Influence of Demonstration, Peer-Tutoring and Lecture Method Provided Activities on learning outcomes of Secondary School students in Ekiti State, Nigeria

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ABSTRACT: *The study compared the influence of demonstration, peer-tutoring and lecture method provided activities on learning outcomes of junior secondary school students in Ikere Local Government Area, Ekiti State, Nigeria. It also determined the influence of demonstration, peer-tutoring and lecture method provided activities on students' attitude towards Mathematics; and it examine the influence of demonstration, peer-tutoring and lecture method provided activities on students' retention ability in Mathematics. The study adopted the non-equivalent pre-test, post-test control group design. The main population for this study included public junior secondary school students in Ikere Local Government Area of Ekiti State, Nigeria. The sample for the study consisted of 120 Junior Secondary School Three (JSS III) students randomly selected from four (4) schools in Ikere Local Government Area of the State. The Schools were assigned to the four groups of Demonstration provided activity, peer-tutoring provided activities, lecture method provided activity and conventional sample using simple sampling. The instruments used for the study were subjected to validity and reliability mechanism. The reliability of the instruments: Mathematics Achievement Test (MAT) and Mathematics Attitudinal Scale (MAS) were determined through the split-half method with reliability coefficient of 0.91 and 0.89 respectively. Three null hypotheses were formulated and tested at 0.05 level of significance using two ways Analysis of Variance (ANOVA) and Bonferroni Post-hoc test. The results showed that there was significant difference in the influence of demonstration, peer tutoring and lecture method activities on the performance of Mathematics students. Based on the findings, conclusion and appropriate recommendations were made.*

Key Words: *Demonstration, Peers, Learning, Outcomes, Lecture Method*

Introduction

Resolutions communiqués and workshops on science, Mathematics and Technology sponsored in the past decades by government and professional bodies and the general aims of Mathematics Education as contained in the National Policy of Education (FRN, 2004) have confirmed to point to the fact that Mathematics learning requires greater attention. In the National Policy of Education (FRN, 2004), Mathematics is one of the leading core and compulsory subjects in the Junior and Senior Secondary School curricula.

Specifically, Mathematics is to equip students to live effectively in our modern age of Science and Technology. Mathematics being the language of science is a very important subject in schools, and its application cuts across all areas of human endeavour. In every country of the world, Mathematics has to be taught to an increasing number of future chemists, psychologists, engineers, medical scientists and physicist.

According to Effardi (2010), there is decline in Mathematics achievement in schools because students consider Mathematics as a difficult and boring subject; the present method of teaching Mathematics is characterized by dispensing rules, definitions and procedures for students to memorize rather than engaging students as active participants through discussions and collaboration among students.

Demonstration activity involves the teacher showing learners how to do something. For example, how to make a tie knot. This activity allows the teacher to show the results that can be obtained from experimenting with objects, and other materials. Demonstration activity has been shown to be effective with both large and small groups. The greater the degree of participation and sensory involvement by the learner, the more effective learning will be.

Uhumuanbi & Mamudu (2009) found that demonstration activity of teaching is sensitive to gender. They reported that exposing students to demonstration activity yielded a better academic and behavioural characteristic and they are increasingly looking for successful instructional and classroom management activity.

Demonstration activity has emerged to become an instructional approach that is gaining growing interest within the engineering education community. Demonstration activity is an instructional strategy that challenges students to "learn how to learn", working cooperatively in groups to seek solutions to real world problems.

Webb & Mastergeorge (2003) peer-tutoring has been defined as a people from similar social grouping who are not professional teachers, helping each to learn and learning themselves by teacher. Peer tutoring is a collaborative approach in learning. In this procedure, students are assembled in groups of two or more and are trained to work together on a specific academic task.

It is now being recognized that there are better ways to learn than through the traditional methods (Wood & Gentile, 2003). Educators are beginning to show an increased awareness of the importance of the way students learn. Many of our standard methods of conveying knowledge have been shown to be relatively ineffective in the students' ability to master and then retain important concepts. The traditional methods do not tend to foster critical thinking, creative thinking and collaborative problem-solving (Wood & Gently, 2003). Bond, Cohen & Sampson (2001), define peer-tutoring as involving students learning from and with each other in ways which are mutually beneficial and involve sharing knowledge, ideas and promotes mastery, accuracy and fluency in content learning.

Peer-tutoring has been commonly implemented in education settings. Research has shown that peer-tutoring has a positive impact on academic outcomes such as reading (Klingner & Vaughn, 1996).

According to Rohrbeck, Ginsburg-Block, Fantuzzo & Miller (2003), peer-tutoring is "systematic, peer mediated teaching strategies". Peer-tutoring and demonstration teaching strategies have been found to be a powerful tool for meeting both the academic and social needs of students in schools at all levels of education. Peer-tutoring has been demonstrated to be successful in promoting the academic and social skills of general education and special education students (Nazzal, 2002).

The teaching and learning process does not only concern teachers and students but also the nature of interaction between them in the classroom. The interaction is the teaching method adopted by the teacher. Some authors have claimed that in the teaching process, it is not the teacher that is most important but the teaching method. The study therefore seeks to investigate how different teaching strategies influence learning outcomes of Mathematics students.

The study would attempt to provide meaningful answers to the following questions.

a. compare the influence of demonstration, peer-tutoring and lecture method provided activities on the learning outcomes of Mathematics students in Ekiti State.
b. determine the influence of demonstration, peer-tutoring and lecture method provided activities on students' attitude towards Mathematics and
c. examine the influence of demonstration, peer-tutoring and lecture method provided activities on students' retention ability in Mathematics.

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

i) There is no significant difference in the performance of Mathematics students that were provided with demonstration, peer-tutoring and lecture method activities.
ii) There is no significant difference in the attitude to Mathematics students provided with demonstration, peer-tutoring and lecture method provided activities on students' attitude
iii) There is no significant difference in the retention ability of Mathematics students provided with demonstration, peer-tutoring and lecture method activities.

Research Methodology

The study adopted the non-equivalent pre-test, post-test control group design. The main population for this study included public junior secondary school students in Ikere Local Government Area of Ekiti State, Nigeria. The sample for the study consisted of 120 Junior Secondary School Three (JSS III) students randomly selected from four (4) schools in Ikere Local Government Area of the State. The choice of JSS III was considered appropriate because these students have been exposed to some basic Mathematical concept and skills which enable them catch up easily. The Schools were assigned to the three groups of Demonstration provided activity, peer-tutoring provided activities and lecture method provided activity using simple sampling.

General Mathematical ability Test (GMAT) was conducted for a school each from each of the four schools selected for the study and this consisted of 25 items. The instrument used to collect relevant data from the respondents. The instruments were subjected to validity and reliability mechanism. The reliability of the instruments: Mathematics Achievement Test (MAT) and Mathematics Attitudinal Scale (MAS) were determined through the split-half method with reliability coefficient of 0.91 and 0.89 respectively.

The administration of the instrument was in three stages: the pre-treatment stage (two weeks), the treatment stage (four week) and the post-treatment stage (two weeks). Eight weeks altogether group was treated with demonstration, peer-tutoring and lecture method provided activities packages. Mathematics Achievement Test (MAT) was also used for both as pre-test and post-test for the purpose of data collection. The researcher adopted the Mathematics Attitudinal Scale (MAS) developed by Aborisade 2007 for the study was also adopted for the study. This was used to assess students' attitude before and after the treatment. The experimental groups was treated with demonstration, peer-tutoring and lecture method provided activities while, the control group were taught with the same concepts but through the conventional teaching approach.

Three null hypotheses were tested at 0.05 level of significance. The data collected were analysed using inferential statistics of two ways Analysis of Variance (ANOVA) and Bonferroni Post-hoc test.

Results and Discussion

Hypothesis 1

There is no significant difference in the Performance of Mathematics Students that were provided with demonstration, peer-tutoring and lecture method activities.

Table 1: Two-way ANOVA of Pre and Post-test Scores of Mathematics Students provided with demonstration, peer-tutoring and lecture method activities

Sources	Type III Sum of Square	df	Mean Square	F	Sig
Corrected Model	3908.616	22	177.664	0.888	0.031
Intercept	2184.656	1	2184.656	10.922	0.004
Demonstration	996.735	1	124.592	4.048	0.012
Peer-tutoring	11.627	1	11.627	3.029	0.036
Lecture method	5.875	8	5.875	2.345	0.048
Demonstration Peer tutoring Lecture method	1143.738	9	127.082	7.281	0.042
Error	3400.359	17	200.04		
Total	176439.000	40			
Corrected Total	7308.975	39			

R^2 = 0.535 (Adjusted R^2 = -0.067)

The result presented in table 1 above shows that the interactive P-value (0.031) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and Mathematics students performance. Also, there is significant main difference in performance of Mathematics students before and after provided with these methods of teaching as P-value (0.004) is less than 0.05 level of significance. Furthermore, there is significant main difference in the performance of Mathematics students provided with Demonstration, peer-tutoring and lecture method activities as P-values (0.042) is less than 0.05 level of significance. Based on these findings, the null hypothesis is rejected. This means that there is significant different in the performance of Mathematics students that were provided with demonstration, peer-tutoring and lecture method activities.

In order to investigate the direction of the differences observed in the performance of Mathematics students provided with demonstration, peer-tutoring and lecture method activities, Bonferroni Post-hoc test was carried out.

Table 2: Bonferroni Post-hoc comparisons of Post-test mean scores of Mathematics students provided with Demonstration, Peer-tutoring and lecture method activities.

Methods	Mean Score	Alpha values	
Demonstration	15.02		
Peer-tutoring	10.05	13.95	
Lecture Method	13.28	10.82	9.58

P>0.05 (Significant)

The result presented in table 2 above shows that Mathematics students provided with demonstration activities performed significantly higher than their counterparts provided with peer-tutoring and lecture method activities. This was deduced as the mean score for demonstration (15.02) was the highest by the mean score for lecture method activities (13.28) and peer-tutoring (10.05).

Hypothesis 2

There is no significant difference in the attitude to Mathematics of Mathematics students provided with demonstration, peer-tutoring and lecture method activities.

Table 3: Two-way ANOVA of Mathematics students attitude to Mathematics provided with demonstration, peer-tutoring and lecture method activities.

Sources	Type III Sum of Square	df	Mean Square	F	Sig
Corrected Model	7025.775	38	184.889	0.377	0.021
Intercept	83142.197	1	83142.197	15.120	0.001
Demonstration	2183.331	9	242.592	0.493	0.005
Peer-tutoring	1846.869	11	167.897	0.369	0.013
Lecture method	2770.056	11	251.869	0.411	0.036
Demonstration Peer tutoring Lecture method	10.30.481	3	343.494	0.301	0.27
Error	3200.000	1	240.000		
Total	134377.000	40			
Corrected Total	7025.775	39			

R^2 = 0.097 (Adjusted R^2 = 0.160)

The result presented in table 3 shows that the interactive P-value (0.021) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and attitude to mathematics students. Also, there is significant main difference in the attitude to Mathematics students before and after treatment as P-value (0.001) is less than 0.05 level of significance. Further more, there is significant main difference in the attitude to Mathematics students provided with demonstration, peer-tutoring and lecture method activities as p-value (0.027) is less than 0.05 level of significance. Based on these findings, the null hypothesis 2 is rejected. Thus means that there is significant differences in the attitude to Mathematics of students provided with demonstration, peer-tutoring and lecture method activities.

In order to investigate the direction of the differences observed in the attitude of Mathematics students provided with demonstration, peer-tutoring and lecture method activities, Bonferroni post-hoc test was carried out.

Table 4: Bonferroni Post-hoc comparison of Mathematics students Attitude provided with demonstration peer-tutoring and lecture method activities.

Methods	Mean Value	Alpha	Values
Demonstration	7.90		
Peer-tutoring	4.38	5.23	
Lecture Method	9.32	7.38	6.10

P>0.05 (Significant)

The result presented in table 4 shows that the attitude to Mathematics student provided with lecture method activities is significant higher than their counterparts provided with demonstration and peer-tutoring activities this was ascertained from the table as the mean value for lecture method activities (9.32) was the highest followed by the mean value for demonstration activities (7.90) and peer-tutoring activities (4.38).

Hypothesis 3

There is no significant difference in the retention ability of Mathematics students provided with demonstration, peer-tutoring and lecture method activities.

Table 5: Two-way ANOVA of Mathematics students' retention ability provided with demonstration, peer-tutoring and lecture method activities.

Sources	Type III Sum of Square	df	Mean Square	F	Sig
Corrected Model	7131.400	37	192.741	0.883	0.001
Intercept	65970.212	1	65970.212	0.707	0.027
Demonstration	900.082	9	100.009	0.953	0.007
Peer-tutoring	2537.906	13	195.224	0.855	0.043
Lecture method	610.995	9	67.888	0.982	0.011

Demonstration Peer tutoring Lecture method	380.250	1	380.250	0.450	0.030
Error	876.500	2	438.250		
Total	133672.000	40			
Corrected Total	8007.900	39			

$R^2 = 0.089$ (Adjusted $R^2 = -1.134$)

The result presented in table 5 shows that the interactive P-value (0.001) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and retention ability of Mathematics students. The table further revealed a significant main difference in the retention ability of Mathematics students before and after treatment as P-value (0.027) is less than 0.05 level of significance. Furthermore, there is significant main difference in the retention ability of Mathematics students provided with demonstration, peer-tutoring and lecture method activities as P-value (0.030) is less than 0.05 level of significance. Based on these findings, the null hypothesis is rejected. This means that there is significant difference in the retention ability of Mathematics students provided with demonstration, peer-tutoring and lecture method activities.

In order to investigate the direction of the difference observed in the retention ability of Mathematics students. Bonferroni post-hoc test was conducted.

Table 6: **Bonferroni Post-hoc** comparison of retention ability of Mathematics students provided with demonstration, peer-tutoring and lecture method activities.

Methods	Mean Value	Alpha	Values
Demonstration	11.92		
Peer-tutoring	15.36	14.35	
Lecture Method	12.02	12.02	11.89

P<0.5 (Significant)

The result presented in table 6 shows that the retention ability of Mathematics students provided with peer-tutoring was higher than their counterparts provided with demonstration and lecture method activities. This was deduced as for mean value for peer-tutoring activities (15.36) was the highest. This was followed by the mean value for lecture method (12.02) and demonstration (11.92).

Discussion of the findings

The findings of the study compared the influence of demonstration, peer-tutoring and lecture method provided activities on the performance of Mathematics students. The study revealed that there is no significant difference in the performance of students taught Mathematics under demonstration, peer-tutoring and lecture method provided activities. In other words, the background knowledge of the students used for the study was relatively equal across the three groups: The result of hypothesis one which states that there is no significant different in the performance of Mathematics students that were provided with demonstration, peer-tutoring and lecture method activities. The result presented shows that the interactive P-value (0.031) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and Mathematics students' performance.

In order to investigate the direction of the differences observed in the performance of Mathematics students provided with demonstration, peer-tutoring and lecture method activities, Bonferroni post-hoc test was carried out for the three group. The result presented shows that Mathematics students provided with demonstration activities performed significantly higher than lecture method activities. This was deduced as the mean score for Demonstration 15.02 was the highest followed by the mean score for lecture method activities (13.28) and peer-tutoring (10.05). This is an indication that the treatment given improved the performance of students.

Hypothesis two aimed at finding the difference in the attitude to Mathematics students provided with Demonstration, peer-tutoring and lecture method activities. The result shows that the interactive P-value (0.021) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and attitude to Mathematics students. Also there is significant main difference in the attitude to Mathematics students before and after treatment as P-value (0.001) is less than 0.05 level of significance. Furthermore, there is significant main difference in the attitude to Mathematics students provided with Demonstration, peer-tutoring and lecture method activities as P-value (0.027) is less than 0.05 level of significance. Based on these findings, the null hypothesis was rejected. In order to investigate the direction of differences observed in the attitude to Mathematics students provided with Demonstration, peer-tutoring and lecture method activities, Bonferroni post-hoc test was carried out. The result presented shows that the attitude to Mathematics of students provided with lecture method activities is significantly higher than their counterparts provided with Demonstration and peer-tutoring activities this was ascertained from the mean value for lecture method activities (9.32) was the highest followed by the mean value for Demonstration activities (7.90) and peer-tutoring activities (4.38).

Hypothesis three aimed at finding the significant difference in the retention ability of Mathematics students provided with Demonstration, peer-tutoring and lecture activities. The result shows that the interactive P-value (0.001) is less than 0.05 level of significance. This means that there is significant interactive difference for methods and retention ability of students. The table further revealed a significant main difference in the retention ability of students before and after treatment as P-value (0.027) is less than 0.05 level of significance. Furthermore, there is significant main difference in the retention ability of students provided with Demonstration, peer-tutoring and lecture method activities as P-value (0.030) is less than 0.05 level of significance. Based on these findings, the null hypothesis was rejected. This means that there is significant difference in the retention ability of Mathematics students provided with Demonstration, peer-tutoring and lecture method activities. In order to investigate the direction of the difference observed in the retention ability of students to Mathematics, Bonferroni post-hoc test was conducted. The result presented shows the retention ability of students provided with peer-tutoring was higher than their counter parts provided with Demonstration and lecture method activities. This was deduced as for mean value for peer-tutoring activities (15.36) was the highest. This was followed by the mean value for lecture method (12.02) and Demonstration (11.92).

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