KASU Journal of Science and Mathematics Education (KJSME)
Volume 1, Number 1, June, 2025 ISSN: 2360-8889
http://journals.kasu.edu.ng/index.php/Science_Education

EFFECTS OF COOPERATIVE LEARNING STRATEGY ON MATHEMATICS RETENTION AND GENDER OF SENIOR SECONDARY SCHOOL STUDENTS IN MINNA METROPOLIS NIGER STATE.

[1]Raji M. O. & [2]Dr. Lambaya I. D.

[1]Department of Science Education
Federal University of Technology, Minna.
Niger State, Nigeria.
[2]Department of Science Education,
Kaduna State University

[*]***Corresponding author email:*** mosesraji520@gmail.com

Abstract

The study investigates the effectsof cooperative learning strategy on mathematics retention and gender of Senior Secondary School Students in Minna Metropolis Niger State.The research adopted the pre-test–post-tests randomize design. The population of the study comprises all 15,218 senior secondary school mathematics students in Minna, Niger State and target population was SS II mathematics student. 120 students were randomly selected from three two senior secondary schools in Minna, for the study. The Instruments for the study is Mathematics Achievement Test (MAT) that was validated by three experts in mathematics education and science education in University, College of Education, and secondary school, because research was carried out in secondary schools with reliability coefficient of 0.81 using PPMC using test retest method and treatment material is Cooperative learning strategy. The Mathematics Achievement Test (MAT) comprises of 30 multiple choice objective questions and cooperative learning strategy comprised of instructions on mathematics. All the experimental groups were given Pretest before the treatment and after treatment posttest were administered on them. Experimental group was exposed to the use of cooperative learning while control group was exposed to conventional lecture method. The retention test was administered on the groups after two weeks of posttest. ANOVA was used for method of data analysis.it was established that there was significant difference in the retention of students taught mathematics using cooperative learning strategy compare to lecture method. Conversely there was no significant difference in the male and female retention of SS II mathematics student taught using cooperative learning strategy. Recommendation; Students should be trained on the use of cooperative learning strategy that improve students retention in teaching and learning of mathematics.

Key Words: Mathematics, Cooperative Learning Strategy, Retention and Gender.

Introduction

Education is the bedrock of growth and advancement of any society. It is the pillar of change and reformation. In essence, it is as clear as crystal that no society can grow beyond the quality of her education system Obodo, 2017. Therefore, it needs to be embraced wholeheartedly by all members in a well-meaning society because it is the only hope and the best investment. It is a great equalizer that creates a level playing field across the strata of the society.

Life without Mathematics is just like a body without a soul. Education is bedrock of growth and development. Mathematics is the pillar education. So, to imagine the world without Science, Technology and Mathematics is a vacuum that can never be filled; nothing can ever stand in place of mathematical reasoning. Absence of mathematics in the present era will render many jobs useless. Many managers need mathematics to arrive at good decision. The best decisions are taken in the presence of a mathematical and statistical data Obodo (2017). Mathematics is the backbone of art, science and technology. Mathematics dictates the functionality of the universe. Science, Technology and Mathematics (STM) constitute the foundation of any scientific and technological development. Science and Technology are the pillars of any structural and physical development in the contemporary world. Apart from the improvement in the standard of living, science and technology have facilitated the development leading to the improvement of the needs and desire to compete with the developed world in all spheres of life, education inclusive Olaniyan, *et al.*, (2015). One of the key problems evolved in development strategy for a developing country like Nigeria is lack of the capacity of appreciation and application for science and technology through developmental efforts Elliot *et al*., (2014). Adequate teaching, especially through the use of

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

good method of teaching at secondary and higher levels development at any phase is always linked with technology. Technology happens when there is advancement in science, hence, science, technology and mathematics are proportional to each other Pujari, (2014).

Mathematics has several applications in real life situations. The beauty of mathematics lives in its several, numerous and varied application in all spheres of life Obodo, (2017). Mathematics can be seen in all facets of life and in day to day occupations such as internet technology, banking, medicine, scientific discoveries and even in the planning of daily activities Anyanwu*et al.,* (2013). Mathematics embraces many important ideas about numbers and space. It involves problem solving activities and means of communication that is the science or practice of transmitting information into symbols and signs Akanni, (2015). The position of Mathematics in the modern period of technological development in the world is critical and profound. Okigbo and Ugwu, (2012**)** emphasized the importance of mathematical knowledge in science that deals with the logic of shape, quantity and arrangement as mathematics is all around us. Mathematics is the building block for everything in our daily lives, including Architecture, Art, Banking, Engineering and even Sports. Since the beginning of recorded history, Mathematics has been at the forefront of every civilized society and it is used in most primitive of cultures. Mathematics remains core subject in both primary and secondary schools (FRN, 2009). Without a credit pass in Mathematics at senior secondary school level, no student can access tertiary education in Nigeria and even at tertiary level mathematics is offered as a general course and is a requirement for graduation for all students (JAMB, 2015). In line with this assertion, there is need for us to have effective way of teaching and learning of mathematics, since this

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

subject is very important subject, so as to enhance meaningful learning and students' achievement with the use of cooperative learning strategy.

Cooperative learning can be defined as a teaching method that involves students in learning process in order to understand and learn content of the subject (Slavin, 2011). Cooperative learning encourages students to interact and communicate with peers in harmony. In this way, cooperative learning promotes values such as honesty, cooperation and mutual respect. Education is the passage of knowledge from persons with knowhow to the persons with a desire to get enlightened (Christensen & Gerald, 2014). This could be accomplished through cooperative learning.

Cooperative learning also enables students to effectively accomplish practical procedures, perform valid research hence making it easier for the educators to manage students' learning. In addition, it encourages the students to effectively contribute towards the problems solving leading to better understanding of the subject (Christensen & Gerald, 2014). According to research, students' participative and active involvement in subjects increases their level of understanding (You, 2014). Through making learning fun, enjoyable and autonomous, cooperative learning could be effective in enhancing the understanding of students (You, 2014) responsibility, tolerance, and willing to sacrifice a consensus. Execution of duties in cooperative learning can develop self-confidence in students. Cooperative learning promotes deep learning of materials and helps students to achieve better grades (Christensen & Gerald, 2014). Cooperative learning cannot be taught through verbal instruction, students can adopt cooperative learning through a process that involves

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

working together in groups, developing a product at the end and examining both the product and cooperation learning strategy in order to improve student retention in mathematics.

Retention is the ability to reproduce the learnt concept when the need arise. Retention takes place when learning is coded into memory, and appropriate coding of incoming information provides the index that may be consulted so that retention takes place without an elaborate search in the memory lane (Achor, Otor, &Umoru, 2013). Anything that aids learning improves retention while things that lead to confusion or interference among learned materials decrease the speed and efficiency of learning and accelerates forgetting. It can be asserted that the poor achievement in mathematics by secondary school students may be due to poor retention (Bichi, 2001). Gambari, Yaki, Gana and Ughovwa (2014) students in conventional teaching method had better retention than other groups.

Gender has been identified as one of the factors influencing students' performance in science and mathematics at secondary schools and higher institution of learning (Anagbogu&Ezeliora, 2007). Researchers like (Ifamuyiwa, 2004) have shown that males performed better than females in science and technology concepts. Using projected and non-projected visuals, boys were found to be performing better than girls (Chinweze, 2007).

From the foregoing, it is of no doubt that cooperative learning strategy has become an increasingly important for students' retention in Mathematics. Therefore, the present study aims atinvestigating the impact of cooperative learning strategy on mathematics retention and gender of senior secondary school students in Minna Metropolis Niger State.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

Aim and Objectives of the Study

The aim of this study is to empirically ascertain the impact of cooperative learning strategy on mathematics retention and gender of Senior Secondary School Students in Minna Metropolis Niger State. Specifically, the study intends to determine

1. Whether cooperative learning strategy will improve students' retention in Mathematics compared to those taught using conventional teaching strategy.

2. Gender difference in Mathematics retention of students taught using cooperative learning strategy.

Research Questions

In order to achieve the objectives of the study, the following questions were formulated:

1. What is the difference in the mean retention of the students taught Mathematicsusing cooperative learning strategy compared to those taught using the conventional teaching strategy?
2. What is the difference in the mean retention of male and female students taught Mathematics using cooperative learning strategy?

Research Hypotheses

H_{O1}: There is no significant difference in the mean retention scores of students taught Mathematics using cooperative learning strategy compared to those taught using conventional teaching strategy.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

H_{O2}: There is no significant difference in the mean retention scores of male and female students taught Mathematics using cooperative learning strategy.

Methodology

The research adopted the pre-test–post-tests randomize design. The population of the study comprises all senior secondary school mathematics students in Minna,Niger State and target population was 6274 SS II mathematics student. 117 students were randomly selected from three two senior secondary schools in Minna, for the study. The Instruments for the study isMathematics Achievement Test (MAT) and treatment material is Cooperative learning strategy. The Mathematics Achievement Test (MAT) comprises of two section, first section comprised of bio-data why second section comprised of 30 multiple choice objective questions and cooperative learning strategy comprised of instructions on mathematics. The Mathematics Achievement Test (MAT) and cooperative learning strategy lesson note was validated by three experts in mathematics education and science educationin both university, college of education, and secondary school, because research was carried out in secondary schools. All the experimental groups were given Pretest before the treatment and after treatment posttest were administered on them. Experimental group was exposed to the use of cooperative learning while control group was exposed to conventional lecture method. The retention test was administered on the groups after two weeks of posttest. ANOVA was used for method of data analysis.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

Results

Research Question One: What is the difference in the mean retention of students taught Mathematics using cooperative strategy compared to those taught using conventional teaching method?

Table I: Mean and Standard Deviation of Posttest and Retention Scores of Experimental and Control Group

GROUP	N	Posttest		Retention test		Mean Gain
		X	SD	X	SD	
Cooperative learning strategy	57	78.68	13.36	79.09	10.55	0.41
Conventional teaching strategy	60	50.22	9.41	51.23	10.81	1.01
Total	117					

Table 1 shows the mean and standard deviation of retention scores of experimental group and control group in posttest and retention test. The result revealed that mean and standard deviation scores of the posttest and retention test experimental group are $\overline{X}$= 78.68, SD = 13.36 and $\overline{X}$ = 79.09, SD = 10.55 respectively. This gives a mean gain of 0.41 in favour of the retention test. On the other hand, the mean and standard deviation of the posttest test and retention test of the control group are $\bar{X}$ = 50.22, SD = 9.41 and $\bar{X}$ = 51.23, SD = 10.81 respectively and gives a mean gain score of 1.01 in favour of the retention test. The result also revealed that experimental group one (CLS), and control group had mean gain of 0.41

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

and 1.01 respectively, and with the control group (CLS) having the highest mean gain of 1.01.

Research Question Two: What is the difference in the mean retention of male and female students taught Mathematics using cooperative learning strategy?

Table 2: The Mean and Standard Deviation of Posttest and Retention Scores of Male and Female Cooperative Learning Strategy

Group	N	Posttest		Retention test		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	38	78.83	12.51	79.25	10.16	0.42
Female	19	78.38	9.93	78.76	11.55	0.38
Total	57					

Table 2 shows the mean and standard deviation of the posttest and retention scores of male and female experimental group. From the result, it can be seen that mean score of the posttest and retention test score of the male are $\bar{X}$ = 78.83, SD = 12.51 and $\bar{X}$ = 79.25, SD= 10.16. The mean gain is 0.42 in favour of the male retention test score. Similarly, the mean and standard deviation of posttest and retention test score of female are $\bar{X}$ = 78.38, SD = 9.93 and $\bar{X}$ = 78.76, SD = 11.55, the mean gain is 0.38 in favour of the female retention test score. Also the result reveals the difference of 0.04 between the retention test mean gains score of male and female in favour of the female.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

Hypothesis One: There is no significant difference in the mean retention scores of students taught Mathematics using cooperative learning strategy compared to those taught using conventional teaching strategy.

Table 3: t-test Analysis of mean retention scores of students taught Mathematics using cooperative learning strategy compared to those taught using conventional teaching strategy.

Participants	N	$\bar{X}$	SD	t-cal	Df	p-value
Cooperative Learning Strategy	57	79.09	10.55			
				24.99	116	0.00
Conventional Teaching Strategy.	60	51.23	10.81			

0.05 level of significance

The mean score cooperative learning strategy X=79.09 and the mean for conventional teaching strategy X = 51.23. The table show that t-cal 24.99, df = 116, with p=0.00. Since p<0.05, hypothesis two is hereby rejected. Therefore, there was no significant difference in the mean retention scores of students taught Mathematics using cooperative learning strategy compared to those taught using conventional teaching strategy.**Hypothesis Two:** There is no significant difference in the mean retention scores of male and female students taught Mathematics using cooperative learning strategy.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

Table 4: t-test Analysis of mean retention scores of male and female students taught Mathematics using cooperative learning strategy

Participants	N	$\bar{X}$	SD	t-cal	df	p-value
Male	38	79.25	10.16			
				1.49	56	0.87
Female	19	78.76	11.55			

0.05 level of significance

The mean score of male mathematics students X = 79.25 and the mean for female mathematics students X = 78.76. The table show that t-cal 24.99, df = 56, with p=0.87. Since p>0.05, hypothesis two is hereby accepted. Therefore, there was significant difference in the mean retention scores of male and female students taught Mathematics using cooperative learning strategy.

Discussion of the Findings

There is significant difference in the mean retention of students taught Mathematics using cooperative learning strategy compared to those taught using conventional teaching strategy. This is in support of findings of Alabi, Thaddeus and Falode (2020) that study indicated that those taught with ILIAS Online Learning Platformhad higher mean achievement scores in Educational Technology than those students in the control group also support Gambari, Balogun and Alfa (2014) who reported that the students taught with Interactive White Board performed better than the control group. Also, high achievers performed better than medium and low achievers respectfully.

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

There is no significant difference between the mean retention scores of male and female students taught Mathematics using the cooperative learning strategy. This is in agreement with findings of Jimoh*etal*(2018) who carried out study on the effect of three modes of mobile instructional package on achievement and gender of mathematics students in Colleges of Education, In North-Central Nigeria. It observed thatthere is no statistical difference in the achievement of male and female students taught with Text Only Mathematics Mobile Instructional Package (TOMMIP).

Conclusions

Cooperative learning strategyimproves students' retention more than other instructional delivery medium such as lecture method.

Cooperative and mastery learning strategy give equal learning opportunities to both male and female in Mathematics.

Recommendations

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

Cooperative learning strategy should be encouraged by teachers in schools for teaching of mathematics.

Students should be trained on the use of cooperative learning strategy that improve students' retention in teaching and learning of mathematics.

Workshop, seminars, symposia and conferences should be organized periodically by school administrators to acquaint new mathematics teachers with recent research findings that

Cite this article as:
Raji M. O& Dr. Lambaya I.D (2025). Effects Of Cooperative Learning Strategy On Mathematics Retention And Gender Of Senior Secondary School Students In Minna Metropolis Niger State

would lead to effective and meaningful teaching and learning with the use of cooperative learning strategy in order to enhance retention.

References

Achor, E. E. Otor, E. E. &Umoru, W. O. (2013).Do teaching strategies matter in students' retention in biology at secondary school level? A consideration of computer-based instruction and conventional strategy. *Journal of Science Technology Mathematics and Education* 10(1) 32 - 37.

Akanni, O. O. (2015). An investigation of difficult topics in the senior secondary school Mathematics curriculum as perceived by student Teachers, *AmericanJournal of Educational Research*, 3(7), 844-848.

Alabi T. O, Thaddeus, H &Falode, O. C. (2020). Effects of ILIAS Online Learning Platform on Academic Achievement in Educational Technology among University Students' in Nigeria. *International Journal of Educational Research*, 03(09), 13-20.

Anagbogu, &Ezeliora, B. (2007). Sex differences and scientific performance. *Women Journal of Science and Technology*, 4(3),10- 20

Anyanwu, R. C., Gambari, A. I., &Ezenwa, V. I. (2013). Comparative effects of two modes of computer assisted instructional package on solid geometry achievement. *Contemporary Educational Technology*, 5(2), 110-120.

Bichi, S.S. (2001). The effect of gender on academic achievement in evolution concepts among secondary students using problem solving strategy. *Zaria Journal of Studies in Education*, 3(1), 132-138.

Christensen, R., Gerald, K. (2014). Comparative measures of grit, tenacity and perseverance. *International Journal of Learning, Teaching and Educational Research*, 8(1), 34-42.

Elliot, D., Wilson D. & Boyle, S. (2014). Science learning via multimedia portal resources: The Scottish case *British Journal of Educational Technology*, 45(4), 571-580.

Gambari, A. I., Falode, C. O. &Adegbenro, D. A. (2014). Effectiveness of computer animation and geometrical instructional model on mathematics achievement and retention among junior secondary school students. *European Journal of Science and MathematicsEducation, 2(2),* 127-146.

Gambari, I. A, Balogun, S. A., & Alfa, A. S. (2014). Efficacy of interactive whiteboard on psychomotor skills achievement of students in isometric and orthographic projection

in junior secondary school students in basic technology subject Abuja. *Journal of Contemporary Educational Technology*.5(4), 316-330.

FRN, (2009). *National Policy on Education*, (Revised) Federal Republic of Nigeria, Lagos: Federal Ministry of Education.

Ifamuyiwa, A. S. (2004). The predictive validity of junior secondary mathematics on senior secondary mathematics, further mathematics and physics.STAN 45th Annual Conference Proceedings.

JAMB (2015). Joint Admission and Matriculation Board, Bwari Abuja, Nigeria.

Jimoh, M. A.,Alabi, T. O., Falode, O. C &Olayiwola, O. R. (2018). Effect of three modes of mobile instructional package on achievement and gender of mathematics students in colleges of education, In North-Central Nigeria, *Association for Innovative Technology Integration in Education (AITIE, 2018)Conference Proceedings*, 20(2), 153-161.

Obodo, G. C. (2017) Applications of Mathematics in Adetula L. O. (2013) Some Important Topic Mathematics Education. 45-54. Marvelous Mike Press Ltd.

Okigbo, E. C &Ugwu, H. I. (2014). Effects of peer tutoring technique in enhancing achievement of junior secondary Mathematics learner. *Journal of Research in curriculum and teaching (JRCT)*, 6(1), 509-517.

Olaniyan, A. O., Omosewo, E.O. &Nwankwo, I. J. (2015). Effect of polya problem solving model on senior secondary school student performance in current electricity. *European Journal of Science and Mathematics Education*, 3(1), 97-104.

Pujari, S. (2014). Importance of science and technology in national development. Retrieved November 19, 2014 from http://www.yourarticlelibrary.com/technology/importance-ofscience- and-technology-in-national-development-essay/8563/.TheImpact of Photography in a Developing Economy (179-190).

Slavin, R.E. (2011). Instruction based on Cooperative Learning. in R.E. Mayer & P.A. Alexander (Eds), Handbook of Research on Learning and Instruction (pp. 344 - 360). New York: Taylor & Francis.