Effectiveness of Cooperative and Competitive Instructional Strategies on Students' Academic Achievement in Mathematics in Ifako Ijaiye Local Government Area of Lagos State

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Abstract

The study investigated the effectiveness of cooperative and competitive instructional strategies on students' academic achievement in Mathematics in Lagos State. The sample of the study consisted of one hundred and eighty (180) Junior Secondary School class two (JSS2) Mathematics students of three randomly selected secondary schools in Ifako Ijaiye Local government Area of Lagos State and made up of ninety (90) boys and ninety (90) girls selected through stratified sampling technique. Quasi experimental design was adopted for the study. Two instruments: Pre-test Mathematics Achievement Test (PMAT) and Post-test Mathematics Achievement Test (PAT) were used to collect data. The reliability coefficients of the instruments were found to be 0.8 and 0.85 using Pearson Product Moment Correlation. The experiment lasted for four weeks, and the data collected were analyzed using analysis of covariance and t-test statistics at $\alpha = 0.05$ level of significance. The finding revealed that cooperative instructional strategy was a better strategy and that boys and girls significantly performed better when taught with cooperative instructional strategy. Based on the findings, it was concluded that cooperative instructional strategy is more potent and better results oriented than competitive instructional strategy, therefore it was recommended that cooperative instructional strategy should be adopted by teachers in the teaching of Mathematics in secondary schools. Mathematics curriculum should inculcate cooperative ideas that will allow meaningful classroom interactive patterns for promoting academic achievement. Cooperative instructional strategy should be introduced in secondary schools in Nigeria.

Keywords: Cooperative instructional strategy, competitive instructional strategy, academic achievement

Introduction

Mathematics as a school subject cuts across all classes in Basic and secondary school level in Nigeria. As a school subject, it prepares learner, stimulates learners and provides sound mathematical and logical experiences required for future vocational development of the society. Despite the prominence attached to mathematics as a school subject, it is a subject that many students dislike (Matawal, 2013). Owing to this, Mathematics educators made series of attempts to encourage and popularize the subject but with a very little rate of

success so far. The results of students in mathematics in external examinations have proven that a lot need to be done in the teaching and learning of mathematics. For example, in year 2009, the Federal Government of Nigeria ordered an investigation into the mass failure of year 2009 Senior School Certificate Examination (SSCE) conducted by National Examinations council (NECO) and West African Examinations Council (WAEC).

According to the Nations Newspaper of November 3, 2009, the paper showed that out of 1, 373,009 candidates who sat for the examination that year, only 353,981 students representing 25% of all the candidates got credits in mathematics. Likewise of those who sat for senior school certificate examination conducted by National Examinations Council (NECO) same year, only 126,500 students representing 10.76% of 1,200,765 students got credits in mathematics. The results of 2018 senior school certificate examination (SSCE) released by WAEC also showed that 54.59% of all candidates failed mathematics (The Punch newspaper, July 17, 2018). The 2019 released result of senior school certificate examination conducted by WAEC also proved a lot needs to be done as 40% of all candidates who sat for the examination failed in mathematics (Guardian newspaper, July 27, 2019). This poor performance was attributed to many factors including ineffective and unproductive strategies used by teachers, poor classroom interaction and poorly developed curriculum among others. It is against this backdrop that the present study focused on determination of a better strategy to be used in the teaching of mathematics.

The way and manner by which mathematics is being introduced to students have been more than anything else responsible for the dread, hatred and negative attitude that many of them have shown for the subject (Lawal, Afolabi & Ajayi, 2017). Among several causes often listed as responsible for this are insufficient books, lack of good teaching aids, poor knowledge of the subject by the teacher and more importantly the teaching approach being presented by the teacher (Oyedeji, 2001).In the traditional classroom setting, the teacher does all the teaching while the students do all the listening. Students are not allowed as active participants, and as such students' individual responses are limited. It is teacher-centered, where teacher dominates the class teaching and it tends to emphasize rote learning rather than meaningful learning. This method of teaching has failed to promote genuine mathematical understanding and there is poor learning outcome (Ilogu, 2012). Also, competitive instructional strategy as contended by Johnson and Johnson (2004) brings a variable into the equation that shifts the participants' attention to the cost and prize of their performance in the task. Competition exists when there is scarcity of a derived learning outcome, students are then positioned to vie for the attachment that comes. This strategy creates a sense of external urgency. Competitive elements presented by this strategy provide consummation of learning opportunities and chance to have fun on the part of students.

Cooperative instructional strategy on the other hand is a mode of learning in which students of different abilities work together in small group to achieve a purpose (Onuka,

2007). Students in a group interact with each other, share ideas and information, seek additional information, and make decision about their findings to the entire class (Kolawole, 2007). Cooperative learning is student-centered versus teacher-centered teaching strategy leading to stronger emphasis on the goal of learning instead of performance goals. It encourages teachers to use alternative assessment techniques that reduce emphasis on competitive examination (Orhun, 2007).

This study is built around the concept of B.F Skinner operant conditioning theory and Bandura social cognitive theory. Skinner (1981) expressed that people do not experience consciousness or emotions but rather their own bodies and internal reactions are responses to internal stimuli. He further argues that learning is the result of responses in a complex situation and need to be strengthened through reinforcement and that much learning occurs when we perform behaviour. This reinforcing stimulus is responsible for response strengthening through increasing the rate of response or making more likely response to occur. They are defined based on the effect which do not depend on mental processes alone but also on material rewards, prizes, promotion recognition, respect, medal, honour among others. These initiate and strengthen the competitive spirit in the learners. In same vein, Bandura (1986) explains social cognitive theory as series of skills which typically shows the combination of observation and performance in a social environment. The learner first observes the model, explain and demonstrate skills and then practice them. It argues that much learning occur when there is a great deal of observation in social context. Collaborative and cooperative expression of facts and series of teaching in a social manner tend to encourage and motivate the learner to perform better. Mathematics teachers can improve the learners' knowledge and insight by means of efficient support in line with group-learning and maximizing the knowledge of their learning preferences.

Previous researches carried on the best learning strategy appear not to show there is improvement in the teaching and learning of mathematics. Ogbonne and Offorma, (2013) explained that competitive instructional strategy improves learning outcome but failed to give details in regard to sex. This study therefore is an extension of work carried out on the best instructional strategy to be used in the teaching of mathematics and also seeks to explore the extent to which each of these strategies could affect the learning of mathematics in secondary school. It seeks to investigate which of the cooperative and competitive instructional strategies will bring about better achievement of students in mathematics and to what extent do these learning affect gender in learning outcome.

Research Questions

The following questions were generated as guide to the study:

1: Is there any significant difference between the average score of students taught with traditional, competitive and cooperative instructional strategies.

2: Is there any significant difference between the mean academic performance of boys and girls taught with competitive instructional strategy.
3: Is there any significant difference between the mean academic performance of boys and girls taught with cooperative instructional strategy.

Methodology

Pretest-posttest non equivalent quasi experimental research design was used for this study. The design was adopted because it establishes a cause effect relationship of the independent variable (teaching strategies) on the dependent variable (student academic performance).

The sample of this study was made up of one hundred and eighty (180) students. Three schools were randomly chosen out of the twenty public secondary schools in Ifako Ijaiye Local Government Area of Lagos State. Ninety (90) boys and ninety (90) girls, through stratified sampling technique, were chosen from the selected schools. The instruments for this study were Pre-test Mathematics Achievement Test (PRTMAT) and Post-test Mathematics Achievement Test (POTMAT). The pre-test mathematics achievement test and post-test mathematics achievement test were two equivalent tests, the contents of the achievement test were randomly selected from the scheme of work provided for secondary schools by Lagos State Ministry of Education. Fifty multiple choice objective items were chosen from a pool of one hundred items prepared after standardization. The instrument was validated by giving it to experts in the field of measurement and evaluation and their comments were correlated to determine the degree of association. The reliability was found to be 0.8 and 0.85

Mathematics teachers were appointed to teach the students the selected topics for two weeks after the pre-test and thereafter the post-test was administered. The completed achievement tests were then collated and scored t-test and ANCOVA were used to analyse the data collected for this study.

Results

In answering the research questions, each of the questions was converted into hypothesis thus

Ho_1: There is no significant difference between the average score of students taught with traditional, competitive and cooperative instructional strategies.

Table 1: Result of the Analysis of covariance on the differences between the Mathematics Achievements of Students taught with traditional, competitive and cooperative instructional strategies

Tests of Between-Subjects

Dependent Variable: post test

	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2060.910[a]	2	1030.455	27.030	.000	.316
Intercept	2743.589	1	2743.589	71.966	.000	.381
Pretests	2.502	1	2.502	.066	.798	.001
Instructional Strategies	2032.238	1	2032.23	53.307	.000	.313
Error	4460.415	117	38.123			
Total	74637.000	120				
Corrected Total	6521.325	119				

a. R Squared = .316 (Adjusted R Squared = .304)

b. Computed using alpha = .05

Table 1 shows there is a significant effect of the treatment on the students' academic achievement ($F_{(2, 176)} = 53.307$); $P < 0.05$; $n^2 = 0.000$) and the Partial eta squared of 0.313 implies that the (traditional, competitive and cooperative instructional strategies) accounts for 79.8% of the observed variance in the post-test scores of students. Therefore the hypothesis is rejected

Table 2:
Estimated marginal means for traditional, competitive and cooperative instructional strategies on academic achievement

Tests of Between-Subjects Effects

Dependent Variable: posttest

	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2060.910[a]	2	1030.455	27.030	.000	.316
Intercept	2743.589	1	2743.589	71.966	.000	.381
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Corrected Total	6521.325	119				

a. R Squared = .316 (Adjusted R Squared = .304)

b. Computed using alpha = .05

Dependent Variable: posttest

Instructional Strategies	Mean	Std. Deviation	N
Traditional	19.68	6.063	60
Competitive	27.97	6.235	60
Cooperative	39.97	4.679	60
Total	29.21	10.093	180

Table 2 shows students with cooperative instructional strategy (X = 39.97) has a higher mean performance than those of competitive instructional strategy (X = 27.97) while those of competitive instructional strategy performed better than students taught with traditional instructional strategy (X = 19.68).

Ho_2: There is no significant difference between the mean academic performance of boys and girls taught with competitive instructional strategy

Table 3:

Differences between the mathematics achievement of boys and girls taught with competitive instructional strategy

	Group N	MEAN	SD	Df	t_{cal}	Sig
Boys	30	28.27	6.107	58	0.370	0.713
Girls	30	27.67	6.535			
$\alpha = 0.05$, df = 58						

The table 3 shows t_{cal} value of 0.370 and P value of 0.713. Testing at an alpha value of 0.05, the p value is higher than the alpha value. Thus, the null hypothesis is accepted. There is therefore no significance difference in performance between boys and girls taught with competitive instructional strategy.

Ho_3: There is no significant difference between the mean academic performance of boys and girls taught with cooperative instructional strategy.

Table 4: Differences between the academic achievement of boys and girls taught with cooperative instructional strategy

	Group	N	MEAN	SD	Df	t_{cal}	Sig
Boys	30	39.87	5.758	58	-0.164	0.870	
Girls	30	40.07	3.373				
$\alpha = 0.05$, df = 58							

The table 4 shows tcal value of - 0.164 and P value of 0.870. Testing at an alpha value of 0.05, the p value is greater than the alpha value. Thus, the hypothesis which states that there is no significant difference between the mean academic performance of boys and girls taught with cooperative instructional strategy is not rejected.

Discussion

Arising from the findings of this study, the students taught using cooperative instructional strategy had mean gain score significantly different from those students taught using traditional or competitive instructional strategies. This finding is in line with Johnson and Johnson (2004), and Caliskan and Sunbul (2011) who all found out that students taught using cooperative instructional strategy had enhanced performance which made them outscored others taught with other instructional strategies.

Secondly, sex interaction of the students taught with competitive instructional strategy clearly shows that males performed better than females. The result of the finding is in consonance with Kolawole (2007). One explanation, as regards this point, is the fact that males are risk takers and more flexible and that they can try new strategies than females.

It is also noted that sex interaction of students taught with cooperative instructional strategy shows both males and females significantly improved after the teaching. This findings alludes that of Finkel (2004) and Toppings (2005) who both found out that cooperative learning impact on one cadre of learners irrespective of sex, social status or ability.

Conclusion

It was concluded from the findings of this study that cooperative learning yields better gain and provides a platform for students to achieve than competitive instructional strategy, hence, it was recommended that:

1. Cooperative instructional strategy should be adopted by teachers in the teaching of Mathematics in secondary schools.
2. Parents should be enlightened on the importance of cooperative interaction through socially engaging task such as group work, assignment etc
3. Mathematics curriculum should inculcate cooperative ideas that will allow meaningful classroom interactive patterns for promoting academic achievement
4. Government, private organization and individuals concerned with the business of education should endeavour to address the obstacles hindering successful implementation of cooperative learning in classroom.

References

Bandura, A. (1986). Social learning theory. New Jersey: Prentice Hall.

Caliskan, M., & Sunbul, M.A. (2011). The effects of learning strategies instruction on metacognitive knowledge, using metacognitive skills and academic achievement (Primary Education Sixth Grade Turkish Course Sample) Educational Sciences: Theory & Practice, 11(1), 133-153.

Finkel, D. L. (2000). Teaching with your mouth shut. Portsmouth, NH: Boynton Cook Publishers.

Ilogu, G.C. (2012). Classroom learning and instruction, Lagos: Wealth smith Books.

Johnson, D. W. & Johnson, R. T. (2004). Assessing students in groups. California: Corwin Press.

Kolawole, E.B. (2007). Effects of competitive and cooperative learning strategies on academic Performance of Nigerian Students in Mathematics. *Educational Research Review, 3*(1), 33-37.

Lawal, B. M., Afolabi J. O. & Ajayi O.R. (2017) Relationships among teaching experience, competence and economics performance of secondary school students in Ibadan, Oyo State. *Unilorin Journal of Lifelong Education, 1*(2), 106-114.

Matawal D. B. (2013). Effects of scaffolding instructional method on SS11 students' achievement in mathematics in Jos North L.G.A., Plateau State, Nigeria. *International Journal of Research in Science, Technology and Mathematics Education, 1*(2): 117-125

Ogbonne, U.T. & Offorma, G.U., (2013). Effects of collaborative learning method on secondary student interest in English language tenses. *International Journal of educational Research 12*(2) 28-135.[13]

Onuka, A.U.O. (2007). Teacher -initiated students-peer assessment: a means of improving learning assessment in large classes. International Journal of Africa American Studies, *6*(1), 18-24

Orhun, E. (2007). Computer and Information sciences - 3. Proceedings of the third international symposium on computer and information sciences. *International symposium on computer and information sciences*. (3rd:1988:Cesme, Turkey)

Oyedeji, O. (1998). Teaching for innovation. Ago Iwoye: OOU Publishing.

Skinner, B.F. (1981). Selection by consequence: *Science,* New series, Vol. *213*, 501-504.

The News Agency of Nigeria (2009). Guardian Nigeria Newspaper. July, 2019.

The News Agency of Nigeria (2009). Punch Nigeria Newspaper. July, 2018.

Topping, K.J (2005). Trends in peer learning: *Journals of Educational Psychology, 77*(2), 264-287.