



Effect of Rotational-Teachers and Fixed-Teacher Teaching Arrangement on Achievement in Variation Among Secondary School Students in Benue Northwest Education Zone, Benue State

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Abstract

This study examined the effect of Teaching Arrangements on Achievement in Variation among Secondary School Students in Benue Northwest Education Zone. In this study, 69 SSS1 students across three LGAs were used for the study. The study adopted quasi-experimental design. One instrument called Variation Achievement Test (VAT) was used for data collection. The data collected were analysed using mean and standard deviation to answer research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings of the study, among others, showed that there is a significant difference in the mean achievement scores of students taught variation using Rotational-Teachers Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement in favour of the students of the Rotational-Teachers Teaching Arrangement. Further analysis revealed that there is no significant difference in the mean achievement scores of male and female students taught in variation. Again, the findings of the study showed that, there is significant interaction effect of teaching arrangements and gender on students' achievement in variation. In conclusion, Rotational-Teachers teaching arrangement improved Students achievement in variation than Fixed-Teacher teaching arrangement. It was recommended among others that Principals of secondary schools should allow mathematics teachers to practice Rotational-Teachers teaching Arrangement in secondary schools.

Keywords: Mathematics, Teaching Arrangement, Poor Achievement, Gender.

Introduction

The continuous poor achievement of students in mathematics at secondary school level is becoming a global concern given the importance of mathematics to the development of science and technology. The knowledge of mathematics is so vital in the success of every learner in his/her day-to-day activities. Nwoye (2017) describes mathematics as the backbone of science and technology and a tool inevitable for human survival in everyday life. It is a subject that affects every aspect of human life at different levels. In spite of the importance of mathematics and its usefulness in everyday life, students always achieve poorly (National Examination Council {NECO}, Chief Examiner's report, 2018).

Achievement is the competency shown by the student in the subject. Its measure is the score on an achievement test. Achievement is the level of

performance attained in a particular task. Reports on students' academic achievement in mathematics paint a

disheartening picture. Ugwuanyi (2015) observed in dismay a high disappointing failure of students in secondary mathematics. From the report of the earlier researchers, there are many factors that could lead to students' poor achievement in mathematics generally. According to Musibau and Johnson (2010), attributed it to factors as; low qualification, lack of experience, poor salaries and allowances, poor supervision, inappropriate use of teaching arrangements. Fixed-Teacher Teaching Arrangement (FTTA) is an arrangement whereby a particular teacher is stationed in a particular class to teach all the mathematics contents in that class alone. According to Etsu and Manko (2019), Fixed-Teacher Teaching Arrangement is an arrangement whereby a single teacher teaches a class and single handedly evaluates them. It is a common



known traditional style of teaching been practiced over the years. Fixed-Teacher Teaching Arrangement is the direct opposite of Rotational-Teachers Teaching Arrangement.

Rotational-Teachers Teaching Arrangement (RTTA) is an arrangement in which two or more experienced teachers share topics, contents, and even branches of a particular subject based on the curriculum of the subject for a common group of students, varying the classes of students and teaching the students to achieve the objective of the work at hand and the needs of the students. According to Basu, Das and Chowdhury (2015), Rotational-Teachers Teaching Arrangement generally comprise staff members who may represent different areas of a subject expertise but who share the same class of students independently and move from class to class delivering their planned periods of instruction irrespective of gender. Gender is a factor that has influenced many educational programmes and learner attainments all over the world today. Ezeh (2013) defined gender as personality traits, attitudes, behaviour, values and roles that the society ascribe to male and female on a differential basis. Gender is a state of being male or female. One could tentatively assert that gender influences instructional arrangements and students' achievement generally.

Perhaps, this is evidenced in various studies as it has been found that gender influences students' achievement. Macphee, Sands and Walet (2012) reported that gender gap exists in students' achievement in mathematics in favour of the males. However, Budiyo and Pratiwi (2018), Tamam, Corebima, Zubaidah and Suarsini (2021) and Filgona (2016) reported higher achievement in mathematics in favour of the females. Contrary to the above, in the findings of Piraksa, Srisawasdi and Koul (2013), Wonu and Anaekwe (2014), Josiah and Adejoke (2014) reported that gender difference does not exist in students' achievement in mathematics learning when exposed to different teaching arrangements. Though, analysis has been carried out in other related teaching arrangements such as team teaching, remote teaching, collaborative and floating facilitators teaching arrangements. From the reviewed literature, the results of some studies carried out on the effectiveness of some of the teaching arrangements showed that arrangements have affected the students' achievement and gender in mathematics learning positively while some of the results of the studies were not in favour of some arrangements.

It is a common knowledge that mathematics is relevant to the development of science and technology

in our society, yet secondary school students, irrespective of gender, have continued to record poor achievement in some areas of mathematics particularly in Variation as reflected in the WAEC Chief Examiners' reports of 2016 to 2021. Evidence from earlier researchers abound also from the related empirical studies that previous studies were done to determine the effects of teaching arrangements on students' achievement in mathematics. However, many of these researchers, report conflicting results in the magnitude of the mean effect on students' achievement of both treatment and control groups when they are exposed to different teaching arrangements. Due to these inconsistencies in research reports, one cannot clearly state the effect of each teaching arrangement that could enhance achievement that is the best or highest. Therefore, attempt should be made to investigate these teaching arrangements further to see if a generalizable conclusion could be arrived at. It is on record that this kind of research studies have been done by some researchers in other areas but were not done in specific areas of mathematics like algebra and particularly in variation, and to the knowledge of the researcher, in the education zone, and hence the need for this present study.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught mathematics using Rotational-Teachers Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement?
2. What are the mean achievement scores of male and female students in mathematics?
3. What is the interaction effect of teaching Arrangement and gender on students' achievement in mathematics?

Hypotheses

The following hypotheses guided the study and were tested at 0.05 level of significance:

H₀₁: There is no significant difference in the mean achievement scores of students taught mathematics using Rotational-Teachers Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement.

H₀₂: There is no significant difference in the mean achievement scores of male and female students in mathematics.



Ho₃: There is no significant interaction effect of teaching Arrangement and gender on students' achievement in mathematics.

Design of the study

The study adopted a quasi-experimental design. Specifically, pretest-posttest non-equivalent control group design was used.

Area of the study

The study was carried out in Benue Northwest Education Zone, Benue State. The zone comprised three Local Government Areas namely; Tarka, Gboko and Makurdi respectively.

Population and sample of the study

The population of the study comprised all 2,757 SSS1 students in the Public Secondary Schools in Benue Northwest Education Zone. The sample size for the study comprised 69 Senior Secondary School Students one (SSS1) chosen from four (4) Secondary Schools which comprised 39 male and 30 female students across Gboko and Tarka Local Government Areas respectively. A multi-stage sampling procedure was adopted.

Instrument for Data Collection

One instrument which was developed by the researcher was used for data collection, namely;

Results

This section presents the results of the data analysis in line with the research questions and hypotheses.

Table 1: Mean analysis of the achievement scores of students taught mathematics using Rotational-Teacher Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement

Group	N	Pre-test		Post-test		Adjusted Mean
		Mean	SD	Mean	SD	
Experimental	40	13.85	2.26	26.60	2.37	26.713 ^a
Control	29	14.69	2.95	16.62	2.37	16.526 ^a

Table 1 shows that the students who were taught mathematics using Rotational-Teacher Teaching Arrangement had a mean achievement score of ($M = 13.85, SD = 2.26$) at the pretest and a mean achievement score of ($M = 26.60, SD = 2.37$) at the posttest, while the students who were taught mathematics using Fixed-Teacher Teaching Arrangement had a mean achievement score of ($M = 14.69, SD = 2.95$) at the pretest and a mean achievement

Variation Achievement Test (VAT). Three experts validated the instrument to ensure that the instrument measured what it was meant to measure. It has a validity index of 0.79

Experimental Procedure

The experiment which lasted for five weeks had its first week used to train research assistants, and sought for permission from principals to carry out research in their respective schools. The research treatment commenced in the second week and lasted for a period of four weeks. The pre-test and posttest Variation Achievement Test (VAT) questions were administered to both experimental groups A and B respectively. The data collected for the pre-test and posttests on the instrument were analyzed separately for the two groups, which were used to answer the research questions and hypotheses for the study. The total duration for the experiment was five weeks.

Data Analysis Technique

The analysis was carried out using the Statistical Packages for Social Sciences Version 21 (SPSS 21).The collected data were analyzed using mean and standard deviation to answer research questions. Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance.

score of ($M = 16.62, SD = 2.37$) at the posttest. Thus, this implies that students taught variation using Rotational-Teacher Teaching Arrangement had higher posttest mean achievement score than those taught using Fixed-Teacher Teaching Arrangement. Besides, the posttest standard deviations of 2.37 and 2.37 respectively, showed that variations in the individual achievement scores of both groups of students from their group means are the same.

Table 2: Analysis of covariance of the effect of method on the achievement of students in variation

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1695.187 ^a	4	423.797	76.306	.000	.827
Intercept	596.129	1	596.129	107.335	.000	.626
Pre-test	16.311	1	16.311	2.937	.091	.044
Group	1682.998	1	1682.998	303.029	.000	.826
Gender	1.663	1	1.663	.299	.586	.005
Group * Gender	.381	1	.381	.069	.794	.001
Error	355.451	64	5.554			
Total	36690.000	69				
Corrected Total	2050.638	68				

a. R Squared = .827 (Adjusted R Squared = .816)

Table 2 revealed that there is a significant difference in the mean achievement scores of students taught variation using Rotational-Teacher Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement in favour of the students taught using Rotational-Teacher Teaching Arrangement, $F(1,$

$64) = 303.029, p = .000$. This implies that the null hypothesis was rejected ($p < .05$). Thus, the effect size (Partial Eta Squared) of .826 implies that 82.6% increase in the mean achievement score of the students is attributed to their exposure to Rotational-Teacher Teaching Arrangement.

Table 3: Mean analysis of the achievement scores of male and female students in variation

Gender	N	Pre-test		Post-test		Adjusted Mean
		Mean	SD	Mean	SD	
Male	39	14.85	2.54	22.49	5.36	22.572 ^a
Female	30	13.37	2.44	22.30	5.75	22.189 ^a

Table 3 shows that the male students had a mean achievement score of ($M = 14.85, SD = 2.54$) at the pretest and a mean achievement score of ($M = 22.49, SD = 5.36$) at the posttest, while the female students had a mean achievement score of ($M = 13.37, SD = 2.44$) at the pretest and a mean achievement score of ($M = 22.30, SD = 5.75$) at the posttest. Thus, it implies that male students had higher posttest mean achievement score than the female students. Besides, the posttest standard deviations of 5.36 and 5.75 for the male and female students respectively, showed that the variation in the individual achievement scores of female students from their group means is higher than those of the male students.

Table 2 revealed that there is no significant difference in the mean achievement scores of male and female students in variation, $F(1, 64) = .299, p = .586$. This implies that the null hypothesis was not rejected ($p >$

$.05$). Thus, gender had no significant influence on the students' achievement in variation.

Table 4: Mean analysis of the posttest achievement scores of male and female students of the experimental and those of the control groups

Group	N	Gender	Mean	Std. Deviation
Experimental	23	Male	26.39	2.61
		Female	26.88	2.06
Control	16	Male	16.88	2.42
		Female	16.31	2.36

Table 4 shows that male students taught variation using Rotational-Teacher Teaching Arrangement had a posttest mean achievement score of ($M = 26.39, SD = 2.61$) while the male students taught



variation using Fixed-Teacher Teaching Arrangement had a posttest mean achievement score of ($M = 16.88$, $SD = 2.42$). On the other hand, the female students taught variation using Rotational-Teacher Teaching Arrangement had a posttest mean achievement score of ($M = 26.88$, $SD = 2.06$) while the female students taught variation using Fixed-Teacher Teaching Arrangement had a posttest mean achievement score of ($M = 16.31$, $SD = 2.36$). This therefore, indicates that while female students taught variation using Rotational-Teachers Teaching Arrangement had higher posttest mean achievement score than the male students taught variation using Rotational-Teachers Teaching Arrangement had, the male students taught variation using Fixed-Teacher Teaching Arrangement had higher posttest mean achievement score than the female students taught using Fixed-Teacher Teaching Arrangement.

Table 2 revealed that there is no significant interaction effect of teaching Arrangements and gender on students' achievement in mathematics, $F(1, 64) = .069$, $p = .794$. Thus, the null hypothesis was not rejected ($p > .05$). This implies that students' achievement in variation as a result of their exposure to two different treatment conditions is not dependent on their gender.

Discussion

The findings of the study indicated that the students who were taught mathematics using Rotational-Teachers Teaching Arrangement had less pretest mean achievement scores than those taught with fixed-Teacher teaching arrangement. On the contrast, those same students who were taught variation using Rotational-Teachers Teaching arrangement had higher posttest mean achievement score than those taught using Fixed-Teacher Teaching arrangement. This implied that the achievement scores of the students taught variation using Rotational-Teachers Teaching Arrangement had increased due to the teaching instructions received from those various teachers who were rotating across those classes teaching with different skills. However, the posttest standard deviations of the two teaching arrangements were the same, which showed the variations in the individual achievement scores of both groups of students from their group means were the same.

Furthermore, the study revealed that there is a significant difference in the mean achievement scores of students taught variation using Rotational-Teachers Teaching Arrangement and those taught using Fixed-Teacher Teaching Arrangement in favour of the

students taught using Rotational-Teachers Teaching Arrangement. This increase in the mean achievement score of the students who were taught variation using Rotational-Teachers was attributed to their exposure to Rotational-Teachers Teaching Arrangement. The finding of this study is in line with the findings of some researchers such as Hyginus and Ogwo (2021), Adewale (2020), Nwadi and Igbo (2017), who reported that the achievements of students taught using Rotational-Teachers teaching Arrangement is higher than students, taught using Fixed-Teacher Teaching Arrangement in the teaching of Variation in Mathematics.

Furthermore, the study's findings also showed that the male students had higher mean achievement score with high standard deviation at posttest than at the pretest. Again, the female students also had a higher mean achievement score at posttest than at the pretest with higher standard deviation. The improvement in achievement scores of the students could be as a result of exposure of the students to these various teaching arrangements. This implies that male students had higher posttest mean achievement score than the female students. Besides, the posttest standard deviation of the male was found to be less than that of the female students. This showed that the variation in the individual achievement scores of female students from their group means was higher than those of the male students. The findings of the results further revealed that there is no significant difference in the mean achievement scores of male and female students in mathematics. This result agrees with findings of some researchers such as Godspower and Sopuruchi (2017) who researched on gender impact on academic achievement of learners in integrated science (diffusion) in Rivers State's Obio Akpor Local Government Area. The results showed that gender has no important impact on the achievement of Integrated Science learners. This implied that the two different teaching arrangements have no significant effect on gender of the students. Students, irrespective of their sex can achieve poor or good in mathematics irrespective of the type of teaching arrangement exposed to.

Again, it was observed from the findings of the study that male students taught variation using Rotational-Teachers Teaching Arrangement had a posttest mean achievement score higher than those male students taught variation using Fixed-Teacher Teaching Arrangement. Furthermore, the female students taught variation using Rotational-Teachers Teaching



Arrangement had a posttest mean achievement score higher than those female students taught variation using Fixed-Teacher Teaching Arrangement. On the contrast, it was revealed from the study that, female students taught variation using Rotational-Teachers Teaching Arrangement had higher posttest mean achievement score than the male students taught variation using Rotational-Teachers Teaching Arrangement. Again, the study revealed that, the male students taught variation using Fixed-Teacher Teaching Arrangement had higher posttest mean achievement score than the female students taught using Fixed-Teacher Teaching Arrangement. The implication of this result is that, female students tend to achieve better when they were exposed to Rotational-Teachers Teaching Arrangement than their male counterpart. However, the male students who were exposed to Rotational-Teachers teaching arrangement tend to achieve more than those who were exposed to Fixed-Teacher Teaching Arrangement. This means that, the Rotational-Teachers Teaching Arrangement have more effect on their learning of mathematics than the Fixed-Teacher Teaching Arrangement. The findings of the results have clearly revealed that there is no significant interaction effect of teaching Arrangements and gender on students' achievement in mathematics. This implies that students' achievement in mathematics as a result of their exposure to two different treatment conditions is not dependent on their gender. This finding is in agreement with Adeneye, Awofala, Abisola and Lawani (2020) who reports that there was no significant interaction effect of treatment and gender on students' achievement in mathematics.

Conclusions

Following the findings of this study, it was concluded that teaching arrangements have significant effect on academic achievement of students in mathematics. It was further found that there was no significant interaction effect of teaching Arrangements and gender on students' achievement in mathematics.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Mathematics teachers should improve their students' achievement in variation by adopting Rotational-Teachers Teaching Arrangement.
2. Mathematics teachers should use Rotational-Teachers Teaching Arrangement other than Fixed-Teacher Teaching Arrangement to raise

the students' level of achievement in mathematics.

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