PLASU Journal of Educational Research (PLASUJER) Vol. 1, No. 2, 2025
A Publication of the Faculty of Education, Plateau State University, Bokkos – Nigeria
ISSN: 3121-9624 https://journals.plasu.edu.ng

EFFECT OF COOPERATIVE LEARNING STRATEGY ON STUDENTS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN PUBLIC SENIOR SECONDARY SCHOOLS IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA

Orisakwe Benedict Emeka
orisakwebenedictemeka@gmail.com
08133229285
Department of Educational Foundation, University of Jos, Plateau State

ABSTRACT

The study investigated the effects of cooperative learning on mathematics academic achievement of Senior Secondary One (SS1) students in Jos North Local Government Area of Plateau State, Nigeria. A quasi-experimental research design, particularly the pretest-posttest control group design was adopted for the study. Two schools were selected using simple random sampling technique. One hundred and twenty students (60 each in both experimental and control groups) were used for the study. A Mathematics Achievement Test (MAT) was used for data collection in the study. The experimental group was exposed to cooperative learning, while the control group was taught using lecture method. Two research questions were raised and two hypotheses were formulated for the study. Means and standard deviation were used to answer research questions while t-test was utilized in testing the hypotheses at 0.05 level of significance. The findings of the study revealed that the experimental group recorded significant improvement in their posttest mathematics mean score compared to the control group. The posttest mean score of male students was higher than their female counterparts. The study recommended that teachers should integrate cooperative learning in mathematics instruction to promote collaboration and enhance students' achievement in mathematics. The Plateau State Ministry of Education should organize training on cooperative learning for teachers to equip them on how to integrate cooperative learning in the classroom.

Keywords: Cooperative Learning Strategy, Mathematics Achievement, Public Secondary Schools.

INTRODUCTION

Mathematics plays a vital role in personal, national and global development. It is a compulsory subject taught at the primary and secondary levels of the Nigeria education system. Its relevance cuts across day-to-day activities, daily business transactions, jobs, to scientific disciplines such as physics, chemistry, engineering, architecture, data science, and medicine. Mathematics is one subject essential for technological growth and advancement as one of the Science, Technology, Engineering and Mathematics (STEM) course. Onoshakpokaiye and Aywiri (2025) posit that STEM education, especially mathematics is essential for economic growth and sustainable development in developing countries because it plays important role in cultivating critical thinking and innovation. In Nigeria, a credit pass in mathematics in the Senior Secondary Certificate Examination (SSCE) is an entry requirement for admission into tertiary institutions (Federal Republic of Nigeria, 2013). Despite the relevance of mathematics, students' achievement in the subject is poor particularly in public secondary schools and several studies have reported a consistently poor achievement in mathematics among secondary school students.

Also, the academic achievement of secondary school students in Mathematics in Plateau State remains unsatisfactory and studies have attributed this challenge to several factors, such as the use of ineffective teaching and learning strategies, poor assessment methods, students' anxiety towards mathematics, negative attitude towards mathematics from both students and teachers, as well as gender-related differences. The method used by mathematic teachers in the teaching and learning of mathematics has been reported to affect students' achievement in mathematics (Abiodun 2024). While there are teacher-dominated methods, there are also learner-friendly methods. The use of learner-friendly methods has been discovered to improve students' achievement more than conventional teaching methods. Some of these learner-friendly methods are: problem-based learning, inquiry-based learning, problem-solving, interactive learning and cooperative learning. Cooperative Learning is a teaching method in which students work together in small groups on structured activities, with individuals' accountability and group assessment (Johnson, Johnson, & Smith, 2014). It requires learners to solve tasks in groups while the teacher guides them. In using cooperative learning method, the teacher serves as a facilitator while the students are responsible for solving tasks presented by the teacher, and members of the group are

encouraged to work hard collectively as a team. The aim is to promote active learning, self-regulation, collaboration and the development of critical thinking skills in the learners

Cooperative Learning is anchored on Jerome Bruner's Constructivism Theory of 1966. The theory states that learning is a functioning process where learners build ground-breaking thoughts and ideas based on their current and past knowledge. Cooperative learning strategy is in tandem with the constructivism view that students gain their own knowledge by making meaning via interaction and engagement with the learning tasks through critical thinking, inquiry and collaboration. Studies have shown that cooperative learning is effective in raising academic outcomes. Siller & Ahmad (2024) reported that cooperative learning helps improve problem-solving and cognitive abilities in students compared to traditional method. Also, Klang et al. (2021) observed that cooperative learning improved students mathematical problem-solving, with peer acceptance and friendships playing a role through discussions and critical thinking. Again, Tinungki et al. (2024) found that there was a substantial increase in problem-solving ability, communication skills, and self-proficiency of students exposed to cooperative learning compared to those taught with traditional method. Thus, the use of cooperative learning through collaborative interaction helps improve students' understanding and mastery of mathematical concepts.

Gender is another variable that has been found to influence students' achievement in school subjects including mathematics. Gender refers to the biological state of an individual being male or female and sex roles. The role of gender in influencing students' academic achievement cannot be underemphasized. Karadag, Agritas and Pulur (2018) opined that gender difference is an important issue which play vital roles in education and has link to achievement and participation in certain school subjects and courses. Studies have revealed that gender affect students' achievement although the findings have been inconsistent. For example, Hossain and Tarmizi (2012) found that students exposed to group learning outperformed the conventional students in their mathematics achievement, and that the performance of female students were significantly better than that of males after group learning treatment. Similarly, Awofala et al. (2020) found that male students outperformed their female counterparts in Mathematics, indicating a statistically significant gender difference. In contrast, Prieto-Saborit et al (2021) reported that students' grade in mathematics improved through higher implementation of cooperative learning for both genders. However, highlighting that cooperative learning reduced gender differences in the learning of Mathematics. Also, Fatade et al. (2019) observed no significant gender differences when student-

centered instructional approaches were employed. Similarly, Di Tommaso (2024) showed that the use of cooperative learning reduced students' mathematics gender gap by about 40%. Therefore, highlighting that carefully designed cooperative learning interventions can preferentially help underperforming groups and therefore enhance gender equity. Considering these inconsistencies, the present study seeks to examine whether gender will significantly affect students' achievement in Mathematics exposed to cooperative learning strategy. Specifically, the study aims to investigate the effect of cooperative learning strategy on mathematics' academic achievement of public secondary school students in Jos North Local Government Area of Plateau State, Nigeria.

The following research questions were raised for the study.

1. What is the mathematics achievement mean scores of the SS1 students before and after exposure to cooperative learning?
2. What is the mathematics achievement mean scores of male and female SS1 students after exposure to cooperative learning?

The following hypotheses were formulated for the study and tested at 0.05 level of significance.

1. There is no significant difference between the mathematics mean scores of the SS1 students before and after exposure to cooperative learning.
2. The mathematics achievement means scores of male and female SS1 students do not differ significantly after exposure to cooperative learning.

METHOD

The study adopted a quasi-experimental research design, specifically the pretest-posttest control group design. The quasi-experimental design is useful when it is not possible to engage in random assignment of subjects to experimental and control groups but to make use intact classes. It involves using intact classes without interference with the normal school arrangement. The population of the study comprised all the SS1 students in all 21 public secondary schools in Jos North LGA. The simple random sampling technique was used to select two public secondary schools out of the 21 public secondary school in Jos North LGA for the research. A sample of 122 students, consisting of 63 students in the experimental group and 59 students in the control group, was used in the study.

The instrument used for data collection was a Mathematics Achievement Test (MAT). The MAT was developed using a table of specifications to ensure adequate allocation of items to each topic of the mathematics contents used in the study. Items in the MAT were structured to cover the

six levels of the revised Bloom (2001) taxonomy of educational objectives. Two experts, one from the Mathematics Education Department, Federal University of Education, Pankshin and one expert from Research, Measurement and Evaluation (RME), department of Educational Foundations, University of Jos scrutinized the items of the MAT for clarity, comprehensiveness and precision. The Cronbach's alpha method was utilized to estimate the reliability of internal consistency of the instrument. A pilot test was conducted with a sample of 40 SS1 students, and reliability coefficient of 0.84 and 0.85 were obtained for the objective and essay sections of the MAT respectively.

The MAT was administered as pre-test to the experimental and control groups after which the experimental group was exposed to the mathematics contents using cooperative learning while the control group was taught the same mathematics content using lecture method. The MAT was then administered again to both groups as posttests. Mean and standard deviation were used to answer the research questions while t-test for independent samples was used in testing the hypotheses at 0.05 level of significance.

RESULTS

The results of the analysis of the data collected for the study are presented below:

Table 1: Pretest and Posttest Mathematics Achievement Mean Score of SS1 Students

Groups	**N**	**Pre-test**		**Post-test**		**Mean Gain**
		Mean	**SD**	**Mean**	**SD**	
Experimental	63	30.06	6.64	50.48	10.06	20.42
Control	59	29.05	6.50	45.35	9.41	16.30

Table 1 reveals that the experimental group's pretest mean was 30.06 (SD = 6.64), and that of the control group was 29.05 (SD = 6.50). The posttest means were 50.48 (SD = 10.06) for the experimental group and 45.35 (SD = 9.41) for the control group, with mean gains of 20.42 and 16.30, respectively, this indicates that students in the two groups performed poorly in mathematics before exposure to treatment however, students exposed to cooperative learning in the experimental group performed better in Mathematics than their counter parts in the control after exposure to treatment.

Table 2: Mathematics Achievement Mean Scores of Male and Female SS1 Students after Exposure to Treatment

Gender	N	Mean	SD	Mean Diff.	Remark
Male	32	50.48	6.76		
				6.13	Mean scores Differed
Female	30	44.35	8.33		

Table 2 shows that the posttest achievement mean scores after exposure to treatment were 50.48 (SD = 6.76) for males and 44.35 (SD = 8.33) for females, with a mean difference of 6.13. This shows that the male students outperformed the female students when exposed to cooperative learning. It can then be concluded that the mean scores in mathematics of male and female students differed.

Table 3: Summary of t-test Analysis for Significant Difference between Mathematics Achievement Mean Scores of the Experimental and Control Groups Before and After Exposure to Treatment

Groups	Type of Test	N	Mean	SD	Df	T	P-value	Decision
Experimental	Pretest	63	30.06	6.64	120	0.842	0.402	**Not Sig**.
Control	Pretest	59	29.05	6.50				
Experimental	Posttest	63	50.48	10.06	120	2.885	0.004	**Sig**.
Control	Posttest	59	45.35	9.41				

$P_1 > 0.05$, $P_2 < 0.05$

Table 3 showed that the p-value (0.402) is greater than the 0.05 level of significance at a degree of freedom of 120, hence the null hypothesis is retained. This reveals that there is no

significant difference between the mathematics achievement mean scores of students in experimental and control groups before their exposure to cooperative learning. Also, the p-value (0.004) is less than the 0.05 level of significance with a degree of freedom of 120, hence the alternative hypothesis is upheld. This indicates that the mathematics achievement mean scores of SS1 students in the experimental and control groups differ significantly after exposure to cooperative learning.

Table 4: Summary of t-test Analysis for Difference between the Mathematics Achievement Mean Scores of Male and Female Students after their Exposure to Treatment

Gender	N	Mean	SD	Df	t	Pvalue	Decision
Male	**32**	50.48	6.76		3.130	0.002	Sig
				60			
Female	**30**	44.35	8.33				

P > 0.05

Table 4 shows that the p-value (0.002) is less than the 0.05 level of significance with a degree of freedom of 60, hence the null hypothesis is rejected. This reveals that there is a significant difference between the mathematics scores of male and female SS1 students after their exposure to treatment.

DISCUSSION

The findings of the study revealed that secondary school students' mathematics achievement before exposure to cooperative learning was poor. However, it was found that students in the experimental group who were exposed to cooperative learning had higher mathematics mean scores than those not exposed to the treatment, indicating that cooperative learning helped in improving students' mathematics achievement in the experimental group when compared to their counterparts in the control group. However, exposure to treatment enabled the male students to perform better in the mathematics achievement test than their female counterparts indicating a significant gender difference in students' achievement in mathematics. This finding aligns with Ezeanyi, Fidel-Imoisili and Sowunmi (2021), who investigated the effect of cooperative learning strategy on senior secondary school students' academic performance in mathematics in Anambra state, Nigeria and found that senior secondary school students performed better when taught

Mathematics concepts using cooperative learning instructional strategy. Also, the findings of the study align with Kolawole (2008) who investigated the Effects of cooperative and competitive learning strategies on academic performance of Nigerian students in mathematics. Result revealed that although cooperative learning was generally more effective than competitive learning, male students performed significantly better than their female counterparts when exposed to cooperative learning strategies.

CONCLUSION

The study concludes that cooperative learning is an effective teaching method for improving Senior Secondary One (SS1) student's academic achievement in mathematics, with male students attaining higher achievement than females in public secondary schools in Jos North LGA, Plateau State.

RECOMMENDATIONS

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

1. Mathematics teachers should provide enabling classroom environment and integrate cooperative learning in the teaching and learning of mathematics to help improve students' academic achievement in the subject.
2. The Plateau State Ministry of Education organize seminars and workshops for mathematics teachers on cooperative learning strategy.
3. The school administration should plan and provide flexible timetables that will allow for interactive sessions, after-school coaching or math clinics, while they encourage and monitor teachers to adopt cooperative learning in their mathematics instruction.
4. Mathematics teachers should employ gender-fair instructional practice to minimize gender disparities in achievement and ensure equitable learning outcomes for both genders.
5. The Plateau State Ministry of Education and other educational policymakers should implement a continuous capacity-building programs on cooperative learning for teachers to equip them with necessary skills for integrating cooperative learning in the classroom.

REFERENCES

Abiodun, T. O (2024). The predictive effects of teaching methods on students' achievement in mathematics. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*. Retrieved from https://www.sfjesgs.com/index.php/SFJESGS/article/view/495

Awofala, A. O. A., Lawani, A. O., & Adeyemi, O. A. (2020). *Motivation to learning mathematics and gender as correlates of senior secondary school students' performance in mathematics. Journal of Educational Sciences, 4*(2), 318–333. Available @ https://doi.org/10.31258/JES.4.2.P.318-333

Bruner, J. S. (1966). Toward a theory of instruction. Cambridge: Harvard University Press.

Carbonaro, A., & Ravaioli, M. (2017). Peer assessment to promote deep learning and to reduce a gender gap in the traditional introductory programming course. *Journal of E-Learning and Knowledge Society, 13*(3). Available @ https://doi.org/10.20368/1971-8829/1398

Di Tommaso, M. L., Contini, D., De Rosa, D., Ferrara, F., Piazzalunga, D., & Robutti, O. (2024). Tackling the gender gap in mathematics with active learning methodologies. *Economics of Education Review, 100,* 102538. https://doi.org/10.1016/j.econedurev.2024.102538

Ezeanyi, B. C., Fidel-Imoisili, O. B., & Sowunmi, E. B. (2021). Effect of Cooperative Learning Strategy (CLS) on Senior Secondary School Students' Academic Performance in Mathematics in Anambra State, Nigeria. *International Journal of Social Sciences and Humanities Research, 4*(10). https://doi.org/10.47191/ijsshr/v4-i10-47

Fatade, A. O., Mogari, D., & Arigbabu, A. A. (2013). Effect of problem-based learning on senior secondary school students' achievements in Further Mathematics. *Acta Didactica Napocensia, 6*(3), 27–43.

Federal Republic of Nigeria. (2013). *National policy on education (6th ed.).* Abuja: NERDC Press.

Hossain, M. A., & Tarmizi, R. A. (2012). Gender-related effects of group learning on mathematics achievement among rural secondary students. *Egitim Arastirmalari - Eurasian Journal of Educational Research, 47,* 1–22.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching, 25*(4), 85–118.

Klang, N., Karlsson, N., Kilborn, W., Eriksson, P., & Karlberg, M. (2021). Mathematical problem-solving through cooperative learning—The importance of peer acceptance and friendships. *Frontiers in Education, 6*, 710296. https://doi.org/10.3389/feduc.2021.710296

Kolawole, E. B. (2008). Effects of competitive and cooperative learning strategies on academic performance of Nigerian students in mathematics. *Educational Research Review, 3*(1), 33–37.

Onoshakpokaiye, O. E., & Aywiri, H. E. (2025). Science, technology and mathematics education: A roadmap to economic growth and sustainable development of the developing nations. *Indonesian Journal of Education and Mathematical Science, 6*(1), 93–104. Retrieved from https://jurnal.umsu.ac.id/index.php/IJEMS/article/view/23902

Prieto-Saborit, J. A., Méndez-Alonso, D., Cecchini, J. A., Fernández-Viciana, A., & Bahamonde-Nava, J. R. (2021). *Cooperative learning for a more sustainable education: Gender equity in the learning of maths.* Sustainability, 13(15), 8220. https://doi.org/10.3390/su13158220

Siller, H.-S., & Ahmad, S. (2024). Analyzing the impact of collaborative learning approach on grade six students' mathematics achievement and attitude towards mathematics. *Eurasia Journal of Mathematics, Science and Technology Education.* Retrieved from https://www.ejmste.com/download/analyzing-the-impact-of-collaborative-learning-approach-on-grade-six-students-mathematics-14153.pdf

Tinungki, G. M., Nurwahyu, B., Hartono, A. B., & Hartono, P. G. (2022). Team-assisted

individualization type of the cooperative learning model for improving mathematical problem solving, communication, and self-proficiency: Evidence from operations research teaching. *Education Sciences, 12*(11), 825. https://doi.org/10.3390/educsci12110825