, Ghana. By investigating the effects of a collaborative, multi-instructor approach on students' understanding and long-term retention of biological material, the study offers empirically grounded evidence to guide policy and practice in the teaching of biology in Ghanaian secondary schools. The findings are intended to contribute to the broader agenda of improving science teaching and learning outcomes, and to position team teaching as a viable, evidence-based pedagogical alternative to the single-teacher model that currently dominates instruction in the municipality's schools.

2. Literature Review

2.1 Conceptual and Historical Overview of Team Teaching

Co-teaching, also known as team teaching, refers to an instructional method in which two or more teachers jointly plan, deliver, and assess learning for a shared group of students (Ezenwosu et al., 2015; Goetz et al., 2023). The strategy draws on the complementary strengths of different teachers, producing a more diverse and dynamic learning experience in which students are exposed to varied instructional perspectives and benefit from more immediate, personalised academic support (Davis, 2021; Muza, 2021). Beyond its benefits to students, team teaching also contributes to teachers' professional development, since collaborative planning and reflection allow teachers to continually refine the quality of their instruction (Awodun & Alake, 2023).

The practice of team teaching can be traced to the mid-twentieth century, with Harvard University's 1955 supervised internship programme widely credited as the first formal implementation (Hooda & Sharma, 2016). By the 1970s, team teaching had gained considerable popularity in Western education systems, and its relevance to contemporary classrooms has only grown since, supported by studies demonstrating its effectiveness across a range of subjects and schooling contexts. Hellier and Davidson (2018) defined team teaching as the collaborative work of qualified educators who jointly plan, organise, and teach toward a common goal, while Jang (2021) more recently characterised it as a distinctive form of instruction in which teachers share decision-making and responsibility as they work toward shared learning objectives. Darma (2018) similarly described team teaching as an arrangement that allows instructors to pool their subject-matter expertise and pedagogical strengths, thereby broadening the range of learning experiences available to students compared with a single-teacher arrangement.

2.2 Team Teaching and Academic Performance

A substantial body of empirical research has examined the effects of team teaching on student academic performance, with findings consistently favouring the strategy. Akpan et al (2021) found that team teaching significantly improved student performance in Introductory Technology at the junior secondary school level in Akwa Ibom State, Nigeria, with team-taught students outperforming those taught by a single teacher. In the specific context of biology, Ajayi and Ayeni (2019) reported that students in Lagos State, Nigeria, who were taught using team teaching achieved significantly better results than those taught using the traditional single-teacher method. This pattern extends to other biological topics and regions: Abdullahi et al (2026) found that students taught the Nervous System through Team-Based Learning in Niger State scored significantly higher than their counterparts taught through traditional lectures, while Awodun and Alake (2023) reported that team teaching had a significant positive effect on academic performance in Basic Science among junior secondary school students in Ekiti State, with gender found to be a non-significant variable in performance gains. Jang (2021) similarly found that students taught biology through team teaching scored significantly higher on post-tests than those taught conventionally, with a large effect size favouring the collaborative approach. Most recently, Iyabo and Olajumoke (2025) presented compelling evidence from Ogun State, Nigeria, where Team-Based Learning produced a statistically significant, large-effect improvement in the academic performance of senior secondary students in Ecology, with the intervention accounting for approximately 74.5 percent of the variance in post-test scores. Beyond instructional strategy, students' broader attitudes toward biology have also been linked to performance outcomes, with Zeidan (2010) finding that students' perceptions of the biology learning environment shaped their attitudes toward the subject, underscoring the importance of instructional approaches that foster more positive and engaging classroom experiences.

2.3 Team Teaching and Knowledge Retention

Retention, understood as the capacity to remember and apply previously learned information after a period of time has passed, is widely regarded as a key indicator of meaningful learning (Ibok & Unoh, 2019). Because team teaching is an interactive process built on engagement, collaboration, and multi-perspectival instruction, students are expected to encode information more deeply and recall it more successfully in later assessments. Empirical evidence supports this expectation: Akinbode et al (2020) found that team teaching enhanced secondary school students' retention of biology concepts,

including cell biology and human physiology, in Ibadan, Nigeria. ISA et al (2025) extended these findings to an international context, showing that team-based learning improved both understanding and retention of ecology and genetics concepts among students in rural schools in China. By contrast, the high forgetting rates and shallow learning frequently observed in abstract science subjects such as biology have been repeatedly attributed to the passive, teacher-centred nature of traditional instruction (Goetz, et al 2023).

Collectively, the reviewed studies highlight the pedagogical value of team teaching in science education and provide empirical support for its wider adoption, particularly given its consistent association with improved academic performance and stronger retention of complex scientific concepts. However, biology teaching at the secondary school level in the Central Region of Ghana continues to rely heavily on the traditional single-teacher model, and student achievement and retention in the more intricate aspects of biology remain below acceptable standards. While a growing body of international and Nigerian evidence supports the effectiveness of team teaching, there is a marked lack of empirical research examining its effects within the Ghanaian secondary school system, and in the Effutu Municipality in particular. This gap in the literature provides the empirical justification for the present study.

Research objectives

1. What is the difference in academic performance between secondary school students taught mammalian system using team teaching and those taught with the conventional (lecture method) approach?
2. What is the difference in retention between secondary school students taught mammalian system concepts using team teaching and those taught with the conventional (lecture method) approach?

Hypothesis

The following null hypotheses were stated at a 0.05 confidence level, to carry out the study:

- H_{01} : There is no significant difference in the academic performance of secondary school biology students taught mammalian system concepts using team teaching compared to those taught using the conventional lecture approach.
- H_{02} : There is no significant difference in the retention of mammalian system concepts among secondary school biology students taught using team teaching compared to those taught using the conventional lecture approach.

3. Research design and methods

3.1 Research Design

The study includes SHS 1 biology students at Winneba Senior High School in Effutu Municipality in the Central Region of Ghana, with a narrow focus on students who study biology as one of the elective science subjects. This study used a quasi-experimental research design, which was suitable for the study since the researcher could not use full randomisation due to the use of intact classroom groups. This approach was deemed suitable because it allows for the investigation of the effectiveness of the intervention in a real-world classroom setting where randomization of students is not practically possible, thereby enhancing the ecological validity of the findings.

3.2 Population and Sampling

The target population was a sample of all SHS 1 biology students attending Winneba Senior High School during the 2024/2025 academic year, amounting to 600 students. A sample of 150 students was taken from this population using stratified random sampling to ensure that both male and female students were proportionally represented. The sample size consisted of 80 male and 70 female students, selected from existing classes in the school. The stratified approach was used to ensure that gender balance was well represented in the study, thus improving the representativeness and generalisability of the results in the study population.

3.3 Research Instruments

To measure academic achievement and retention, the researcher developed an instrument named the Biology Achievement and Retention Test (BART). This instrument comprised 20 multiple-choice questions based on the objectives for the SHS 1 biology syllabus, specifically focusing on the topic of the mammalian system. The items were organized to include four response choices (A-D), and the test was administered as a pre-test, post-test, and delayed retention test during the data collection stages. Additionally, a small demographic survey was conducted to gather background information about the participants' age and gender.

3.4 Data Collection Procedure

The students sampled (150) were divided into two groups: an experimental group containing 75 students and a control group containing 75 students. The experimental group received instruction in biology using the team teaching strategy, whereby two qualified biology teachers jointly planned, taught, and assessed the same group of students simultaneously. The control group was taught using the traditional single-teacher method, which is the standard form of teaching currently practised at Winneba Senior High School. The two groups were selected from two intact classes to reduce chances of contamination across the treatment conditions. To ensure fairness and equity, both groups received the same amount of instructional time and covered the exact same curriculum content, differing only in the instructional strategy utilized.

3.5 Data Analysis

The data gathered during the pre-test, post-test, and retention test were analysed using descriptive and inferential statistics. The research questions were answered by calculating descriptive statistics in terms of mean scores and standard deviations. At the level of 0.05, independent samples t-tests were used to test the null hypotheses to determine whether statistically significant differences in academic performance and knowledge retention existed between the team teaching and conventional teaching groups. The Statistical Package for the Social Sciences (SPSS) Version 25 was used to conduct all statistical analyses.

3.6 Instrument Validity and Reliability

The BART was validated by expert and peer review. The instrument was tested for content coverage, clarity of items, language suitability, and correspondence to the SHS 1 biology curriculum objectives by experienced biology teachers and science education specialists. The results of these evaluators were included in the final version of the instrument, leading to a satisfactory inter-rater agreement of 80%, which was considered acceptable. A pilot study was then carried out with a sample of SHS 1 biology students at a school in the Effutu Municipality (not part of the main study) to assess clarity and reliability. The

Cronbach's alpha reliability coefficient obtained was 0.78, which is above the minimum acceptable threshold of 0.70, thereby validating the internal consistency of the instrument.

3.7 Ethical Considerations

The study's conduct received ethical approval from the Ghana Education Service (GES), the Effutu Municipal Education Directorate, and the Winneba Senior High School administration. All participants and their guardians were informed about the study's purpose, procedures, and voluntary nature before the start of data collection, and informed consent was obtained through writing. The ethical principles of anonymity, confidentiality, and free participation were strictly adhered to throughout data collection, analysis, and reporting.

4. Findings

Research Question 1: What is the difference in academic performance between secondary school students taught the mammalian system using team teaching and those taught with the conventional (lecture method) approach?

To answer this research question, the mean academic performance scores and standard deviations for both the team teaching (Experimental) and conventional (Control) groups were calculated from the post test results.

Table 1: Mean Academic Performance Scores of Team Teaching and Conventional Groups.

Group	N	Mean	Std.Dev
Experimental	75	15.31	1.20
Control	75	10.56	1.08

Source: Field data, 2026

The descriptive statistics of academic performance on the post-test indicate that the experimental group (N = 75) taught using the team-teaching strategy has a mean post-test score of 15.31 out of 20 (SD = 1.20), corresponding to 76.5 per cent accuracy. Conversely, the control group, which received the traditional single-teacher method (N = 75), had an average of 10.56/20 (SD = 1.08), or 52.8 per cent accuracy. The average 4.75-point difference in favour of the experimental group indicates that learners taught using team teaching were significantly better in biology on the post-test than students in the conventional group. This indicates that team teaching has a positive influence on students' performance in studying biology concepts.

Table 2: Mean Retention Scores of Team Teaching and Conventional Groups.

Group	N	Mean	Std.Dev
Experimental	75	14.01	1.56
Control	75	8.27	1.46

Source: Field data, 2026

Table 2 shows the average retention score of the two groups in the Biology Achievement and Retention Test (BART), which was conducted three weeks after the end of the instruction. The experimental group, whose teaching strategy was the team teaching one (N = 75), achieved a mean score of 14.01 (SD = 1.56) in retention, which is equivalent to a retention rate of about 70.1 per cent of the overall marks. The control group, which was taught by the traditional single-teacher approach (N = 75), had a significantly smaller mean retention score of 8.27 (SD = 1.46), which is the retention rate of about 41.3 percent. The mean difference of 5.75 marks between the experimental and the control groups in favour

of the former group implies that students who were taught by team teaching retained much more biological knowledge at the end of the three-week period compared to those in the control group. This is shown by the slightly larger standard deviation of the experimental group (SD = 1.56) over the control group (SD = 1.46), as a consequence of the natural variation of individual learners in the rate of forgetting, which is consistent with the anticipated results of retention studies. A preliminary analysis of these means indicates that the team teaching technique is positively affecting the retention of biology concepts among SHS 1 students of Winneba Senior High School in the long term, with the experimental group significantly doing better than the control group.

Hypothesis testing

Hypothesis 1

Ho₁: There is no significant difference in the academic performance of secondary school biology student taught mammalian system concepts using team teaching and those taught using conventional (single teacher) approach

To test this hypothesis, an Independent Samples t-test was conducted to compare the mean academic performance scores of the experimental (team teaching) group and the control (conventional) group on the post-test. The significance level (α) was set at 0.05.

Table 3: Independent Samples t-test to compare the academic performance

Group	N	Mean	SD	df	t-value	P-value	Decision
Experimental	75	15.31	1.20	148	25.492	<.001	Rejected
Control Group	75	10.56	1.08				

Source: Field data, 2026

Table 3 shows the outcome of the independent samples t-test that was used to test whether a statistically significant difference existed in the academic performance of students taught through the use of the team teaching strategy and those taught through the traditional single-teacher approach on the post-test. The group that was taught using the team teaching method (N = 75) had a mean post-test score of 15.31 (SD = 1.20), and the group that was taught using the conventional approach (N = 75) had a significantly lower mean post-test score of 10.56 (SD = 1.08). The average difference of 4.75 marks between the two groups determined using the post-test scores gives us a first hint that students in the team teaching group had better performance in biology in comparison with their counterparts in the conventional group.

To find out whether this difference was statistically significant, independent samples t-test was performed at a level of significance of 0.05. The test result obtained was $t(148) = 25.492$, $p < .001$. As the p-value obtained is significantly less than the required significance level of 0.05, the null hypothesis according to which the performance of the students in the secondary schools in the study, when it comes to teaching about the mammalian system, is significantly different when the teacher is using team teaching compared to when the teacher was using the traditional single-teacher method is rejected. This conclusion shows that the variation in the means of post-test scores between the experimental and control groups was not chance but an actual and direct effect of the instructional strategy used.

Hypothesis 2

Ho₂: There is no significant difference in retention of secondary school biology student taught mammalian system concepts using team teaching and those taught using conventional (single teacher) approach.

To test this hypothesis, an Independent Samples t-test was conducted to compare the mean retention scores of the experimental (team teaching) group and the control (conventional) group on the post- test for retention. The significance level (α) was maintained at 0.05.

Table 4: Independent Samples t-test to compare the Retention Scores of the experimental and Control Groups.

Group	N	Mean	SD	Df	t-value	P-value	Decision
Experimental	75	14.01	1.56	148	23.298	< .001	Rejected
Control Group	75	8.27	1.46				

Source: Field data, 2026

The findings of the independent-samples t-test used to determine whether there is a statistically significant difference in retention scores between students taught the team-teaching strategy, and those taught the conventional single-teacher strategy, are presented in Table 4. The experimental group (N = 75) had a mean retention score of 14.01 (SD = 1.56), and the control group (N = 75) had a lower mean retention score of 8.27 (SD = 1.46). The independent-samples t-test showed that the retention scores in the two groups differed significantly ($t(148) = 23.298$, $p < .001$). The p-value of < 0.001 is less than the level of significance of 0.05, and thus the null hypothesis that there was no significant difference in retention of biology concepts taught using team teaching and those taught using the conventional approach is rejected. These findings show that the team-teaching approach led to a much higher rate of knowledge retention among SHS 1 Biology students at the Winneba Senior High School than the traditional approach, demonstrating that team teaching is a more effective teaching approach that can enhance long-term retention of biological concepts.

5. Discussion of findings

The results of this study are discussed in relation to the two hypotheses, which are tested with references to the existing empirical literature on team teaching and its impacts on academic achievement and knowledge acquisition in biology education.

The initial discovery of this research is that students who were taught the mammalian system in biology using the team-teaching strategy fared much better than those taught using the conventional lecture approach. The mean score in the experimental group (15.31, SD = 1.20) was 76.5% accurate, compared with 10.56% (SD = 1.08) in the control group. The first null hypothesis was rejected, as the independent-samples t-test showed the difference between the two to be statistically significant ($t(148) = 25.492$, $p < .001$). Similarly, the second finding shows that the experimental group retained much more biological knowledge than the control group, with a mean retention score of 14.01 (SD = 1.56) in comparison to the control group (8.27 (SD = 1.46) and the t-test also shows that there is a statistically significant difference between both groups ($t(148) = 23$). The average difference of 5.75 marks on the retention test in favour of the experimental group, which was significantly higher than the difference of 4.75 marks on the retention test at post-test, only serves to emphasise the increasing and long-lasting benefit of team teaching over the traditional method in fostering long-term knowledge retention among SHS 1 Biology students at Winneba Senior High School.

These results align with the findings of Goetz et al (2023), who established that team teaching has a significant effect on academic performance and retention of biological concepts among secondary school biology students in Sokoto State, Nigeria. The current results are also consistent with Akpan et al (2021), who established that team teaching increased student performance significantly in Introductory Technology among students in the Junior Secondary School in Akwa Ibom State, Nigeria, and Ajayi and Ayeni (2019),

who found that team teaching resulted in much better biology assessment scores among students in the senior secondary school in Lagos State. In terms of retention, in particular, the results are similar to those of Akinbode et al (2020), who found that team teaching made students better retain the biological concepts, especially cell biology and human physiology, among secondary schools students in ISA et al (2025), who reached a similar conclusion, as team teaching improved the understanding and retention of The high performance/retention of the experimental group in the current study is explained by the collaborative and multi-perspectival character of team instruction that provides students with different teaching methods, immediate feedback, and active involvement in the lessons, thus, allowing them to think deeper and to encode biological material in the long-term memory more effectively (Davis, 2021; Ibok & Unoh, 2022; Muza 2021). By contrast, the inactive and teacher-dominant characteristics of the traditional lecture format inhibit students' active involvement and create weaker memory impressions that are more prone to confusion over time (Noreen & Rana, 2019; Behlol, 2020).

Nevertheless, current results contradict the report by Ahmed, Bello, Alabi, Sulaiman, and Ahmed (2022), who found no significant difference in achievement with team teaching. This divergence suggests that while team teaching has potential, its success may depend on the specific context or the quality of its implementation, as inconsistent application can limit its benefits.

The aggregate results of this research suggest that team teaching is a better pedagogical approach than the traditional lecture method to improve both the short-term academic achievement and long-term knowledge acquisition of SHS 1 Biology students at Winneba Senior High School in the Effutu Municipality of Ghana, which adds to the existing literature of this topic that supports the wider use of collaborative teaching methods to teach science in secondary schools.

6. Recommendations

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

1. Biology teachers in Winneba Senior High School should utilise team teaching methods more frequently, especially when teaching complex biological topics, as a means of enhancing academic performance and retention among students
2. School authorities and educators must also institute periodic in-service training, workshops and seminars to help biology teachers acquire the necessary skills and collaborative competencies that are required to effectively implement team teaching.
3. Municipal Education Directorate and curriculum planners must include team teaching in instructional policy frameworks, and institutional support, such as flexibility in scheduling and allocation of resources, must be provided to enable effective application of the same in science instruction in secondary schools.

7. Conclusion

The study has conclusively established that team teaching is a more effective approach for improving the academic performance and retention of biology concepts among SHS 1 students at Winneba Senior High School in the Effutu Municipality. Students who were exposed to team teaching had better academic performance and better retention of biological knowledge than those taught using the traditional lecture method. Team teaching in its collaborative form fosters student participation, diversification of teaching, instantaneous feedback and conceptual comprehension by integrating the knowledge of a group of teachers. These benefits can see team teaching as an extremely effective pedagogical approach to enhancing the outcome of science education. Since the team

teaching group scored higher on both performance and retention outcome measures, the research has a significant empirical basis of the implementation of team teaching as a feasible instructional method to improve the teaching of biology in Ghanaian secondary schools.

Author contributions: The author contributed to every stage of the study and concurs with the reported results and conclusions.

Funding: The study received no financial support.

Ethical statement: Written informed consent was obtained from all participants prior to their participation in the study.

Declaration of interest: The author declares no conflicts of interest.

Data sharing statement: Data supporting the findings and conclusions are available upon reasonable request from the corresponding author.

Use of AI: This study used AI for language refinement and paraphrasing.

References

- Abdullahi, M., Mohammed, I. A., & Bello, A. (2026). Effect Of Flipped Classroom On Performance Of Secondary School Biology Students In Gombe State Nigeria. *Gombe Journal Of Education*, 9(1), 1-16.
- Ahmed, M. A., Bello, G., Alabi, H. A., Sulaiman, M. M., & Ahmed, A. R. (2022). Effects of team teaching on senior school students' achievement in adaptation in Ilorin, Nigeria. *Jurnal Bioedukatika*, 10(2), 78-84. <https://doi.org/10.26555/bioedukatika.v10i2.22235>.
- Ajayi, T., & Ayeni, A. (2019). Effect of team teaching on the academic performance of senior secondary school students in biology in Lagos State, Nigeria. *Lagos State Educational Research Journal*, 7(2), 55-67.
- Akinbode, O., Adepoju, P., & Yusuf, S. (2020). Influence of team teaching on retention of biology knowledge among Nigerian secondary school students. *Journal of Science Education in Nigeria*, 9(1), 29-40.
- Akpan, G. A., Usoro, H. S., Akpan, I. G., & Ekpo, A. B. (2021). Effects of team teaching on students performance in introductory technology in secondary schools in Akwa Ibom State, Nigeria. *An International Multi-Disciplinary Journal, Ethiopia*. 4 (3b), 41-54
- Anaeto, F. C., Asiabaka, C. C., Ani, A. O., Nnadi, F. N., Ugwoke, F. O., Asiabaka, I. P., Anaeto, C. A., & Ihekeronye, N. (2016). The roles of science and technology in national development. *International Standard Journal Number*, 3(3), 38-43.
- Awodun, A. O. & Alake, E. S. (2023). Effects of team teaching strategy on students' academic performance in basic science in junior secondary schools in Ekiti State, Nigeria. *International Journal of Early Childhood Special Education (INT-JECSE)* 15 (05), 132 – 141 <https://doi.org/10.48047/INTJECSE/V1515.18>
- Behlol, G. (2020). *Development and validation of module in English at secondary level in Pakistan*. (Unpublished Ph.D thesis). International Islamic University, Islamabad.
- DARMA, I. A. (2018). *Effects of team teaching approach on academic performance of social studies students in colleges of education in Kano State, Nigeria* (Doctoral dissertation).
- Davis, S. R. (2021). *Two teachers, one Classroom: The challenges and rewards of team-teaching* (Unpublished graduate project). Faculty of Education, Curriculum and Leadership, University of British Columbia. <https://open.library.ubc.ca/soa/cIRcle/collections/graduateresearch/42591/items/1.0398181>

- Ezenwosu, N. E., Esomonu, N. P., & Akudolu, L. R. (2015). A comparison of the effect of team teaching approach and single teacher teaching approach on senior students' essay/letter writing performance. *Journal of Emerging Trends in Educational Research and Policy Studies*, 6(4), 315-320.
- Goetz, T., Zirngibl, A., Pekrun, R., & Hall, N. (2023). Emotions, learning, and achievement from an educational-psychological perspective. In P. Mayring & C. von Rhöneck (Eds.), *Learning emotions: The influence of affective factors on classroom learning* (pp. 9–28). Peter Lang.
- Hellier, S., & Davidson, L. (2018). Team teaching in nursing education. *The Journal of Continuing Education in Nursing*, 49(4), 186–192. <https://doi.org/10.3928/00220124-20180320-09>
- Hooda, M., & Sharma, M. (2016). The effect of team teaching on academic achievement of 9th graders in science. *Scholarly Research Journal for Interdisciplinary Studies*, 3(23), 1906-1915.
- Ibok, E. E., & Unoh, E. O. (2019). Students' perception of teachers' evaluation technique and teacher-student relationship and their academic achievement in algebraic processes in Uyo Education Zone of Akwa Ibom, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED)*, 1(1), 120-132.
- Isa, B. M., Robertson, U. O., Ibrahim, N. T., & Adamu, A. (2025). Impact of team-teaching strategy on performance and retention in biology concept among secondary school students in Sokoto State, Nigeria. *Federal University Gusau Faculty of Education Journal*, 2(2), 1–9. <https://doi.org/10.64348/zije.2025113>
- Iyabo, O. R., & Olajumoke, S. K. C. (2025). Effect of Teamâ “Based Learning Strategy on Senior Secondary School Biology Studentsâ Academic Achievement in Ecology in Abeokuta Metropolis, Ogun State. *International Journal of Research and Innovation in Applied Science*, 10(6), 1616-1623.
- Jang, S. J. (2008). The effects of integrating technology, observation, and writing into a teacher education method course. *Computers & Education*, 50(3), 853–865. <https://doi.org/10.1016/j.compedu.2006.09.002>
- Muza, S. H. (2021). Team teaching approach on academic performance of students in faculty of education. *The Universal Academic Research Journal*, 2(2), 58-63.
- Noreen, R., & Rana, A. K. (2019). Activity-based teaching versus traditional method of teaching in *mathematics*. *Bulletin of Education and Research*, 41(2), 145-159.
- Okenyi, C. (2013). The challenges and prospects of biology education in Nigeria. *Journal of Assertiveness: ISSN*, 2276, 9684.
- West African Examinations Council. (2015-2020) *Biology chief examiner reports for May/June*. WAEC.
- Zeidan, A. (2010). The relationship between grade 11 Palestinian attitudes toward biology and their perceptions of the biology learning environment. *International Journal of Science and Mathematics Education*, 8(5), 783–800. <https://doi.org/10.1007/s10763-009-9185-8>