

## Research Article

## Influence of Gender and School Location on Science and Mathematics Students' Achievement in Western Senatorial District of Nasarawa State, Nigeria

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**Abstract:** This study investigated the influence of gender and school location on Science and Mathematics students' achievement in Western Senatorial District of Nasarawa State, Nigeria. Survey and ex post facto research design were adopted for the study. Four research questions and four research hypotheses guided the study. The population of the study comprised 35,570 Senior Secondary two (SSII) students from 98 coeducational schools in Western Senatorial District of Nasarawa State, Nigeria. Stratified random sampling technique was used to select 1600 students from 20 coeducational schools. First the Senatorial District was stratified into urban and rural schools, afterwards, 10 schools were randomly selected each from urban and rural areas. From each school selected, one intact Science class was purposively sampled from urban and rural areas respectively to make up the 20 schools; comprising 959 students from the urban schools selected and students from the rural schools selected were used for the study. Two instruments namely; Science Achievement Proforma (SAP) and Mathematics Achievement Proforma (MAP). SAP and MAP were designed to collect information on school locations and 2017/2018 Students' Mock Examination scores in Mathematics and Science. Data collated were analysed using descriptive statistics of mean and standard deviations to answer the research questions while the Z-test was used to test the hypotheses at 0.05 level of significance. The findings of the study revealed that male science and mathematics students achieved significantly better than their female counterparts. Also, the findings showed that a significant difference existed between the achievement of Science and Mathematics students in urban and rural schools in favour of the urban students. Based on the findings of the study, it was recommended that; School administrators and teachers should pay attention on matters that would help rural students to measure up with their urban counterparts through provision of adequate school facilities.

**Keywords:** Achievement, Gender, Mathematics, School Location and Science.

### INTRODUCTION

The trend in the academic achievement of secondary school Science and Mathematics students in Nigeria in the past years has become a major source of concern to all stakeholders in the Science, Technology and Mathematics (STM) Educational sector (Nwadinigu & Azuka-Obieke, 2012). Science educators believe that any nation that hopes to develop must not neglect the teaching and learning of science in its schools (Fafunwa, 2004). Science education is a veritable instrument for social change which brings about socio-economic development and empowerment all the world. The application of scientific knowledge to real life problems is the most powerful instrument for enabling

society to face global challenges and innovations in education. Eze (2010) maintained that science education is at the centre of empowerment of students toward self-reliant and industrial skills that are needed for survival especially in this era of global economic crisis. Mathematics on the other hand is the chief corner stone of all sciences without which there will be no technology and without technology, there will be no modern society. This implies that a strong background in mathematics is critical for the nation's scientific and technological development.

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Researchers such as (Nwadinigu & Azuka-Obieke, 2012; Igoegwu & Okonkwo, 2012; Kola & Taiwo, 2013) opined that underachievement in science and mathematics among secondary school students could be attributed to several factors such as poor teaching, psychological factors, unpreparedness on the part of the students, poor learning environment, school locations, gender stereotyping, dearth of qualified teachers among others. As a result of the decline in science and mathematics students' achievement, stakeholders in STM agree that the huge investment in science and technology education is not yielding the desired dividend.

Gender remains an important factor to be considered in the determination of students' academic achievement. Gender has been identified as a major factor that affects students' achievement in science and mathematics examinations and science and technology endeavor (Omiko, 2017). Oni (2014) posited that in Nigeria, women are marginalized while men are given greater opportunities to advance based on their science background. In the Nigerian setting, this factor has been found to offer males an unfair advantage over their female counterparts. Alabi (2014) reported that women are hindered from progressing through discrimination on the basis of gender, early marriage and child bearing and as a result, they are deprived sound education, job opportunities and incapacitated and rendered passive generally in the society. Researchers (Oludipe, 2012; Kola & Taiwo, 2013) in their various studies observed that there is no significant difference between male and female achievement; on the other hand, (Onuekusi & Ogomaka, 2013; Amoo; 2013; Igoegwu & Okonkwo, 2012) found out that a significant difference did exist between the achievement of male and female students in favour of the male students. Nevertheless, there is no specific study on the influence of gender and school location on Science and Mathematics students' achievement in Western Senatorial District of Nasarawa State; hence the need for this study.

The importance of school as a citadel of learning in any social environment is not an over statement. The extent to which school location determines students' achievement lies with the particular type of school, its size and whether it is near or far away from another school. School location refers to a school's site, type of buildings, usage, capacity, teachers, students, environment and other parameters for rationalization of both rural and urban school map (Igoegwu & Okonkwo, 2012). The location of secondary schools in Nigeria is done haphazardly, without recourse to laid down statutes. The unplanned location of secondary schools has therefore, limited their spatial distribution resulting in their concentration to very few locations (Wong, Shi, Gao, Zheteyeva & Lane, 2014). The implication is that while some students spend little time to reach their schools from

their homes, others have to travel long distances (Owoeye & Yara, 2010).

Another impact of rural and urban schools' location is the preference teachers have for urban schools where social amenities avail, to the detriment of rural schools where population is low and only subsistence livelihood prevails (Ronfield, Kwol & Reinin, 2016). The resultant effect of these factors on secondary schools is that qualified teachers refuse posting to rural locations, rural dwellers refuse sending their children to schools because they rely on them for subsistence living and help, and where parents hesitate to entrust their daughters to male teachers, fearing promiscuity (Mhiliwa, 2015; Tumwebaze, 2016).

Researches (Graham & Lauren 2013; Ayub, Yunus, Mahmud, Salim & Suleiman, 2017; Alokani, 2013) have shown significant difference in students' achievement between rural and urban located schools. Such achievements in favour of urban schools, for instance, must have been borne out of many facilities available which were not available in the rural schools. Ronfeldt, Kwok and Reininger (2016) observed a significant influence of school location and students' achievement, where large schools in urban locations performed better than small schools in rural locations.

Other researches (Tayyaba, 2012, Alokani, 2013) have found contrary results from the ones elaborated above. For instance, Alokani (2013) found students from rural locations performed better than their counterparts in verbal aptitude and English language. Genshenson and Langbein, 2015 found that school size could not exert direct effect on achievement in Science between students in urban and rural locations.

The persistent underachievement of students in Science and Mathematics is alarming, this calls for a review of current strategies in teaching and learning of the subjects. In addition, teaching and learning of Science and Mathematics has been a problem to teachers and educators for years now. There is also the worrisome decline in students' enrolment in Science and other related areas in higher institutions. This is an indication of a serious gap between the expectations of the National Policy on Education (NPE) on Science and Technology and the actual situation in terms of achievement and enrolment of students in Science and Technology. The present study therefore, is aimed at determining the influence of gender and school location on Science and Mathematics students' achievement. Specifically, the study sought to find out the influence of;

- i. gender on Science students' achievement.
- ii. gender on Mathematics students' achievement.
- iii. school location on Science students' achievement.
- iv. school location on Mathematics students' achievement.

**Research Questions**

The following research questions guided the study:

- i. What are the mean achievement scores of male and female students in Science?
- ii. What are the mean achievement scores of male and female students in Mathematics?
- iii. What are the mean achievement scores of urban and rural students in Science based on gender?
- iv. What are the mean achievement scores of urban and rural students in Mathematics based on gender?

**Hypotheses**

The following hypotheses were tested at 0.05 level of significance:

**H<sub>01</sub>:** There is no significance difference between the mean achievement scores of male and female students in Science.

**H<sub>02</sub>:** There is no significance difference between the mean achievement scores of male and female students in Mathematics.

**H<sub>03</sub>:** There is no significance difference between the mean achievement scores of urban and rural students in Science based on gender.

**H<sub>04</sub>:** There is no significance difference between the mean achievement scores of urban and rural students in Mathematics based on gender.

**METHODOLOGY**

The study employed survey and ex-post facto design in which the variables of the study were not manipulated or controlled. It focused on gender, school location and students' achievement in Science and Mathematics. The population of the study comprised

35,570 (20,900 were male students and 14,670 were female students) senior secondary two (SSII) students from 98 coeducational schools (57 schools from the urban area and 41 schools from the rural area) in Western Senatorial District of Nasarawa State, Nigeria. Stratified random sampling technique was used to select 1600 (950 males and 650 females) students from 20 coeducational schools. First the Senatorial District was stratified into urban and rural schools, afterwards, 10 schools were randomly selected each from urban and rural areas. From each school selected, one intact Science class was purposively sampled from urban and rural areas respectively to make up the 20 schools; comprising 959 (558 males and 401 females) students from the urban schools selected and 644 (377 males and 267 females) students from the rural schools selected were used for the study. Two instruments namely; Science Achievement Proforma (SAP) and Mathematics Achievement Proforma (MAP). SAP and MAP were designed to collect information on school locations and 2017/2018 Students' Mock Examination scores in Mathematics and Science (the average score for Physics, Chemistry and Biology made up the Science achievement scores). Data collated were analysed using descriptive statistics of mean and standard deviations to answer the research questions while the Z-test was used to test the hypotheses at 0.05 level of significance.

**RESULTS**

**Research Question One**

What are the mean achievement scores of male and female students in Science?

The data used to answer this research question is presented in Table 1.

**Table 1 Means, Standard Deviations and Z-test of Male and Female Science Students' Achievement.**

Gender	N	Mean	SD	df	Z-cal	Z-crit.	Decision
Male	950	27.76	6.84	1598	6.48	1.96	Reject H <sub>0</sub>
Female	650	25.94	4.27				
<b>Total</b>	<b>1600</b>						

Table 1 shows that the mean achievement scores of male Science students stood at 27.76 with SD of 6.84. The mean achievement scores of their female counterparts is 25.94 with SD 4.27.

**Hypothesis One**

There is no significance difference between the mean achievement scores of male and female students in Science.

From Table 1, Z-calculated = 6.48 and with df = 1598 at  $\alpha = 0.05$ , Z-critical = 1.96. Since Z-calculated

> Z-critical, the null hypothesis is rejected. This indicates that there is significant difference in the mean achievement scores of male and female Science students. Hence, male students achieved higher in Science than their female counterparts.

**Research Question Two**

What are the mean achievement scores of male and female students in Mathematics?

The data used to answer this research question is presented in Table 2.

**Table 2 Means, Standard Deviations and Z-test of Male and Female Mathematics Students' Achievement.**

Gender	N	Mean	SD	df	Z-cal	Z-crit.	Decision
Male	950	33.42	5.32	1598	8.15	1.96	Reject H <sub>0</sub>
Female	650	27.46	3.45				
<b>Total</b>	<b>1600</b>						

Table 1 shows that the mean achievement scores of male Science students stood at 33.42 with SD of 5.32. The mean achievement scores of their female counterparts is 27.46 with SD 3.45.

**Hypothesis Two**

There is no significance difference between the mean achievement scores of male and female students in Mathematics.

From Table 2, Z-calculated = 8.15 and with df = 1598 at  $\alpha = 0.05$ , Z-critical = 1.96. Since Z-calculated

> Z-critical, the null hypothesis is rejected. This indicates that there is significant difference in the mean achievement scores of male and female Mathematics students. Hence, male students achieved higher in Mathematics than their female counterparts.

**Research Question Three**

What are the mean achievement scores of urban and rural students in Science based on gender?

The data used to answer this research question is presented in Table 3.

**Table 3 Means, Standard Deviations and Z-test of Urban and Rural Science Students' Achievement.**

School Location	Gender	N	Mean	SD	Df	Z-cal	Z-crit.	Decision
Urban	Male	558	31.22	9.12	1596	20.14	1.96	Reject H <sub>0</sub>
	Female	401	26.01	7.09				
Rural	Male	377	27.14	7.81				
	Female	267	24.98	6.54				
<b>Total</b>		<b>1600</b>						

Table 1 shows that the mean achievement scores of male Science students in the urban area stood at 31.22 with SD of 9.12. The mean achievement scores of their female counterparts is 26.01 with SD 7.09. It also shows that the mean achievement scores of male Science students in the rural area stood at 27.14 with SD of 7.81. The mean achievement scores of their female counterparts is 24.98 with SD 6.54.

**Hypothesis Three**

There is no significance difference between the mean achievement scores of urban and rural students in Science based on gender.

From Table 3, Z-calculated = 20.14 and with df = 1596 at  $\alpha = 0.05$ , Z-critical = 1.96. Since Z-calculated > Z-critical, the null hypothesis is rejected. This indicates that there is significant difference in the mean achievement scores of male and female Science students in the urban and rural areas. Hence, male students in both urban and rural areas achieved higher in Science than their female counterparts.

**Research Question Four**

What are the mean achievement scores of urban and rural students in Mathematics based on gender?

The data used to answer this research question is presented in Table 4.

**Table 4 Means, Standard Deviations and Z-test of Urban and Rural Mathematics Students' Achievement.**

School Location	Gender	N	Mean	SD	df	Z-cal	Z-crit.	Decision
Urban	Male	558	39.45	8.31	1596	21.08	1.96	Reject H <sub>0</sub>
	Female	401	30.98	7.87				
Rural	Male	377	32.77	7.76				
	Female	267	27.86	6.24				
<b>Total</b>		<b>1600</b>						

Table 4 shows the mean achievement scores of Mathematics students in urban schools 39.45 is higher than that of their rural counterparts 32.77. The mean achievement of students in urban schools is above the average mark of 25, while that of those in the rural schools is below average.

**Hypothesis Four**

There is no significance difference between the mean achievement scores of urban and rural students in Mathematics based on gender.

From Table 3, Z-calculated = 21.08 and with df = 1596 at  $\alpha = 0.05$ , Z-critical = 1.96. Since Z-

calculated  $> Z$ -critical, the null hypothesis is rejected. This indicates that there is significant difference in the mean achievement scores of male and female Mathematics students in the urban and rural areas. Hence, male students in both urban and rural areas achieved higher in Mathematics than their female counterparts.

## DISCUSSION

The findings of this study revealed that male students achieved better than the female students significantly in both Science and Mathematics. This finding is in agreement with the findings of Onuekwusi and Ogomaka (2013), Amoo (2013) and Okereke (2011) who found out in their different researches in Science and Mathematics that male students achieve better than their female counterparts. But in disagreement with findings of Oludipe (2012), Kola and Taiwo (2013) who found out that a significant difference did not exist between the achievement of male and female students' achievement in Science and Mathematics. The male may have achieved better because of the preferential treatment accorded to them by society.

Findings from this study also revealed a significant difference between the achievement of urban and rural students in favour of the urban students in both Science and Mathematics. This is in agreement with the findings of Kapinga (2014), Onuekwusi and Ogomaka (2013), Igoegwu and Okonkwo (2012), Ogunshola and Adewale (2012), Tayyaba (2012), Graham and Lauren (2013) and Alokun (2013) whose separate researches revealed significant difference in Science students' achievement between rural and urban schools in favour of the urban schools. Also Amoo (2013), Ayub, Yunus, Mahmud, Salim and Suleiman (2017) found out that significant differences existed in Mathematics students' achievement between rural and urban schools in favour of the urban schools. Such achievements in favour of urban schools, for instance, might have been borne out of many facilities available which were not available in the rural schools. This negates the findings of (Genshenson & Langbein, 2015) who found that school location has no direct effect on achievement in Science between students in urban and rural locations.

The urban students may have achieved better than the rural students as a result of lack of relevant facilities, students' lack of interest and motivation as most spend school hours on farm work, market errands etc. This implies that, students from rural schools who may have similar learning abilities with the students from urban schools are limited by some factors that stunt their academic achievement.

## CONCLUSION

The findings of this study revealed that male Science and Mathematics students achieved significantly higher than their female counterparts. Also, the findings showed that a significant difference did exist between the achievement of Science and Mathematics students in urban and rural schools in favour of the urban students.

## Recommendations

From the findings of this study, the following recommendations were made;

- School administrators and teachers should pay attention on matters that would help rural students to measure up with their urban counterparts through provision of adequate school facilities.
- Awareness concerning gender equality, gender disparity and stereotype as it relates to the study of Science and Mathematics among students should be created by stakeholders in education to close up the gap between males and females.

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