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CONTENTS

EFFECTIVENESS OF INDIVIDUALISTIC AND COOPERATIVE TEACHING STRATEGIES IN LEARNING GEOMETRY AND PROBLEM SOLVING IN MATHEMATICS AMONG JUNIOR SECONDARY SCHOOLS

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Abstract

This study sought to ascertain problem solving in mathematics using cooperative and individualistic strategies in teaching and learning Geometry among Junior Secondary Schools. A sample size of one hundred students from three secondary schools in Ibadan North Local Government was used.

These students were grouped into control, cooperative and individualistic teaching strategies groups, in which it was set up to test the effectiveness of the individualistic and cooperative teaching strategies.

The instruments used were two teaching strategies packages Mathematics Achievement test in Geometry and students attitude inventory in Mathematics. t-test, ANOVA were used in the analysis of the data collected. The results of the study show that there is a significant difference in the cooperative and individualistic groups to conventional teaching method.

Educational systems throughout the world place importance on the teaching and learning of mathematics and a lot of resources are allocated to maintain and improve efficiency and effectiveness in these activities. Mathematics is important because the study of the subject is associated with more academic and/or career opportunities. Burton (1979) relates the importance of mathematics to the scientific, industrial, technology and social progress of a society. It has further been

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suggested that secondary school mathematics is more basic to a scientific career than even secondary school science courses.

Over the years the quest for the best approach to the teaching and learning of mathematics has been advocated. Among many scholars that worked on teaching strategies are Akinsola, (1994); concept mapping Polya (1964), Ausubell (1968) Popola (2002) to mention but a few. The issue of poor academic achievement in our schools has become the concern of parents, government and every citizen in our society. It is also the basic reason behind the mass failure that has deprived many young school leavers for gaining admission into higher institution of learning.

The government together with the parents and general public on many occasions has attributed the poor performance in mathematics to many factors including the teachers non-challenging attitude to work, inadequate texbooks, unqualified teachers to handle senior classes, student's attitude towards mathematics and other factors as regards students' performance in mathematics.

Mathematics is a science that studies numbers, shapes, objects and their properties which are needed as a basic requirement for all sciences, engineering and the social sciences.

It is against this background that the present researcher has focused among other things on cooperative and individualized strategies in teaching and learning geometry to see whether it could improve students achievement and attitudes towards mathematics. The survey seeks to get to the root of the cooperative learning strategy versus individualized studies in Geometry.

Cooperative learning strategy has been defined by Slawin (1982) as an instructional method in which students of all levels of performance work together in small groups towards a common goal. Also defined by Nodding (1989) as pupil-pupil inter actions as well as teacher-pupil interaction. Interactions are encouraged in their learning strategy.

Recent evidence indicates that students performance is greatly influenced by their modes of relationship with peers (Johnson 1983). It is on this basis that many contemporary researchers find it profitable

to investigate student-student interactive/socialization dimension of the learning environment.

Therefore, there is a need to examine the interactions of the students in order to determine whether the interaction pattern can help in problem solving in the teaching and learning of mathematics.

The purpose of this study is to determine the effectiveness of cooperative and individualized teaching styles in learning Geometry of plane shapes among students of Junior Secondary schools. The study was designed to examine the following basic questions:

1. Will there be any difference in scores between cooperative, individualistic and control groups in learning geometry of plane shapes?
2. Will there be any difference in test scores between cooperative and individualistic method of problem solving in geometry of a plane shapes?

Hypothesis

Based on the above stated problem, the following null hypothesis were to be tested:

Ho1: There will be no significant difference in the mean test scores between cooperative group and individualized group in problem solving in geometry.

Ho2: There is no significant difference in the mean attitude towards mathematics between cooperative group and individualized group.

The aim of this study is to compare two teaching methods (cooperative and individualized strategies) with the intention of finding out their effect on students achievement in mathematics.

The better style can then be recommended for teachers of mathematics in the teaching learning situations. Experienced mathematics teachers do know that certain methods of teaching mathematics are more effective than others. It is hoped that if a style of teaching mathematics is known and can result in the improved performance of students in the subject then such a method should be adhere to by the teachers.

Mathematics being a compulsory subject for all students from

primary education up to the senior secondary education will be improved by the use of concrete materials using cooperative group method.

A large number of students will have an understanding of the basic concepts that will enable them enter into science oriented professions which require a knowledge of mathematics.

Thus, the result will be useful to all workers in education when advising or suggesting the best method to be used when solving problems in mathematics to the Government.

Finally the finding will provide useful information upon which future research work in the area of problem solving in mathematics may be used.

The Scope of the Study

This study was carried out in three schools in Ibadan North Local Government of Oyo state for a period of eight weeks. The sample was restricted to one hundred students from Junior Secondary School III.

Problem Solving Technique

Abimbade (1995) state that problem solving technique involves a complex method process of identifying a problem and selecting appropriate solution process through visualizing, abstracting and associating ideas. This method can be used at any stage of education from the pre-schools (Kindergarten) to the University.

Cooperative Learning Strategy

Okebukola (1986) defined cooperative learning strategy as one in which the goals of the separate individuals are so linked with that of the participants that there is a positive correlation among their goal attainments. An individual can obtain his goal only if the participants can obtain their goals too. Thus, a person seeks an outcome that is beneficial to all those with whom he/she is cooperatively linked. The psychological consequences of such a state of affairs according to Okebukola (1986); are:

a. **Substitutability:** The action members being inter-changeable if one member has engaged in a certain behaviour.

b. **Positive cathexis:** If the action of one member moves the individuals in the group towards their goals, his actions will be favorably evaluated by others.

c. **Inducibility:** The actions of the individual in the group move the others towards their goals.

Okebukola (1984), stated that cooperative strategy is a team event like football team members of the team, work together to score more points than opposition and when a member of the team scores a goal, all members of the team benefit towards the goals of winning the game. He stated further that for Biology laboratory work, students may be asked to interact with the learning materials on an individual basis. This is often the case when for instance, there are enough specimens to go round all the students in the class.

In Mathematics classroom teaching where cooperative strategy is being adopted, Adebayo (1996), advocated the following points should be considered.

1. Choosing appropriate learning tasks that are related to the instructions.
2. Determining pattern of groupings to be adopted and organizing students into groups.
3. Monitoring of activities by the teachers. This usually leads to teacher identifying misconceptions.
4. Providing feedback: This may take the form of reward on group or individual basis, re-teaching of misconceived concepts etc. The main aim of cooperative learning strategy is to maximize students involvement where the teacher minimizes his involvement by briefing and presenting a topic, engaging students in class activities which involve group work with or without material feedback.

Okebukola (1985), examined the relative effectiveness of cooperative and individualized patterns in promoting the acquisition of scientific process skills during Biology laboratory activities. He used 720 secondary class Biology students (352 girls, 368 boys) with mean age of 13.6 year in six randomly selected secondary schools in Ondo State. The result showed effective interaction favouring cooperative strategy in performance improvement.

Goods (1990) and Ojo (1992) are of the opinion that cooperative learning strategy has a unique advantage of motivating the active learner and making them enthusiastic and love the subject generally.

Okebukola and Ahove (1994) expressed that cooperative learning strategy has been found to increase proficiency of students in mathematics and sciences, promote higher quality thinking and higher self-esteem interaction and greater acceptance of handicapped students.

Nicholas and Miller (1994) examined the effects of cooperative learning on sixty-two high schools' students in an algebra class. The results obtained show that students in the cooperative group reveal higher significant gains than those in the control group on factors such as algebra achievement, efficiency, intrinsic valuing of algebra and learning goal orientation and when the cooperative class was switched back to the traditional approach there was a reduction in their motivational and achievement levels.

It is however of great importance for science and mathematics teachers to make use of cooperative learning strategy in order to improve teaching and learning.

METHOD

Research Design : This study adopted pre-test post-test quasi experimental strategies. The study employed a cross-sectional design to investigate two teaching strategies in mathematics achievement in Geometry and attitudes among Junior secondary school 3 students.

Sample: The participants for the study were 100 JSS 3 students (Males=65, female=35) from three secondary schools in Ibadan North Local Government. They were randomly selected with the assumption that they all had comparable learning capability. The 40 by 30 by 30 students each from the three schools were employed for this study. They were grouped into three groups namely experimental and control in which experimental were further subdivided into two that is cooperative and individualistic learning style. The cooperative group consisted of 22 boys and 18 girls while the individualistic group consisted of 13 boys and 17 girls.

Each group had 5 periods a week of 40 minutes per period.

Measures Used:

The instruments used in this study are:

1. Lesson notes prepared on the different teaching packages on Geometry with the help of structured textbooks on Geometry.

2. Mathematics achievement test based on those topics treated. After a thorough analysis of mathematics textbooks, objectives were formulated and a table of specifications was prepared for the groups. Test items were constructed based on the specifications with the assistance of a subject teacher who eventually did the teaching after being instructed by the researcher. The items consisted of perimeter and area of Circle, rectangle, square, triangle, polygon and some geometrical theorems/proofs with difficulty levels varying from simple re-collection to application. The test consisted of 25 multiple-choice items after the final draft. These were sufficiently reliable as reflected by the Cronbach alpha of 0.82.
3. The student attitude scale: To examine attitudes of students towards mathematics, a likert type scale was used. The scale consisted of 20 items. The respondents were asked to indicate their agreement with each attitude statement on a four point scale (very high, high, low, very low). Scoring of the students ratings was dependent on whether the attitude statement was negative or positive. The items dealt, among other things with perceived importance of mathematics, students motivation to work hard in mathematics, whether they enjoyed the challenge presented by mathematical problems and whether they liked studying mathematics.

Administration

Procedured Pre-test were initially given to the three groups before treatment of the packages. After the packages, post-test was given, the test was aimed at measuring students' cognitive achievement in mathematics concepts taught to the groups.

In cooperation groups students worked together as a group in the problem solving and all the group members contributed. They reached consensus based on their suggestions, ideas and decisions. The group members sought help and assistance from each other rather than from the teacher. Students were allowed to make their own judgment and they were asked leading questions relevant to their point of view when they could not proceed on their own.

In individualistic group, the emphasis was on heuristic methods

and researchers stated how discovery method was used to solve problems. Heuristic approach in problem solving allows students to work on their own. The students sought assistance from their teacher and not from other students. If the students could not proceed on, the teacher asked leading questions relevant to their point of view, individual efforts were rewarded as the lesson progressed. After this each group was again tested. This experiment was observed for eight weeks.

RESULTS AND DISCUSSION

The statistical methods utilised for the quantification of data in testing the two predicted null hypotheses were the t-test and analysis of variance (ANOVA). The decision was effected at the alpha level of 0.05. The computed details are however, summarised subsequently in the tables (1 to 4).

Table 1

Summary of Analysis of Variance of the three teaching strategies (one way)

Source	SS	df	MS	F-ratio
Between	2766.4	2	1383.2	
Within	978.0	97	81.5	16.97
Total	3744.4	99		

Looking at the F-distribution table, one finds that 0.05F2, 97= 3.07. The calculated F is 16.97 and the critical F is 3.07. Therefore Ho_1 is rejected since the calculated F-value is greater than the critical F-value meaning that the methods made a significant difference in the achievement scores of the students.

HO_2: There is no significant difference in the mean attitude between cooperative group and individualized group.

Table 2

t-test showing mean difference between cooperative group and individualized group attitude

Attitude	N	$\bar{X}$	S.D	df	tcal	tcrit	P
Cooperative group	36	67.6	3.5				
				68	29.4	1.67	0.05
Individualized group	34	64.4	5.9				

In Table 2 the attitude mean and standard deviation of cooperative group are respectively 67.6 and 3.5 as against their individualized group whose attitudinal mean and standard deviation are 64.4 and 5.9. The null hypothesis is rejected because tcal is greater that tcrict that is 29.4>1.67, meaning that the group attitude is significantly different between the co-operative group and the individualistic group.

Table 3

t-test showing mean difference between cooperative group and conventional group attitude

Attitude	N	$\bar{X}$	S.D	df	tcal	tcrit	P
Cooperative Group	36	27.6	1.8				
				64	40.2	1.67	0.05
Conventional	30	25.6	2.5				

From Table 3, the calculated t-value is greater than t-value, therefore the null hypothesis is rejected meaning that significant relationship exists between the two attitudinal groups.

Table 4

t-test showing attitudinal mean difference between individualized group and conventional group

Attitude	N	$\bar{X}$	S.D	df	tcal	tcrit	P
Individualized Group	34	56.7	3.8				
				32	-16.3	1.67	0.05
Conventional	30	59.3	12.5				

In table 4, the calculate t-value is lesser than critical t-value, meaning that no significant mean difference exists between students attitudinal scores of those in individualized group and those in conventional group.

Summary of findings and conclusions based on the outcomes of the statistical analysis of the data, the following results and respective inferences were obtained:

1. There was a significant difference in the pre-test mean scores between groups as shown in the table.

2. The difference was also significant in the post test mean scores.
3. A significant difference was observed in the attitudinal mean scores between groups cooperative and individualistic. The attitude change can be attributed to the treatment effect.

In conclusion, problem solving in mathematics has helped students to perform well in mathematics and changed their attitude towards mathematics. The cooperative group in mathematics problem solving showed a better performance in mathematics than the other groups.

Recommendations

The following recommendations are made in view of the findings from this study:

1. The teachers should use cooperative strategy in mathematics problem solving. Students should be encouraged to solve mathematical problems while working in groups cooperatively where ideas, assistance, opinion and help are received by the participating students.
2. Using individualistic strategy allows students to compete among themselves.

Refencences

Akinsola, M.K (1994); Comparative Effects of Mastery Learning and Enhanced Mastery Learning strategies on students' achievement and self-concept in mathematics unpublished Ph.D. Thesis, University of Ibadan.

Ausubell, D.P. (1968); The use of advance organizers in the learning and retention of meaningful verbal materials. Journal of Educational Psychology, 15(5) 217-278.

Bello J.Y. (1981); Basic Principle of Teaching. Spectrum Ibadan 25-27.

Berlkowitz, S. Szabo, M. and Boloc, S (1980); Cooperative versus competition education 16-30.

Goods, T.L. (1990) Using workss groups in mathematics instruction. Educational leadership 47, 56-62.

Johnson, B.T. and Johnson, R.T. (1982). Cooperation in learning. Ignored but powerful. Lycium 1 (5), 22-26.

Nicholas, J.D. and Miller, R.R. (1994) Cooperative learning and students motivation. Contemporary Educational psychology 19(2) 167-188., Ojo,M.O. (1992); The differential effectiveness of cooperative,

competitive and individualistic classroom interaction patterns on students chemical problem-solving skills.

Okafor, N.P. (1992); Effects of co-operative learning and conceptual change. Pedagogical strategies on students achievement and attitude towards chemistry. (Unpublished project) University of Ibadan.

Okebukola, P.A. and Ahove, M.A. (1994); Instructional strategies for sustaining. the development of environmental Education among science student (Unpublished paper).

Okebukola, P.A. (1985); The Relative Effectiveness of co-operative and competition technique in strengthening students performance in science class. Science Education 69(4) 501-509 John Wiley and Sons Inc.

Okebukola, P.A. (1986); Impact of extended co-operative, competitive and individualistic instructions. John Wiley and Sons Inc.

Polya, G. (1964). How to solve it. New York Double day.

Popoola, A.A. (2002); Effects of Heuristic problem solving and Programmed Instructional strategies on senior secondary school students learning outcomes in mathematics. Unpublished Ph.D. Thesis, University of Ibadan.

The Nigerian Teacher Today 1(2) 121-129.