



EFFECTIVENESS OF COOPERATIVE LEARNING STRATEGY WITH COMPETITIVE LEARNING STRATEGY ON STUDENTS' ACADEMIC PERFORMANCE AND RETENTION IN MATHEMATICS IN MAIDUGURI, BORNO STATE

BY

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Abstract

The study was designed to investigate the effectiveness of cooperative learning strategy with competitive learning strategy on students' academic performance and retention in mathematics in Maiduguri, Borno state. The study was guided by two objectives, two research questions and two hypotheses respectively. The design of the study was quasi-experimental, tested with pre-test, post-test and post-posttest. The population of the study comprised of sixteen (16) public senior secondary schools. The sample of this study was one intact class selected each from the two schools under study using simple random sampling technique. One was assigned as experimental class while the other was assigned as control class. The validated instruments for data collection for this study was Mathematics Test (MT) with 20 multiple choice items with 4 options (A-D). The experimental groups were taught using Cooperative Learning strategy while control groups were taught using Competitive method. The collected data were analyzed using frequency counts, the simple percentages and descriptive statistics (mean and S.D of the scores) to answered the research questions. While the hypotheses were tested using Z-test of independent sample. The result of the findings revealed that, in post-test, the mean scores of the experimental (16.19) is higher than the mean score (12.45) of the control group. Therefore, Cooperative Learning Strategy is effective in teaching Mathematics. The analyses of the findings on students' level of retention revealed that, in post-posttest, the mean of the experimental group which is 17.50 is higher than the mean score of the control group which is 13.20. The result of hypothesis one revealed that, there was significant difference in students' academic performance in Mathematics between the experimental and the control groups because the post-test result showed that ($Z = 7.661$; $p=0.000<0.05$; $df= 120$). Therefore, Cooperative Learning strategy has significant effect on students' academic performance over competitive method, as such, hypothesis one is rejected. The hypothesis two results revealed that, there was significant difference on Statistical Analysis of Cooperative Learning Strategy and Competitive Learning Strategy based on Students' Retention in Mathematics, when exposed to Cooperative Learning strategy ($Z = 8.088$; $p=0.000<0.05$; $df= 120$), as such, hypothesis two is rejected. The study concludes that, use of Cooperative Learning Strategy in teaching Mathematics improves students' academic performance and retention in mathematics. Therefore, the study recommends that, Cooperative Learning strategy be adopted in teaching Mathematics for the purpose of improving the students' academic performance and retention in mathematics at any level.

INTRODUCTION

Education is a systematic process through which a child or an adult acquires knowledge, experience, skill and sound attitude, it makes an individual civilized, refined, cultured and educated and for a civilized and socialized society Parankimalil (2012). Education is the only estimated process or right way to make progress and prosperity and to bring changes in individuals (is an integral parts of human life) and in society (UNESCO, 2013). In the profession of teaching, educators try to come up with learning methodology to be used in teaching a specific subject properly, so that students take full advantage of learning. Learning is change in behavior which can appropriately occurs when students are actively involved in the construction of their knowledge (Mestre & Cocking, 2002). Generally, there are three major structures of learning, these are: competition learning, independent or individualistic learning, and cooperative learning (Roon, et al., 1983). T

hese three ways of learning lead to different interaction patterns and thus promote different learning outcomes. In competition learning, students perceive that they can achieve their goals if other students fail to do so sometime do it for getting grade, price, promotion or scholarship. In independent learning, the achievement of each student is unrelated to others; there is no concern about competing for grades since there is an individualistic goal structure and student goal achievement is independent. In cooperative learning, students' goal achievements are positively correlated. Cooperative learning has emerged as the leading new approach to classroom instruction (Slavin, 2006).

Simply putting students in groups and telling them to cooperate would not produce the desired outcomes of Cooperative learning, there are five elements that must be observed for real learning to occur; these five elements are; (1) Positive interdependence: Team members are obliged to rely on one another to achieve the goal. If any team members fail to do their part, everyone

suffers consequences. (2) Individual accountability: All students in a group are held accountable for doing their share of the work and for mastery of all of the material to be learned. (3) Face-to-face promotive interaction: Although some of the group work may be parceled out and done individually, some must be done interactively, with group members providing one another with feedback, challenging reasoning and conclusions, and perhaps most importantly, teaching and encouraging one another. (4) Appropriate use of collaborative skills: Students are encouraged and helped to develop and practice trust-building, leadership, decision-making, communication, and conflict management skills. (5) Group processing: Team members set group goals, periodically assess what they are doing well as a team, and identify changes they will make to function more effectively in the future (Johnson & Johnson, 2006).

According to Marzano, Pickering, and Pollock (2003), reasons for cooperative learning are; Promote student learning and academic achievement, enhance student satisfaction with their learning experience, help students develop skills in oral communication, develop social skills & promote student self-esteem, help to promote positive race relations and can lead to a gain as high as 28 percentiles in measured student achievement. Johnson and Johnson (2008) postulated five steps to be used by teachers during cooperative learning setting, these include;

Step 1: Introduction: The teacher introduces the activities and emphasizes the need for each group to work collaboratively as a team and what is expected of them to do in the collaborative learning lesson.

Step 2: Divide the students into group of five: The teacher arranges the experimental class into groups and gives the necessary guidelines; each group will be comprised of only five students with homogeneity in academic ability for better interaction between the group members.

Step 3: Activities to be carried by each group: To ensure that each group members are in their appropriate groups and materials needed for the activity are placed on the table before them after given the necessary guidelines.

Step 4: Discussion of concept taught: Team members are obliged to rely on one another to achieve the goal during the classroom activities, if any team members fail to do their part, everyone suffers consequences.

Step 5: Evaluation: The teacher ensure of individual accountability of each group members.

According to Lam, Law & Cheung (2004), Competitive learning strategy occurs when one student goal is achieved and all others may fail to reach that goal and can be used or applied between individuals or groups, where a group setting is appropriate (when students are reviewing learned materials). Its teaching paradigms consist of individual student's effort characterized by competitive testing to access their competences and create an elevation hierarchy based on grades, this leads to a performance goal as the desired outcome of the educational experience (Oloyede, Adeborrowale, & Ojo, 2012). According to Akinbobola, (2006), Nigerian present educational system is based on competition among students for grades, social recognition, scholarships and admissions to higher schools. He continued by saying that in a traditional competitive classroom, students are concerned with their individual grades and their place in grade curve. According to Okereke, (2010), the primary goal of every educational institution is to achieve effective teaching and learning, this can be possible if efforts are put in place to ensure that students actively participate in the learning processes.

Competition exists when there is a scarcity of a desired learning outcome and students are then positioned to struggle for the attainment of that outcome and it is a learning strategy that creates

a sense of external urgency and drama in students (Webster, 2007). Competitive learning strategy as contented by Johnson and Johnson, (2006), brings a variable into the equation that shifts the participants attention to the cost of their performance in the task and use of its strategy in a classroom brings a change in students' attitude. Competitive learning strategy gives students an air of importance and motivates them to perform better especially when rewards are attached to it (Emmer & Gerwels, 2006). In using competitive learning strategy, the grouped students tend to place increased value on the outcomes of their efforts and tend to decrease their focus on the process. That is, students will increase attention on what it takes to outshine others and decrease attention on learning for its own sake. Competitive element has an effect on a group dynamics because it is often motivated by a competition that develops creativity and problems solving skills (Qin, Johnson & Johnson, 2005).

Okereke, (2014) Competitive learning strategy is about teaching students how to learn without fear of failure or letting their ego's become too involved. Students can access the joy of the moment, involvement, challenge, adventure, and suspense can be fun if students feel free and the situation support fun over comparison. Fun during this learning strategy occurs when students see that competition as the game, the fleeting reality and the learning relationships, and self-respect as the lasting reality.

In summary, Cooperative learning is not simply a synonym for students working in groups. A learning exercise could only be qualified as Cooperative Learning (CL) to the extent that the five listed elements are present opined by (Johnson & Johnson, 2006). Consonant with the reasons given by Marzano, Pickering, and Pollock (2003) on uses of cooperative learning and five steps to be used by teachers during cooperative learning setting postulated by (Johnson and Johnson, 2008). Opined by Lam, Law & Cheung (2004) that, Competitive learning strategy occurs when

one student goal is achieved and all others may fail to reach that goal, this shown that, interdependence is not necessary. Consonance with Oloyede, Adeborrowale, & Ojo, 2012 and Akinbobola, (2006) competitive is an educational system based on competition among students for grades, social recognition, scholarships and admissions to higher schools, its goal is more of competition than goal of learning.

1.2 Statement of the problem

Despite the relative importance of mathematics in science and science related courses as well as in medicine and social sciences and the huge investment in educational sector, students' performance in the subject remained consistently poor (Adolphus, 2011). According to him mathematics educators are trying to identify the major problems associated with the teaching and learning of mathematics in the nation's schools. Despite all these noble efforts, the problem of poor performance in mathematics has continued to surface in nation's public Schools examinations.

Moreover, performance and retention of students in Mathematics in Nigeria public schools is generally poor. Many students especially in the study area have fear or lack of interest for mathematics; as a result, they shun away from mathematics classes, paid little or no attention to lessons and as a result, continue to experience difficulties in answering questions in it (Kajuru & Kauru, 2010). Therefore, they may end of with poor performances and retention in terminal or SSCE examinations. To corroborate the above statement, below is the WAEC result from 2015-2018 showing Students' academic performance in Mathematics of MMC, Borno State.

Table 1: Students' academic Achievement in Mathematics at (SSCE) level West African Examination Council (WAEC) in Borno State from 2014-2017

YEARS	Registered students	No of Passed Students	% of passed Students	No of Failed Students	% of failed Students
2014	3676	1205	32.8	2471	67.2
2015	6829	1513	22.2	5316	77.8
2016	1542	382	24.8	1160	75.2
2017	7225	1023	14.2	6202	85.8

Source: Borno State, Education Resource Centre (ERC), 2018

Objectives of the Study

The objectives of the Study are:

1. To investigate the effect of Cooperative Learning Strategy with Competitive Learning Strategy on Students' academic performance in Mathematics.
2. To determine the Students' level of Retention on Cooperative Learning Strategy with Competitive Learning Strategy in Mathematics.

Research questions

The research questions are:

1. What is the effect of Cooperative Learning Strategy with Competitive Learning Strategy on Students' academic performance in Mathematics?
2. What is the Students' level of Retention on Cooperative Learning Strategy with Competitive Learning Strategy in Mathematics?

Research hypotheses

To achieve the objectives of the study, a null hypothesis was formulated and tested at $p \leq 0.05$ level of significance:

H₀₁: There is no significance difference between Cooperative Learning Strategy and Competitive Learning Strategy on Students' academic performance in Mathematics.

H₀₂: There is no significance difference between Cooperative Learning Strategy and Competitive Learning Strategy on Students' level of Retention in Mathematics.

Review of related literature

Kolawole (2008) investigated on the effects of the cooperative and competitive learning on academic performance of students in mathematics in Nigeria. The sample of the study was 400 Senior Secondary Schools III, Mathematics students made up of 240 boys and 160 girls randomly selected from four out of five States in South West Nigeria. Quasi experimental design was adopted. Two instruments were used namely Mathematics Pre-Test Achievement Test (PTAT) and Post-Test Achievement Test (PAT) to collect data. The data collected in this study were subjected to Z-test analysis at $\alpha = 0.05$ level of significance. The findings revealed that cooperative learning strategy is more effective than competitive learning strategy and that boys performed significantly better than girls in both learning strategies.

Isah (2015) investigated on the impact of cooperative learning strategy on performance and retention in geometry among junior secondary school students in Sokoto state, Nigeria. The design of the study was quasi experimental with pretest, posttest and post posttest design. The population of 10,103 students used for the study; purposive sampling procedure was used to select 354 students from the study area. GCPT was administered before and after the treatment. Four research questions were asked from which four null hypotheses were developed and tested at 0.05 level of confidence. Independent t-test was used to analyze each hypothesis appropriately. CLS was used to teach experimental group in geometry construction of JSS III while CLM was used to teach control group the same topics. The study indicates that CLS improved performance and retention ability of students in geometry construction. The analysis of the data indicated that students taught with CLS performed and retained significantly higher than students taught with

CLM. Male students taught with CLS performed better than the male students taught with CLM. The study found no significant difference between male and female students taught with CLS. Female exposed to CLS did not perform better than the Female exposed to CLM.

Sale (2011) conducted a research on the effect of cooperative and individualistic learning strategies on academic performance of students in the general chemistry laboratory, used quasi-Experimental design. The samples of the study were divided into two groups (experimental and control). The hypotheses were first generated, after the data were collected, analyzed using t-test at $\alpha = 0.05$ level of significance. The findings revealed that a cooperative learning strategy is more effective than an individualistic strategy; and, the students in the cooperative group performed significantly better. The mean difference of the final examination of 6.80, $t = 6.10$, $p = 0.001$ indicated that the difference of the results for control group and experimental group was significant at $p < 0.05$. It's also revealed that, Students of cooperative groups, responses toward perception on Mathematics were positive. Almost 90% of the students would like to help, get help and mutually discuss the labs with their partners. A majority of them were in agreement that working as a group to conduct an experiment could improve their teamwork skills as well.

Okereke & Ugwuegbulam (2014) conducted a research on effects of Competitive Learning Strategy on Secondary School Students Learning Outcomes: Implications for Counselling in Nigeria. The study sought to find out the effects of competitive learning strategy on secondary school students learning outcomes in chemistry. Two null hypotheses were formulated to guide the study. The study adopted a quasi-experimental design. There were 337 senior secondary students II (SSS II) purposively selected from eight (8) intact classes in Imo State from 3 boys only and 3 girls only schools. The instrument for data collection was titled "chemistry Achievement Test (CAT)" designed by the researchers. It was validated before being put into

use. The experimental treatment lasted for four weeks and data collected were analyzed using Analysis of Covariance (ANCOVA). The findings showed that competitive learning strategy enhanced students' learning outcomes in chemistry.

Materials and Methods

The research design for this study was quasi experiment which consists of one experimental and one control groups adopting Pretest, post-test and post-posttest, to determine whether there were any statistical differences between the two groups. The experimental groups were taught using Cooperative Learning Strategy Control groups were taught using Competitive Learning Strategy. The population for this study comprises of sixteen (16) public senior secondary schools in Maiduguri Metropolis, Borno State, which includes; four (4) male schools, four (4) female schools and eight (8) mixed (coeducation) schools while the samples of the study was two (2) SSII intact classes randomly selected from the two (2) mixed schools under study. Mathematics Test (MT), consist of twenty (20) items of multiple choice objective tests was used for data collection. The items were drawn carefully within the scope of Mathematics SSII syllabus, also to be answered by Students.

The content validation of the Mathematics Test (MT) for this study was carried out by a panel of experts specialized in the field and in addition, has experience in both WAEC and NECO exams. Those experts critically assessed the appropriateness of the items through face-to-face validity method, whether or not the statements in the tests were clear, readable, hard or too simple for SS II students, whether or not the test items are related within the content of the senior secondary school Mathematics syllabus. Their suggestions and corrections were taken into consideration in the final formulation of the test instruments before administration. The instruments were pilot tested with 20 respondents (10male and 10female) in order to determine the reliability co-

efficient of the instrument adapted. The split-half and Cronbach Alpha (Spearman Brown) was used and the reliability coefficient was found to be 0.85 which shows that the instrument is reliable for the study. The Pre-test on Mathematics Test (MT) was administered to both Experimental and control groups prior to treatment in order to ascertain the homogeneity of the groups.

The Post-test of Mathematics Test (MT) was administered to the two groups after teaching the groups for a period of six (6) weeks using the same scheme of work. Then post-posttest followed after two (2) weeks of the post-test to determine the retention level of the Students. In each respect, graduate of Mathematics (teacher) in each school were employed as assistant researchers. All the teachers used in this study were professional teachers as well as WAEC markers and they were given the detailed instructions of the lesson.

After treatments, the scores in Pre-test, Post-test and Post-posttest of both groups were collated, the Mathematics test (MT) answered by the respondents, subjected to appropriate Statistical analysis, that is using frequency counts, percentages, bar-charts, descriptive Statistics in form of Mean (\bar{x}) and standard deviation (S.D) to answer the research questions and inferential statistics that is independent sample z-test to test the hypotheses at $\alpha = 0.05$ level of significance. The computer package used for the data analyses was Statistical Package for Social Sciences (SPSS) version 16.0.

Results and Discussions

Table 2: Frequency distribution of the respondents based on schools

SCHOOLS	FREQUENCY			PERCENTAGES
	Male	Female	Number (N)	
A	40	22	62	51.00
C	35	25	60	49.00
TOTAL	75	47	122	100

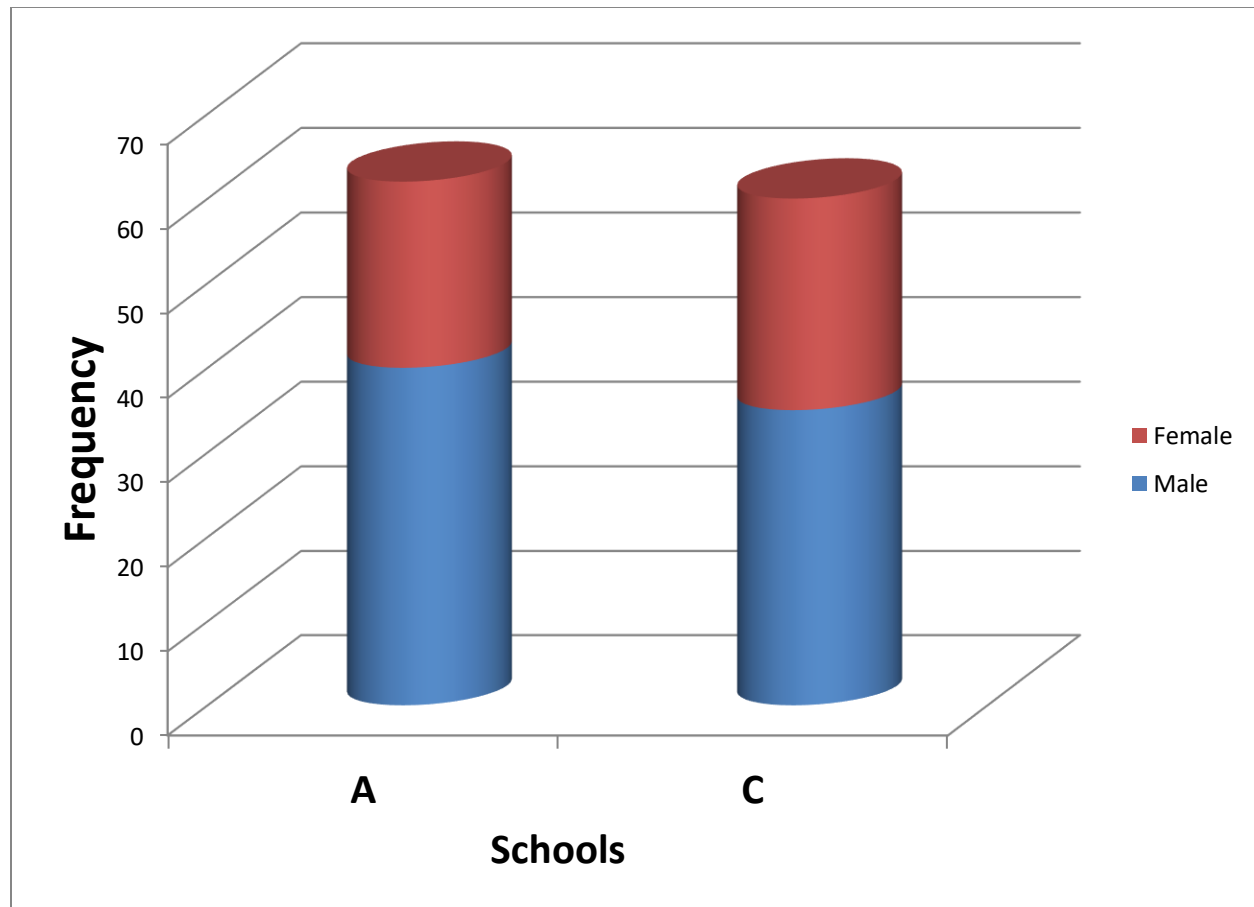


Figure 1: Bar-chart showing the distribution of students of the sampled schools

Figure 1 showed the distribution of the sampled schools. 62 respondents (40males and 22females) representing 51.00% were from school A and 60 respondents (35males and 25females) representing 49.00% were from school C. Therefore, school A has the high number of respondents than school C, but School C has the high number female than School A.

Data Analysis

The data obtained from the Mathematics Test (MT) were analyzed using descriptive statistics to answer the research questions and z-test at $P \leq 0.05$ level of significance to test the hypotheses, and results were presented as follows.

Research Question One: What is the effect of Cooperative Learning Strategy with Competitive Learning Strategy on Students' academic performance in Mathematics in Maiduguri, Borno State?

The Mathematics Test (MT) was used in collecting data on the effect of Cooperative Learning Strategy with Competitive Learning Strategy in Mathematics and the summary of the analysis is presented in table 3, using frequency (N), Mean (\bar{x}) and Standard Deviation (SD).

Table 3: Statistical Analysis of Cooperative Learning Strategy with Competitive Learning Strategy on Students' academic performance in Mathematics in Maiduguri, Borno State

Groups	Pre-test			Post-test			Remarks
	N	Mean (\bar{x})	S.D	N	Mean (\bar{x})	S.D	
Experimental	62	12.24	4.015	62	16.19	1.726	Cooperative Learning is Effective
Control	60	11.78	3.897	60	12.45	3.437	
TOTAL	122			122			

Result from table 4.2 revealed that in pre-test, mean of the experimental and the control groups are 12.24 and 11.78 respectively which shows that the performance of the students in the two groups were very closed with the difference of 0.46, the analyses revealed that, the two groups are equivalent at the entry level in term of students' academic performance, while in post-test, the mean scores of the experimental group which is 16.19 is higher than the mean score of the control group which is 12.45 with the difference of 3.74. Therefore, the Statistical analyses revealed that, Cooperative Learning Strategy is effective in teaching Mathematics than Competitive Learning Strategy

Research Question Two: What is the Students' level of Retention on Cooperative Learning Strategy with Competitive Learning Strategy in Mathematics in Maiduguri, Borno State?

The Mathematics Test (MT) was used in collecting data on the Statistical Analysis of Cooperative Learning Strategy with Competitive Learning Strategy on students' level of Retention in Mathematics and the summary of the analysis is presented in table 4.3, using frequency (N), Mean (\bar{x}) and Standard Deviation (SD).

Table 4: Statistical Analysis of Cooperative Learning Strategy with Competitive Learning Strategy on students' level of Retention in Mathematics in Maiduguri, Borno State

Groups	Post – Test			Post – Posttest		
	N	Mean (\bar{x})	S.D	N	Mean (\bar{x})	S.D
Experimental	62	16.19	1.726	62	17.50	2.055
Control	60	12.45	3.437	60	13.20	3.588
TOTAL	122			122		

Result from table 4.3 revealed that in post-posttest, the mean of the experimental group which is 17.50 is higher than the mean score of the control group which is 13.20 with the difference of 4.30. Therefore, Cooperative Learning Strategy is effective on Students' Retention in Mathematics than Competitive Learning Strategy.

Hypotheses Testing

Hypothesis One: There is no significance difference between Cooperative Learning Strategy and Competitive Learning Strategy on Students' academic performance in Mathematics in Maiduguri, Borno, Nigeria.

The Mathematics Test (MT) was used in collecting the data on the Statistical Analysis Cooperative Learning Strategy and Competitive Learning Strategy on Students' academic performance in Mathematics and the summary of the analyses are presented in table 4.4, using frequency (N), Mean (\bar{x}), Standard Deviation (SD) and Z - test.

Table 5: Summary of the post-test results of the independent sample z-test on the Statistical Analysis of Cooperative Learning Strategy and Competitive Learning Strategy on Students' academic performance in Mathematics

Group	N	\bar{x}	SD	Df	Z	P-value	Remarks
EXP.	62	16.19	1.726	120	7.661	0.000	Significant
CON.	60	12.43	3.402				
Total	122						

Results from table 5 revealed that in the post-test statistical analysis, there was significant difference in students' academic performance in Mathematics between the experimental and the control groups because the p-value of (0.000) is less than the level of significance ($\alpha=0.05$), the results further revealed that the mean score (16.19) of the experimental group is higher than the mean score (12.43) of the control group and the difference is statistically significant. Therefore, Cooperative Learning Strategy has significant effect on Students' academic performance in Mathematics. As such, hypothesis one is rejected.

Hypothesis Question Two: There is no significance difference between Cooperative Learning Strategy and Competitive Learning Strategy based on Students' level of Retention in Mathematics.

The post post-test of the Mathematics Test (MT) was used in collecting the data on the effect of Cooperative Learning Strategy and Competitive Learning Strategy on Students' Retention in Mathematics and the summary of the analyses are presented in table 6, using frequency (N), Mean (\bar{x}), Standard Deviation (SD) and Z - test.

Table 7: Summary of the independent sample z-test on the effect of Cooperative Learning Strategy and Competitive Learning Strategy based on Students' Retention in Mathematics

Group	N	\bar{x}	SD	df	Z	P-value	Remarks
EXP	75	17.50	2.055	120	8.088	0.000	Significant
CONT	47	13.20	3.588				

122

Results from table 7 revealed that there was significant difference between Cooperative Learning Strategy and Competitive Learning Strategy based on Students' level of Retention in Mathematics, because, the p-value (0.000) is less than the level of significance ($\alpha=0.05$). Therefore, As such, hypothesis two is rejected.

Conclusions

Based on the findings of this study, the following conclusions were drawn:

- i) The use of Cooperative Learning Strategy in teaching Mathematics improves students' academic performance, because, the mean score of the experimental group which is 16.19 is higher than the mean score of the control group which is 12.45. In addition, Students' interactions in a small group enable them to generate a new learning experience through positive interdependence and individual accountability, face to face promotive interaction, appropriate use of collaborative skills and group processing to achievement the desired goal.
- ii) The result of the post-posttest showed that, Cooperative Learning strategy helps in improving Students' level of retention in Mathematics, because, the mean of the experimental group which is 17.50 which is higher than the mean score of the control group which is 13.20 with the difference of 4.30. Therefore, Cooperative Learning Strategy is effective on Students' Retention in Mathematics than Competitive Learning Strategy.

iii) When the Experimental group was taught using Cooperative Learning strategy, the post-test result revealed that, there was significant effect of Cooperative Learning strategy on students' academic performance in Mathematics with p – value 0.00 which is less than the level of significant ($\alpha=0.05$). Therefore, Statistically, Cooperative Learning Strategy has significant effect on Students' academic performance in Mathematic.

iv) Cooperative Learning strategy helps in improving Students' Retention in Mathematics, because, the reason indicated by the p -value (0.000) which is less than the level of significance ($\alpha=0.05$) in hypothesis two, which lead to correct decision of hypothesis two.

Recommendations

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

- i. Cooperative Learning strategy has significant on Students' Academic performance in Mathematics. For this reason, mathematics teachers should adapt the strategy when teaching Mathematical concepts to improve the Students' performance in mathematics.
- ii. The Federal Ministry of Education (FME) and the State Ministry of Education (SME) should encouraged Mathematics text book authors to incorporate Cooperative Learning strategy which is progressive and successful strategy of teaching mathematics, that can improve both Student' Academic performance and retention in Mathematics, by showing its effectiveness through the teachers' training or workshops.

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