

## **Effect of Cooperative Learning Method on Secondary School Students' Achievement in Biology, Federal Capital Territory, Abuja Nigeria**

**I.A. Ojelade<sup>1</sup>, M.A. Apochi<sup>2</sup>, H.S. Sani<sup>3</sup>**

<sup>123</sup>Department of Science & Environmental Education

Faculty of Education

University of Abuja, Nigeria

[anniesteve240@gmail.com](mailto:anniesteve240@gmail.com)

**Abstract:** *This study examined the effect of Cooperative Learning Method on secondary school students' achievement in Biology, Federal Capital Territory, Abuja Nigeria. The study adopted a quasi-experimental pre-test, post-test, non-randomized control group design. The population comprised 5,888 Senior Secondary School II (SS II) Biology students in public secondary schools in Gwagwalada Area Council, Federal Capital Territory, Abuja. A sample of 118 students selected through purposive and simple random sampling techniques participated in the study. The instrument used for data collection was the Biology Achievement Test (BAT), which yielded a reliability coefficient of 0.80 using Pearson Product Moment Correlation. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was employed to test the hypotheses at the 0.05 level of significance. The findings revealed that students taught Biology using the Cooperative Learning Method achieved significantly higher than those taught using the Conventional Teaching Method. The study also found no significant difference between the achievement scores of male and female students taught Biology using the Cooperative Learning Method. It was concluded that Cooperative Learning Method is an effective and gender-inclusive instructional strategy for enhancing students' achievement in Biology. Based on the findings, it was recommended that Biology teachers adopt Cooperative Learning Method in classroom instruction, while educational authorities should provide training opportunities to strengthen teachers' competence in implementing learner-centred instructional strategies. The study contributes to the growing body of evidence supporting cooperative learning as a viable approach for improving Biology achievement among secondary school students.*

**Key words:** *Cooperative Learning Method, Biology Achievement, Gender and Conventional Teaching Method.*

### **Introduction**

Science education is widely recognized as a fundamental driver of scientific advancement, technological innovation, and socio-economic development. Across the world, nations have continued to invest in science education because of its capacity to develop critical thinking, problem-solving abilities, creativity, and scientific literacy among learners. In contemporary knowledge-driven societies, science education extends beyond the acquisition of scientific facts to the development of competencies that enable individuals to understand, interpret, and respond effectively to emerging global challenges. The growing demand for scientific and technological expertise has further reinforced the importance of strengthening science education systems through innovative instructional approaches capable of improving learners' engagement and academic outcomes. According to Okebukola, science education remains indispensable for national development because it provides the human capital required for scientific discoveries, technological innovations, and sustainable economic growth. Similarly, UNESCO emphasized that quality science education equips

learners with the competencies necessary for lifelong learning, informed decision-making, and active participation in modern society [1].

The increasing complexity of scientific knowledge and the changing nature of learning have necessitated a shift from traditional teacher-centred instruction to learner-centred pedagogical approaches. Contemporary science education advocates instructional practices that actively involve learners in the construction of knowledge through collaboration, inquiry, experimentation, and problem-solving. This paradigm shift is driven by evidence suggesting that meaningful learning occurs when students actively engage with concepts rather than passively receive information from teachers. In support of this position, Aregbesola et al. noted that the future of science education depends largely on the adoption of innovative pedagogical strategies that foster active participation, critical thinking, collaboration, and knowledge creation. Likewise, Aregbesola and Bara'u argued that instructional approaches that promote interaction and collaborative learning significantly enhance conceptual understanding and improve learners' academic achievement in science-related disciplines [2], [3]. These perspectives suggest that the effectiveness of science education is closely linked to the quality of instructional methods employed in classrooms. Within the framework of science education, Biology occupies a prominent position because of its relevance to understanding life processes, environmental sustainability, health promotion, food security, and technological advancement.

Biology is one of the core science subjects offered at the secondary school level and serves as a prerequisite for admission into several science-oriented programmes such as Medicine, Nursing, Pharmacy, Agriculture, Microbiology, Environmental Sciences, and Biotechnology. The subject provides learners with essential knowledge about living organisms and their interactions with the environment, thereby contributing to the development of scientific literacy and responsible citizenship. The Federal Republic of Nigeria recognizes Biology as a critical component of science education because of its role in preparing students for scientific careers and promoting national development through scientific knowledge and innovation. Despite the importance of Biology in the Nigerian educational system, students' achievement in the subject has remained a source of concern among educators, curriculum developers, examination bodies, and policymakers [4]. Reports from public examination bodies have consistently shown fluctuations in students' performance in Biology, with many learners demonstrating difficulties in understanding abstract concepts, applying scientific principles, and solving Biology-related problems.

These challenges have been attributed to several factors, including inadequate instructional resources, poor learning environments, insufficient practical experiences, and ineffective teaching methods. According to the West African Examinations Council, students' inability to adequately interpret biological concepts and apply scientific reasoning remains one of the major factors responsible for unsatisfactory performance in Biology examinations. Similar concerns were raised by the National Examinations Council, which highlighted persistent weaknesses in students' conceptual understanding and scientific application of biological knowledge. The recurring challenge of low achievement in Biology has stimulated increasing scholarly interest in the identification of instructional strategies capable of enhancing students' learning outcomes [5], [6]. Educational researchers have argued that students learn more effectively when instructional approaches provide opportunities for active participation, peer interaction, and collaborative knowledge construction. Consequently, attention has shifted towards learner-centred instructional methods that encourage students to become active participants in the learning process.

Ojelade et al. observed that instructional strategies that actively engage learners in classroom activities significantly improve students' understanding of scientific concepts and academic achievement. Similarly, Ubom et al. reported that student-centred instructional approaches enhance learners' participation, motivation, and achievement in science subjects by creating opportunities for meaningful interaction and knowledge construction. One instructional approach that has received considerable attention in science education research is the Cooperative Learning Method (CLM). Cooperative learning is a teaching strategy in which students work together in small, heterogeneous groups to achieve common academic goals while remaining individually accountable for their learning outcomes. The method is founded on the principle that learning is enhanced when students

interact, share ideas, explain concepts to one another, and collectively solve academic problems. Unlike conventional teaching methods where students are often passive recipients of information, cooperative learning encourages active engagement, peer support, mutual responsibility, and collaborative problem-solving. Johnson et al. described cooperative learning as a structured instructional approach that promotes positive interdependence, individual accountability, face-to-face interaction, interpersonal skills, and group processing. These characteristics make cooperative learning particularly suitable for Biology instruction, where conceptual understanding often requires discussion, observation, analysis, and interpretation of scientific phenomena [7].

The increasing advocacy for cooperative learning is supported by substantial empirical evidence demonstrating its positive influence on students' academic achievement. Gillies found that cooperative learning promotes active engagement, improves communication skills, strengthens peer relationships, and enhances academic performance. Similarly, Kyndt et al. reported that cooperative learning contributes significantly to improved achievement outcomes because it creates supportive learning environments that encourage active participation and collective responsibility for learning. These findings suggest that cooperative learning has considerable potential for improving students' achievement in Biology, particularly within contexts where traditional instructional methods continue to dominate classroom practice. Apart from instructional methods, gender has remained an important variable in science education research because of its potential influence on students' learning experiences and academic outcomes. While some studies have reported significant differences in favour of either male or female students, others have found no meaningful gender-related variations in achievement when effective instructional strategies are employed. Ojelade and Aregbesola observed that academic achievement in science subjects may be influenced by a combination of instructional, environmental, and learner-related factors rather than gender alone [8], [9].

This suggests that the effectiveness of an instructional strategy may play a more significant role in determining achievement outcomes than biological sex differences. The issue of gender becomes particularly relevant within cooperative learning environments because such settings provide equal opportunities for participation, interaction, and knowledge sharing among learners. Ojelade et al. emphasized that girls possess the intellectual capacity required for successful participation in science but often encounter socio-cultural barriers that affect their confidence and engagement. The authors argued that supportive instructional environments capable of promoting collaboration and active participation can enhance learning outcomes for both male and female students. This position highlights the need to examine whether cooperative learning produces differential achievement outcomes among male and female students studying Biology. In the Federal Capital Territory, Abuja, considerable efforts have been directed towards improving science education through teacher development programmes, and enhanced access to educational resources [10].

Nevertheless, concerns regarding students' achievement in Biology persist across many secondary schools. Classroom practices in some schools continue to be dominated by conventional teaching approaches characterized by teacher-centred instruction, limited student interaction, and minimal opportunities for collaborative learning. Furthermore, existing studies have produced inconsistent findings regarding the influence of gender on students' achievement under cooperative learning environments. While some researchers have reported gender-related differences, others have found that cooperative learning benefits male and female students equally. It is against this background that this study seeks to examine the effect of Cooperative Learning Method on secondary school students' achievement in Biology, Federal Capital Territory, Abuja.

### **Purpose of the Study**

The purpose of this study is to examine the effect of cooperative learning method on Secondary School students' achievement in Biology in the Federal Capital Territory, Abuja. Specifically, the study seeks to:

- i. determine whether there is a difference between the mean achievement scores of students taught Biology using the Cooperative Learning Method (CLM) and those taught using the Conventional Teaching Method (CTM) in the Federal Capital Territory, Abuja.

- ii. determine whether there is a difference between the mean achievement scores of male and female students taught Biology using the Cooperative Learning Method in the Federal Capital Territory, Abuja.

### **Research Questions**

The following research questions guided the study:

- i. What is the difference between the mean achievement scores of students taught Biology using the Cooperative Learning Method and those taught using the Conventional Teaching Method?
- ii. What is the difference between the mean achievement scores of male and female students taught Biology using the Cooperative Learning Method?

### **Research Hypotheses**

The following null hypotheses will be tested at the 0.05 level of significance:

**H<sub>0</sub>:** There is no significant difference between the mean achievement scores of students taught Biology using the Cooperative Learning Method and those taught using the Conventional Teaching Method.

**H<sub>0</sub>:** There is no significant difference between the mean achievement scores of male and female students taught Biology using the Cooperative Learning Method.

Science education represents a specialized field of study concerned with developing scientific knowledge, skills, values, attitudes, and competencies required for understanding natural phenomena and addressing societal challenges. The contemporary conception of science education extends beyond the acquisition of scientific facts to the cultivation of critical thinking, creativity, scientific inquiry, problem-solving abilities, and evidence-based decision-making. As societies become increasingly dependent on science and technology, the role of science education in preparing learners for participation in scientific, economic, and social development has become more significant. UNESCO emphasized that quality science education equips learners with competencies needed for lifelong learning and responsible citizenship. Within the broad spectrum of science education, Biology provides learners with opportunities to understand the structure, functions, growth, evolution, and distribution of living things while developing scientific skills necessary for investigating biological phenomena. Campbell et al. described Biology as a discipline that explains life processes across different levels of organization, thereby enabling learners to appreciate the interconnectedness of living systems. The Nigerian Educational Research and Development Council stated that Biology education is designed to promote scientific inquiry, observation, experimentation, interpretation of biological data, and application of knowledge to everyday life situations. Consequently, effective Biology instruction requires teaching approaches capable of engaging learners actively in the learning process while promoting conceptual understanding and scientific reasoning [11].

The attainment of educational objectives in Biology depends substantially on students' academic achievement, which serves as an indicator of the extent to which instructional goals have been realized. Academic achievement refers to the measurable level of knowledge, understanding, skills, and competencies acquired by learners after exposure to educational experiences. Slavin, identified academic achievement as a major outcome variable in educational studies because it provides evidence regarding the effectiveness of instructional practices, curriculum implementation, and learning environments. Students' academic achievement is influenced by numerous factors, including learner characteristics, teacher competence, instructional resources, school environment, parental support, and teaching methods. Among these factors, instructional methods have attracted considerable scholarly attention because of their direct influence on classroom interaction and learning outcomes. Instructional methods refer to the procedures, techniques, and strategies employed by teachers to facilitate learning and achieve educational objectives. The effectiveness of any instructional method is determined by its capacity to engage learners actively, stimulate critical thinking, encourage participation, and promote meaningful understanding of concepts. Modern

educational philosophy increasingly supports learner-centred instructional approaches that provide opportunities for collaboration, inquiry, discussion, and knowledge construction rather than passive reception of information.

One instructional strategy that has gained considerable prominence in contemporary science education is the Cooperative Learning Method [12]. Cooperative learning is a structured instructional approach in which learners work together in small groups to achieve shared academic goals while remaining individually accountable for their contributions. Johnson et al. identified positive interdependence, individual accountability, promotive interaction, interpersonal skills, and group processing as the essential elements of effective cooperative learning. These elements collectively create learning environments that encourage active participation and shared responsibility for academic success. The increasing popularity of cooperative learning is attributable to its ability to transform classroom instruction from a teacher-dominated activity into an interactive process that actively involves learners in knowledge construction. Within Biology classrooms, cooperative learning provides opportunities for students to discuss concepts, conduct investigations, interpret observations, solve problems collaboratively, and communicate scientific ideas effectively. According to Kyndt et al. cooperative learning enhances academic achievement by increasing learner engagement, improving motivation, strengthening peer relationships, and facilitating meaningful cognitive processing. These characteristics make the method particularly suitable for Biology instruction, where conceptual understanding often requires dialogue, experimentation, and collaborative exploration [13].

Another important issue associated with students' achievement in Biology is gender. Gender has remained a significant variable in science education research because of persistent concerns regarding participation, achievement, and representation in science-related disciplines. Historically, disparities in science achievement have often been attributed to socio-cultural expectations, learning opportunities, classroom experiences, and motivational factors. Baysal, et al. suggest that the use of supportive instructional approaches can minimize achievement differences between male and female learners. However, the present study is anchored on two complementary theoretical perspectives: Social Constructivist Theory and Social Interdependence Theory. The Social Constructivist Theory was propounded by Lev Semyonovich Vygotsky in the theory posits that learning is fundamentally a social process in which knowledge is constructed through interaction, collaboration, communication, and shared experiences with others. Vygotsky argued that cognitive development occurs when learners engage with more knowledgeable individuals, such as teachers or peers, within what he termed the Zone of Proximal Development (ZPD), where learners can achieve higher levels of understanding through guided support than they can independently.

The relevance of this theory to the present study lies in its support for the Cooperative Learning Method, which encourages students to work together in small groups to exchange ideas, explain concepts, and solve Biology-related problems collaboratively. The Social Interdependence Theory originated from the work of Kurt Lewin and was later expanded by Morton Deutsch and further developed by David Johnson and Roger Johnson in their theory of cooperative learning and group dynamics. The theory asserts that the manner in which goals are structured determines the way individuals interact and subsequently influences learning outcomes. According to the theory, positive interdependence exists when individuals perceive that they can achieve their goals only if other members of the group also achieve theirs, thereby promoting cooperation, mutual support, shared responsibility, and collective success. In contrast, negative interdependence fosters competition, while the absence of interdependence encourages individualistic efforts [14], [15]. The theory maintains that cooperative interactions enhance academic achievement because learners assist one another, exchange knowledge, provide feedback, and collectively solve problems. The relevance of Social Interdependence Theory to this study is evident in the structure of the Cooperative Learning Method, where students work in groups to achieve common academic objectives while remaining individually accountable for their learning. Through positive interdependence, learners are motivated to support one another's understanding of Biology concepts, thereby promoting higher academic achievement.



Empirical investigations on cooperative learning have expanded considerably over the past two decades owing to the increasing demand for instructional approaches that promote active learning, critical thinking, and improved academic achievement. Driessen et al. found that cooperative learning environments increased student engagement, peer explanation, collaborative reasoning, and sustained participation during classroom instruction. Similarly, Santhosh et al. discovered that active classroom participation enabled learners to construct scientific explanations collectively, thereby improving both cognitive achievement and classroom engagement. While Öztürk, after synthesizing findings from twenty-three meta-analyses conducted between 2010 and 2021, concluded that cooperative learning exerts a moderate but consistent positive influence on students' learning outcomes across different levels. Cochon, found that cooperative learning method structured collaboration encourages cognitive elaboration, active participation, and mutual academic support, thereby facilitating meaningful learning experiences. Likewise, Komala et al. after synthesizing fifty experimental studies, reported a moderate positive overall effect of cooperative learning on Biology achievement, with stronger effects observed among senior secondary school students than junior secondary school learners [16].

Gender has also received considerable empirical attention within cooperative learning research. While earlier studies frequently reported achievement differences between male and female learners, contemporary investigations increasingly suggest that effective learner-centred instructional strategies minimize such disparities. Ojelade et al. argued that girls possess intellectual capabilities comparable to those of boys and that differences in science achievement are more strongly associated with learning opportunities, classroom experiences, and socio-cultural influences than biological sex. UNESCO similarly emphasized that equitable instructional practices and inclusive classroom environments contribute significantly to reducing gender disparities in science participation and achievement. These findings imply that cooperative learning, by promoting equal participation and shared responsibility, may provide comparable learning benefits for both male and female students. Despite the considerable volume of studies on cooperative learning, important gaps still exist in the literature. Existing studies have reported inconsistent findings regarding the magnitude of its effect on students' academic achievement, particularly in science subjects [17], [18]. Also, there is also insufficient evidence on whether the method provides comparable learning outcomes for both male and female students in FCT. These unresolved issues create a need for further investigation and provide the basis for the present study.

## **Method**

The study adopted a quasi-experimental pre-test, post-test, non-randomized control group design involving two intact SS II Biology classes drawn from public secondary schools in Gwagwalada Area Council, Federal Capital Territory, Abuja. The target population comprised 5,888 SS II Biology students in thirteen public secondary schools, from which a sample of 118 students was selected through purposive and simple random sampling techniques. One intact class served as the experimental group and was taught selected Biology concepts using the Cooperative Learning Method (CLM), while the other served as the control group and was taught using the Conventional Teaching Method (CTM) for a period of six weeks. Data were collected using a researcher-developed Biology Achievement Test (BAT) consisting of 30 multiple-choice items drawn from standardized WASSCE Biology questions. The instrument was subjected to face and content validation by experts in Science Education, Biology Education, and Measurement and Evaluation, while a pilot study yielded a reliability coefficient of 0.80 using Pearson Product Moment Correlation. Pre-test and post-test scores were administered to determine students' achievement before and after treatment. Data collected were analyzed using mean and standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) was employed to test the hypotheses at the 0.05 level of significance.

## Results

### Presentation of Data

The analysis of the data for the study and the results obtained from the findings were presented according to the research questions and the research hypotheses raised in the study.

### Demographic Data

**Table 1: Distribution of Sample by Group**

| Group        | N   | Percentage |
|--------------|-----|------------|
| Control      | 60  | 50.9%      |
| Experimental | 58  | 49.1%      |
| Total        | 118 | 100%       |

Table 1 shows the distribution of sample by group. There were 118 students sampled in total. 60 students which represent 50.9% of the sample were control group while 58 students which represent 49.1% of the respondent were experimental group.

**Research Question 1:** What is the difference between the mean achievement scores of students taught biology using cooperative learning method and those taught using conventional teaching method in Abuja?

**Table 2: Mean and Standard Deviation of Achievement Scores of Students Taught Biology Using Cooperative Learning Method and Those Taught Using Conventional Teaching Method in Abuja**

| Group           | N  | Mean         | Std. Dev. |
|-----------------|----|--------------|-----------|
| Experimental    | 58 | 55.00        | 3.38      |
| Control         | 60 | 33.07        | 6.69      |
| Mean difference |    | <b>21.93</b> |           |

Table 2 shows that students taught Biology using the Cooperative Learning Method obtained a mean achievement score of 55.00 (SD = 3.38), while those taught using the Conventional Teaching Method obtained a mean score of 33.07 (SD = 6.69). The mean difference of 21.93 indicates that students exposed to the Cooperative Learning Method performed better academically than those taught using the Conventional Teaching Method. The lower standard deviation of the experimental group further suggests that their achievement scores were more consistent [19]. Therefore, the findings imply that the Cooperative Learning Method enhanced students' achievement in Biology more effectively than the Conventional Teaching Method.

**Research Question 2:** Is there any difference between the mean achievement scores of male and female students taught biology using cooperative learning method in Abuja?

**Table 3: Mean and Standard Deviation of Achievement Scores of Male and Female Students Taught Biology Using Cooperative Learning Method in Abuja**

| Group        | Gender          | N  | Mean        | Std. Dev. |
|--------------|-----------------|----|-------------|-----------|
| Experimental | Male            | 28 | 54.71       | 3.04      |
|              | Female          | 30 | 55.27       | 3.69      |
|              | Mean difference |    | <b>0.56</b> |           |

Table 3 reveals that male students taught Biology using the Cooperative Learning Method obtained a mean achievement score of 54.71 (SD = 3.04), while female students obtained a mean achievement score of 55.27 (SD = 3.69). The mean difference of 0.56 in favour of the female students indicates a slight difference in achievement scores between the two genders. However, the difference is

negligible, suggesting that both male and female students benefited similarly from the Cooperative Learning Method.

### Testing of Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

**H<sub>01</sub>:** There is no significant difference between the mean achievement scores of students taught biology using cooperative learning method and those taught using conventional teaching method in Abuja.

**Table 4: ANCOVA Results of Achievement Scores of Students Taught Biology Using Cooperative Learning Method and Those Taught Using Conventional Teaching Method in Abuja**

| Source          | Type III Sum of Squares | df  | Mean Square | F        | Sig.  |
|-----------------|-------------------------|-----|-------------|----------|-------|
| Corrected Model | 16148.316 <sup>a</sup>  | 4   | 4037.079    | 342.244  | 0.000 |
| Intercept       | 2771.628                | 1   | 2771.628    | 234.965  | 0.000 |
| Pretest         | 1896.372                | 1   | 1896.372    | 160.765  | 0.000 |
| Gender          | 1.828                   | 1   | 1.828       | 0.155    | 0.695 |
| Group           | 14670.84                | 1   | 14670.84    | 1243.723 | 0.000 |
| Gender * Group  | 0.105                   | 1   | 0.105       | 0.009    | 0.925 |
| Error           | 1332.938                | 113 | 11.796      |          |       |
| Total           | 244348                  | 118 |             |          |       |
| Corrected Total | 17481.25                | 117 |             |          |       |

**Sig. at  $p \leq 0.05$**

Table 4 presents the ANCOVA results comparing the achievement scores of students taught Biology using the Cooperative Learning Method and those taught using the Conventional Teaching Method while controlling for pretest scores. The analysis revealed a significant main effect of teaching method on students' achievement scores,  $F(1,113) = 1243.723$ ,  $p < .05$ . Since the obtained p-value (0.000) is less than the 0.05 level of significance, the null hypothesis was rejected [20]. This indicates that a significant difference exists between the achievement scores of students taught using the Cooperative Learning Method and those taught using the Conventional Teaching Method. The result further showed that gender had no significant effect on achievement,  $F(1,113) = 0.155$ ,  $p = 0.695$ , and the interaction between gender and teaching method was also not significant,  $F(1,113) = 0.009$ ,  $p = 0.925$ . Therefore, the Cooperative Learning Method significantly improved students' achievement in Biology.

**H<sub>02</sub>:** There is no significant difference between the mean achievement scores of male and female students taught biology using cooperative learning method in Abuja.



**Table 5: ANCOVA Results of Achievement Scores of Male and Female Students Taught Biology Using Cooperative Learning Method in Abuja**

| Source          | Type III Sum of Squares | df | Mean Square | F       | Sig.  |
|-----------------|-------------------------|----|-------------|---------|-------|
| Corrected Model | 331.906 <sup>a</sup>    | 2  | 165.953     | 28.694  | 0.000 |
| Intercept       | 4892.418                | 1  | 4892.418    | 845.922 | 0.000 |
| Pretest         | 327.487                 | 1  | 327.487     | 56.624  | 0.000 |
| Gender          | 1.741                   | 1  | 1.741       | 0.301   | 0.585 |
| Error           | 318.094                 | 55 | 5.784       |         |       |
| Total           | 176100                  | 58 |             |         |       |
| Corrected Total | 650                     | 57 |             |         |       |

**Sig. at  $p \leq 0.05$**

Table 5 presents the ANCOVA results comparing the achievement scores of male and female students taught Biology using the Cooperative Learning Method in Abuja while controlling for pretest scores. The analysis revealed that gender had no significant effect on students' achievement scores,  $F(1,55) = 0.301$ ,  $p = 0.585$ . Since the obtained p-value is greater than the 0.05 level of significance, the null hypothesis four was not rejected. This indicates that there is no significant difference between the achievement scores of male and female students taught Biology using the Cooperative Learning Method [21]. Although female students recorded a slightly higher mean achievement score than male students, the difference was not statistically significant. Therefore, the Cooperative Learning Method was equally effective in improving the achievement of both male and female students in Biology.

### **Discussion of Findings**

The findings of this study revealed that students taught Biology using the Cooperative Learning Method achieved significantly higher mean scores than their counterparts taught using the Conventional Teaching Method. The result further showed a statistically significant difference in achievement in favour of students exposed to cooperative learning, indicating that the method enhanced students' understanding of Biology concepts and improved their academic achievement. The superiority of the Cooperative Learning Method may be attributed to its emphasis on active participation, peer interaction, collaborative problem-solving, and shared responsibility for learning. Through group discussions and knowledge sharing, students were provided with opportunities to clarify misconceptions, explain concepts to peers, and construct understanding collectively, thereby facilitating meaningful learning. This finding is consistent with the propositions of Vygotsky's Social Constructivist Theory, which emphasizes that learning occurs through social interaction and collaborative engagement among learners [22]. The finding also supports Social Interdependence Theory, which posits that positive interdependence among group members promotes cooperation, motivation, and improved academic outcomes. The finding is in agreement with Driessen et al. who reported that cooperative learning significantly improved students' academic performance through enhanced engagement, peer explanation, and collaborative reasoning. The result also corroborates the findings of Santhosh et al. who observed that collaborative instructional approaches improved learners' conceptual understanding and achievement in science-related subjects. Similarly, Öztürk found that cooperative learning exerts a positive influence on students' learning outcomes across different educational levels, while Eslit reported that structured collaboration promotes active participation and academic success. The finding further aligns with the studies of Komala et al. Gillies, and Kyndt et al. all of whom concluded that cooperative learning enhances academic achievement by creating supportive learning environments that encourage interaction and collective responsibility. Therefore, the present finding provides further empirical evidence that Cooperative Learning Method is an effective instructional strategy for improving students' achievement in

Biology.

The findings of the study further revealed that there was no significant difference between the achievement scores of male and female students taught Biology using the Cooperative Learning Method. Although female students obtained a slightly higher mean score than their male counterparts, the difference was not statistically significant, indicating that both genders benefited equally from the instructional approach [23]. This finding suggests that Cooperative Learning Method provides an inclusive learning environment where learners are given equal opportunities to participate, contribute ideas, and engage in academic activities irrespective of gender. The collaborative structure of the method appears to minimize barriers that may otherwise influence achievement differences between male and female students by promoting interaction, peer support, and shared learning experiences. The finding supports the position of Ojelade et al. who argued that girls possess intellectual capabilities comparable to those of boys and can achieve equally well in science when provided with supportive learning environments. The result also agrees with UNESCO (2024), which emphasized that equitable instructional practices contribute significantly to reducing gender disparities in science education [24], [25]. Furthermore, the finding corroborates the submission of Goduje, who reported that learner-centred instructional approaches have the potential to minimize achievement differences between male and female learners. The result is equally consistent with the findings of Johnson et al. who maintained that cooperative learning promotes positive interdependence and equal participation among learners, thereby creating opportunities for all students to succeed academically. Consequently, the finding suggests that Cooperative Learning Method is gender-friendly and capable of enhancing Biology achievement without favouring either male or female students. Overall, the findings of this study demonstrate that Cooperative Learning Method is a highly effective instructional strategy for improving students' achievement in Biology and that its benefits are experienced equally by both male and female learners [26].

### **Summary**

This study investigated the effect of Cooperative Learning Method on secondary school students' achievement in Biology, Federal Capital Territory, Abuja Nigeria. The study specifically examined the difference in achievement between students taught Biology using the Cooperative Learning Method and those taught using the Conventional Teaching Method, as well as the difference in achievement between male and female students exposed to the Cooperative Learning Method. A quasi-experimental pre-test, post-test, non-randomized control group design was adopted. Data were collected using the Biology Achievement Test (BAT) and analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA). The findings revealed that students taught Biology using the Cooperative Learning Method achieved significantly higher than those taught using the Conventional Teaching Method. The findings further showed that there was no significant difference between the achievement scores of male and female students taught using the Cooperative Learning Method. The study therefore established that Cooperative Learning Method is an effective instructional strategy for improving students' achievement in Biology irrespective of gender.

### **Conclusion and Recommendations**

Based on the findings of the study, it was concluded that Cooperative Learning Method significantly enhances students' achievement in Biology more than the Conventional Teaching Method. The method promotes active participation, collaborative learning, peer interaction, and meaningful engagement with instructional content, which collectively contribute to improved learning outcomes. The study also concluded that Cooperative Learning Method provides equal learning opportunities for both male and female students, as gender did not significantly influence achievement under the instructional approach. Therefore, Cooperative Learning Method is an effective and gender-inclusive instructional strategy for improving Biology achievement among secondary school students in the Federal Capital Territory, Abuja.

Based on the findings and conclusions of this study, the following recommendations were made:

Biology teachers should adopt the Cooperative Learning Method in classroom instruction to enhance

students' achievement and understanding of Biology concepts.

School administrators should encourage and support the use of cooperative learning strategies through regular classroom supervision and instructional monitoring.

Biology teachers should provide equal opportunities for participation during cooperative learning activities to sustain the gender-friendly nature of the instructional approach by the students.

#### Educational Implications of the Study

The findings of this study have important implications for Biology education, classroom practice, and educational policy. The demonstrated effectiveness of Cooperative Learning Method suggests that learner-centred instructional approaches can significantly improve students' academic achievement in Biology. The study provides empirical evidence that active engagement and collaboration among learners enhance understanding and retention of scientific concepts. The finding that gender did not significantly influence achievement implies that Cooperative Learning Method can serve as an inclusive instructional strategy capable of promoting equity in science education. The study also highlights the need for continuous professional development programmes that will equip teachers with the knowledge and skills required to effectively implement cooperative learning in Biology classrooms. Furthermore, the findings support ongoing efforts aimed at improving science education through innovative pedagogical practices that foster meaningful learning experiences.

#### Suggestions for Further Studies

Similar studies should be conducted in other science subjects such as Chemistry and Physics to determine whether the effectiveness of Cooperative Learning Method extends across different science disciplines.

Future researchers should replicate the study in other states and geopolitical zones of Nigeria to enhance the generalizability of the findings.

Further studies should investigate the effect of Cooperative Learning Method on other learning outcomes such as retention, attitude, motivation, and interest in Biology.

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