

**IMPACT OF COOPERATIVE LEARNING ON SENIOR SECONDARY SCHOOL
STUDENTS MATHEMATICS ACHIEVEMENT IN ABUJA, NIGERIA**

BY

JUBRIL, Al-janat

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**DEPARTMENT OF SCIENCE EDUCATION
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
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ABSTRACT

This study investigated the impact of cooperative learning on senior secondary school students' mathematics achievement in Abuja, Nigeria. Two research questions and two research hypothesis guided the study. The study employed the pre-test, post-test experimental and control group design. The sample for this study was 126 SS II students of mathematics in two senior secondary schools in Abuja, Nigeria. The instrument used for data collection was the Mathematics Achievement Test (MAT). The reliability of the instrument was determined using the Pearson Product Moment Correlation Coefficient (PPMCC). Data were analyzed using mean, standard deviation and T-test statistics at 0.05 level of significance. The result of the study revealed that there was significant difference in the mean achievement scores of students taught mathematics using cooperative learning and those taught using conventional method ($t=3.442$, $df=124$, $p<0.05$), there was no significant difference in the mean achievement scores of male and female students taught mathematics using cooperative learning ($t=0.72$, $df=56$, $p>0.05$). Based on the findings and implications of the study, it was recommended that teachers should be encouraged to use cooperative learning method of teaching in classrooms, this will improve students' achievement in mathematics.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Mathematics is for life and we do mathematics in one way or the other in our daily activities. On the ground that the knowledge of mathematics is required now than ever especially with the current issue of science and technological advancement and attainment of the Millennium Development Goals (MDGs), the Federal government of Nigeria accorded prominence to the teaching and learning of mathematics in schools. Mathematics occupies a central place in our school curriculum as it is made a compulsory subject for all learners in both primary and secondary schools as contained in the National Policy on Education (FRN, 2004). Every career a child may choose to pursue in life are full of things that requires application of mathematical knowledge and skills for example, in information technology. Mathematics is still a subject that is considered difficult and boring to many students.

According to (Zakaria & Daud, 2012), weaker students feel anxiety toward mathematics, and this anxiety affects their performance in mathematics. Students who lack mastery in mathematics are less successful, despite being in secondary schools for a long period of time. Based on observations of high school mathematics students, the information shows that students are not actively involved in developing knowledge; they receive information passively and are less motivated. This passivity has caused much concern among educators because knowledge of mathematics plays a significant role in enhancing the country's social economic development. The quality of education that teachers provide to students is

dependent upon what teachers do in their classroom (Zakaria, 2012). The teaching method used in the classroom is one of the factors that make students become passive and have less interaction with each other in doing tasks. Therefore, to enhance the understanding of mathematics, students must be more active in the classroom and must creatively acquire knowledge, especially in understanding and solving mathematical problems. The cognitive and affective development of students in mathematics can be improved by giving students the opportunities to develop, to interact, and to share ideas with friends through cooperative learning.

(Zakaria, 2012) agree that in cooperative learning students work face to face to complete a given task collectively. Cooperative learning encourages students to be active participants in the construction of their own knowledge. Cooperative learning also encourages students to interact and to communicate with peers in harmony. In this way, cooperative learning promotes values such as honesty, cooperation, mutual respect, responsibility, tolerance, and willing to sacrifice a consensus. Execution of duties in cooperative learning can develop self-confidence in students. A study by Zakaria, Chin, and Daud (2010) found that cooperative learning improves students' achievement in mathematics. Further, cooperative learning is an effective approach that mathematics teachers need to incorporate into their teaching. Cooperative learning promotes deep learning of materials and helps students to achieve better grades (Shimazoe & Aldrich, 2010). Melihan and Sirri (2011) concluded that the cooperative learning method is more effective than the traditional teaching method in the academic success of students. Cooperative learning is a student-centered way of teaching that emphasizes cooperation and teamwork. Rance-roney (2010) describes cooperative learning as a classroom practice where students work in team to construct

knowledge and accomplish tasks through cooperative interaction. Working in groups allows students to be in an interactive environment. This interaction helps them to develop language and social skills. During cooperative learning, students are engaging in the task, increasing their confidence, and becoming responsible for their own learning (Sajedi, 2014).

1.2 Statement of the Problem

The level of mathematics in our educational system is in great danger. This is as a result of poor attitudes and performance by both students and teachers. In spite of the fact that it is taught compulsory to all the students in the secondary and primary schools, everybody has a complaint against the teaching of mathematics. It is dull, boring, difficult and useless from the point of view of the learner. It is also believed that mathematics is an exceptionally difficult subject and hence, its study requires special ability and intelligence. Although, research studies have been carried out on this problem already, but the researcher also want to work on this problem without disregarding other works.

Research suggest that students learn best when they are actively involved in the process (Ellis and Goodyear, 2010; Laurillard, 2012), and cooperative learning within the classroom setting can be an effective way of facilitating this. it is quite evident that the active involvement of students in classroom and outside the classroom teaching learning process enables them to develop their critical thinking skills which may improve their achievement scores (Diriba and Lamessa, 2017). Students who are engaged in the learning gain more confidence, understanding and overall self-esteem in mathematics (Finch, 2015).

Therefore, the researcher will try to investigate the impact of cooperative learning on student's Mathematics achievement in some selected senior secondary schools in Abuja, Nigeria. Hence, it is with this information that the researcher is initiated to conduct a research.

1.3 Aim and Objectives of the Study

The aim of this study is to find out the impact of cooperative learning on senior secondary school student's mathematics achievement in Abuja, Nigeria. The study aim to achieve the following specific objectives; to determine

1. The impact of cooperative learning on students' performance in mathematics.
2. Gender difference on students' performance in mathematics using cooperative learning approach.
3. The perception of students when they are taught using cooperative learning approach.

1.4 Research Questions

On the course of this study, the following questions were formulated and answered. The questions are as follows;

1. What is the difference in mean achievement scores of students when taught using cooperative learning approach and those taught using conventional approach?
2. What is the gender difference in mathematics students' performance when taught using cooperative learning approach?

1.5 Research Hypothesis

The following null hypotheses are raised to guide the study:

HO₁: There is no significant difference in the mean scores of students when taught mathematics using cooperative learning and those taught using conventional method.

HO₂: There is no significant gender difference in the mean scores of students' performance when taught mathematics using cooperative learning.

1.6 Significance of the Study

This research work which aimed at identifying the impact of cooperative learning on senior secondary student's mathematics achievement, its findings will be of great significance to the teacher; project and cooperative learning allow for complex subject matter to be broken up into smaller parts.

The students; the research work will greatly remove the impression that mathematics is difficult which makes students very reluctant in studying mathematics. The students can reinforce skills like planning and communication and also learn accountability, Problem solving and project management.

The school administration; this research work will provide data to the selected school staffs to justify the continued implementation of cooperative learning in the senior secondary school mathematics classrooms.

1.7 Scope and Delimitation of the Study

This study focuses on the impact of cooperative learning in senior secondary school student's mathematics achievement in some selected schools in Abuja, Nigeria. Some senior secondary schools will be selected and used for this study.

1. Government Science Secondary School, Tunga maje, FCT Abuja.
2. Government Science Secondary School, Zuba, FCT Abuja

1.8 Operational Definition of Terms

1. **Cooperative Learning:** A teaching strategy where small groups of teams work together towards a common goal.
2. **Mathematics:** Mathematics from Greek word, "mathema" knowledge, study of topic such as quantity (numbers, shapes, structure, space and change)
3. **Impact:** a significant or strong influence.
4. **Achievement:** an award for completing a particular task or meeting an objective.
5. **Teamwork:** the cooperative effort of a group of people for a common objective.

CHAPTER TWO

REVIEW OF RELATED LITERATURES

This chapter contains relevant literatures on the impact of cooperative learning on student's mathematics achievement. The literature is reviewed and discussed under the following sub-headings: Conceptual Framework, Theoretical Framework, Empirical Study and Summary of literature reviewed.

2.1 Conceptual Framework

2.1.1 Concept of Mathematics

Mathematics is seen to be a science that deals with numbers, qualities and forms. It involves many deductive processes such as assuming, computing, hypothesizing and proving. The product of mathematics includes formulas, theorems, axioms, theories, postulates, proofs and definitions. Schalms (2013) defined mathematics as a science that exists in various structures which cannot be completely exhausted. Hence, he said that "the extent to which mathematics is or can be learned is unlimited. Becchams (2010) stated clearly that studying mathematics could be for the attainment of two major goals. First, to acquire useful knowledge and secondly, to cultivate mental powers, that is mathematics is studied because of its utility and intellectual values. German mathematician Synthazner conceptualized that mathematics isn't just about numbers, symbols, proofs, etc. but that its knowledge is just the essential tool that any society needs. According to Synthazner, mathematics if used adequately on a daily basis can help overcome the difficulties confronting a nation. Every individual requires the knowledge of mathematics to function effectively and efficiently in today's world irrespective of his/her job or profession (Okafor, Samuel, Bassey, 2013). It is a tool that can be used in our daily life to overcome the difficulties faced.

Zenetah (2011) stated that mathematics achievement plays a vital role in the teaching process because achievement implies the positive or negative tendency towards the subject. Various researchers concluded that student's positive attitude towards mathematics leads towards success in mathematics.

2.1.2 Concept of Cooperative learning

According to brown (2015), cooperative learning is a generic term covering a multiplicity of techniques in which two or more students are assigned a task that involves collaboration and self-initiated language. Richards, (2012) defines cooperative learning as a learning activity which involves a small group of learners working together. The group may work on a single task or on different parts of a larger task. In addition, Harris and sherblom (2010) define a group as a collection of at least three and ordinarily fewer than twenty individuals who are interdependent, influence one another over some period of time, share a common goal or purpose, assumed a specialized role, have a sense of mutual belonging, maintain norms and standards for group membership, and engage in interactive communication. From these definitions, it can be concluded that cooperative learning is a learning activity which involves learners working together in a small team or group to perform a task.

Cooperative learning is a pedagogical teaching method in which students work together in groups of two to five members and each member participates in solving a common problem, without the direct intervention of a teacher. These groups are not random, but they are determined by the teacher. The teacher takes into account several parameters in order to create productive teams. These parameters are determined by each lesson and the goals the teacher sets (Chionidou, 2010. Matsagouras, 2011).

In the traditional classroom, the lesson is based on lectures and the center of the learning process is the teacher. In such an environment, students are only passive receivers. Their only action is to record knowledge when they watch the lecture of their teacher or when the teaching process takes the form of questioning. As a matter of fact, in the latter form, only correct answers are accepted, while the incorrect answers are ignored (Effandi & Zanaton, 2014). This process can often be lonely and frustrating for students. Perhaps it is not surprising that many students and adults 'fear' mathematics. They often believe only a few talented people can achieve in the field of mathematics (David, 2010). The cooperative learning method helps pupils to understand that knowledge is not teacher-owned but that it exists independent of the teacher. The role of the teacher in cooperative learning is that of guiding learning activities and the teacher must also learn from the pupils. In cooperative learning, there must be an environment which promotes democratic trading of ideas. There must be a friendly environment where each child must be free to express his/her views. Pupils, apart from sharing information, are helped to develop better personal relationships. Cooperative learning is centered upon the constructivism model of learning. According to the report from the National Council of Teachers of Mathematics (NCTM), it is said that cooperative learning in mathematical education plays an essential role in students' question acquisition and in criticizing constructively, all leading to productive and beneficial outcomes in student learning. Cooperative learning is a distribution of effort to some students and this gives each one specific roles to perform. This creates a sense of responsibility and autonomy, since some tasks are split into several subtasks which are related and dependent on one another. As a jigsaw, subtasks must be completed to form the whole. It pushes a student to do his/her part in order to make the whole process flow

smoothly. In other words, cooperative learning is a great learning opportunity for students mathematically as well as socially (Allen 2012). Learning mathematics is the main focus of cooperative learning, but there are also social benefits that students will gain by working collaboratively. Effective cooperative learning can teach students to communicate with others and create a position in an argument by using objective facts to back themselves up instead of trying to persuade through emotions. Cooperative learning is a great way for students to learn how to work in a team environment which is a key skill to have in life and for their future. Lastly, through effective cooperative learning, students learn to respect each other and the differences they may have amongst group members such as varying races and socioeconomic statuses (Allen 2012).

2.1.3 Concept of Academic Achievement

Academic achievement really means three things. The ability to study and remember facts, being able to study effectively and see how facts fit together and form larger patterns of knowledge and being able to think for yourself in relation to facts, and thirdly being able to communicate your knowledge verbally or in writing. Academic achievement is a measurement used for instructional, administrative, guidance and counselling, and research purposes. Educators and researchers have contributed to the factors or social variables that influence student's achievement.

Academic achievement cannot be reasonably discussed in the absence of a prior specification of the educational goals of the educational system. This is because, achievement indicates the level at which students are expected to accomplish as a result of having gone through a programme of learning process. Academic achievement usually receives the greatest attention of the teachers and consequently is most frequently assessed,

often to the serious neglect of the more tangible traits of intelligence, attitude, interests, aptitude and personality.

Several studies have shown that academic achievement differs across nationality. A study by Yousef (2011) showed that foreign students outperformed local students in mathematics. It is believed that learning methods play a small role on academic achievement. However small the effect on learning outcomes, it is accepted that learning methods can help students enhance their own learning and thus encourage self-directed learning.

2.2 Theoretical Framework

This study is based on three major theoretical ideas. The first one is the constructivist theory, the second is the social independence theory and thirdly is the motivational theory.

2.2.1 Constructivist Theory.

Based on the pioneering work of Piaget and Rance (2010) constructivist theories are grounded in the idea that the process of learning involves humans constructing and refining mental structures to organize and reorganize existing knowledge and ultimately incorporate new information. From this perspective, cooperative learning activities such as discussions, debates, and explanations force individuals to confront confusion and construct new, improved mental images when engaging with new concepts. Through a cognitive conflict between an existing way of thinking and new information, mental re-structuring occurs and the new structure is retained, to be used in later situations (and as the basis for later restructuring).

2.2.2 Social Interdependence Theory.

Social structures impact, and some say even determine, how individuals act and react. If we understand how individuals react to various social structures, we can predict the interactions and outcomes, according to this theory, based in the work of Thanes and Phelps (2011). In terms of cooperative learning, positive interdependence (cooperation) results in positive, promotive interactions between individuals. In contrast, negative interdependence (competition) promotes negative, oppositional Interactions as individuals work to undermine each other. For social interdependence theorists, this explains why in many studies that compare cooperative, and competitive learning, the cooperative group fares best.

2.2.3 Motivational Theory.

Several different theories focus attention on the motivations of the learner. These range from Skinner's behaviorist perspective which focuses on the extrinsic motivators (e.g., rewards and grades) to those who focus on intrinsic motivators such as the desire to succeed (Ryan, 2005). From this perspective, the reward structures, in terms of grades, acknowledgement, and social rewards, are the keys to understanding the effects of working in groups.

Lewin theory of motivation stated that tension within an individual motivates movement toward an accompanying goal. Johnson and Johnson, (2013) pointed out that the reward distribution motivates individuals to behave cooperatively.

Clifford, (2014) indicated a need for providing a system which offers fair or equal chances of success for students to ensure optimum performance. In a study on motivational effects, involving senior secondary school students performing a substitution task in a variety of

grouping arrangements, she found greater performance among students competing with others of like ability than among unequally matched students. She asserts that although students feel justified in striving for an award which represents superior performance among equals, it is far less socially acceptable to seek recognition when competitors are poorly matched on ability. This is especially true for those who have a marked advantage.

2.3 Empirical Studies

Review of some literatures by Lawson (2013) indicates that Within the classroom walls, learning space should be as flexible as possible, not only because different teachers and classes require different configurations, but because in order to fully engage in constructivist learning, students need to transit between lecture, group study, presentation, discussion, and individual work time. A study by Goos (2014) looked at the teachers' role of implementing norms and practices that will encourage mathematical thinking. The study found that "through scaffolding, peer collaboration, and the interweaving of spontaneous and theoretical concepts, students can be influenced with the help of the teacher to improve their understanding of mathematics. Interviews of the students in the study found that students who were allowed time to collaborate about mathematics pushed their thinking and tested their understanding of the concept. When students are given only correct answers to a problem without detailed explanation, students do not have the opportunity to learn and they stop trying to understand. It is the job of the teacher to maintain high quality relationships among the students. The work provided to the students must be challenging and the teacher must not step in too early to help but rather allow time for students to work together to find the answer. Teachers are facilitators and are responsible for modeling respectful behavior, allow discovery and create a space that allows students to be critical

thinkers. In order to make cooperative learning work within the classroom the teacher must first create a safe place for students. “Teachers who are intentional about building successful, dimensional and vibrant classrooms can experience the joy of invested students who understand the value of respecting and challenging competing ideas and experiences” (Greene & Mitcham, 2012).

For many years, educators and researchers have debated which school variables influence student achievement. As policy makers become more involved in school reform, this question takes on new importance since their initiatives rely on presumed relationship between various educational related factors like class size, school size, teaching methods, etc. teaching method is an important educational topic among policy makers, educational leaders, teacher education institutions and those interested in improving public education. Webb, 2014) found that students are more aware of which peers need help when working in cooperative groups. Students learn to help others, justify their own theory, view, or strategy, and resolve disagreements.

Cooperative learning enhances intergroup relationships, social acceptance, and friendship among students. “Outcomes seen in many studies of cooperative learning include gains in self-esteem, liking of school, time on-task, and attendance” (Wilkins, 2013). With cooperative learning, all students can be successful in a classroom, even high achievers and gifted students. Cooperative learning is beneficial for everyone.

2.4 Summary of Reviewed Literature

In spite of the importance of mathematics, the reviewed literatures in this study shows that students’ achievement is still quite low. Most importantly, among the factors that hinder

students' achievement in mathematics is teaching approach. In this chapter, a serious effort was made to review a lot of related literatures to the study. Some theoretical constructs were reviewed. From, the reviewed literatures, the researcher observed that the theories helped to clarify the conflicting views on cooperative learning and serves as theoretical framework for the study.

Research points to the benefits of cooperative learning for students of all age groups. If cooperative learning is structured correctly and monitored by the teacher, the academic benefits are positive for all groups of students, high achievers as well as low achievers. Providing opportunities for students to discuss, analyze, debate and understand each other gives opportunities for deeper learning to happen. Students are less likely to disengage, more likely to take ownership in their learning and are more likely to have a deeper understanding of concepts and problem solving strategies. This clarification helped the researcher to sharpen the focus of this work.

CHAPTER THREE

RESEARCH METHODOLOGY

In this chapter, the research methodology is presented and discussed under the following subheadings: Research design, population of the study, sample and sampling techniques,

research instrument, validity and reliability of the instrument, method of data collection method of data analysis.

3.1 Research Design

The research design adopted for this study is Quasi-experimental design. Quasi-experimental design is considered appropriate because it establishes a cause-effect relationship between the independent and dependent variables of a study. In quasi experiments, the investigator uses control and experimental groups but does not randomly assign participants to groups. The design is used where it may not be permissible to randomly assign subjects to groups and the researcher may have no option but to use already existing groups in form of classrooms (Awotunde, 2014). The design will be used to investigate the impact of cooperative learning on senior secondary students' mathematics achievement in Abuja, Nigeria. The design is conceptually represented below:

Table 3.1 Research Design Format

Groups	pre-test	treatment	post-test
Experimental Group	O ₁	X	O ₂
Control Group	O ₃	—	O ₄

Key:

O₁ and O₃: represent Pre-test

X: represent treatment

O₂ and O₄: represent Post-test.

3.2 Population of the Study

The population targeted for this study is drawn from all senior secondary school two (SS II) mathematics students in two secondary schools located within Gwagwalada area council in F.C.T, Abuja totaling 13,213,source (F.C.T SEB, 2018). The target population is made up of second year Senior Secondary School Students (SSS 2) with an average age of 15 years. The population is heterogeneous as it contains students of different socio-economic backgrounds, gender, abilities, cultures, ethnicity and religion.

3.3 Sample and Sampling Techniques

For the sample of the study, a total of one hundred and twenty four (126) SS II students of mathematics in Government science secondary school Tunga-maje and Government science secondary school Zuba were randomly selected using simple random sampling technique. SS II students of mathematics in Government science secondary school Tunga-maje were used as experimental group while SS II students of mathematics in Government science secondary school Zuba were used as control group.

Table 3.2 sample size by gender and schools

Groups	schools	Male	Female	Total
Experimental group	GSSS Tunga-maje	35	23	58

Control group	GSSS Zuba	38	30	68
Total		73	53	126

3.4 Research Instrument

A Mathematics Achievement Test (MAT) was developed by the researcher in accordance with SS II mathematics curriculum. The MAT which consist of 20 test items based on the topic ‘‘Approximation’’ which was taught will contain multiple choice questions with four (4) options from (A-D), one correct answer and three distractors for the students to choose from within the period of forty (40) minutes, this is for the sole purpose of testing the students understanding on the concept taught. A marking guide was designed for marking the scripts with each question carrying one (1) mark. Total score for the MAT is 20.

Table 3.3: Table of specification for Mathematics Achievement Test (MAT)

Topic	knowledge	Comprehension	application	Analysis	synthesis	evaluation	total
Approximation	3	2	9	2	2	2	20
Percentage	15%	10%	45%	10%	10%	10%	100%

3.5 Validation of the Research Instrument

The instrument was validated by three experts. Two senior lecturers from the department of science education, Federal University of Technology Minna, while the third is a senior lecturer from the department of mathematics, Federal University of Technology Minna.

3.6 Reliability of the Instrument

The Mathematics Achievement Test (MAT) was subjected to a test using test re-test method employing Pearson Product Moment Correlation Coefficient (PPMCC). SS II students outside the sampled schools but within the targeted school was used to determine the consistency of the instrument used. The test was administered to twenty (20) students within an interval of two weeks. The data obtained was analyzed using Pearson Product Moment Correlation (PPMC) and coefficient $r = 0.85$ was obtained, this indicated that the test items were reliable and can be used for data collection.

3.7 Method of Data Collection

The instrument was administered with the permission from the school principals and the assistance of the mathematics teachers in the schools. A lesson plan was developed by the researcher based on the chosen topic ‘‘Approximation’’. After teaching in each school for two weeks, each lesson lasted for the period of 40 minutes based on senior secondary school time table for teaching mathematics in Abuja, then the instruments was administered on both the experimental and control groups, the scores was collected, recorded and subjected to data analysis using SPSS statistics.

3.8 Method of Data Analysis

The data collected was analyzed using mean, standard deviation and T-test with a statistical tool of SPSS. The research questions was answered using mean and standard deviation. While the hypothesis formulated to guide the study was tested at 0.05 level of significance using Statistical Package for Social Sciences (SPSS).

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION.

This chapter deals with the presentation of results under the following sub-headings: presentation of results and discussion of major findings. Account of data collected from the instrument of study was presented respectively statistically. Mean, standard deviation and t-test were used for analysis and testing of the research hypothesis.

4.1 Data Presentation

Table 4.1: T-test on the pre-test scores of Mathematics Achievement Test of the Group

Group	N	df	\bar{X}	SD	t-value	P-value
Experimental Group	58		6.71	2.57		
		124			0.74	0.45
Control Group	68		6.37	2.53		

Table 4.1 shows the t-test analysis of pre-test score of students in the experimental group and those in control group, with a p-value of 0.45 at $p > 0.05$. This implies that there is no significant difference in the pre-test scores of student before the treatment.

Research Question 1: What is the difference in mean scores of students when taught using cooperative learning approach and those taught using conventional approach?

Table 4.2: mean and standard deviation of students taught using cooperative learning approach and those taught using conventional approach.

Variable	N	Mean	SD	Mean difference	Remark
Experimental group	58	11.97	2.93		
				1.92	Significant
Control group	68	10.04	3.28		

The result in table 4.2 above shows that there is a significant difference in the performance of students taught using cooperative learning approach with mean of 11.97 and standard deviation of 2.93 and those taught using conventional approach with mean of 10.04 and standard deviation of 3.28, with a marginal mean difference of 1.92.

Research question 2: What is the gender difference in mathematics students' performance when taught using cooperative learning approach?

Table 4.3 Mean and standard deviation of male students taught using cooperative learning approach and female students taught using cooperative learning approach

Variable	N	Mean	SD	Mean difference	Remarks
Cooperative learning (Male)	35	11.94	3.12		
				-0.06	not significant
Cooperative learning (Female)	23	12.00	2.68		

The result in table 4.3 above shows that there is no significant difference in the performance of male students taught using cooperative learning approach with mean of 11.94 and standard deviation of 3.12 and female students taught using cooperative learning approach

with mean of 12.00 and standard deviation of 2.68, with a marginal mean difference of -0.06.

4.2 Hypothesis testing

Each of the hypothesis formulated were tested and the results obtained are presented in the section below:

HO1: There is no significant difference in the mean scores of students when taught mathematics using cooperative learning approach and those taught using conventional approach.

To test this hypothesis, data collected were analyzed using t-test statistics at $p \leq 0.05$.

Table 4.4: Summary of t-test comparison of the achievement scores of students taught mathematics using cooperative learning approach and those taught using conventional approach.

Group	N	df	\bar{X}	SD	t-value	P-value
Experimental Group	58		11.97	2.93		
		124			3.442	0.0008
Control Group	68		10.04	3.28		

***Significant at $p \leq 0.05$**

From the result shown in Table 4.4 it was found that there is a significant difference between the mean scores of students taught using cooperative learning approach and those taught using conventional approach as determine by the t-test analysis $t(124)=3.442$,

$p \leq 0.05$. Students taught using cooperative learning approach ($M=11.97$; $SD=2.93$) scored higher than the students taught using conventional approach ($M=10.04$; $SD=3.28$). Therefore, the hypothesis was rejected.

HO₂: There is no significant gender difference in the mean scores of students' performance when taught mathematics using cooperative learning approach.

Table 4.5: Summary of t-test comparison of the achievement scores of Male students taught mathematics using cooperative learning approach and female students taught using cooperative learning approach.

Group	N	df	\bar{X}	SD	t-value	P-value
Cooperative learning (Male)	35		11.97	3.12		
		56			0.72	0.943
Cooperative learning (Female)	23		12.00	2.68		

***Significant at $p \leq 0.05$**

From the result shown in Table 4.5, it was found that there is no significant difference between the mean scores of male students taught using cooperative learning approach ($M=11.97$; $SD=3.12$) and female students taught using cooperative learning approach ($M=12.00$; $SD=3.28$) as determined by the t-test analysis $t(56)=0.72$, $p \leq 0.05$. Hence, the hypothesis is retained.

4.3 Discussion of Results

The analysis of data carried out in this study are based on the hypothesis stated in chapter one. The first finding revealed that there was significant difference between the academic performance of students taught mathematics using cooperative learning approach and those taught using conventional approach. The experimental group retained more knowledge of mathematics concept than the control group as shown by the post-test. This is in agreement with the study of (Yusuf, 2011) who concluded that there was a statistically significant difference in the performance of students taught using cooperative learning approach and those taught using conventional approach. The finding also support the study of (Usman, 2015) with the title “implementation of cooperative learning in the classroom” which indicated that the average scores of the experimental group is significantly higher than the control group. Overall, the study showed that the learning of mathematics using cooperative learning approach has a positive impact on student’s performance.

The second finding indicated that there was no significant difference between the performance of male and female students taught using cooperative learning approach. This means that cooperative learning is gender-friendly. Irrespective of gender, both male and female students equally benefitted from use of this approach. This finding is in agreement with (Yusuf, 2011), who investigated the effect of co-operative instructional strategy on student performance to find out among other things whether or not the use of co-operative learning strategy has any significant gender effects on academic performance. He found that there was no significant difference in the performance of male and female students taught using co-operative learning strategy.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter discusses mainly the summary of the study, Conclusion of the study, Recommendation of the study and Suggestions for further research.

5.1 Summary

The research work investigated the impact of cooperative learning on senior secondary school students' mathematics achievement in F.C.T, Abuja. The study was categorized into five chapters. Chapter one discusses the following sub-headings: Background to the study, Statement of the problem, Purpose of the study, Objective of the study, Research Questions. Research Hypothesis, Significance of the study, Scope and Delimitation of the study and Operational Definition of terms. Two research questions were raised for the study.

In chapter two, related literature was reviewed on the research which gives the researcher knowledge on how much work have been done in respect to the research topic and the area to really focus on.

Basically, chapter three deals mainly with the research methodology with the following sub-headings: Research Design, Population of the study, Sample and Sampling techniques, Research instrument, Validity and Reliability of the Research instrument, Method of data collection and Method of data analysis. Chapter three explains the research design to be an experimental type in which two schools were randomly selected from F.C.T, Abuja.

In chapter four, the data collected were presented and analyzed using mean, standard deviation and t-test with a statistical tool of SPSS. Hence, the two research questions were adequately answered, and the two hypothesis were tested, and the findings revealed that there is a significant difference in the mean scores of students when taught mathematics using cooperative learning and those taught using conventional method.

Finally, chapter five summaries the whole research work where conclusions were drawn and also useful and necessary recommendations were provided as well as useful suggestions for further studies.

5.2 Conclusion

Significant difference in students mathematics performance was found between the experimental and control groups. After the treatment, experimental group students showed significant improvement in mathematics performance and attitude towards mathematics in comparison to control group students, students seem to prefer learning mathematics by sharing knowledge. They feel contented when they can function effectively in the cooperative learning. It is hoped that the findings of this study may assist policymakers and teachers to identify appropriate measures that could promote cooperative learning in mathematics classrooms.

Basically, the findings of this study have shown a great improvement in mathematics performance attitudes towards mathematics. Therefore, cooperative learning can be successfully used to promote students' performance in mathematics in secondary schools in FCT, Abuja.

5.3 Recommendations

In the light of this findings, the following recommendations were made:

1. School curriculum planners should consider the introduction of cooperative learning approach of learning in our schools and adjust the curriculum for the purpose.
2. Mathematics teachers should be encouraged to use group wprk approach as alternative strategy that they can fall back on in order to improve the teaching and learning of mathematics in senior secondary school
3. The impact of cooperative learning approach of learning and mathematics achievement at senior secondary school should be carried out to compliment the present research.
4. The impact of cooperative learning approach on various ability level, retention, gender and anxiety should be carried out.
5. Schools should provide enough time, like double periods, for the method to give it a trial run in the time-table.

5.6 Suggestions for further findings.

Areas where further research could be done are as follows:

1. A follow-up study of this research to cover all the secondary schools in FCT, Abuja.
2. A similar research should be carried out in other stated of the federation.
3. A similar research should be done in other branches of science.

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APPENDIX I

MATHEMATICS ACHIEVEMENT TEST

ON

Impact of Cooperative learning on Senior Secondary School Students Mathematics Achievement in Abuja, Nigeria

Dear respondents,

I am a final year student of Federal University of Technology, Minna, carrying out a research on the above topic. The purpose of this study is to examine the Impact of Cooperative learning on Senior Secondary School Students Mathematics Achievement in Abuja, Nigeria

Please study carefully and circle the appropriate answer. All information gathered shall be used for research purpose and shall be treated with confidentiality.

SCHOOL:

CLASS:

SEX: M () F ()

1. is the process of using rounded value when presenting numerical data and making rough calculations.

A. approximation B. estimation C. figures D. Numerals

2. Round off 163.864 to 2 decimal places

A. 163.84 B. 163.86 C. 163.85 D. 164

3. Round off 163.864 to the nearest whole number

A. 163 B. 165 C. 164 D. 163.9

4. Round off 146.83 to 3 significant figures

A. 146 B. 146.830 C. 149 D. 147

5. Round off 8.026 to 2 significant figures

A. 8.03 B. 8.02 C. 8.11 D. 8.04

6. The digits 1, 2, 3 and 4 are rounded

A. up B. down C. left D. right

7. The digits 5,6,7,8 and 9 are rounded

- A. left B. right C. up D. down
8. Approximate 257.894 to 4 significant figures
A. 257.8940 B. 258 C. 257.8 D. 257.0
9. What is the approximate value of 29.9?
A. 30 B. 29 C. 28.0 D. 29.10
10. The significance of a digit depends on its position
A. NO B. YES C. A&B D. none of the above
11. is the most significant in 146.86
A. 86 B. 6 C. 1 D. 4
12. Round off 0.002487 to 3 significant figures
A. 0.00 B. 0.0024 C. 0.002 D. 0.00249
13. Round off 36.9 to 2 significant figures
A. 37 B. 36 C. 36.1 D. 36.0
14. Approximate 80.968 to 1 significant figures
A. 80.96 B. 80.97 C. 80.9 D. 80
15. Approximate 163.864 to the nearest hundred
A. 164 B. 163 C. 200 D. 170
16. Round off 450170 to 3 significant figures
A. 45000 B. 45017 C. 450 D. 450000
17. Round off 0.002487 to 1 decimal place
A. 7.9 B. 8.1 C. 7.0 D. 7-8
18. Round off 52.84 to the nearest whole number
A. 52.9 B. 53 C. 52.8 D. 52
19. The first significant figure in a decimal fraction for the first non-zero digit in the fraction
A. NO B. false C. YES D. ANONE OF THE ABOVE
20. The first significant figure in the decimal 0.0024 is
A. 0.002 B. 4 C. 0 D. 2

ANSWERS TO MATHEMATICS ACHIEVEMENT TEST

1. A
2. B
3. C
4. D
5. A
6. B
7. C
8. D
9. A
10. B
11. C
12. D
13. A
14. B
15. C
16. D
17. A
18. B
19. C
20. D