

EFFECTS OF GENDER AND SCHOOL LOCATION ON MATHEMATICS ACHIEVEMENT OF SENIOR SECONDARY SCHOOL STUDENTS IN KATSINA EDUCATIONAL ZONE, KATSINA STATE, NIGERIA

By

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Abstract

The study investigated the effects of gender and location on mathematics achievement of senior secondary school students in Katsina educational zone, Katsina State, Nigeria. The design adopted for the study was a descriptive research of the survey type. The population of the study consisted of thirteen thousand, seven hundred and sixty-five (13,765) senior secondary two (SS 2) students in the zone. Sample of two hundred (200) students comprising 100 males and 100 females from four co-educational schools were drawn using simple random sampling and purposive sampling respectively. The instrument used for data collection was a 30-item Mathematics Achievement Test (MAT). The instrument was validated by two experts in mathematics education and one in measurement and evaluation. The reliability coefficient obtained was 0.81. Based on the objectives, this study was guided by two (2) research questions which was answered using descriptive statistics of mean and standard deviation. Two (2) null hypotheses stated were tested at 0.05 level of significance using Analysis of Variance (ANOVA). The results obtained from data analysis revealed that there was no significant difference in the mathematics achievement with respect to gender. Findings from the study also showed that students from the urban area achieved significantly better than students from the rural area in mathematics. Based on the findings, it was recommended among others that Government and other Stakeholders in education through relevant agencies should equip rural schools with facilities that are available in urban schools to improve students' mathematics achievement in rural schools and Government should also provide adequate incentives in form of rural teaching allowance that will attract teachers to the rural areas.

Keywords: Education, Mathematics, Gender, School location.

Introduction

It is generally recognized that one of the major if not the most important functions of the school system is to produce the pool of skilled manpower which a nation needs to grow. To this effect countries all over the world depend on their educational systems for the development of their future workforce (Ekeh, 2003). Thus, education is an important instrument through which human resources development is achieved. It is in line with this that Nigeria in its national education policy stated that education is the instrument par excellence for effecting national development (Federal Government of Nigeria (FGN), 2004). According to Adeneye and Oludola (2013), education is the instrument par excellence for effecting social, psychological, economic, political, intellectual and other developmental transformations. Therefore, no nation can afford to neglect education.

Mathematics is the heart of every educational system. In any prevailing and successful nation mathematics knowledge in formal education curricula has been their focus. No nation has developed without mathematics. Okpala, Okoye and Anene (2018) posited that

the role played by mathematics in the day to day activities of man is suggestive of the fact that mathematics is needed by all and this places the subject at a vantage position for all development. In the words of Kolawole, Oladosu and Ajetunmbis (2013), mathematics is an instrument that facilitates the learning of other school subjects and a vital tool for resolving problem situations in all disciplines. The importance attached to mathematics in the school curriculum from primary to secondary levels of education reflects the vital role played by the subject in the society. According to Odili (2006), mathematics competence is essential for the grooming of an informal citizenry and for the continuous production of high skilled personnel required by industries, technology and science. In the light of this, the National Policy on Education (FRN, 2008) recommended mathematics as one of the core subjects in the primary and post primary schools. In order to secure admission for most courses in tertiary institutions, a credit pass in mathematics is a pre-requisite.

In spite of the importance of mathematics to national development, it has been observed that it is one of the subjects in which students perform poorly (Domyil, 2015). In the same vein, Akanmu and Fajemidagba (2013) asserted that despite the huge importance attached to the study of mathematics in Nigeria and the effort of the government in making mathematics a compulsory subject, students' achievement in both external and internal examinations have consistently remained poor. Table 1 shows the achievement of students as given by WAEC chief examiner's report of 2010 – 2016.

Table 1

Students' WASSCE Results of General Mathematics (May/June, 2010 - 2016)

Year	Total No. who sat	No. of Students with Credit & above (A1 – C6)	% of students with Credit & above (A1 – C6)	No. of Students with (D7 – F9)	% of students with (D7 – F9)
2010	1,351,557	453,447	33.55	898,110	66.45
2011	1,540,250	587,630	38.93	952,620	61.07
2012	1,675,224	819,390	49.00	852,834	51.00
2013	1,543,683	555,726	36.00	987,957	64.00
2014	1,692,435	529,732	31.30	1,162,703	68.70
2015	1,539,442	544,638	34.18	1,048,804	65.82
2016	1,544,234	597,310	38.68	946,924	61.32

Source: Test Development Division, West African Examination Council (WAEC) Lagos, Nigeria (2010 – 2016).

Analysis of the achievement of the students in WASSCE Mathematics in the year 2010 – 2016, as shown in Table 1, indicates that all the years' results (seven years) had below 50% of students who had credit pass in the subject. Table 1 result shows the dismal achievement of students in mathematics over seven years' period (2010 - 2016).

According to Musibau and Johnson (2010), mass failure of students in external examinations has been attributed to a number of factors which include teachers' factors (low qualification, lack of experience, poor salaries and allowances, poor supervision), students' factors (poor ability of students, under age, unwillingness to learn, bad peer groups influence). Furthermore, other factors such as attitude of students and teachers, study habit, teaching methods, school environment, government policy, family types, school location, students' gender have been identified in several studies as factors influencing students' academic achievement (Edwards, 2000; Aremu & Soka, 2003; Asikhia, 2010;

Akomolufe&Olorumfemi-Olabisi, 2011; Udousoro, 2011).More so, Kissau (2006) andBosedo (2010) confirmed that gender of the student and location of schoolinfluence students' academic achievement.

Gender is an important variable in the school system. Gender refers to the condition of being male or female. According to Kanno (2008), gender is an analytic concept that describes sociological roles, cultural responsibilities and expectations of men and women in a given society or cultural setting. Ezeh (2013) explained that 'gender describes the personality traits, attitudes, behaviours, values, relative power, influence, roles and expectationthat society ascribes to the two sexes on a differential basis'. Therefore, gender is a psychological term and a cultural construct developed by society to differentiate between the roles, behaviour, mental and emotional attributes of males and females (Eugene &Ezeh, 2016).Hence, Okeke (2008)described the males attributes as bold, aggressive, tactful, economical use of words while the females are fearful,timid, gentle, dull, submissive and talkative. This may be the reason Umoh (2003) asserted that more difficultworks are usually reserved for males while the females are considered feminine in a natural setting. Gender is a major factor that influences career choice and subject interest of students. Thus, inschools, males are more likely to take todifficult subject areas like mathematics while the females take tocareer that will not conflictwith marriage chances, marriage responsibilities and motherhood (Okeke, 2008). Gender roledifferentiations are also encouraged in pictorial illustrations in textbooks which usuallyportray males as doctors, lawyers, engineers, professors while the females are seen as nurses, cooks and mothers.This creates mental picture in the mind of the readers of the role expectation from the society (Umoh, 2003; Babajide, 2010). Furthermore, Ezeudu and Obi(2013) stated that teachers also encourage gender stereotype by giving different treatment to males and femalesin class. Teachers go further to give different career guidance to males and females. In the home,they said responsibilities are assigned differently to males and females; the society frown at seeing a male cooking or afemale climbing a tree. The males are also assigned leadership positions and the females are to assist or to follow. However, it is expected that thelearning experiences offered to students in schools should not discriminate against males and females. Thereis the need to see that both male and female students are given equal access to education especially in mathematics.

The ultimate of all teachers is to provide equal opportunities for every student (male or female) in the classroom (Ofodu& Lawal, 2010). Nevertheless, research evidences and experiences have shown that gender is a significant factor in determining the achievement of students in learning tasks. In consonant to this, Akinyele (2004) opined that gender of a student has great influence on his or her academic achievement in school subjects.

Research findings have been inconclusive as to whether males achieve higher than femalesin mathematics or vice-versa. Many findings favoured males, others favoured females while others showed no difference, indicating some conflicting views on the effect of gender on academic achievement in mathematics. Hasan and Khan (2015) had clearly identified that there was difference between the mean scores in Mathematics of male and female students of IXth grades. The male students had shown significantly higher performance in Mathematics than their female counterpart. Allahnana, Akande, Vintseh, Alaku and Alaku (2018) in their study on Assessment of Gender and Interest in Mathematics Achievementin Keffi Local Government Area of Nasarawa State, Nigeria found that there was a significant difference between mean achievement of male and female students inMathematics and that the male

students excelled in Mathematics more than their female counterparts. Ma'Moon (2005) in his own study found that there was a significant gender difference in mathematics. However, the difference was in favour of the female students as the female students had significantly higher scores than male students for Logical thinking, Mathematical proof, and for total Mathematical thinking and Mathematics achievement. Furthermore, a study conducted by Abiem and Odok (2006), revealed that girls achieved better than boys in number and numeration. However, Okwu and Aligba (2004) carried out a study to assess the effect of gender on mathematics achievement of secondary school students as well as identify the influence of location on mathematics achievement of secondary school students. The findings show that there was no significant difference between the performance of boys and girls in the mathematical test. Spence (2004) found no significant influence of gender on the achievement of college students in mathematics when they were exposed to mathematics courseware in online and traditional learning environment. Also, Nepal (2016) in his study observed that there was no significant difference between every aspect of Mathematical Thinking and Mathematics Achievement between male and female students of grade X.

Location of schools could also be a factor that affects students' achievement in mathematics. Ezeudu (2003) stated that schools location means urban and rural schools. Location is a particular place in relation to other areas (Quirk, 2003). School location according to Ntibi and Edoho (2017) refers to the particular place, in relation to other areas in the physical environment (rural or urban), where the school is sited. They also stated that in Nigeria, rural life is uniform, homogenous and less complex than that of urban centres, with cultural diversity, which often is suspected to affect students' academic achievement. This is because urban centres are better favoured with respect to distribution of social amenities such as pipe borne water, electricity, healthcare facilities while the rural areas are less favoured. This is also true in the distribution of educational facilities and teachers. Akpan (2008) indicated that schools in urban areas have electricity, water supply, more teachers, more learning facilities and infrastructure. Supporting this, Ezike (2001) stated that urban areas are those with high population density, high variety and beauty while rural areas are those with low population, subsistence mode of life, monotonous and burden. Alordiah, Akpadaka and Oviogbodu (2015) opined that students attending rural schools face challenges of higher poverty than those attending urban schools. They further asserted that in Nigeria, the lingua franca is English language, which in most cases is not widely spoken in rural schools. What obtains in most cases is the native language of that setting. This can greatly affect students' performance in mathematics since it is with English language mathematics is taught and assessed in schools. Urban schools have main advantages like availability of resources, library, opportunities, good environment and teachers. However, one of the greatest advantages of rural schools is the tendency for smaller classes, which promise increased student evaluation, and provide greater flexibility in teaching strategy.

These prevailing conditions imply that learning opportunities in Nigerian schools differ from school to school. It would appear therefore that students in Nigerian urban schools have more educational opportunities than their counterparts in rural schools have. While some studies have shown positive effect, others have shown negative effect of school location on the students' achievement in mathematics.

Ahiaba and Igweonwu (2003) investigated the influence of school location on the performance of mathematics and basic science students in rural and urban schools at the SSC examination and found that mathematics and basic science students in urban schools

performed better with superior grades than their rural counterparts while failure rate was higher in the rural schools. Nwogu (2010) found that location was significant in learning aspects of mathematics and basic science that involve angles, with rural students exhibiting more learning difficulties than their urban counterparts do. Alordiah, et al (2015) investigated the influence of gender, school location and socio-economic status on students' academic achievement in mathematics. Findings from their study showed that there was significant difference between the performance of urban students and rural students and that the urban students performed better than the rural students did. Yet Gana (1997) in his study on the effect of using designed visual teaching models on the learning of Mathematics at Junior Secondary level of Niger State, found that there was no significant difference in Mathematics achievement scores of students in urban and rural allocations. Similarly, Ntibi and Edoho (2017) in their own study on influence of school location on students' attitude towards mathematics and basic science found that there is no significant difference in the mean performance scores between urban and rural school students with positive attitude towards mathematics and basic science. However, none of the literatures reviewed showed the superiority of rural students on urban students in mathematics achievement.

Based on previous studies, findings of scholars on the effects of gender and school location on mathematics achievement of students have been contradictory, this calls for continuous verification of the effects of gender and school location on students' academic achievement in mathematics from place to place and from time to time. Hence, there is need to finding out the effects of gender and school location on mathematics achievement of senior secondary school students in Katsina educational zone, Katsina State, Nigeria.

Statement of the Problem

Mathematics is a core subject in the school system. This is in appreciation of its significant role in national development. This implies that mathematics as a subject occupies a significant position in the school curriculum. Yet the performance of students in this all-important subject is very discouraging. Many factors have been suggested to be responsible for the poor achievement of students in the subject. Gender and school location have been identified as some of the factors that can have effect on students' academic achievement in mathematics. Previous studies on the effect of these variables on academic achievement are inconclusive. While some of the findings of the studies discovered that, there is a significant effect of these variables on students' academic achievement. Some studies equally discovered that these variables do not have significant effect on students' academic achievement. Therefore, there is the need to continue to find out the effects of gender and school location on students' academic achievement in mathematics.

Furthermore, literatures reviewed indicated that researches on these variables have not been conducted in Katsina State, specifically in Katsina educational zone. It is on this premise that the study intends to investigate the effects of gender and school location on mathematics achievement of senior secondary school students in Katsina educational zone, Katsina State.

Objectives of the Study

The main objective of the study is to determine the effects of gender and school location on mathematics achievement of senior secondary school students. The specific objectives are to:

1. Examine the effect of gender on mathematics achievement of students.
2. Determine the effect of school location on mathematics achievement of students.

Research Questions

1. What is the difference in the mean mathematics achievement scores of male and female students?
2. What is the difference in the mean mathematics achievement scores of rural and urban students?

Research Hypotheses

1. There is no significant difference in the mathematics achievement of students with respect to gender.
2. There is no significant difference in the mathematics achievement of students with respect to school location.

Methodology

Research Design

The design adopted for this study was a descriptive research of the survey type in which the variables were not manipulated nor controlled. It focused on gender, school location and the mathematics achievement of students. The dependent variable was mathematics achievement of students. The independent variables were gender and school location.

Population and Sample

The target population of this study consisted of thirteen thousand, seven hundred and sixty-five (13,765) senior secondary two (SS 2) students in Katsina educational zone of Katsina state which comprised of eight thousand three hundred and ninety-seven (8,397) males and five thousand three hundred and sixty-eight (5,368) females. To select the sample for this study, a purposive sampling technique was used to select four (4) co-educational senior secondary schools, two from Katsina town representing urban and two outside Katsina town representing rural. A sample of two hundred (200) students comprising 100 males and 100 females (25 males and 25 females from each of the four schools) were drawn using simple random sampling.

Instrumentation

The instrument used for data collection was Mathematics Achievement Test (MAT). It consisted of two (2) sections: A and B. Section A sought the demographic data of the students while section B comprised thirty (30) multiple choice test items with four options A – D. The test items were based on the mathematics curriculum content of SS 1 and SS 2. Students were expected to circle the option bearing the correct answer. The instrument was developed by the researchers and validated by two experts in mathematics education and one in measurement and evaluation. The instrument was pilot tested on a different set of students that did not take part in the study. Test-retest method was used to find the reliability of the instrument. The Pearson Product Moment coefficient was used to test the internal consistency of the test item and the reliability coefficient was found to be 0.81. This result indicated that the instrument was reliable. The researchers administered the instrument to the students personally and it lasted for one and a half hour. The completed test sheets were also collected the same day at the spot. The test was dichotomously scored (i.e. 1 for correct answer and 0 for wrong answer). After marking, the scores collected were statistically analysed to answer the research questions and test the null hypotheses. The research questions were answered

using descriptive statistics of mean and standard deviation while the null hypotheses stated were statistically tested using Analysis of Variance (ANOVA) at 0.05 level of significance.

Results

The results of this study based on the data collected and analysed are presented as follows:

Answering the Research Questions

The result of the data analysis for answering the research questions is presented in Table 1 and Table 2.

Research Question 1: What is the difference in the mean mathematics achievement scores of male and female students?

Table 1

Summary of Mean Achievement and Standard Deviation of Male and Female Students' Score.

Group	N	Mean (\bar{X})	Std. Deviation	Std. Error	Mean Difference
Male	100	7.19	3.28	0.33	0.35
Female	100	7.54	2.68	0.27	
Total	200				

NB: Male = urban & rural males, Female = urban & rural females.

Table 1 reveals that the male students have a mean achievement score of 7.19 while the female students have a mean achievement score of 7.54. Thus, the mean achievement score of the female students is higher than that of the male students. There is a mean difference of 0.35 in favour of the female students. This implies that the female students are a little better in mathematics than their male counterpart in the study area based on the descriptive analysis.

Research Question 2: What is the difference in the mean mathematics achievement scores of rural and urban students?

Table 2

Summary of Mean Achievement and Standard Deviation of Urban and Rural Students' Score

Group	N	Mean (\bar{X})	Std. Deviation	Std. Error	Mean Difference
Urban	100	7.94	3.08	0.31	1.15
Rural	100	6.79	2.80	0.28	
Total	200				

NB: Urban = urban males & females, Rural = rural males & females.

Table 2 shows that the mean achievement score of the urban students is 7.94 while that of the rural students is 6.79. Thus, the mean achievement score of the urban students is more than that of the rural students. There is a mean difference of 1.15 in favour of the urban students. This implies that the urban students are better in mathematics than their rural counterpart in the study area based on the descriptive analysis.

Research Hypothesis 1

Ho₁: There is no significant difference in the mathematics achievement of students with respect to gender.

Table 3

One-way ANOVA Summary Table of Achievement Scores of Students with respect to Gender.

Source	Sum of Squares	df	Mean Square	F _{cal}	F _{tab}	Sig.	Remark

Between Groups	6.125	1	6.125	0.683	3.90	0.410	NS
Within Groups	1776.230	198	8.971				
Total	1782.355	199					

Not Significant at $p > 0.05$ level

Table 3 shows that $F_{cal} = 0.683 < F_{(1,198)} = 3.90$ at 0.05 level of significance. Alternatively, the p-value observed is 0.410 which is greater than the alpha value of 0.05. Hence the null hypothesis is retained, indicating that there is no significant difference in the achievement of male and female students in mathematics. Therefore, the observed difference in the mean achievement score of the male and female students in mathematics in favour of the female students is not statistically significant. In essence, both male and female students performed equally.

Research Hypothesis 2

H_{02} : There is no significant difference in the mathematics achievement of students with respect to school location.

Table 4

One-way ANOVA Summary Table of Achievement Scores of Students with respect to School Location.

Source	Sum of Squares	df	Mean Square	F_{cal}	F_{tab}	Sig.	Remark
Between Groups	66.125	1	66.125	7.629	3.90	0.006*	S
Within Groups	1716.230	198	8.668				
Total	1782.355	199					

*Significant at $p < 0.05$ level

Table 4 reveals that $F_{cal} = 7.629 > F_{(1,198)} = 3.90$ at 0.05 level of significance. Also, the p-value observed is 0.006 which is less than the alpha value of 0.05. Hence, we fail to retain the null hypothesis, indicating that there is a significant difference in the mathematics achievement of the students with respect to gender. Therefore, the observed difference in the mean achievement score of the urban and rural students in favour of the urban students in mathematics is statistically significant, meaning that the urban students performed better than the rural students.

Discussion

Findings from the study revealed that there is no significant difference in the mean achievement scores of male and female students in mathematics. That is, gender does not significantly affect the achievement of students in mathematics. The interaction between male and female students in the co-educational schools used in this study might be the determining factor why there is no significant difference in the mathematics achievement of male and female students. This finding supports the finding of Idris (2015), where he found that there was no significant difference gender wise in students' mathematics performance and that of Nepal (2016). However, this finding contradicted the finding of Hooda and Devi (2017) who found that gender has a significant effect on mathematics achievement among secondary school students and that of Allahnana et al (2018).

Furthermore, findings of the present study also showed that there is a significant difference in the mathematics achievement of the students with respect to school location.

The urban students performed better than the rural students. This may be because the urban students are better staffed and are exposed to better instructional facilities, good study habits, as well as better learning environment than the rural students who are poorly staffed due to teachers declining posting to rural schools. Also, most rural students are not exposed to good instructional facilities, good study habits and lack good environment that could support learning. This finding disagrees with the findings of the study by Gana (1997), and Ntibi and Edoho (2017) who all found that there was no significant difference in Mathematics achievement scores of students in urban and rural locations but is in line with the findings of Ahiaba and Igweonwu (2003), Nwogu (2010) and Alordiah, et al (2015) who their studies showed the superiority of urban students over their rural counterparts in mathematics achievement.

Conclusion

This study showed that there existed no significant difference in the academic achievement of male and female students in mathematics. However, there was a significant difference in the academic achievement of urban and rural students in mathematics in favour of the urban students in Katsina educational zone, Katsina State, Nigeria.

Recommendations

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

1. Government and other Stakeholders in education through the relevant agencies should equip ruralschools with facilities that are available in urban schools to improve students' mathematics achievement in rural schools;
2. Government should provide adequate incentives in form of rural teaching allowance that willattract teachers to the rural areas;
3. Government and other Stakeholders should establish more co-educational schools in order to bring about greater competition between male and female students in mathematics achievement;
4. Equal supervisory activities by ministry official should get to all schools irrespective of location;
5. More researches should be conducted to find out the effects of gender and school location on the mathematics achievement of secondary school students in Nigeria most especially using junior secondary schools and single sex schools.

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