

Impact of Cooperative Learning Approach on Senior Secondary School Students Performance in Mathematics

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This research work investigated the impact of cooperative learning approach on the performance of secondary school students in mathematics using some selected secondary schools. It employed one hundred and twenty students selected from the entire population of students offering mathematics at the senior secondary two (SS 2) levels of the selected schools. Quasi- experimental research design was used and the samples were grouped into groups A and B named experimental and control groups respectively. The experimental period was four weeks with a total number of sixteen hours of lesson delivery for each group. The experimental group was taught using the cooperative learning approach while the control group was taught using the conventional method. A Mathematics Test of Assimilation (MTAS) was administered to the groups and the result was analyzed using t-test. The analysis revealed that the experimental group has a mean score that is significantly higher than that of the control group ($p < 0.05$). It was also observed that sex difference or gender has no significant influence on the performance of students in mathematics when taught using or not using cooperative learning approach ($p < 0.05$). The research generally revealed that the experimental group performed better than the control group. This implies that cooperative learning approach has significant effect on students' performance in secondary school mathematics. It is therefore recommended that teachers of mathematics should work together toward the improvement of students' performance in mathematics.

Mathematics is for life and we do mathematics in one way or the other in our daily activities. The knowledge of mathematics is required now than ever especially with the current issue of science and technological advancement and attainment of the Millennium Development Goals (MDGs). It is on this ground that the Federal government of Nigeria accorded prominence to the teaching and learning of mathematics in schools. Mathematics occupies a central place in our school curriculum as it is made a compulsory subject for all learners in both primary and secondary schools as contained in the National Policy on Education (FGN, 2004).

Every career a child may choose to pursue in life are full of things that requires application of mathematical knowledge and skills.

Mathematics is life giving water to science and technology. In other words, mathematics to science and technology is what water is to the fish. Just like Azuka (2000) said, mathematics permeates the whole society and its use seems to assume ever increasing importance as our society become more technological. Therefore, complex mathematics skills and thinking are not prerogative of scientists, engineers and technologist only, but they are used in everyday decision making by people. However, as noted by Ojo (1986), mathematics has for long time been notorious killer of ambitions among Nigerian students. The building of a nation

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technologically is the sole responsibility of all her citizens irrespective of gender, class, status and religion, (Kojjigiji, 2008).

Science in general and mathematics in particular has long been criticized by students and teachers alike to be full of abstract ideas. It is a subject dreaded by several students in all tiers of education (Bello, 2006). In spite of the deliberate attempts to avoid mathematics by most students, the fact remains that it is a core subject in some disciplines. Over the years, efforts have been made by mathematics educators towards improving the teaching and learning of mathematics in Nigerian schools. Despite these diverse efforts, Agwagah (2005), Ale (1981) and Lassa (1984) revealed that mathematics education in Nigeria is still in a deplorable state at all levels of Nigerian education. Fasasi (2009), made effort to find solution to the ugly situation of poor performance in mathematics and identified teaching techniques of the teachers as one of the contributory factors. This may be because effective teaching makes learning more quantitative and qualitative. Fasasi (2009) revealed that instructional approaches adopted by the teacher affects the cognitive, affective and psychomotor outcomes of the learner.

Statement of the Problem

The traditional place of mathematics in our educational system is in great danger. This is as a result of poor attitudes and performance by both students and teachers. It should be frankly admitted that the present day teaching of mathematics is far from being satisfactory. In spite of the fact that it is taught compulsory to all the students in the secondary and primary schools, they do not become adept even in elementary arithmetic (Bello, 2006).

Everybody has a complaint against the teaching of mathematic. It is dull, boring, difficult and useless from the point of view of the learner. It is also believed that mathematics is an exceptionally difficult subject and hence, its study requires special ability and intelligence. Therefore everybody should not be burdened with the study of this tough subject.

Why do most students take mathematics subject up to the senior secondary school level and yet a greater percentage of them fail? Why do both teachers and students perform poorly in the teaching and learning of mathematics in the secondary schools? How do the present tradition of teaching far from being satisfactory? Is the teaching approach of teachers a contributory factor to the poor performance of students in mathematics? The answers to these questions may be found in the impediments which hamper students from a successful learning of mathematics at all levels in the secondary schools.

Purpose of the Study

The purpose of the study is to ascertain the impact of cooperative learning approach on the student's performance in mathematics in some selected secondary schools in Adamawa State. The study sought to achieve the following objectives: -

1. To determine the impact of cooperative learning approach on students' performance in mathematics.
2. To determine the effect of gender on students performance in mathematics using cooperative learning approach.

Research Hypotheses

The following null hypotheses are raised to guide the study: -

H₀₁: Cooperative learning approach has no significant impact on students' performance in mathematics.

H₀₂: There is no significant gender difference in students' performance when taught mathematics using cooperative learning approach.

Methodology

This study employed parallel group design which consists of two groups; the control group and the experimental group. The cooperative learning approach used to teach the experimental group while the control group was taught with the conventional lesson method. A pre-test and post – test was also administered to both the control group and experimental group using the Mathematics Test of Assimilation.

Three co-educational schools were randomly selected and used for the study from the Central local government areas of

Adamawa state. The local governments include Song, Girei and Yola North local governments.

The population of the study consists of all senior secondary school two (SSS 2) students offering mathematics in the selected schools. The age range of these students was 16-19 years.

The samples for this study were randomly selected from each school as shown in the table below.

Table 1: Selection of samples from each school

| School | Total number | Experimental Group | Control Group |
|---------------|--------------|--------------------|---------------|
| GSS Girei | 70 | 20 | 20 |
| GSS Song | 55 | 20 | 20 |
| GDSS Doubelli | 80 | 20 | 20 |
| Total | 205 | 60 | 60 |

A sample of twenty students (20) was randomly selected from each school for both the experimental and the control groups. Each group has a total of twenty (20) students. The total sample size was 120.

The instrument used in this study was the Mathematics Test of Assimilation (MTAS). This instrument consists of 24 question items constructed to cover all the topics treated during the experimental period. These items were constructed to

test for the understanding of the concepts and at the same time the application of what has been learnt. The topics taught were selected from the minimum standard prepared by the Adamawa State Examination Resource Centre (ADERC). The topics selected were mathematics topics offered by Senior Secondary School two (SSS 2) in the selected school.

MTAS was validated by experts for both face and content. The instrument was subjected to reliability test using alternate form method and yielded a correlation coefficient of 0.879. This implies that the instrument is reliable.

The selected samples of students were divided into two groups. Group one (1) served as the control group (C_G) taught using the conventional lesson method and group two (2) served as the experimental group (E_G) taught using the cooperative learning approach. The two groups were taught for three (3) periods of forty minutes (40 minutes) each for four (4) weeks. Each group was taught for a total number of eight (8) hours. The test was administered to both groups at the end of the experimental period and compared with the results of the pretest. The data collected was analyzed using the t-test statistical tool to test the two hypotheses of the study.

Results

H_{01} . Cooperative learning approach has no significant impact on students' performance in mathematics.

Table 2: Summary of analysis of scores for the experimental and control group using t-test.

| Groups | Mean | SD | N | Df | Std error | T tabulated | t-cal. |
|---------------|-------|-------|----|-----|-----------|-------------|--------|
| Exp Group | 41.91 | 15.37 | 60 | 118 | 1.98 | 1.98 | 3.13 |
| Control Group | 36.60 | 19.26 | 60 | | | | |

From table 2 above, the values of 41.91 and 36.60 are the calculated means for experimental and control groups respectively. Standard deviations of 15.37 and 19.26 were also obtained for the experimental and control groups respectively. The calculated t-value was 3.13 while the critical t-value was 1.98.

The calculated t-value, 3.13 was observed to be higher than the critical t-value 1.98, at 118 degree of freedom 0.05 level of significance. From the results obtained, hypothesis 1 which states that cooperative learning approach has no significant effect on students' performance in mathematics is rejected. Therefore, cooperative learning approach has

significant effect on student’s performance in mathematics.

H₀₂: There is no significant gender difference in students’ performance when taught mathematics using cooperative learning approach.

Table 3. Summary of analysis of scores for male and female students in the experimental group

| Groups | Mean | Standard Deviation | N | Df | Standard error | t-table | t-cal. |
|--------|-------|--------------------|----|----|----------------|---------|--------|
| Male | 45.80 | 22.54 | 30 | 58 | 2.05 | 1.98 | 1.69 |
| Female | 41.30 | 18.85 | 30 | | | | |

Table 3 presents the means, standard deviations, calculated t-value and critical t-value. The means value of 45.80 and 41.30 were obtained for the male and female students taught with cooperative learning approach. The standard deviations obtained for the male and female students were 22.54 and 18.85 respectively. The t-calculated obtained was 1.69 and the t-critical value was 1.98. The t-calculated (1.69) was observed to be lower than the t-critical value (1.98) at 58 degree of freedom and 0.05 level of significance. This implies that there is no significant effect between male and female students performance in mathematics using cooperative learning approach.

Discussion

There is a significantly positive effect of cooperative learning approach on the performance of students used for this study. This is indicated in the higher mean scores of the experimental group compared to the control group (see table 2). The findings in respect of the performance of students using cooperative learning approach in the experimental group agreed with the findings of Kagan (1993), Cohen (1994) and Slavin (1990), who in their individual studies discovered that the approach is a valuable strategy for helping students attain high academic standards. The findings also agreed with Dansereau (1987) and Nattiv (1994) who in their different studies also reported that cooperative learning approach enhances performance and instill cooperative attitudes in students which results in improving learning. Davidson and Kroll (1991) also reported that the approach enhance student’s performance in mathematics.

This finding may be attributed to several a factor among which is interdependence. When students work in cooperative teams in which “all work for one” and “one works for all” team members receive the emotional and academic support that helps them persevere against the many obstacles they face in school (Johnson and John 1994). Another factor which may be attributed to the findings in study is interaction among the students which agreed with the findings of Mcgroarty (1993) that interaction creates natural interactive contexts in which students have authentic reasons for listening to one another, asking questions, clarifying issues and restating points of view. It also stimulates and develops the students’ cognitive abilities.

There is no significant effect of cooperative learning approach on gender of students. (See table 3). It was observed from the results of the findings that female students performed as well as their male counterparts.

This finding points to the fact that employing cooperative learning approach in mathematics lessons or class has a very high degree of succeeding. Hence, cooperative learning approach usually do have positive effects on students’ achievement. The approach is also very flexible which can be used or adapted for students with special needs. Cooperative learning is a powerful educational approach which helps all students attain content standards and develops inter-personal skills needed for succeeding in a multicultural world.

Conclusion

The educationist would find the prospects outlined above very attractive. It is however very important that the cooperative learning strategy is an aid to positive

learning and a new pedagogy to be employed by all teachers. The one fact that stands out from this technological era is that we cannot afford to exclude cooperative learning approach in the teaching of mathematics and other subjects at all levels of our educational system. If this strategy is adopted in the teaching of mathematics, the subject will be better understood and consequently allay the fear that several students have about mathematics.

In this study, it has been pointed out that teaching mathematics in classrooms that contain large number of students does not guarantee any meaningful learning of the subject. In order to teach mathematics so that it makes meaning to the learners therefore, mathematics teachers must explore and use the approaches that would ensure that the learners participate actively in the learning process. To this effect formation of learning groups as cooperative approach is important.

Recommendations

Based on the findings of this study, the following recommendations have been proffered:

- i. That training and workshops aimed at equipping the teachers with the basic skills of cooperative learning approach in lesson delivery should be organized on a regular basis.
- ii. That cooperative learning approach should be made a compulsory part of the curriculum for colleges of education and universities so as to help in equipping would be teachers adequately for the task of this modern age lesson delivery approach.
- iii. Mathematics teachers should be sensitized and encouraged to use practical, child-centered, activity-based and problem-solving methods of teaching mathematics such as the cooperative learning approach.
- iv. Mathematics teachers should also keep abreast with innovations and new trends in mathematics education through participation in seminars, workshops, short and long term refresher courses.
- v. Teachers should help students develop computational and organizational skills, as well as

vocabulary ability to relate ideas to problem-solving.

References

- Agwagah, U.N.V. (2005). The teaching of Mathematics for critical thinking, essential skills for effective living Abacus. The journal of Mathematical Association of Nigeria (MAN) 30 (1) 38 – 45
- Ale, S.O. (1981). Mathematics as a Universal Language. A Paper presented at Ahmadu Bello University, Zaria.
- Azuka, F. (2000). Mathematics in technological development, focus on the next millennium-implications of secondary education. Journal of Mathematical Association of Nigeria. 25 (1) 74-82.
- Bello A.S. (2006). A Survey of Selected Approaches to the Teaching of Mathematics in Nigerian Secondary Schools *Dougirei Journal of Education* 7 (1) 94-102.
- Cohen, E.G. (1994). Designing group work; strategies for the Heterogeneous Classroom. New York; Teachers College Press.
- Davidson N. & Kroll D.L. (1991). An Overview of Research on Cooperative Learning Related to Mathematics *Journal for Research in Mathematics Education*, 22 (5) 12-20
- Donsereau, F. (1987). Transfer from Cooperative to Individual Studying. *Journal of Reading*, 10 (2) 10-12.
- Fasasi, F.M. (2009). Institutional impediments associated with students' failure in secondary school in Adamawa state *Journal of Educational studies* 14(1) 93-98
- Federal Republic of Nigeria (2004). National Policy on Education. Lagos: NERDC Press
- Johnson, D.W. & John R.T. (1994). Learning together and Alone Cooperative, Competitive, and Individualistic Learning, Edina, Minn: Interaction Book Company.
- Kagan S. (1993). The Structural Approach to Cooperative Learning”, in cooperative Learning: A response to Linguistic and Cultural Diversity. In D.H. Daniel

- (ed), Mchenry III and Washington, D.C. Delta Systems and center for Applied Linguistic.
- Kojigiji T.S. (2008). Statistical Analysis of Gender Inequalities in Attitude and Performance of Students in Mathematics at the Junior Secondary Schools in Mathematics at the Junior Secondary Schools in Adamawa state. *International Journal of Numerical Mathematics*, 3 (1) 8 – 12.
- Mcgroarty M. (1993). Cooperative learning and Second Language Acquisition, “in Cooperative Learning: A response to Linguistic and Cultural Diversity. In D.H. Daniel (ed.), Mettenry III and Washington D.C; Delta Systems and center for Applied Linguistic:
- Nattiv, A. (1994). Helping Behaviour and Mathematics Achievement gain of Students using Cooperative Learning. *The Elementary School Journal* 94 (3) 12 – 14.
- Lassa, P.N. (1984). The sorry state of Mathematics Educations in Nigeria. An Inaugural Address delivered at University of Jos. January.
- Ojo, J.O. (1986). Improving Mathematics Teaching in our Schools, Abacus, *Journal Mathematical Association of Nigeria* 17 (1) 164-177.
- Slavins, R.E. (1990). Research on Cooperative Learning: Consensus and Controversy. *Journal of Educational Leadership*, 47 (4): Association of Supervision and Curriculum Development Publishers.

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