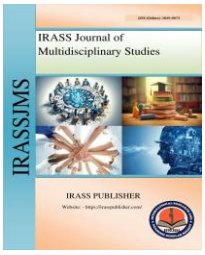
IRASS Journal of Multidisciplinary Studies
Abbriviate Title- IRASS J Mul Stud
ISSN *(Online) 3049-0073*
https://irasspublisher.com/journal-details/IRASSJMS
Vol-2, Iss-4 (April-2025)



COMPARATIVE EFFECT OF INDIVIDUALISED AND COOPERATIVE LEARNING STRATEGIES ON SECONDARY SCHOOL STUDENTS INTEREST IN MATHEMATICS

Ikegbunam Benedette Ifeoma[1]*, Okafor Chinyere Francisca[2], Nnorom Nneka Rita[3]

[*1-2-3] Science Education Department, Faculty of Education Chukwuemeka Odumegwu Ojukwu University, Igbariam

Corresponding Author Ikegbunam Benedette Ifeoma

Science Education Department, Faculty of Education Chukwuemeka Odumegwu Ojukwu University, Igbariam

Article History

Received: 29 / 03 / 2025

Accepted: 20 / 04 / 2025

Published: 24 / 04 /2025

Abstract: The investigation explored the comparative effects of individualised and cooperative learning strategies on secondary school students' interest in Mathematics, focusing on topics such as Venn diagrams, union sets, intersection sets, empty sets, and measures of central tendency. It formulated two hypotheses and research questions directed the investigation. The study was carried out in Anambra State's Awka Education Zone using a quasi-experimental approach with targeted population of 8,583 SS II Mathematics students from 65 co-educational secondary schools. Six schools were randomly selected, resulting in a sample of 270 students (100 males and 170 females). Data was collected using the Mathematics Interest Inventory (MII), structured from Surya and Arty's Chemistry Attitude and Interest Questionnaire Scale (2020). The MII underwent face and content validation, achieving a reliability coefficient of 0.73 through Cronbach's alpha. Analysis of Covariance (ANCOVA) assessed the hypotheses at a 0.05 significant level, whereas mean and standard deviation analyses addressed the study issues. The findings indicated that cooperative strategies enhance interest, though no significant difference was observed. Individualised learning produced higher interest among males, while females showed more engagement with cooperative methods. The study recommended government support for teacher training in individualised strategies and the promotion of cooperative learning in the curriculum to improve interest in Mathematics, leading to conclusions and educational implications for teaching practices.

Keywords: Mathematics, Interest, Individualised Learning and Cooperative Learning.

How to Cite: Ifeoma, I. B., Francisca, O. C., Rita, N. N., (2025). COMPARATIVE EFFECT OF INDIVIDUALISED AND COOPERATIVE LEARNING STRATEGIES ON SECONDARY SCHOOL STUDENTS INTEREST IN MATHEMATICS. *IRASS Journal of Multidisciplinary Studies, 2(4),26-31.*.

Introduction

Mathematics is an essential cornerstone of human development and progress. Its significance extends beyond mere calculations; it is a language that helps us understand and interpret the world around us. Numerous disciplines, including science, engineering, economics, and more and technology depend heavily on Mathematics which enabling advancements that improve our quality of life. More so, in science, Mathematics provides the frameworks and tools necessary to model natural phenomena, conduct experiments, and analyze data. This relationship has led to groundbreaking discoveries in physics, chemistry, and biology. In engineering, mathematical principles are vital for designing structures, systems, and technologies, ensuring safety and efficiency in construction and manufacturing (Okafor & Nwosu 2021).

Mathematics applications also contribute to technological advancements, economic stability, and the development of essential skills that empower individuals and societies alike. However, in spite of all of this vital role Mathematics to humanity, students' are reported to be experiencing weaknesses in some major concepts of the subject in the West African Examination Council (WAEC) organized examination.

The WAEC Chief Examiners' reports from 2017 to 2023 highlight persistent weaknesses among students in Mathematics across various areas. Key issues noted in 2017 included difficulties in logarithmic expressions, circle theorems, measures of central tendency, translating word problems into mathematics, geometry involving cyclic quadrilaterals, and solving quadratic equations. Reports from 2018 echoed similar concerns, emphasizing challenges with trigonometric expressions, probability, integration, and vector angles. In 2019, weaknesses in circle areas, trigonometry, and angles of elevation were noted. The 2020 report reiterated issues with trigonometric simplification, probability, and circle theorems. By 2021 and 2022, weaknesses in sector and segment problems, angle measurements, and Venn diagrams emerged. The most recent report in 2023 confirmed ongoing difficulties in circles, measures of central tendency, and geometric constructions. A consistent pattern indicates students struggle particularly with set theories, Venn diagrams, and various aspects of circle Mathematics across the years.

Obikezie et. al. (2023a) asserted that weaknesses in secondary school students' understanding of most science subject including most Mathematics concept is as result of insufficient foundational knowledge, ineffective teaching methods, lack of practice, and anxiety during examinations. While Soni (2020) noted that the weaknesses of students in Mathematics concepts of set theorem, venn diagram, union, interception, empty set and circle theorem could be as a result of factors like inappropriate use of students' learning style, teaching style, environmental factor and lack of material in teaching and learning the subject. The author further opined that students' learning style is an essential factor in learning every aspect of Mathematics. Moreover, Xing (2023) maintained that students' learning style speaks on the understanding that every student learns differently. Xing (2023) further averred that this is known as individual learning style. In technical terms, individual's preferred method of absorbing, understanding, and remembering knowledge is referred to as their learning style. Moser and Kimberly (2023) asserted that there are many examples of individualised learning style which includes: visual, aural, tactile, kinesthetic, sequential, concurrent, conversational, interactive, logical and introspective, direct, indirect, individualised learning style, cooperative learning and rhythmic/melodic. In this study, attention was focused on the comparative effect of individaulised and cooperative learning styles of students' interest.

Students' interest in learning science subjects is critical for fostering engagement and academic success. Utilizing individualised and cooperative learning strategies can significantly enhance this interest and motivation. Individualised learning tailors educational experiences to meet each student's unique needs, interests, and learning styles. By allowing students to explore topics that resonate with them personally, educators can create a more compelling and relevant learning environment. This is to say that individialised learning strategy accommodates varying paces, helping learners grasp complex concepts without feeling overwhelmed (Obikezie et. al., 2023a). While on the other hand, cooperative learning emphasizes collaboration among students, promoting teamwork and communication skills. Engaging in group projects and discussions fosters a sense of community and support, making students feel connected to their peers. This social interaction can increase enthusiasm for science subjects, as students are encouraged to share ideas, challenge each other, and learn collectively (Obikezie et. al., 2023b).

Combining these strategies may create a dynamic learning environment that caters to individual preferences while promoting collaboration. For example, in a science classroom, students could choose specific experiments or research topics to pursue individually while working in groups to present their findings. This dual strategies may not only enhances understanding but also cultivates a classroom culture where students feel empowered and invested in their learning. Ultimately, implementing individualised and cooperative learning strategies can significantly boost students' achievement in science and Mathematics which result to increase in individual interest (Ikegbunam et al., 2025). No wonder authors like Edekor and Agbornu (2020) reported that students have interest more in the use of cooperative learning approach regardless of their degree of proficiency compared to those pupils who were instructed using the other learning methods like traditional learning method and individualised learning method.

While some studies observed that individualised learning strategy developed students' interest in science and in calculation subjects (Dawal, 2021; Nela et. al., 2018). But Ferhat and Mehmet (2016) revealed that there were no notable distinctions between the two learning groups of innovative strategy in terms of the pretest and posttest. Moreover, Iluobe and Garba (2022) observed that among others that individualized instructional strategy is effective over lecture method on male and female NCE Chemistry students' acquisition of process skills but no significant difference in interest when compared with other learning strategy.

In terms of gender, Dawal (2021) revealed that the mean scores for females in interest are higher than that of the males in the use of individualised learning strategy while Edekor and Agbornu (2020) confirmed that female students' develop more interest than their male counterpart in the use of cooperative learning strategy in learning science and calculative concept in secondary school learning environment. Additionally, some study show that female students have different cognitive strategies and levels of interest, which may affect how they approach individualized learning in science subjects (Uboh & Inyang, 2022). However, Udu (2020) reported no significant difference in the mean interest scores of male and female students taught Organic Chemistry using individualized learning strategy and those taught using cooperative learning strategy.

The persistent weaknesses in senior secondary school Mathematics, as indicated by WAEC Chief Examiners from 2017 to 2023, highlight a critical need for innovative instructional strategies to enhance student engagement and achievement. Despite various teaching methods, students continue to struggle with fundamental concepts in geometry, trigonometry, and measures of central tendency, which can lower their interest in the subject. Given that students' interest is foundational for academic success, this study investigated the comparative effects of individualised and cooperative learning strategies on secondary school students' interest in Mathematics. Individualised learning personalizes educational experiences, while cooperative learning fosters collaboration and community. By exploring how these strategies can be effectively combined, the study aims to determine their impact on enhancing students' interest and understanding in Mathematics, ultimately addressing the gaps identified in the reports and promoting better educational outcomes in a subject essential for academic and career advancement.

The Research Goal

This study's primary goal was to compare the effects of cooperative and individualised learning styles on secondary school students' interest in mathematics.

In particular, the research determined the

- Mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.
- Mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.

Questions for Research

The study was directed by the following research questions:

- What is the mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy?
- What is the mean interest scores of male and female students taught Mathematics using individualised

learning strategy and those taught using cooperative learning strategy?

Hypotheses

The following null hypotheses were examined at the significance level of 0.05.

- There is no significant difference in the mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.
- There is no significant difference in the mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.

Results

Research Question 1

What are the average interest scores of children who get mathematics instruction using individualized and cooperative learning strategies?

Table 1: Mean and Standard Deviation Interest Scores for Students Taught Cooperative Learning Strategy (CLS) and Individualised Learning Strategy (ILS) in Mathematics

		Pre-interest		Post-interest		
Groups	N	Mean	SD	Mean	SD	Mean Gain
ILS	150	30.13	7.88	96.79	14.87	66.66
CLS	120	15.50	2.34	99.90	11.30	84.40

The results from the table above indicate that students taught Mathematics using individualised learning strategy (ILS) had pre- and post-interest mean scores of 30.13 and 96.79, respectively, while those taught with cooperative learning strategy had scores of 15.50 and 99.90. The standard deviations for post-interest scores were higher than pre-interest for both groups, indicating greater variability afterward. Both strategies improved students' interest in Mathematics, with cooperative learning showing a higher post-interest mean score than ILS. Specifically, students using cooperative learning had a mean gain interest score of 84.40 compared to 66.66 for ILS, highlighting an interest difference of 17.74 in favour of cooperative learning. Thus, cooperative learning proved more effective in fostering interest in Mathematics concepts.

Research Question 2

How much interest do male and female students who are taught mathematics utilizing individualized and cooperative learning strategies have on average?

Table 2: Interest Scores, Mean and Standard Deviation, of Male and Female Students Taught with Cooperative Learning Strategy (CLS) and Individualised Learning Strategy (ILS)

			Pre-interest		Post-interest		
Groups	Gender	N	Mean	SD	Mean	SD	Mean Gain
ILS	Male	50	33.36	10.39	99.90	14.59	66.54
	Female	100	28.51	5.66	95.23	14.83	66.72
CLS	Male	50	15.56	2.04	99.62	11.58	84.06
	Female	70	15.44	2.55	100.10	11.18	84.66

Table 2 presents the mean and standard deviation interest scores of male and female students taught Mathematics through individualised learning strategy (ILS) and cooperative learning strategy (CLS). For male students using ILS, the pre- and post-interest mean scores were 33.36 and 99.90, with standard deviations of 10.39 and 14.59, resulting in a mean gain of 66.54. Female students in ILS had pre- and post-interest scores of 28.51 and 95.23, with standard deviations of 5.66 and 14.82, leading to a mean gain of 66.72. Though male students showed slightly higher post-interest mean scores, the mean gain difference was just 0.18 in favor of males.

In contrast, male students using CLS had pre- and post-interest means of 15.56 and 99.62 (mean gain of 84.06), while females scored 15.44 and 100.10 (mean gain of 84.66). Female students excelled in CLS, with a mean gain difference of 0.60 favoring females.

When comparing the strategies by gender, female students in CLS showed the highest interest with a post-interest mean score of 100.10. They were followed by male students in ILS (99.90), male students in CLS (99.62), and female students in ILS (95.32).

Hypothesis 1

There is no significant difference in the mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.

Table 3: Analysis of Covariance (ANCOVA) of Students' Mean Interest Scores Between Two Learning Strategies ILS and CLS in Mathematics

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Decision
Corrected Model	70.069a	1	70.069	.385		
Intercept	369236.286	1	369236.286	2031349		
Leaning Strategies	70.069	1	70.069	.385	0.535	NS
Error	48714.094	268	181.769			
Total	2650888.000	270				
Corrected Total	48784.163	269				

According to the results in Table 3, there is no discernible difference between the mean interest scores of students who were taught mathematics using a cooperative learning technique and those who were taught it individually (F(1,70.069) =.385, p = 0.535). The null hypothesis, according to which there is no significant difference in the mean interest scores of students taught mathematics using individualized learning strategies and those taught using cooperative learning strategies, is upheld because the obtained p-value is greater than the predetermined 0.05 level of significance. This suggests that there is no discernible difference in the mean interest scores of students taught mathematical concepts through individualized and cooperative learning strategies in this study.

This implies that there is no significant difference in the mean interest scores of students taught Mathematics using individualized learning strategy and those taught using cooperative learning strategy.

Hypothesis 2

There is no significant difference in the mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.

Table 4: The ANCOVA Results of Male and Female Students Interest Scores when Taught with Two Leaning Strategies of ILS and CLS in Mathematics.

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Decision
Corrected Model	557.843[a]	1	557.843[a]	3.100		
Intercept	173649.151	1	173649.151	964.991		
Leaning Strategies	557.843	1	557.843	3.100	0.079	NS
Error	48226.320	268	179.949			
Total	2650888.000	270				
Corrected Total	48784.163	269				

The result in Table 4 show that there is no significant difference in the mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy, F(1,557.843) =3.100, *p*=0.079. Since the obtained p-value is higher than the stipulate 0 .05 level of significance, the null hypothesis which stated that there is no significant difference in the mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy is uphold. This implies that the mean interest score of male and female students taught Mathematics concepts using individualised and cooperative learning strategy has no significant difference in mean interest scores in respect to the study. That is to say that there is no significant difference in the mean interest scores of male and female students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy.

Discussion of Findings

The discussion of findings was organized under the following**:**

- Enhancing Students' interest in Mathematics through use of individualised learning strategy and cooperative learning strategy.
- Students gender evaluation in Mathematics through the use of individualised learning strategy and cooperative learning strategy.

Enhancing Students' interest in Mathematics through use of individualised learning strategy and cooperative learning strategy

The findings of the study showed that students taught Mathematics with cooperative learning strategy develop interest more than those taught with individualised learning strategy. This is in line with Edekor and Agbornu (2020) who confirmed in their study that students have interest more in the use of cooperative learning strategy irrespective of their ability level than those students who were taught using the other learning methods like traditional learning method and individualised learning method. But the finding is not in line with group of researchers who observed that individualised learning strategy developed students' interest in science and calculate subjects (Dawal, 2021; Nela et. al., 2018). The outcome of the study where students taught Mathematics with cooperative learning strategy develop interest more than those taught with individualised learning strategy could be as a result that cooperative learning strategy promote a collaborative environment that can lead to higher interest and achievement which foster stronger relationships among students.

More so, this study observed no significant difference in the mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy. This is in accordance with Ferhat and Mehmet (2016) who revealed that no significant differences were found between two learning groups in terms of the pretest and posttest. The result of the finding is also in surpport with Iluobe and Garba (2022) findings who observed that among others that individualised instructional strategy is effective over lecture method on NCE Chemistry students' acquisition of process skills but no significant difference in interest when compared with other learning strategy. There is no significant difference in the mean interest scores of students taught Mathematics using individualised learning strategy and those taught using cooperative learning strategy. This could be that both individualised instructional strategy (IIS) and cooperative learning instructional strategy (CLIS) aim to enhance students' engagement and motivation by catering to different students' needs and learning preferences. Each strategy encourages active participation; IIS allows students to learn at their own pace and focus on their interests, while CLIS promotes collaboration among peers, which can also align with their interests. Both strategies are designed to foster a supportive learning environment that respects individual students' interests and encourages success. Because of this study, it has joined the body of evidence that claims there is no discernible difference between students who are taught mathematics using individualised learning strategies and those who are taught using cooperative learning strategies in terms of their mean interest scores.

Students gender evaluation in Mathematics through the use of individualised learning strategy and cooperative learning strategy.

The findings of the study showed that male students developed more interest than female students taught Mathematics with individualised learning strategy while female students developed more interest than male students taught Mathematics with cooperative learning strategy. This is not in line with Dawal (2021) who revealed that the mean scores for females in interest are higher than that of the males in the use of individualised learning strategy but in line with Edekor and Agbornu (2020) who confirmed that female students' develop more interest than their male counterpart in the use of cooperative learning strategy in learning science and calculative concept in secondary school learning environment. The finding that male students developed more interest than their female counterpart in use of individualised learning strategy in Mathematics could be linked to various factors, including societal influences, confidence levels, and cognitive strategies. Studies suggest that gender effects exist in learning Mathematics, with males potentially exhibiting greater engagement due to cultural expectations or prior experiences that foster confidence in mathematical abilities. Furthermore, women have demonstrated varying levels of motivation and cognitive techniques, which could influence how they approach individualized learning in this field (Uboh & Inyang, 2022). Additionally, the fact that female students showed greater interest in mathematics than male students did when taught using a cooperative learning approach may be explained by the increased engagement, self-worth, and confidence that cooperative learning environments promote. These environments encourage teamwork and assistance, which can be especially helpful for female students and result in a more satisfying learning experience for the secondary school mathematics ideas they study.

Furthermore, the study's findings revealed no discernible difference in the mean interest levels of male and female students who received mathematics instruction utilizing individualized and cooperative learning strategies. This is in line with Udu (2020), who found no discernible difference between the mean interest scores of male and female students who were taught organic chemistry utilizing a cooperative learning approach and those who were taught it alone. Since there was no appreciable difference in the mean interest scores of male and female students taught mathematics using individualized learning strategies and those taught using cooperative learning strategies, it is possible that both learning strategies effectively engage students, leading to comparable levels of interest regardless of gender. Furthermore, it can be because of the educational environment in the study's sample schools, where factors like curriculum relevance, teacher efficacy, and student support networks could be crucial in maintaining interest across genders. Significant variations in interest scores may also be lessened by personal learning preferences and prior mathematical experiences. This study has joined the body of research that found no discernible difference between male and female students who were taught Mathematics using individualised learning strategies and those who were taught the subject through cooperative learning strategies in terms of their mean interest scores.

In conclusion

The following deductions were made in light of the study's results:

The study compares individualised learning strategies to cooperative learning strategies in Mathematics, revealing notable findings on student interest. Cooperative learning enhances students' interest more effectively than individualised learning, there is no significant difference in interest levels between the two teaching strategies.

Individualised learning particularly benefits male students in terms of interest whereas cooperative learning proves more effective for female students in these areas. However, there are no significant differences in interest when comparing male and female students within either learning strategy.

Recommendations

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

- Educators should receive training in these methods, but elements of cooperative learning should also be integrated to maintain student interest.
- Targeted interventions are needed to support female students, such as mentorship programs and relevant contexts for learning. Creating mixed-gender collaborative projects can engage all students. Regular assessments should monitor the effectiveness of different strategies by gender to inform teaching practices.
- Incorporating technology for personalized experiences can enhance engagement. Additionally, teacher training on differentiation and gender dynamics is essential. Future research should explore how gender interacts with teaching methods to create a balanced educational environment.

References

1 Dawal, B. S. (2021). Effects of individualized instructional strategy (iis) on the achievement and interest of students in basic science and technology in a covid-19 preventive classroom management in Plateau state. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*, 3(2), 109-120.

2 Edekor, L.K., & Agbornu, S. (2020). Coopeartive learning strategy and students' performance in mathematics in junior high school hohoe municipality. *Ghana American Journal of Education Research*, 8(9), 693-697.

3 Ferhat, B & Mehmet, G. (2016). The effect of individualized instruction system on the academic achievement and interest scores of students. *Hindawi Publishing Corporation Education Research International, 2(1), 12-19.* http://dx.doi.org/10.1155/2016/7392125

4 Ikegbunam, B. I., Okafor, C. F., & Nnorom, N. R. (2025) Comparative effect of individualised and cooperative learning strategies on secondary school students' achievement in mathematics. Unizik Journal of STM Education, 8(1), 122-140. https://journals.unizik.edu.ng/jstme/article/view/5893/4892

5 Iluobe, M. M., & Garba, A. M. (2022). Effects of individualized instructional strategy on nce chemistry students' acquisition of process skills and interest in qualitative chemical analysis. *International Journal of Innovative Social & Science Education Research*, 10(3), 85-93.

6 Moser, T. S., & Kimberly, W (2023). Effects of learning styles on academic achievement in a middle school science classroom. *American Journal of Educational Research*, 11(1), 1-6.

7 Nela, T. M., Vesna, S. Z., & Jelena, V. M. (2018). Models of individualised instruction and possibilities for their application in initial mathematics teaching-teacher perception. *International Journal of Humanities and Social Science, 8(7), 13-25.*

8 Obikezie, M. C., Ezeliorah, B. A., & Okafor, T. U. (2023a). Effect of generative learning model on secondary school students' academic achievement in chemistry. *UNIZIK Journal of Educational Research and Policy Studies*, 15 (3), 45-55.

9 Obikezie, M. C., Nwuba, S. I., & Ibe, F. N. (2023b). Influence of school location and gender on generative learning model on secondary school students' academic achievement in chemistry. *Journal of Educational Research*, 2(1), 51-59. https://doi.org/10.56773/ejer.v2i1.16

10 Okafor, C. F., & Nwosu, C. E (2021). Effect of jigsaw teaching strategy on senior secondary school students' achievement in mathematics in Onitsha education zone of Anambra state. *Chukwuemeka Odumegwu University Journal of Education & Allied Discipline*, 3(1), 11-22.

11 Soni, S. (2020). A study on relationship between mental ability and academic achievement of students. *International Journal of Reseer and Analytical Review*, 7(2), 369 – 374.

12 Uboh, D. E & Inyang, F. N. (2022). Effects of individualized and cooperative learning strategies on students' achievement in physics among public secondary schools in mkpat enin local government area of Akwa Ibom State, Nigeria. *Journal of Research in Education and Society*, 13(2), 57-69.

13 Udu, D. A. (2020). Comparative effects of individualised and cooperative learning instructional strategies on senior secondary school students' academic achievement in organic chemistry. *Electronic Journal of Science Education*, 22 (2), 12-31.

14 WAEC. (2022). *Chief Examiner's Report, 2017, 2018, 2019, 2020, 2021*, 2022 and 2023. www.waec.online.org.Ng/E-learning/Biology/Domain.

15 Xing, B. Y. (2023). A review of research on learning style. Open Journal of Modern Linguistics, 13(2), 263-275. https://doi.org/10.4236/ojml.2023.132016.