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EFFECTS OF GROUP AND TEACHER - STUDENTS INTERACTION STRATEGIES ON STUDENTS' ACHIEVEMENT IN ALGEBRA IN FEDERAL CAPITAL TERRITORY, ABUJA

BY

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Abstract

The study investigated the effect of Group and Teacher-student interaction strategies on students' Achievement in algebra. Population of the study consisted of 31,874 JS2 Students in 176 junior secondary schools in Abuja. Simple random sampling was used to select 200 students from three different schools. A quasi-experimental design was adopted for the study which was made up of two experimental groups and a control group. Algebra Achievement Test was used for data collection. The instrument was validated by two mathematics educators and one expert in measurement and evaluation for both face and content validation. A reliability coefficient of 0.82 was obtained using Kunder- Richerson 21 formula. Mean and standard deviations were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The study revealed that Students taught algebra using group interaction strategy achieved better than students taught using teacher-students strategy and lecture method. It also revealed that male students achieved better than their female counterparts in group interaction strategy while the female students achieved better than the male students in teacher-student interaction strategy. It was recommended among others, that teachers should adopt both teacher-student and group interaction strategies in teaching algebra aspect of mathematics in junior schools to improve students' achievement in mathematics.

keywords: Group interaction strategy, teacher-student strategy, achievement, gender

Introduction

The importance of Mathematics as a field of study has been well established. It is concerned primarily with ideas, processes and reasoning. It is also concerned with problem solving which is a complex activity that goes on in the human mind. Mathematics can therefore be seen as a way of thinking, a way of organizing thought to give logical proof. The Federal Government of Nigeria (FGN, 2014) stressed that students should be well equipped to live effectively in our modern age of mathematics and technology. To achieve this laudable aim, Mathematics as a subject was included in the core subjects to be taught in the 6-3-3-4 Education system (now 9-3-4). Mathematics has contributed to the objective of general education and day to day activities of mankind. Hence, in most countries of the world, the study of Mathematics is made compulsory at the primary and secondary school levels (Odeyemi, 2016). Mathematics is a core subject in primary and secondary school and a credit pass in mathematics at the Senior School Certificate Examination is needed as a pre-requisite for admission into tertiary institutions in Nigeria (Salmiza & Mohammed, 2021). Unfortunately, students' achievement in mathematics has not been impressive.

The disheartening high failure rate in mathematics at pre-tertiary school level has bothered the minds of many researchers, authors and mathematics educator. This has been attributed to the common teaching method usually adopted by teachers (Odeyemi, 2016). The Mathematics teaching in Nigeria is largely teacher-centered and traditional approach. Researchers have revealed that the teacher centered strategy normally used by teachers would not assist the students to be active recipient of knowledge by which the achievement can be improved (Oloyede, 2020). Every developing nation like Nigeria needs to improve in her education through the use of better teaching methods. In considering ways and means of ensuring effective teaching and learning of mathematics in school that can enhance students' achievement, various teaching methods have been adopted by mathematics educators and researchers. Choosing the appropriate teaching method and how this method is utilized is very essential in teaching algebra aspect of mathematics to attain good achievement.

Group interaction is a teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject (Jordan and Stanovich, 2014). Each member of a team is responsible not only for learning what is taught but also for helping teammates learn, thus creating an atmosphere for a

classroom achievement. Aldrich and Shimazoe (2015) defines group interaction as an educational approach which aims to organize classroom activities into academic and social learning experiences which enhances positive interdependence among students. According to Aldrich and Shimazoe (2015) students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, learning in group can help students capitalize on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.) for academic achievement, furthermore, the teacher's role changes from giving information to facilitating students' learning (Ergu & Gezer, 2016). Maxwell, Stein, Grover and Henningsen (2016) further describe successful group interaction strategy tasks as intellectually demanding, creative, open-ended, and involve higher order thinking tasks. Group interaction strategy is also working together to accomplish shared goals within classroom situation, individuals seek outcomes that are beneficial to themselves and to all other group members. Duncan (2020) stated that group interaction strategy consists of five basic elements: positive interdependence, promote interaction, individual accountability, teaching of interpersonal and social skills, and quality of group processing. Learning situations are not classroom if students are arranged into groups without positive interdependence. Positive interdependence means that in classroom interaction strategy situations, students are required to work together as a cohesive group to achieve shared learning objectives. In the process, students must be responsible for their own learning and for the success of other group members' learning (Slavin, 2012). Apart from group interaction strategy, students can also interact with teacher in algebra class.

Teacher- student classroom interaction strategy is a two-way process because each participant influences the other's behavior, that is, the students condition their teacher behavior and vice versa (Inamullah, 2015). The teacher and students both play a role in influencing student achievement since this relationship is an essential part of teaching and learning process. Students must learn to interact respectfully, but must also learn how to be assertive without being rude, so that their opinions are heard without disruption. Improving students' relationships with teachers has important, positive and long-lasting implications for students' academic and social development. Students with close, positive and supportive relationships with their teachers will likely attain higher than those students with more conflicting relationships. Sharah (2017) believes that it is interaction that promotes higher achievement in algebra.

Algebra is a branch of mathematics dealing with symbols and the rules for manipulating those symbols. The field of algebra can be divided into secondary concepts called elementary algebra and more abstract study of numbers and equations called abstract algebra. Algebra is widely used in many fields such as accounting, programming, physics, engineering and medicine. It can also be used for everyday problem solving when it comes to unknown variables in mathematical expressions (Maccini & Strickland 2012).

Achievement is measured by the students' marks on the achievement test developed by the researcher. Amuche (2016) states that poor achievement in secondary school mathematics is more in female than the male students. Bebefiafia (2013) study on gender in relation to mathematics achievement shows that girls in federal government colleges are performing better than boys in numeracy and other mathematical skills. The researcher maintained that the issue of gender difference in mathematics achievement in Nigeria has some peculiarities in terms of regional differences, school standard, location and teaching method. Closing the gender gap in mathematics achievement and having equality of outcomes should be the utmost goal of every teacher.

Statement of the Problem

Algebra is often seen as a difficult aspect of mathematics by students, probably because it uses letters to represent numbers and so they cannot grasp its abstract nature. This has led to Nigerian secondary school students viewing mathematics as difficult and abstract in nature because they have great difficulty in understanding, assimilating and retaining the mathematics concepts especially algebra taught to them in the classroom. Research has shown that mathematics teachers tend to use abstract approach in teaching algebra, students therefore cannot visualize their answers and usually see no relationship between algebra examples and their real world experiences. Consequently, this has led students into rote learning a number of algorithms without knowing why they are applying a particular algorithm. The resultant effect is poor achievement in mathematics. This poor achievement has been of great concern to parents, teachers, students and the nation as a whole. If this poor achievement continues, the growth of the nation's economy will be highly affected.

Therefore, the problem of this study was to find out the effects of group and teacher-students interaction strategies on students' achievement in algebra. The research also tried to answer the question: Would the use of group and teacher-students strategies bridge the gender gap on students' achievement in algebra

Purpose of the study

The main purpose of this study is to investigate the effects of group and teacher-students interaction strategies on students' achievement in algebra among junior secondary schools in Federal Capital Territory (FCT) Abuja. Specifically, the study sought to find out:

1. Difference in the achievement of students taught with group and teacher- students' interaction strategies and those taught with lecture method.
2. Influence of gender on the achievement of students in algebra when taught using teacher- students interaction strategy.
3. Difference in male and female students achievement when taught algebra using teacher-student interaction strategy.

Research Questions

The following research questions were answered in the course of this study:

1. Are there difference in the achievement of students taught algebra using group interaction strategy, teacher-student interaction strategy and lecture method?
2. How does gender influence the achievement of students taught algebra using group interaction strategy?

Research Hypotheses

The following null hypotheses were tested at 0.05 levels of significance:

Ho_1: There is no significant difference between the achievement of students taught algebra using group and teacher-student interaction strategies and lecture method

Ho_2: Significant difference does not exist between the achievement of male and female students taught algebra using group interaction strategy.

Methodology

The research design used for this study was a quasi-experimental design, non-randomized pretest, posttest, and control group design. Simple random sampling was used to select three schools from Abuja Municipal Area Council (AMAC). Students in their intact classes were assigned to experimental and control groups. Data were source via Algebra Achievement Test (AAT) was used to measure the pre-test scores and post-test scores of the involved participants. Research questions were answered using mean, standard deviation while hypotheses were tested with analysis of covariance (ANCOVA). ANCOVA was used because it takes care of

any existing difference between groups. Kunder- Richerson 21 formula was used to determine the reliability of the instrument was found to be 0.82

RESULTS

Research Question 1

Are there differences in the achievement of students taught algebra using group interaction strategy, teacher-student interaction strategy and lecture method?

Table 1:

Descriptive statistics of the groups

Teaching Method	No. of Students	Type of Test	Mean	Standard Deviation
Group interaction	70	Pretest	28.60	10.19
		Posttest	50.46	9.42
Teacher-student	62	Pretest	25.55	10.28
		Posttest	50.97	8.93
Lecture method	68	Pretest	23.81	9.31
		Posttest	38.12	7.98

Table 1 shows the mean scores and standard deviations of the students in the experimental and control groups. From Table 1 it could be seen that the mean scores of students taught with group interaction strategy were 28.60 and 50.46 in pretest and posttest respectively and standard deviation of 10.19 in pretest and posttest of 9.42 in the AAT. The students taught using teacher- student strategy had mean scores of 25.55 and 50.97 in pretest and posttest respectively, with standard deviation of 10.284 and 8.983 in pretest and posttest. For students, who were taught using lecture method, their mean scores were 23.81 and 38.12 and standard deviation of 9.31 and 7.98 in pretest and posttest respectively. Students taught with teacher- student interaction strategy had highest mean score while those taught with lecture method had the lowest mean score. The standard deviation scores for the pretest and posttest were not at much variance implying that the efficacy of the treatment is sustainable.

Hypothesis One: There is no significant difference between the achievement of students taught algebra using group and teacher-student interaction strategies and lecture method

Table 2:
Shows the summary of the Analysis of Covariance (ANCOVA) result on students' achievement scores in AAT.

Source of Squares	Type III sum of squares	DF	Mean Squares	F	Remark	Sig
Corrected Model	9560.084[a]	3	3186.70	45.56	0.00	S
Intercept	34951.344	1	34931.34	535.28	0.00	S
Group	5782.766	2	2891.38	44.06	0.00	S
Pretest	2449.730	1	2449.73	37.33	0.00	S
Error	12862.636	196	65.63			
Total Corrected	453386.000	200				
Total	22422.720	199				

S = Significant at P < 0.05

The result indicated that the noted difference between mean interest scores of the three groups is significant at 0.05 alpha levels. This is from the fact that $F_{(1,196)}$ = 44.06 and P < 0.05 α = 0.05. The null hypothesis that there is no significant difference in the mean achievement scores of students taught using group, teacher-student interaction strategies and lecture method was therefore rejected showing that a difference does exist.

Research Question 2

How does gender influence the achievement of students taught algebra using group interaction strategy?

Table 3:
Descriptive statistics of Male and Female Students in Group Interaction

Gender	No. of Students	Type of Test	Mean	Standard Deviation
Male	37	Pretest	28.84	10.25
		Posttest	50.46	10.05
Female	33	Pretest	28.33	10.27
		Posttest	50.45	8.81
		Posttest	38.12	7.98

Table 3 shows the mean scores and standard deviations in AAT of male and female students taught using group interaction strategy. Table 3 reveals that the male students had mean scores of 28.84 and 50.46 in pre-test and post-test while standard deviation was 10.25 and 10.05 in pre-test and post-test respectively. The female students had mean scores of 28.33 and 50.45 and standard deviation was 10.27 and 8.81 in pre-test and post-test respectively. From the result, it was noticed that male students had mean scores and standard deviation higher than female when taught using group interaction strategy.

Hypothesis Two: Significant difference does not exist between the achievement of male and female students taught algebra using group interaction strategy.

Table 4:
ANCOVA analysis of Male and Female Students in Group Interaction Strategy

Source of Squares	Type III sum of squares	DF	Mean Squares	F	Remark	Sig
Corrected Model	2278.181[a]	2	1139.09	19.86	0.00	S
Intercept	9169.648	1	9169.648	159.86	0.00	S
Gender	1.364	1	1.364	0.02	0.88	BS

Pretest	2278.180	1	2278.180	39.72	0.00	S
Error	3843.191	67	57.36			
Total Corrected	184336.000	70				
Total	6121.371	69				

S = Significant at P < 0.05

Table 4 shows the ANCOVA result of male and female students in AAT for group interaction strategy

The result revealed that the noted difference between male and female is not significant at 0.05 alpha level. This is from the fact that $F_{(1,67)}$ = 39.72 and P > 0.88 α = 0.05. The null hypothesis was therefore not rejected, indicating that there is no significant difference in mean achievement scores of male and female students taught using group interaction strategy.

Discussion

The findings from analysis of data collected show a significant difference in achievement of students taught using group interaction strategy. Students taught using group interaction strategy performed better than the students in teacher – students interaction strategy and lecture method. Again students taught algebra using teacher – student strategy performed better than students taught with lecture method. The finding of this study contradicts that of Majanga, Nasongo and Sylvia (2016) who found that students taught mathematics using group strategy and lecture method achieved equally.

Teacher-students interaction strategy affected students' achievement in mathematics positively. Analysis of data collected shows that students taught using teacher-student interaction strategy performed better than students taught using lecture method which is in line with the findings of Amuche (2016) who found that students taught using teacher- students strategy performed better than those taught using lecture method.Analysis of data collected showed that female students in teacher-student interaction strategy performed better than the male students in the same group, which contradicts Chiver (2014) who found that boys achieved better than girls using teacher-student interaction strategy.

Also analysis of data collected reveals that male student performed better than female students in group interaction strategy which is in line with Aldrich and Shimazoe (2015) who found that boys performed better than girls using group interaction strategy and also significant difference exist in the achievement scores of male and female students in group strategy. The finding shows that male students achieved in the company of other better than female students when taught with group strategy but it may not necessarily mean that group strategy is more beneficial to male students. Other factors could have determined the difference. For example male students can be more determined and so can think critically and could perform better than their female counterparts.

Conclusion

The findings of this study have shown that teacher-student interaction strategy has the more significant effect on students' achievement than group interaction strategy. This result imply that the learning approach which is mainly lecture method employed by mathematics teachers in teaching might have been partly responsible for the persistent under-achievement of students in mathematics. The implications of this findings hinge on the development of better teaching strategies for teaching of mathematics.

Recommendations

Based on the findings, the following recommendations were made:

1. Mathematics teachers should adopt the use of teacher-student and group interaction strategies in teaching algebra aspect of mathematics in order to enhance students' interest and achievement.

2. Curriculum planners should include teacher-student and group interaction strategies as major methods for teaching algebra topics when planning mathematics curriculum..

3. Teachers should be trained through workshops and seminars on how to use group and teacher-student interaction learning strategies in schools.

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