



## **Gender Difference In Mathematics Achievement And Retention Among Secondary School Students In Nsukka Education Zone, Enugu State, Nigeria**

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### **ABSTRACT**

The study examined gender difference in mathematics achievement and retention among secondary school students in Nsukka Education Zone, Enugu State, Nigeria. The study adopted Quasi-experiment design: Pre-test-posttest nonequivalent group design. The population of the study comprise of five thousand, two hundred and forty-seven (5257) males and female senior secondary school class-two (SS2) students in the fifty-nine (59) public secondary schools in Nsukka educational zone of Enugu State. Which is made up of 2410 male and 2847 female students. The sample for the study comprises of 105 senior secondary schools class-two (SS2) students made up of 48 males and 57 females from four public secondary schools in the zone draw using multistage sampling technique. Mathematics achievement tests (MAT) were used for data collection. The mean and standard deviation were employed to answer the research question while analysis of Covariance (ANCOVA) was used to test the null hypotheses formulated at 0.05 level of significance. The Findings shows that, male students had higher achievement in mathematics than their female counter. Gender was a significant factor. Male students also have higher mathematics retention abilities than female students, this also manifested in their higher achievement in mathematics than female senior secondary school students. The study recommended among other things that, Gender as a factor in students' achievement in mathematics should be considered in preparation for the implementation of mathematics curriculum contents. In other words, the study is recommending that mathematics teachers should identify examples and illustrations that will clearly understand by both male and female students in mathematics classroom in order to close the gender gap in students' achievement in mathematics in senior secondary schools.

**Keywords:** Gender, Mathematic, Retention, Secondary School, Mathematics achievement.

### **INTRODUCTION**

Gender which is a societal construct plays a great role in the way individual engage in their daily activities which include academics. However, effort to understanding how gender can influence senior secondary school students in achievement and retention in Nsukka Education Zone of Enugu State has remained under studied over the years, most especially in Mathematics.

Mathematics is the "science of numbers," in which numbers and factors are used to figure out, define, and express various concepts. Mathematics education is to a nation what protein is to a young human

organism. According to Awofala (2000), cited in Adewale (2011), mathematics is a foundational science for understanding most other areas and an essential part of the global way of life. Mathematics provides students with a remarkable collection of tools for comprehending and changing the world. Mathematics is critical in speeding a country's social, economic, and technological development. According to Ziegler and Loos (2014), mathematics is a science that is derived from the study of mathematical figures and the computation of numbers. They went on to say that mathematics is a science that studies dynamic structures that are created by utilizing consistent definitions and rationale to explain its qualities and instances. Mathematics is a human activity that involves the resolution of problems (Godino, 2017). Mathematics is critical in speeding a country's social, economic, and technological development. Today's world, which is increasingly reliant on science and technology, necessitates a greater understanding of mathematics on the part of its citizens.

Mathematics is one of the most important subject in secondary school. This justifies why the federal government of Nigeria made it a compulsory school subject. According to National Policy on Education (2013) mathematics helps in the inculcation of the right type of value and attitude for survive of the individual and the Nigeria society; to provide necessary mathematical background for higher learning; the acquisition of appropriate skills abilities and competencies both mental and physical equipped for the individual to live and contribute to the development of his society; to develop precisely logical and abstract thinking; to encourage creativity; to develop the ability to recognize problem and to solve them with related mathematical knowledge; to foster the desire and ability to be accurate to a degree relevant to the problem at hand; and to develop interest for mathematics and provide a solid foundation for everyday living. Despite these objectives and the overall importance of mathematics to every individual, the performance and achievement of secondary school students over the years has been declining over the last decade in both internal and external examinations most especially WAEC and NECO.

Students' academic achievement refers to how well a student is accomplishing his or her studies. Academic achievement enables us to obtain information on the extent to which a student has attained the criterion performance. It also enables us to determine the relative position or rank of individual student with respect to their performance. Aronson (2012) explained academic achievement as the degree of attainment by student in schools, colleges and universities at a given period. Aniekwe (2019) sees achievement as a test for the measurement and comparison of skills in various fields of academic study. Hence achievement could be described as a task which has been accomplished successfully, especially by means of exertion, skill practice or perseverance.

Some of the purposes of academic achievement are itemized by Ekhasemomhe (2010) as follows: to determine the relative effectiveness of the programme in terms of students behavioural output; to identify students' growth or lack of growth in acquiring desirable knowledge, skills, attitudes and societal values; to help teachers determine the effectiveness of their teaching technique and learning materials; to help motivate students to learn more as they discover their progress or lack of progress in a given task; to encourage students to develop sense of discipline and systematic study habits; to acquaint parents or guardians with their children's performance; to predict the general trend in the development of the teaching-learning process; to make reliable decision about educational planning; and to provide educational administrators with adequate information about teachers' effectiveness and school needs. Senior secondary school students' academic achievement in Mathematics as reported by the Chief WAEC examiner (2011-2021) showed that secondary school students' academic achievement in economics over the years has been below 50%. (Chief WAEC examiner, 2011-2021). These low students' performance in mathematics might be influence by their gender among other factors.

Gender usually refers to traits and behaviours that a particular culture judges to be appropriate for men and women. Gender can be defined as the socially constructed roles, behaviour, activities and attributes that a particular society considers for men and women (World Health Organization, WHO, 2014). Umoh (2003) defined gender as a mental term used to describe the behaviors and characteristics that people are anticipated to have based on whether they were born male or female. Zhu (2007) looked into gender differences in mathematical problem solving patterns, using secondary sources. The large body of literature reports that there are gender differences in mathematical problem solving favouring males.

Oribhabor (2020) found a significant difference in the Mathematics achievement of the male and female students in favour of the males. While, Ato and Adelaide (2015) found out that gender is not a significant factor in secondary school students' mathematic achievement. This implies that, there is no consensus among previous researcher on whether senior secondary school student differ by gender or not.

There have been conflicting findings on the roles that gender play in academic achievement of senior secondary school students in Mathematics. For example; Oribhabor (2020) found a significant difference in the Mathematics achievement of the male and female students in favour of the males. Similarly, Oluyemo, Kukwil, Anikweze and Shaluko (2020) found that male students excel in Mathematics more than their female counterparts. Abakpa (2011) and Collins (2014) who found out in their respective studies that gender has influence on students' achievement when taught using innovative teaching technique in some specific classrooms as mathematics. Similarly, Ajai and Imoke (2015) established that gender plays significant role in shaping students' achievement in science related subjects such as mathematics especially when a new teaching technique such as field dependent and filed independent is applied in classroom teaching and learning experiences. Additionally, Mutai (2016) found out that, gender was strongly associated with mathematics achievement. Male students performed better than females. On the contrary, Ajai and Imoko (2015) found out that, male and female students trained algebra using PBL didn't fundamentally contrast in achievement. Similarly, Ato and Adelaide (2015) found out that gender is not a significant factor in secondary school students' mathematic achievement.

Retention on the other hand, refers to the ability of the learners to recall information, ideas or learning activities at a later time which he/she may be ask to mention, write or remember after some times. Bichi (2001) defined retention as the ability to maintain and later recall information or knowledge gained after learning. Alake (2015) sees retention as the ability to store information which can be easily recalled from the short term memory and long term memory. Therefore, retention is a very important aspect of students learning or rather an aspect of measuring the cognitive ability of learners. Studies on gender and retention of mathematics among secondary school students also presented conflicting results over the years. Enikanolaye (2021) found out that, there was a significant difference in the mathematics retention of secondary school students based on gender. On the contrary, Obi, Agwagah, Newen and Nwoye (2017) found out that gender is not a significant factor in the level of mathematics retention among secondary school students.

Personal observation by the researcher over the years has showed that senior secondary school students are not performing well in mathematics in most of the secondary schools in Nsukka Education Zone of Enugu State. This has manifested in the continuous poor performance of senior secondary school students in Mathematics in WAEC and NECO. Considering the importance of mathematics to every individual, it is imperative to examine gender difference in mathematics achievement and retention among secondary school students in Nsukaa Education Zone, Enugu State, Nigeria, where no previous similar existed to the best knowledge of the researcher through extant literature search.

### **Purpose of the Study**

The main purpose of the study is to examine gender difference in mathematics achievement and retention among secondary school students in Nsukaa Education Zone, Enugu State, Nigeria. the specific purposes of the study are to:

1. Examine the achievement scores of male and female senior secondary school students in mathematics
2. Examine the retention scores of male and female senior secondary school students in mathematics
3. Ascertain the difference in the achievement scores of male and female senior secondary school students in mathematics
4. Ascertain the difference in the retention scores of male and female senior secondary school students in mathematics

### **Hypotheses**

The following hypotheses were postulated to guide the study and was tested at 0.05 level of significance:

**H<sub>01</sub>:** There is no significance difference in the mathematics achievement scores of male and female senior secondary school students

**H<sub>02</sub>:** There is no significance difference in the mathematics retention scores of male and female senior secondary school students

**METHODOLOGY**

The study adopted Quasi-experiment design: Pre-test-posttest nonequivalent group design. According to Kerlinger (1970) quasi-experimental situations is applied to much educational research where the random selection or random assignment of schools and classroom is quite impracticable. This design was considered most appropriate because this study seeks to examine the effect of cognitive style and gender on the achievement of secondary school students in mathematics through pretest-posttest technique. The population of the study comprise of five thousand, two hundred and forty-seven (5257) males and female senior secondary school class-two (SS2) students in the fifty-nine (59) public secondary schools in Nsukka educational zone of Enugu State. Which is made up of 2410 male and 2847 female students across the three local government areas in the education zone. The sample for the study comprises of 105 senior secondary schools class-two (SS2) students made up of 48 males and 57 females from four public secondary schools in the zone draw using multistage sampling technique.

The study adopted mathematics achievement tests (MAT) for collecting data. Mathematics Achievement Tests MAT contains 30 items and each question has options (A-D) to be selected from. Overall, reliability index for Mathematics Achievement Tests (MAT) is 0.79. The experiment group and control group were pre-tested using the mathematics achievement test (MAT). For the experiment group the students were exposed to some of mathematical concepts drawn from the second term curriculum of the schools. The students are taught using their regular class teacher under the supervision of the researcher. The teachers were trained for one week. The experiments were conducted using the normal school periods of lesson. The experiment lasted for a period of three weeks. At the end of the experiment post-test was administered which was a disguised pre-test to the research subjects, the pretest was disguised to avoid the test effect on the subjects. The whole exercise of teaching and testing was monitored by the researcher to ensure that there was no deviation from the specification in the guide. Also, after the three weeks meant for the study the students in the control group were also given the post-test which was disguised pre-test to the research subjects. The mean and standard deviation were employed to answer the research question while analysis of Covariance (ANCOVA) was used to test the null hypotheses formulated at 0.05 level of significance.

**RESULTS**

The results of the study are presented in line with the research questions and hypotheses that guided the study.

**Research Question 1:** *What is the achievement scores of male and female senior secondary school students in mathematics?*

**Table 1:** Pretest-Posttest Mean achievement scores of male and female senior secondary school students in mathematics in Nsukka Education Zone

Gender	N	Pre-test		Post-test		Mean Gain Scores	Mean Gain Difference
		Mean	SD	Mean	SD		
Male	48	18.52	4.87	26.34	5.90	7.82	0.34
Female	57	17.47	3.03	24.95	5.66	7.48	

Result in Table 1 shows the mean achievementscores of male and female senior secondary school students in mathematics. The male students had mean achievement score of 18.52 with standard deviation of 4.87 at pre-test and 26.34 with standard deviation of 5.90 at post-test. The mean gain score of male students was 7.82. On the other hand, female students had mean achievement score of 17.47 with standard deviation of 3.03 at pre-test and 24.95 with standard deviation of 5.66 at post-test. The mean gain scores of the female students was 7.48. The mean gain difference of .34 was recorded for the two groups in favour of the male students. The standard deviation of each group from the mean ranged from 3.03 –

5.90; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

**Research Question 2:** *What is the retention scores of male and female senior secondary school students in mathematics?*

**Table 2:** Pretest-Posttest Mean retention scores of male and female senior secondary school students in mathematics in Nsukka Education Zone

Gender	Pre-test			Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Male	48	35.93	8.73	64.56	12.38	28.63	3.72
Female	57	36.62	9.63	61.53	11.90	24.91	

Result in Table 2 shows the mean retention scores of male and female senior secondary school students in mathematics. The male students had mean retention score of 35.93 with standard deviation of 8.73 at pre-test and 64.56 with standard deviation of 12.38 at post-test. The mean gain score of male students was 28.63. On the other hand, female students had mean retention score of 36.62 with standard deviation of 9.63 at pre-test and 61.53 with standard deviation of 11.90 at post-test. The mean gain scores of the female students was 24.91. The mean gain difference of 3.72 was recorded for the two groups in favour of the male students. The standard deviation of each group from the mean ranged from 8.73 – 12.38; indicating that the respondents were not too far from the mean and from one another in their responses, adding further validity to the mean.

**Hypotheses**

**H<sub>01</sub>:** There is no significance difference in the mathematics achievement scores of male and female senior secondary school students

**Table 3:** Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean achievement scores of male and female senior secondary schools in mathematics in Nsukka Education Zone

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	426.515 <sup>a</sup>	4	106.629	3.996	.008
Intercept	957.981	1	957.981	35.901	.000
Pretest Achievement	75.065	1	75.065	2.813	.101
Treatment	295.083	1	295.083	13.022	.002
Gender	14.577	1	14.577	.546	.464
Treatment * Gender	3.751	1	3.751	.141	.710
Error	1147.402	135	26.684		
Total	33504.000	140			
Corrected Total	1573.917	139			

Result of the analysis in Table 3 revealed that gender as a factor in the study has a significant effect on the mean achievement scores of secondary school students in mathematics. This is because the calculated F-value of 13.022 in respect of the treatment as main effect has a probability value of 0.002 and therefore significant at .05 level of significance. This implies that gender influence students’ achievement in mathematics. Therefore, the null hypothesis of no significance difference in the mathematics achievement scores of male and female senior secondary school students in Nsukka Education Zone was rejected. Therefore, the researcher concludes that there was a significance difference in the mathematics achievement scores of male and female senior secondary school students in Nsukka Education Zone.

**H<sub>02</sub>:** There is no significance difference in the mathematics retention scores of male and female senior secondary school students

**Table 4:** Summary of the 2-Way Analysis of Covariance (ANCOVA) of Mean retention scores of male and female senior secondary school students in mathematics

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	561.076	4	140.269	5.392	.001
Intercept	425.589	1	425.589	16.360	.000
Pretest retn	120.554	1	120.554	4.634	.037
Treatment	424.077	1	424.077	16.302	.000
Gender	1.719	1	1.719	.066	.798
Treatment * Gender	13.734	1	13.734	.528	.471
Error	1118.591	135	26.014		
Total	33920.000	140			
Corrected Total	1679.667	139			

Result of the analysis in Table 4 revealed that gender as a factor in the study has a significant effect on the mean retention scores of secondary school students in mathematics. This is because the calculated F-value of 16.302 in respect of the treatment as main effect has a probability value of 0.000 and therefore significant at 0.05 level of significance. This implies that gender influence students' retention in mathematics. Therefore, the null hypothesis of no significance difference in the mathematics retention scores of male and female senior secondary school students in Nsukka Education Zone was rejected. Therefore, the researcher concludes that there was a significance difference in the mathematics retention scores of male and female senior secondary school students in Nsukka Education Zone.

### **DISCUSSION OF THE FINDINGS**

The findings of the study revealed that, male senior secondary school students had higher mathematics achievement than their female counter. The study also revealed that, there was a significance difference in the mean achievement scores of male and female senior secondary school students in Nsukka Education Zone. This finding is in line with the earlier findings of Abakpa (2011) and Collins (2014) who found out in their respective studies that gender has influence on students' achievement when taught using innovative teaching technique in some specific classrooms as mathematics. Similarly, Ajai and Imoke (2015) established that gender plays significant role in shaping students' achievement in science related subjects such as mathematics. In line with the above findings, the present study was carried out to ascertain if gender has any influence on students' achievement in mathematics and the findings of the study have been able to prove that gender has significant influence on students' achievement in senior secondary schools in Nsukka Education zone, Enugu State.

The findings of the study revealed that, male senior secondary school students had higher mathematics retention score than female students. It was also revealed that, there was a significance difference in the mathematics retention scores of male and female senior secondary school students in Nsukka Education Zone. This finding is in line with the earlier findings of Fakeye (2010) and Bassey, Umosen, and Udida (2013) who found out in their respective studies that gender has influence on students' retention when taught using innovative teaching technique in some specific classrooms as mathematics. In line with the above findings, the present study was carried out to ascertain if gender has any influence on students' retention in mathematics and the findings of the study have been able to prove that gender has significant influence on students' retention in senior secondary schools in Nsukka Education zone, Enugu State.

## CONCLUSION

The study examined gender difference in mathematics achievement and retention among secondary school students in Nsukka Education Zone, Enugu State, Nigeria. Based on the findings, the study concluded that male senior secondary school students have higher mathematics achievement and retention than their female counterparts. It was also concluded that, gender is a significant factor that influence senior secondary school students' achievement and retention in Nsukka Education zone, Enugu State. Male students have higher mathematics retention abilities than female students, this also manifested in their higher achievement in mathematics than female senior secondary school students.

## RECOMMENDATIONS

Based on the findings of the study, the following recommendations were suggested:

1. Gender as a factor in students' achievement in mathematics should be considered in preparation for the implementation of mathematics curriculum contents. In other words, the study is recommending that mathematics teachers should identify examples and illustrations that will clearly understand by both male and female students in mathematics classroom in order to close the gender gap in students' achievement in mathematics in senior secondary schools.
2. More attention should be given to female secondary school students as the findings revealed that male students had higher mathematics achievement.
3. Mathematics teachers should device appropriate teaching strategies to improve mathematics retention among students, most especially female students.

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