# A Comparative Analysis on Gender and School Location in Mathematics Achievement Using a Standardized Mathematics Achievement Test for SS2 Students in Rivers State

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**Abstract**

The study is aimed at comparing the academic performance of SS 2 students in mathematics based on gender and school location using a standardized mathematics achievement test in public senior secondary schools in Rivers State. Two research questions and hypotheses guided the study. The design used for the study was the comparative descriptive design. The population of the study was 61,049 and the sample size was 400, this was calculated using Taro Yamene method for both gender and school location from 10 schools randomly selected in the 3 senatorial districts of the state. To achieve the objective of the study, standardized mathematics achievement test adapted from an existing mathematics achievement test (MAT) for SS 2 students based on their 2021/2022 1st term scheme of work was used to get the scores of the students. Mean and standard deviation was used to answer the research questions, while the null hypotheses were tested at 0.05 alpha level of significance using independent sample t-test. The results indicate that there was a statistically significant difference in the mathematics achievement of students based on gender and school location in the mathematics achievement of SS 2 mathematics students. The study therefore recommends among others that; female students should be encouraged to see mathematics as a simple subject.

**Keywords**:  Gender, School location, Achievement test, Standardized mathematics achievement test.
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## INTRODUCTION

In Nigeria and perhaps the whole of Africa, Arigbabu et al, (2004) are of the opinion that gender bias is still very prevalent. Abdullahi, et al, (2007) agreed that socialization patterns in Nigeria and most African setting, place enormous restrictions on the female gender and from her a higher input of daily domestic labour than from the male. This perception automatically scheme female out from any consideration for serious professional discipline even in cases where the female appears to be more brilliant than their male counterparts. Raimi et al, (2006) observed in their

research on gender differences among college students in integrated science, that there is a significant difference between males and females in their attitude towards integrated science. Oludipe, (2012) and Kola et al, (2013) observed in their various studies that there is no significant difference between male and female performance.

Gender difference in relation to mathematics achievement has been intensely studied in the past three decades (Ackerman, 2006 & Mamoon, 2021). Many researchers have found no relationship between gender and mathematics achievement. For instance, Young, (in Mamoon, 2021) studied $3^{rd}$, $7^{th}$, and $10^{th}$ grades in Western Australia in relation to gender differences in mathematics achievement, he found that both males and females in the $3^{rd}$ and $7^{th}$ grades had mean scores which were similar in achievement tests. Moreover, Zabel et-al in Ma'moon, (2021) found that juvenile offenders exhibited no significant relationships between gender in some topics of mathematics. In addition, for grades (7-10) in Los Angeles, Ai in Ma'moon, (2021) reported no relationship between the two groups of high achieving students in their initial status and growth rate in relation to mathematics scores. Similarly, Ackerman, (2006) considered that both genders have the same cognitive ability.

In Nigeria for instance, the lingua Franca is English Language, which in most cases is not spoken widely in rural schools. What is obtainable in most cases is the mother tongue of that setting. This on its own can affect immensely the performance of students in mathematics since it is with English language mathematics is being taught and assessed in schools. Availability of resources, good environment, opportunities, social amenities and mathematics teachers are some of the advantages that urban schools have over their rural counterparts. However, one of the greatest advantages rural schools have over urban schools is the tendency for smaller classes, which promises increased students' evaluation and provide greater flexibility in teaching strategy. However, in their study, Igboegwu et-al, (2012) discovered a significant difference in student's achievement with respect to school location and education zones. The study showed that urban schools significantly achieved better than students in the rural schools. Also, Owoeye, (in Caroline, et-al, 2015) found that students in urban schools performed better than students in rural schools in all forms of achievement test used. Kissau, (2006), however, reported that students in urban and rural location performed in a similar manner.

It is also worthy of mention here that in a recently organized science quiz competition by the Nigeria Liquefied Natural Gas company (NLNG) between June and July, 2022 for public senior secondary schools in Rivers State in mathematics, physics, chemistry, biology and computer science. Findings revealed that schools in the urban areas out-performed their counterparts from the rural schools. The results showed that out of the first 30 schools who scored 60% and above, 17 schools were from the urban area, 9 were from the semi-urban schools while 7 were from the rural schools. This is an indication that public senior secondary schools in the urban areas are better equipped in terms of teacher manpower and facilities for effective delivery of teaching and learning.

Learners' achievement are determined mainly through achievement test. Achievement tests are any tests aimed at measuring students' acquired learning in an educational or training programme setting. These tests may comprise of one to several items that can be dichotomously

scored (Salkind, 2007). Achievement tests are developed with the primary aim of measuring competency in a specified domain, and the students' knowledge and abilities will be measured by these instruments (Hanif et-al, 2017). These can assist in grading, tracking, placement, promotions and graduation decisions. Moreover, these are used to ascertain the weaknesses and strengths of a program. They can be teacher-made tests, standardized assessments and curriculum-based measurement (Schneider, et-al, 2015). An achievement test however, is one that is designed to measure a student's grasp of some body of knowledge or his proficiency in certain skills, whereas a test of educational achievement is a test designed to measure knowledge, understanding, and skills in a specified subject or group of subjects. In summary, it is understood that this test is a successful means of determining the extent to which the student has attained a certain degree of progress towards a desired goal or objective.

The process of teaching and learning involves testing as an integral part; however, based on the purpose they serve, tests are classified into different categories such as, achievement test, performance tests, short answer tests, essay tests, multiple choice tests, true/false tests, matching tests, placement tests, diagnostic test, proficiency test, aptitude test, norm referenced tests, criterion-referenced tests, summative tests, formative tests, group tests, individual tests, speed tests, power tests, verbal tests, non-verbal tests, culture biased tests, culture-fair tests, standardized tests, non-standardized tests etc. Davis, (2013); Ramadan, (2014), Asuru (2015), Inko-Taria et-al, (2017), Christian, (2017). Asuru, (2015) notes that achievement test serves the following functions in schools; to select the students for admission, to classify the students, to encourage the students, to promote the students, to issue certificates on the basis of public examinations and results, to evaluate educational problems, selection of candidates in different fields and for admission of students in schools, determination of class and promotion, in the field of medicine and counseling, achievement tests are also used extensively to evaluate the teaching work of teachers. Wu in Ezeugo et-al, (2021), views achievement tests as tests constructed to measure the knowledge, skills and abilities attained by a testee in a field, a subject area or a content domain in which the testee has received instructions or training.

Standardized mathematics achievement tests are evaluative devices developed to ascertain a sample of behaviour from an individual in a domain of interest in which the test administration and scoring process is uniform across individuals and both reliability and validity evidence exists such that generalization regarding the person's characteristic can be made from the test score (Morrison et-al, 2018). Thorndike, (2014), indicated that the term standardized tests means the availability of normative data (although the term basically points to the adoption of uniform administration procedures. Basically, standardized achievement tests are designed and prepared with the assistance of experts in measurement and evaluation for large number of students. It is accompanied with a manual. They are administered under uniform procedures. They are scored and interpreted in a standard and consistent manner such that comparison of individual or groups of students become realizable, (Ifeakor, 2011). It is on this premise that the present study is focused on carrying out a comparative analysis on gender and school location in mathematics achievement using a standardized mathematics achievement test for SS 2 students in Rivers State.

## STATEMENT OF THE PROBLEM

Gender and location have been identified as some of the factors that can influence students' academic achievement in mathematics. Previous studies on the influence of these variables on academic achievement are not conclusive. While some of the findings of the studies discovered that, there is a significant influence of these variables on students' academic achievement. Some studies equally discovered that these variables do not significantly influence students' academic achievement. Female students feel that they cannot compete with their male counterpart in learning mathematics. However, the gender differences in mathematics have led to our females to become backward unsuccessful persons in the area of science and technology. It is in the light of this that the present study was carried out using a standardized mathematics achievement test to carry out a comparative analysis based on gender and school location for SS2 mathematics students in Rivers State.

## PURPOSE OF THE STUDY

The purpose of the study was to compare the academic achievement of SS2 students in mathematics based on gender and school location in public senior secondary schools in Rivers State through the administration of a standardized mathematics achievement test which was adapted from a standardized mathematics achievement test (MAT) for SS 2 students constructed by the researcher. Specifically, the aim of the study is;
1.      To find out the difference in SS2 students' mathematics academic achievement based on gender in public senior secondary schools in Rivers State.
2.      To determine the difference in SS2 Students' academic achievement based on school location in public senior secondary schools in Rivers State.

## Research Questions

The following research questions guided the study;
1.      What is the mean difference in the academic achievement of SS2 students in mathematics based on gender in public senior secondary schools in Rivers State?
2.      What is the mean difference in the academic achievement of SS2 students in mathematics based on school location in public senior secondary schools in Rivers State?

## Hypothesis

1.      There is no significant mean difference in SS 2 students' mathematics academic achievement based on gender in public senior secondary schools in Rivers State.
2.      There is no significant mean difference in SS 2 students' academic achievement based on school location in public senior secondary schools in Rivers State.

## Methodology

The research design adopted for this study was a comparative descriptive research design. The design was considered appropriate because this approach permits the use of existing intact units for comparison and does not involve manipulating an independent variable. It is mostly

used when the purpose of the investigation is to describe the characteristics of the individual and compare the variables describing the research sample as they naturally exist (Siedlecki, 2020). The population of the study was 61,049 and the sample size was 400, this was calculated using Taro Yamene method for both gender and school location from 10 schools randomly selected in the 3 senatorial districts of Rivers State. The choice of senior secondary school two (SS 2) students was considered more appropriate because they had been exposed to some basic mathematical concepts. The sample was selected using multistage sampling technique. In stage one, two (2) local government areas each were selected from the senatorial districts of Rivers State, namely Rivers West, Rivers East and Rivers South East using simple random sampling technique. In the second stage, ten (10) public senior secondary schools were selected using stratified sampling technique. In stage three, the SS 2 class intact size of each of the ten (10) schools were used for the study. To achieve the objective of the study, a standardized mathematics achievement test adapted from an existing mathematics achievement test (MAT) for SS 2 students based on their 2021/2022 1st term scheme of work which was designed and constructed by the researcher was used to get the scores of the students. The researcher took permission from the management of each sampled school in other to administer the test. The two research questions and hypotheses were analysed using mean and standard deviation to answer the research questions while the null hypotheses were tested at 0.05 alpha level of significance using independent sample t-test.

## Results

**Research Question 1:** What is the mean difference in the academic achievement of SS2 students in mathematics based on gender in public senior secondary schools in Rivers State?

**Table 1: Mean difference and standard deviation of mathematics achievement of SS2 students based on gender.**

| Gender | N | Mean | SD | Mean Difference |
|--------|-----|-------|-------|------------------|
| Males | 196 | 39.51 | 16.54 | |
| Females | 204 | 36.26 | 17.08 | 3.25 |

The results in table 1, indicates that the mean score and standard deviation of male SS 2 students in the mathematics achievement test was (M = 39.51, SD = 16.54), while the mean score and standard deviation of female SS 2 students in the mathematics achievement test was (M = 36.26, SD = 17.08), indicating a mean difference of 3.25. This result indicates that the mean performance of male SS 2 students in the mathematics achievement test in public senior secondary schools in Rivers State was higher than the mean scores of female SS 2 students in public senior secondary schools in Rivers State.

**Hypothesis 1**: There is no significant mean difference in SS2 students' mathematics academic achievement based on gender in public senior secondary schools in Rivers State.

**Table 2: Result of t-test analysis on mean difference of mathematics achievement of SS 2 students based on gender.**

| Gender | N | Mean | SD | df | α | t − value | P − value | Decision |
|---|---|---|---|---|---|---|---|---|
| Male | 196 | 39.51 | 16.54 | 398 | 0.05 | 1.869 | 0.063 | Significant |
| Female | 204 | 36.26 | 17.08 | | | | | |

In table 2, t-test results show that the mean scores and standard deviation for male SS2 students in the mathematics achievement test was (M = 39.51, SD = 16.54) while the mean scores and standard deviation for female SS2 students in the mathematics achievement test was (M = 39.51, SD = 17.08). The table also show calculated (t = 1.869, p = 0.063 > 0.05) which is greater than the chosen level of significance which was gotten at 398 degrees of freedom. Therefore, the null hypothesis is not accepted. This implies that there is a significant difference in the mean scores of SS 2 students based on gender in public senior secondary schools in Rivers State.

**Research Question 2:** What is the mean difference in the academic achievement of SS 2 students in mathematics based on school location in public senior secondary schools in Rivers State?

**Table 3: Mean difference and standard deviation of mathematics achievement of SS2 students based on school location.**

| School Location | N | Mean | SD | Mean Difference |
|---|---|---|---|---|
| Urban | 200 | 39.48 | 16.08 | |
| Rural | 200 | 35.53 | 16.19 | 3.95 |

The results in table 3 indicates that the mean score and standard deviation of SS2 students in urban schools in the mathematics achievement test was (M = 39.48, SD = 16.08), while the mean score and standard deviation of rural SS 2 students in the mathematics achievement test was (M = 35.53, SD = 16.19), showing a mean difference of 3.95. This result indicates that the mean performance of SS 2 students in the urban schools in the mathematics achievement test in public senior secondary schools in Rivers State was higher than the mean scores of SS 2 students in rural schools in public senior secondary schools in Rivers State.

**Hypothesis 2**: There is no significant mean difference in SS 2 students' mathematics academic achievement based on school location in public senior secondary schools in Rivers State.

**Table 4: Result of t-test analysis on mean difference of mathematics achievement of SS2 students based on school location.**

| School Location | N | Mean | SD | df | α | t − value | P − value | Decision |
|---|---|---|---|---|---|---|---|---|
| Urban | 200 | 39.48 | 16.08 | 398 | 0.05 | 2.445 | .015 | Significant |
| Rural | 200 | 35.53 | 16.19 | | | | | |

In table 4, t-test results show that the mean score and standard deviation for SS 2 students in the urban schools in the mathematics achievement test was (M = 39.48, SD = 16.08), while the mean score and standard deviation for rural SS 2 students in the mathematics achievement test was (M = 35.53, SD = 16.19). The table also show calculated (t = 2.445, p = .015 > 0.05) which is greater than the chosen level of significance which was gotten at 398 degrees of freedom. Therefore, the null hypothesis was rejected. This implies that there is a significant difference in the mean scores of SS 2 students based on school location in public senior secondary schools in Rivers State.

**Discussion of Findings**

The results in Table 1 on the mathematics achievement level of SS2 students based on gender indicates that the mean score and standard deviation of male students in the mathematics achievement test was (M = 39.51, SD = 16.54), wile the mean score and standard deviation of female students in the mathematics achievement test was (M = 36.26, SD = 17.08), showing a mean difference of (3.25). This result indicates that the mean score of male students who took part in the SS2 mathematics achievement test (MAT) in public senior secondary schools in Rivers State had a higher mean when compared to their female counterparts in the public senior secondary schools in Rivers State. This is in line with the findings of Onuekwusi et-al, (2013) and Amoo, (2013), but disagreed with the findings of Kola et-al, (2013) who observed that there is no statistically significant difference in the academic performance of students based on gender. This result is also consistent with results of a study carried out by Baya'a in Mamoon, (2021) who studied 9th grade to 12th grade Arab students at the private and comprehensive Arab high school in occupied Palestine. The study was aimed at finding out male and female differences in mathematics achievement. The sample size of the study was (418) students, (214 male students and 204 female students). The mean scores in the mathematics final tests for the last four trimesters were used to measure mathematics achievement, and the results indicated that, there was a statistically significant difference between the mathematics achievement of males and females, in favour of males. In a similar vein, Gabriel et-al, (2006), carried out a study on gender and course selection in upper secondary education on effects of academic self-concept and intrinsic value. They investigated gender differences of achievement in mathematics and biology using data from (1148) students in 10th grade in Germany. In relation to mathematics achievement tests the results indicated that males outperformed females, and they reported higher mathematics self-concepts and intrinsic values.

The result in Table 2 of t-test on the mathematics achievement of SS2 students based on gender, shows that the mean score and standard deviation for male students in the mathematics achievement test was (M = 39.51, SD = 16.54), while the mean score and standard for female students in the mathematics achievement test was (M = 36.26, SD = 17.08). The table also shows calculated (t = 1.869, p = 0.578 > 0.05) which is greater than the chosen level of significance which was gotten at 398 degrees of freedom. Therefore, the null hypothesis was not accepted. This implies that there is a statistically significant difference in the mean scores of SS 2 students based on gender in public senior secondary schools in Rivers State. This result showed that there

is a statistically significant difference in the academic achievement of students based on gender. This result is inconsistent with result of a study carried out by Kola et-al, (2013) who observed no significant difference based on gender as regards their performance in mathematics.

The results in Table 3, indicates that; the mean score and standard deviation of SS2 students in the urban schools in the mathematics achievement test was (M = 47.92, SD = 16.50), the mean score and standard deviation of rural SS2 students in the mathematics achievement test was (M = 27.18, SD = 9.24), showing a mean difference of (20.74). This result indicates that the mean score of students in the urban public senior secondary schools in Rivers State who took part in the SS2 mathematics achievement test (MAT) performed better when. The results of the study agree with that of Amoo (2013), Onuekwusi et-al, (2013), Igboegwu et-al, (2012), who from findings of similar studies carried out discovered that the students in the urban schools performed better than their rural counterparts when assessed through an achievement test. The difference in mean scores between urban and rural school students based on the opinion of the researcher may have been attributed to one of the following; teachers not wanting to go to the rural schools to teach thereby placing the rural schools at a disadvantage position, students in rural schools spending much time on farm work, teachers not being able to adequately cover their scheme of work for the term since it was a standardized achievement test. The result however, negates that of Kissau et-al, (in Caroline, et-al, 2015) who opined that there was no significant difference in the mean scores of urban and rural students. In addition, the high performance by the students from the urban schools may also be attributed to the following facts; the urban schools are constantly supervised by ministry officials as against the rural schools, higher number of teachers, availability of good learning physical environment, etc. This implies that the students from the rural schools who may have the same ability with students from urban schools are limited by some factors that prevent them from being their best in their academics.

The result of Table 4 of t-test on the mathematics achievement of SS2 students based on school location, shows that the mean score and standard deviation for urban SS2 students in the mathematics achievement test was (M = 47.92, SD = 16.50), the mean score and standard deviation for rural SS2 students in the mathematics achievement test was (M = 27.18, SD = 9.24). The table also show calculated (t = 15.512, p = 0.001 < 0.05) which is less than the chosen level of significance which was gotten at 398 degrees of freedom. Therefore, the null hypothesis is accepted. This implies that there was no significant difference in the performance of urban and rural SS 2 students who participated in the mathematics achievement test (MAT) based on school location in public senior secondary schools in Rivers State. This implies that there is a no statistically significant difference in the mean scores of SS2 students based on school location in public senior secondary schools in Rivers State. This result is in disagreement with previous studies carried out by Eraikhuemen, (2003) who investigated to find out if there is significant difference in achievement of students in mathematics based on school location, his findings revealed that students in urban schools did better than their peers in rural schools.

## CONCLUSION

Gender and school location were an important concern in the study. the study found out that, the male students who took part in the SS2 mathematics achievement test (MAT) in public senior

secondary schools in Rivers State had a higher mean score than their female counterparts. In no instance did the females achieve higher than the males in this study. In a similar vein, students in the urban public senior secondary schools in Rivers State who took part in the SS2 mathematics achievement test (MAT) performed better when compared to their rural counterparts.

## RECOMMENDATIONS
In the light of the above findings, the study recommends that;
1.   Teachers and parents should encourage female students to see mathematics as a simple subject. They should also be acquainted with objects that are mathematically inclined such as triangles, squares, circles, etc. at a tender age, so as to arouse their interest in the learning of mathematics.
2.   Adequate incentives should be provided by the government for rural school teachers in other to encourage them to put in their best. The government should also provide social amenities for the rural schools which will enhance better academic performance of students. Teachers should also use methods of teaching that would promote interest of students in the learning of mathematics.

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