Effect of Group Discussion Teaching Strategy on Senior Secondary School Students' Achievement in Mathematics in Delta Central Senatorial District of Delta State.

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Abstract

Performance in mathematics among Senior Secondary School students has remained persistently poor in Nigeria. It is as a result of this that this study examined the effect of group discussion method on achievement in mathematics against the common traditional teaching method. The study adopted the quasi-experimental non-equivalent pretest, posttest non-randomized control group design which involved groups of students in their intact classes assigned to experimental and control group. The population for the study consisted of all Senior Secondary School Mathematics (SS II) students from Delta central senatorial district of Delta state. Multi stage and purposive sampling techniques was used to select a sample size of eighty-seven (87) students from two (2) schools from the population. The experimental group is forty seven (47) students while forty (40) students constituted the control group. Two instructional packages were developed for the study. A validated Mathematics Achievement Test (MAT) was used for data collection. Using KR-20 formula, a reliability coefficient of 0.79 was obtained. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at 0.05 level of significance. Findings revealed that the experimental group who had their instruction through group discussion was more successful than the control group who had theirs through the common traditional method of instruction. However, there was no significant difference in the achievement of male and female students taught using the strategy. The teaching strategy is therefore recommended for teaching students to improve achievement in mathematics.

Keywords: Achievement, Group Discussion Method, Traditional Teaching. Schools

Introduction

The understanding of science and technology is very much related to understanding mathematics as a subject. Teaching and learning of mathematics has recently attracted the attention of mathematics educators, researchers and other stakeholders. This is as a result of the fact that, mathematics is the basis for scientific and technological break-through that has led to the classification of countries into developed or developing nations, in the context that developed countries are economically, scientifically and technologically independent while developing countries depend on the developed ones (Ale & Adetula, 2010). The importance of mathematics is seen in all areas in our daily life by the way we measure, estimate prices of goods and services when shopping etc. As adults, we need to be able to calculate and compare payment systems, figure out loans and in some other things the knowledge of

mathematics is indispensable. The prominent position accorded to mathematics among other school subject is as a result of its importance in our daily life and the recognition of the indispensable role it plays in the advancement of human development. This has earned it the status of a compulsory (core) subject in the school curriculum at both primary and secondary levels of education in Nigeria (National Policy on Education, 2013). This unique position made it to serve as a foundation or pre-requisite for other advanced fields of study useful to humanity that includes the following; Engineering, Computer science, Medicine, Pharmacy among others. This goes to show that in order for a student to be able to study any of the aforementioned disciplines at the tertiary education level successfully; such a student has to be well grounded and good in Mathematics at the senior secondary school level.

However, with the current trend of persistent poor performance of students in

Mathematics at the senior secondary level, Nigeria's quest at creating a globally competitive economy and human capital base to meet her recovery and economic growth might not be attained if this poor performance in Mathematics is not attended to. Reports revealed that the average percentage of students that passed Mathematics at credits level and above (A1-C6) is 37.37% while a staggering 62.63% failed for seven (7) consecutive years (2010 – 2016) in Nigeria, WAEC (2018) (See table 1). This poor performance in mathematics reflects the serious handicap the country is confronted with in producing graduates of mathematics and its related courses at the university and other tertiary institutions. This may lead to insufficient number of workers in careers that require a mathematics background in national development.

Table 1: Total number of students in Nigeria that sat for the May/June WASSCE in general Mathematics between 2010 - 2016.

YEAR	Total No. Who Sat	No. of Students that Obtained Credit & Above (A1 - C6)	% of Students with Credit & Above (A1- C6)	No. of Students with (D7- F9)	% of Students with (D7- F9)
2010	1,351,557	453,447	33.55	898,110	66.45
2011	1,540,250	587,630	38.93	952,620	61.07
2012	1,675,224	819,390	49.00	852,834	51.00
2013	1,543,683	555,726	36.00	987,957	64.00
2014	1,692,435	529,732	31.30	1,162,703	68.70
2015	1,593,442	544,638	34.18	1,048,804	65.82
2016	1,544,234	597,310	38.68	946,924	61.32
	Mean (%)	**37.37**			**62.63**

Source: Test Development Division, West African Examination Council (WAEC) Lagos, Nigeria.

Among the factors reported to be responsible for the poor performance is inadequate preparation, shortage of qualified teachers, inadequate teaching aids, inappropriate teaching methods, lack of good school environment and infrastructural facilities (WAEC, 2016). Mathematics teaching can only be result-oriented when students are willing and the teachers are favorably disposed to using the appropriate methods and resources in teaching the students.

From literature, researcher's observation, and practicing Mathematics and other science teachers in Delta state, the most widely used method by teachers is the teacher centred lecture method of "talk and chalk" where the teacher works some examples on the board and students then copy these examples into their exercise books after which students are given problems to solve based on the examples given or better still, teacher stands at the front of the class "telling" students about mathematics and other science ideas and this results into poor communication of concepts to the students. The students on their part find it difficult to understand the concepts (Omoifo, 2012). The instructional problems of traditional lecture method has serious drawbacks in the sense that majority of students have difficulties in assigning meaning to information, understanding the content as a whole, locating new information in their schema and transforming this information to knowledge. It is no longer a secret that most secondary school learners cannot perform many simple Mathematics operations needed for everyday life and work. Even in the class and in examination when students are encouraged to show their methods as well as answers,

many inappropriate reasoning errors, lack of complete understanding and other avoidable behaviours are displayed (Odili,2006; Okurumeh 2009, Okurumeh, 2019).

The teaching of Mathematics should encourage active participation of students for better understanding of its concepts. Discussion teaching method serves as an alternative method in this regard. It is a cognitive technique based on the constructivist approach to mathematics and science teaching. It involves the breaking of class into smaller groups for effective discussion on a topic, a problem or issue. It is a process of thinking together with active student's participation and the teacher acting as a moderator. Seweje (2000) explained that a teacher is expected to be a facilitator whose main function is to help learners to become active participants in their learning process and thereby making meaningful connection between prior knowledge, new knowledge and the processes involved in learning. It gives learners opportunity to express their views and ideas and to hear those of their peers. It also helps to develop student's opinion; attitudes and values. Discussion teaching strategy which according to Geoffrey in Okurumeh (2013) carries a hidden message – the learner is being told by the teacher that "I value your experience and I am interested in your opinion". This is at variant with the unspoken word of students in a "talk and chalk" or simply put "traditional lecture" teaching strategy where the students know nothing of value about the topic. Group discussion may take a variety of forms such as small group, round table, panel discussion, opposing panel and debate (Adewuya, 2003; Okurumeh, 2013).

Several research studies have been conducted to seek for alternative strategies which will encourage students' active involvement and promote students achievement of learned concepts in Mathematics and other science subjects . For instance, a research study conducted by Okurumeh (2013) on the effects of teaching Chemistry through disucussion and invention teaching model on students' achievement. The finding shows that the students in the experimental groups of all the schools used had significantly better post-test mean achievement scores than the control groups taught by lecture method. The study thus, concluded that discussion and invention teaching strategies has significant effect on the achievement of the students in the experimental group than the control group. Similar studies on the use of other student centred strategies reported significant difference in favour of the experimental groups (Yara, 2008; Okurumeh, 2009; Anyamene, Nwokolo, Anyachebelu, & Anemelu, 2012 , Okurumeh, 2019).

The influence of gender difference on students' achievement in mathematics and other sciences has generated a lot of concern among mathematics and science educators. A great deal of research work has been done to find out if it is true that there is gender difference in achievement in mathematics or not. Researches have shown that gender plays a significant role when it comes to achievement. Anyamene, Nwokolo, Anyachebelu, and Anemelu, (2012) reported a significant gender – group difference in Mathematics. However, this is at variance with the findings of Nwagbo and Obiekwe 2010; Yusuf and Afolabi, 2010 and Okurumeh, 2019 who reported that there was no significant difference in sex in Mathematics achievement. Among the reasons given for sex differences in achievement were the kind of learning environment as well as instructional strategy used by the teacher. In view of the foregoing, the present study investigated the effect of group discussion teaching strategy on the performance of students in Mathematics in Senior Secondary schools (SS II) students in Delta central senatorial district of Delta state

Statement of the Problem

The primary reasons for teaching mathematics are to help students understand important concepts in mathematics, to help them improve their ability of analytical thinking, problem solving and to enable them to use the mathematics they learned to solve practical problems in their field of interest. The development of scientific skills, abilities and knowledge needed to function in today's technological world that is driven by Information and Communication Technology (ICT) is also of paramount importance. The teaching of mathematics in secondary schools leaves much to be desired. The teaching methods adopted by teachers play an important role in students' understanding of mathematics concepts. This study seeks to address the problem of: What is the effect of group discussion and traditional lecture method on students' achievement in Mathematics?

Research questions

1. Is there a difference in the mean achievement scores of students taught Mathematics using group discussion method and those taught using traditional lecture method of instruction?

2. Is there a difference in the mean achievement scores of male and female students taught Mathematics using the group discussion method?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

H_{O1}: There is no significant difference in the mean achievement scores of students taught Mathematics using Group Discussion Method (GDM) and the Traditional lecture Method (TLM).

H_{O2}: There is no significant difference in the mean achievement scores of male and female students taught Mathematics using group discussion method.

Methodology

The study adopted the quasi-experimental non-equivalent pretest, posttest non-randomized control group design which involved groups of students in their intact classes assigned to experimental group and control group. The experimental group was exposed to Group discussion method and the control group to Traditional method of instruction. The dependent variable was achievement and the moderating variable was gender at two levels (Male and female). The target population of this study was all public co-educational Senior Secondary School II (SSII) students in Delta Central Senatorial District of Delta state. The district is made up of eight local government areas. A multi stage and purposively sampling technique procedure was used to select two (2) schools from the population to form a sample size of eighty seven students (experimental group (47) and control group (40).

The test instrument, Mathematics Achievement Test (MAT) was a 30 item multiple-choice objective test with four response options each. A table of specification was prepared; it covers all the sub-topics that were treated, based on some levels of Bloom's taxonomy of educational objectives of knowledge, comprehension and application. The distribution of test items are done in such a way to ensure equal and adequate coverage of the units taught and each sub-topic was given a percentage weight based on the extent of sub-topic relative to others. To test the reliability of the instruments, it was trial tested within the targeted population but outside the sample for the study. A reliability coefficient of 0.79 was obtained using Kuder-Richardson 20 (KR-20) formula.

Data collected were analysed thus: mean and standard deviation were used to answer the research questions while t-test was used for the hypotheses at an alpha level of 0.05.

Results

A test of difference on achievement at pretest of the groups using t-test, showed no significant difference between the two groups (experimental and control) in achievement in Mathematics concepts before the treatment, indicating that the subjects were homogenous at the beginning of the study.

Hypothesis 1

$H0_1$ There is no significant difference in the mean achievement scores of students taught Mathematics concepts using group discussion method (GDM) and the Traditional lecture Method (TLM).

Table 2
Summary of Descriptive Statistics of SS II Mathematics Students mean Achievement scores by teaching methods

Teaching method	N	Pretest mean	SD	Posttest mean	SD	Mean gain
GDM.	47	14.49	3.021	26.81	5.45	12.32
TLM	40	14.72	2.792	19.28	3.75	4.55

Results presented in Table 2 shows that the experimental group exposed to group discussion teaching method had a higher posttest mean gain score (12.32) than the control group exposed to the traditional method of instruction (4.55). This shows that the students taught with group discussion method of teaching out-performed the students taught with the traditional method of instruction.

To determine if the difference is as stated in hypothesis one $(H0_1)$, a t-test for independent samples was used and was presented in Table 3.

Table 3
Summary of Independent samples t-test of Achievement scores of SS II Mathematics Students by teaching methods at posttest

Teaching method	N	Mean	S.D	t	Sig(2 tail) (p)
GDM	47	26.81	5.45		
				-7.38	0.00
TLM	40	19.28	3.75		

$\alpha = 0.05$

Results presented in Table 3 shows a calculated t-value of -7.38 and a p-value of 0.00 testing at an alpha level of 0.05. The p-value is less than the alpha level. The null hypothesis of no significant difference is rejected. There was a significant difference in posttest score of the experimental group exposed to GDM teaching strategy ($M =26.81$, $SD = 5.45$) and control group exposed to TLM ($M = 19.28$, $SD = 3.75$), (t (85) = -7.38, p< 0.05). This implies that there was a significant difference between the mean achievement scores of students in the experimental group exposed to GDM teaching strategy and the control group exposed to traditional lecture method of instruction in favour of the experimental group. The difference in the mean achievement scores of students taught mathematics concepts with GDM and TLM is significant and not by chance, meaning the treatment was effective.

Hypothesis 2

$H0_3$:   There is no significant difference in the mean achievement scores of male and female students taught mathematics concepts using GDM

Table 4

Summary of Descriptive statistics of Male and Female SS II Mathematics Students'
Achievement scores taught using Group discussion teaching method

Gender	N	Pretest mean	SD	Posttest mean	SD	Mean gain
Male	20	15.15	2.70	26. 55	4.98	11.4
Female.	27	14.26	3.15	27.00	5.86	12.74

Results presented in Table 4 shows the mean gain difference of male and female students in experimental group exposed to GDM teaching strategy. The female students had a slightly higher mean gain score (12.74) than the male students (11.4). The difference is in favour of the female students.

To determine if the difference is as stated in hypothesis two (HO_2), a t-test for independent samples was used and was presented in Table 5.

Table 5

Summary of Independent samples t-test of achievement scores of male and female SS II
Mathematics students using GDM teaching method at posttest

Gender	N	Posttest mean	SD	t	Sig(2 tail) (p)
Male	20	26.55	4.98		
				-.28	.78
Female	27	27.00	5.86		

$\alpha = 0.05$

Results presented in Table 5 shows an independent sample t-test value of -.28 and a p-value of .78, testing at an alpha level of 0.05. Since the p-value is higher than the alpha level. The null hypothesis of no significant difference is not rejected. There was no significant difference in mean posttest score of male and female students in the experimental group exposed to GDM teaching strategy, male ($M = 26.55$, $SD = 4.98$) and female ($M = 27.00$, $SD = 5.86$); $t_{(45)} = .78$, $p > 0.05$. This result suggests that gender does not have any influence in the study. The teaching strategy is not gender biased.

Discussion of findings

Finding of this study revealed that there was significant difference between the achievement of students in mathematics concepts using Group Discussion and traditional lecture method of instruction in favour of group discussion method. The participatory and engagement nature of the strategy could have been responsible for the result. This finding is supported by the earlier findings of Olorundare and Oyelekan (2009); Anyamene, Nwokolo, Anyachebelu, and Anemelu (2012) and Okurumeh (2019) who found that students exposed to innovative teaching strategies that engages the student in learning processes performed significantly better than those exposed to the traditional method of instruction. This present finding is also in agreement with the finding of Gambari, Yaki, and Olowe,(2013) who

stated that student centred teaching strategies are more effective in improving students' achievement in mathematics and other sciences.

The influence of gender on the academic performance of students in mathematics using group discussion method in experimental learning settings was examined. The result of the analysis of independent samples t-test shows no significant gender difference for learners exposed to discussion method. This finding showed that gender had no influence on the performance of students in mathematics. This finding on gender agrees with the earlier finding of Nwagbo and Obiekwe (2010); Fakomogbon, Shittu, Omiola and Morakinyo (2012) and Gambari, Yaki; Olowe (2013) and Okurumeh, (2019) who reported no significant difference in the performance of male and female students exposed to innovative strategies. Thus, it can be deduced that the use of group discussion method can enhanced the performance of both male and female students equally. It is not gender controlled rather it is friendly.

Conclusion

Based on the findings of this study, the following conclusions are drawn.

a. Discussion teaching method is very effective in promoting students achievement in mathematics.

b. Discussion teaching method is a good strategy for improving mathematics achievement irrespective of gender.

Recommendations

In view of the findings of this study, the following recommendations are made

- Mathematics teachers should be trained and encouraged in the use of discussion teaching method.
- Mathematics seminars and workshops should be organized for all serving mathematics teachers on the effective use of the instructional strategy
- The framework for planning lessons and teaching mathematics in our secondary schools should be on group discussion teaching strategy.

References

Adewuya, S .A (2003) An evaluation of social studies curriculum in Osun State College of Education, Nigeria. Unpublished M.A(Ed) Thesis, OAU, Ile-Ife.

Ale, S. O. & Adetula, L. O. (2010). The national mathematical centre and the mathematics improvement project in nation building. *Journal of Mathematical Sciences Education*. 1(1) 1-19.

Anyamene, A., Nwokolo, C., Anyachebelu, F., & Anemelu, V. C. (2012). Effect of computer-assisted packages on the performance of senior secondary students in mathematics in Awka, Anambra State, Nigeria. *American International Journal of Contemporary Research, 2(7), 61-65.* Available online at *www.aijcrnet.com*

Fakomogbon, M. A., Shittu, A. T., Omiola, M. A., & Morakinyo, O. K. (2012). Design, development and validation of a web-based instructional package for teaching ceramics concepts in basic technology for the junior secondary school students in Nigeria. *Interdisciplinary*

journal of contemporary research in business, 3(10), 534.

Federal Republic of Nigeria (2013). National policy on Education (Revised) Lagos, National Educational Research Council Press.

Gambari, A .I., Yaki, A. A., & Olowe, T .T. (2013). Understanding the concept of Animal nutrition and digestive system in Biology using computer simulation. *Bulgarian Journal of Science Education, 22(5), 649-669.*

Geoffrey, P (2001). Teaching today-approach guide.(2nd ed) Nelson Thornes Ltd. Delta place 27; Bath road Cheltenham; G1537th United kingdom.

Nwagbo, C. & Obiekwe, C. (2010). Effects of constructivist instructional approach on students' achievement on basic ecological concepts in biology. *Journal of Science Teachers Association of Nigeria (JSTAN) 45 (1,2)*

Odili G. O. (2006).Mathematics in Nigeria Secondary Schools. A teaching Perspective Port-Harcourt, Rex Charles and Patrick Limited in association with Anachuma Educational Books, 168 – 216.

Okurumeh, O. G. (2019). Effect of animal nutrition and digestion simulation (ANDS) on students' achievement and retention in biology. Unpublished Ph.D. thesis Department of Curriculum and Instructional Technology, University of Benin.

Okurumeh E.(2013). Effects of discussion and invention teaching strategies on senior secondary school student's achievements in chemistry in Delta state; Unpublished M.Ed. thesis Delta state University; Abraka.

Okurumeh, A.E. (2009). Effects of three modes of retention enhancement strategy on achievement and problem solving skills of senior secondary students in mathematics. Unpublished Ph.D. thesis Department of Teacher Education University of Ibadan.

Omoifo, C. N. (2012). Dance of the Limits, Reversing the Trends in Science Education in Nigeria, 124th Inaugural Lecture University of Benin, Benin City, Nigeria.

Oyelekan, O. S. & Olorundare, A. S. (2009). Development and validation of a computer instructional package on electrochemistry for secondary schools in Nigeria. *International Journal of Education and Development using ICT*, 5(2), 88-104.

Seweje, R.O (2010) Defining issues in Science education 24th inaugural lecture, university of Ado-Ekiti, March 8th.

West African Examination Council (2010 - 2015). Chief examiner's report. Lagos: WAEC.

Yara, P. O (2008). School environment and students factors as predictors of achievement in school mathematics, Unpublished Ph.D. Thesis, Department of Teachers Education, University of Ibadan.