



EFFECT OF VIDEO-TAPED INSTRUCTION ON ACHIEVEMENT AND GENDER AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA

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Abstract:

The deplorable state of mathematics in the country has been a source of concern to Mathematics educators, Government and the Society at large. The effect of an innovative method such the use of videotaped instruction for learning mathematics at junior secondary school level was therefore experimented. A random sampling technique was used in selecting the three schools out of 50 junior secondary schools in Federal Capital Territory (FCT), Abuja, Nigeria, with each serving as experimental group consisting of 81 males and 83 females (164) and control group, consisting of 80 male and 78 female (158), which gave a total sample size of 322 students. This study adopted a quasi-experimental research design with non-equivalent pretest, posttest control group design. A validated 40 multiple-choice items of Mathematics Achievement Test (MAT) developed by the researcher, was used in accessing the outcome of the study. Two research questions and two hypotheses guided the study. Mean and Standard deviation was used for answering the research questions while Analysis of Covariance (ANCOVA) was used for testing the hypotheses at 0.05 levels of significance. The result revealed that there was no significant gender difference between male and female taught Mathematics using video-taped instruction ($F_{Cal} 1,322 = 100$, $p > .05$). And there is no significant interaction effect between teaching method and gender on students' achievement in mathematics ($F_{CAL} 1,322 = 1.99$; $P > .05$). That means that there is a significant treatment difference ($F_{Cal} 1,322 = 160.98$, $p < .05$). The researcher recommended that workshops, seminars and conferences should be organized for teachers on the importance of video-taped instructions for the teaching and learning of Mathematics.

Keywords: mathematics achievement, video-taped instruction, conventional methods and gender

1. Introduction

The objective of Mathematics education is to impart such knowledge which will not only reflect the beauty of Mathematics but will also give an experience of its strength to support the development of other spheres of human knowledge and in solving the pressing problems which the society face at any given epoch. This is in line with broad goal of secondary education, which among others, is to prepare individuals for useful living within the society, and higher education Federal Republic of Nigeria. (FRN, 2009, 14)

Since Mathematics is used to achieve the objective as stated above, the method of instruction should be dynamic. As Azuka (2012) opined that the nature and method of studying Mathematics changes from time to time according to the changes in the society. Equally, instructional techniques have shifted from teachers-centered to student-centered. Instructional resources are essential teaching materials that enhance the teaching-learning process. Abubakar (2015) reiterated that the major role of instructional materials is to provide a wide range of alternative avenues through which the same unit of instruction can be presented to learners. He submitted that the effective utilization of instructional aids in schools, make students to learn in a meaningful way and so, they become actively involved intellectually, perceptually and physically. Instructional resources can be classified into Human and material resources. The material resources are further classified into tangible and intangible resources. The tangible resources are grouped into visual, oral and audio-visual aids.

Aceleyado (2004) posited that the motivation to learn and perform better in Mathematics is affected by the learning procedure, the instructional approaches, resources and technologies used. The conventional or traditional approach has been widely used from year to year as a primary method of transmitting information to students (Ekwueme, Popola and Orin, 2012) the approach include the lecture or expository method, discussion method, demonstration method and so on. In the conventional method, the teacher communicates ideas to learners by direct verbal discourse sometimes called talk and chalk method. The approach is teacher centered, encourages rote learning and fails to motivate the students' interest and achievement in Mathematics.

In the contemporary classroom, learning can be made easier through the use of instructional technology. Difficult and abstract concept, topics or units of Geometry and Mensuration such as Pythagoras's rule, surface area of a cone, surface area of a cylinder, Cartesian plane and coordinates can be simplified and better explained through the use of some audio-visual materials. Audio-visual media are instructional resources and devices that can appeal to the sense of hearing and sight (Abubakar, 2015). They include television, cinema, video tape recorder, cassette and projector. The use of video-taped instructions may likely save time and cost and also bridge the existing gap in the shortage of teaching personnel because of the overloading of available teachers. They

have the potential that students will learn more, retain better what they learnt and even improve their performances and the skills they are expected to develop.

Atovigba, Vershima, O'kwu and Ijenkeli (2012); Umar, Yaganawali, Hajja and Muhammed, (2015), Adigun, Onihunwa, Irunkhai, Sada and Adesina, (2015), studied the influence of gender, school type and location on the academic achievement of secondary school student in Mathematics. They found out that there was no significant interaction effect between gender, school type and location on student achievement in Mathematics. Orubu, (2012) studied the influence of gender and socioeconomic factor on performance in Mathematics in Ethiopian east Local Government Area of Delta State, Nigeria. Analysis reveals that gender has no significant relationship with performance in Mathematics.

They reported that gender has a significant influence on academic achievement of students. The disparity in achievement in favour of males could be abated with the use of video-taped instruction. The video-taped instruction may motivate the interest of both gender and bridge the existing gap thereby enhancing their achievement in Mathematics. This therefore sustains the curiosity of the researcher and this makes it necessary to understand how achievement may be influenced by gender and video-taped instruction.

1.1 Statement of the Problem

The reason why women cannot do well and participate fully in Science has been the subject of discourse and concern to educators. Over years, women have been underrepresented in Science, Technology, Engineering and Mathematics (STEM) and in some cases denied access (Nzewi, 2003). He opined that the under representation and under achievement of females in the disciplines are historical and have been brought by several inter-related sociocultural and interacting school factors which act singly and jointly to depress female interest, enrolment, participation and achievement in Science and Technology and Mathematics at various level in education

The influence of gender in students' academic achievement has been a major concern to educational researchers, yet no consistent results have emerged. Babakk, (2010); Nonyelu and Anikweze, (2012); Dunia, (2014); Eze, Ezenwafor, and Obidile, (2016) in their analysis of gender issues in Nigeria formal education system observed that there seem to be a general consensus that boys perform better than girls in Mathematics and Science in general. They explained that the situation has been blamed on factors as child socialization patterns, cultural attributes that lead to see female children as less important than their male counterpart, poor self-concept and self-confidence and negative self-talk. These uncertainties form the thrust of this study. It is therefore, pertinent to find out the Effect of Video-Taped Instruction on students' academic achievement in relation to gender.

1.2 Purpose of the Study

The study sought to find out the effect of video-taped instruction and gender on students' achievement in Mathematics. Specifically, the objectives of the study were to:

- 1) examine the influence of gender on students' achievement in Mathematics when taught with video-taped instruction.
- 2) find out the interactive effect between teaching methods and gender on students' achievement in Mathematics.

1.3 Research Question

To provide direction and sharpen the focus of the study, the following research questions were posed:

- 1) What is the effect of gender on students' achievement in Mathematics after using video-taped instruction?
- 2) What is the interactive effect between teaching methods and gender on students' achievement in Mathematics?

1.4 Statement of the Hypotheses

The following hypotheses which were tested at 0.05 levels of significance, were formulated to guide the study.

H0₁: There is no significant difference in the achievement mean scores of male and female students taught Mathematics with video-taped instruction and those taught with conventional methods.

H0₂: there is no significant interaction effect between the teaching methods and gender on students' achievement in mathematics.

1.5 Significance of the Study

Any effort made to improve Mathematics instruction will be highly welcomed in this age of Science and Technology for the development of the country. This study is therefore, vital in finding out whether video-taped instruction can improve Mathematics achievements of students. It believes that this present study might be of benefit to the following: students, teachers, parents, Mathematics instructional materials expert, the Federal Ministry of Education and the Universal Basic Education.

The findings and suggestions of this study might encourage Mathematics teachers to make use of video-taped instructional approach to reduce their work load resulting from large classes. The findings of this study might help to bridge the disparity in achievement between male and female students in Mathematics. Parents might be encouraged to procure video-taped instruction for their children who will make learning of Mathematics effective and efficient. Mathematics instructional material expert might be encouraged to produce video-taped instruction on various Mathematics topics. The result of this study might motivate the Federal Ministry of Education and the Universal Basic Education Board to invest in the production of

video-taped instructions for students in Junior Secondary Schools, encourage the use of such instructional materials to make the learning of Mathematics innovative.

2. Materials and Methods

The research design for the study is quasi-experimental. In a Quasi-experimental design, there is no randomization. Quasi-experimental design, Anikweze (2012) posited, has been developed to control as many threats to validity as possible in a situation where at least one of the three elements of true experimental research is lacking (i.e. manipulation, randomization and equivalent control group). A simple random sampling technique was employed in selecting the three out of 50 Junior Secondary Schools in the Municipal Council Area of the FCT, Abuja

Selection of two intact classes from the arm of the JSII classes in each of the three selected schools were randomized and were further randomly assigned to experimental and control groups. The experimental group consists of 81 males and 83 females (164) and control group consists of 80 males and 78 females (158) which gave total sample size of 322 students.

2.1 Instrumentation

The instrument used for this study was Mathematics Achievement Test (MAT). Tools used were Control Group Lesson Plan (CGLP), Video-Taped Instruction Lesson Plan (VTILP) and Video cassette. The MAT constructed by the researcher consists of 40 multiple-choice questions with 4 options. The items were generated from the units of Geometry and Mensuration taught in the second year of all Junior Secondary School in the FCT, Abuja. The table of specifications for the 40-item multiple-choice Mathematics Achievement Test was presented to obtain content validity in terms of comprehensiveness of the items in the test. Experts in Mathematics, Measurement and Evaluation validated the instrument. The logical validity index of MAT is 0.85. The instrument was pilot tested to determine the reliability using small group of the target population. Kuder-Richardson 21 was used to get the reliability co-efficient (r) of .62 for MAT.

3. Result and Discussion

The results of data analysis were presented and interpreted according to the research questions and hypotheses guiding the study.

Research Question 1: What is the effect of gender on students' achievement in Mathematics after using video-taped instruction?

Table 1: The Mean Achievement Scores of Male and Female Students
Taught Mathematics using Video-Taped Instruction

Group			Pre-test		Post-test		Achievement Gain	
	Gender	N	Mean	S.D	Mean	S.D	Mean	S.D
Experi. Group	Male	81	45.16	13.37	63.41	16.17	18.25	2.80
	Female	83	45.13	11.14	63.40	13.52	18.27	2.38
	Total	164						

Table 1 showed that male students had a mean score of 45,16 with a standard deviation score of 13,37 in the pre-test and a mean score of 63,41 with a standard deviation score of 16.17 in the post-test. While their female counterpart had a mean score of 45.13 with a standard deviation score of 11.14 in the pre-test and a mean score of 63.40 with a standard deviation score of 13.52 in the post-test. The achievement gains of male and female in experimental group were almost the same 18.25 and 18.27.

Research Hypothesis 1: There is no significant difference in the mean achievement of male and female students taught Mathematics with video-taped instruction while controlling the effect of pre-test.

Table 2: Summary of Analysis of Covariate (ANCOVA) for
Male and Female Taught Mathematics with Video-Taped Instruction

Source	Type III Sum of Squares	Df	Mean Square	F	P. Value
Corrected Model	23609.61	2	11804.81	23.84	.000
Intercept	1691.73	1	1691.73	6.83	.000
Pre-test	19931.16	1	19931.16	80.49	.000
Group	2455.40	1	2455.40	9.92	.000
Sex	244.80	1	244.80	1.00	.081
Error	39247.38	159	123.81		
Total	588000.00	164			
Corrected Model	62856.99	163			

- a. R Squared = .376 (Adjusted R Squared = .368)
- b. Alpha = .05

Table 2, show that there was no significant gender difference in post-test Mathematics scores of students exposed to video-taped instruction after controlling for pre-test Mathematics scores, $F(1,164) = 1.00, p > .05$. Thus the null hypothesis of no significant gender difference was not rejected.

Research question 2: What is the interactive effect between teaching methods and gender on students' achievement in Mathematics?

Table 3: The Mean Achievement Scores of Male and Female Students Taught Mathematics using Video-Taped Instruction and the Conventional Approach

Group			Pre-test		Post-test		Achievement Gain	
	Gender	N	Mean	S.D	Mean	S.D	Mean	S.D
Experi. Group	Male	81	45.16	13.37	63.41	16.17	18.35	2.8
	Female	83	45.13	11.14	63.40	13.52	18.27	2.38
		80	43.39	13.37	52.30	14.75	8.91	1.38
		78	43.37	17.58	52.28	20.21	8.91	2.63
	Total	322						

Table 3 revealed that for the experimental group, male students had a mean score of 45.06 with a standard deviation score of 13.37 in the pre-test and a mean score of 63.41 with a standard deviation score of 16.17 in the post-test. While their female counterparts had a mean score of 45.13 with a standard deviation score of 11.14 in the pre-test and a mean score of 63.40 with a standard deviation score of 13.52 in the post-test.

For the control group, it was observed that male had the mean score of 43.39 with a standard deviation score of 13.37 in the pre-test and a mean score of 52.30 with a standard deviation score of 14.75 for post-test. Their female counterparts had a mean score of 43.37 with a standard deviation of 17.58 in the pre-test and a mean score of 52.28 with a standard deviation score of 20.21 in the post-test. The result showed that the mean achievement scores of males in the pre-test scores for the experimental and control groups were higher than their female counterpart but slightly different in the post test scores. The achievement gain mean scores for male and female in experimental group 18.35 and 18.27 with standard deviation 2.8 and 2.38 respectively, control group achievement gain mean scores 8.91 and 8.91 with standard deviation 1.38 and 2.63 respectively.

Research Hypotheses 2: There is no significant interaction effect between teaching methods and gender on students' achievement in Mathematics. The hypothesis was tested by analyzing the obtained data with ANCOVA statistic. The result is shown in Table 4.

Table 4: Summary of Analysis of Covariate (ANCOVA) for Teaching Methods and Gender

Source	Type III Sum of Squares	Df	Mean Square	F	P. Value
Corrected Model	47219.22	4	11804.81	23.84	.000
Intercept	3383.45	1	3383.45	47.67	.000
Pre-test	39862.31	1	39862.31	13.66	.000
Group	4910.80	1	4910.80	160.98	.000
Sex	489.59	1	489.59	19.83	.000
Group*Sex	11.99	1	11.99	1.99	.161
Error	78494.75	317	247.62	s.05	.826
Total	1176000.00	322			
Corrected Model	125713.98	321			

a. R Squared = .376 (Adjusted R Squared = .368)

b. Alpha = .05

Table 4, shows that there was significant treatment difference in the post-test Mathematics scores of the students exposed to video-taped instruction after controlling for pre-test Mathematics scores, $F(1,322) = 160.98, p < .05$. Thus the null hypothesis of no significant treatment difference was rejected. Hence there is a significant treatment difference in students' achievement. Table 4, also revealed that gender has a significant effect on students Mathematics achievement $F(1,322) = 19.99, p < .05$. Thus the null hypothesis of no significant gender difference was rejected since sex was significant. Table 4, also shows that the interaction effect between teaching method and gender on students' achievement in Mathematics was not significant $F(1,322) = 1.99, p > .05$. The null hypothesis of no significant difference for interaction effect between teaching method and gender was not rejected.

4. Major Findings

The data collected from MAT was analyzed using mean deviation, standard deviation and Analysis of Covariance (ANCOVA) which gave rise to the following findings. Analysis of the result as shown in table 1 showed that the mean achievement scores of male in the pre-test scores for experimental and control groups were significantly higher than their female counterpart but at almost the same for the experimental and control groups in post-test scores. Table 2 showed that there exist, significant treatment difference between teaching methods and gender on students' achievement in Mathematics at $F(1,322) = 160.98 P < .05$ and $F(1,322) = 19.83 P < .05$. There is no significant interaction effect between teaching methods and gender at $F(1,322) = 1.99 P > .05$

4.1 Discussion

Having run the Analysis of Covariance, results relating teaching methods and gender on students' achievement in Mathematics, the researcher was able to find out that there is no significant interaction effect between teaching methods and gender. The coefficient of determination was low .368 that means 37% of the total variation in male and female achievement scores were counted for by the variation on teaching method. Hence, hypothesis of no significant interaction effect was not rejected.

5. Conclusion

Based on the findings, the following conclusion was drawn:

- 1) There is no significant difference between achievement mean scores of male and female students taught Mathematics with video-taped instruction.
- 2) There is a significant treatment difference in student's achievement
- 3) There is no significant interaction effect between teaching methods on gender on students' achievement

6. Recommendation

In view of the findings, the following recommendations are made:

- 1) Boys and girls should be given equal opportunity in studying Mathematics using video-taped instruction since their potential in the subject is not significantly different
- 2) Mathematics experts and instructional technologist should be funded by the government for the production of video-taped instruction in various topics for schools.

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About the Authors

The study is a joint output of dedicated academics and educators who have several years of experiences in education research works.

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