Influence of School Location and Interest in Secondary School Students' Academic Achievement in Mathematics Niger State Nigeria

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Abstract: **This study assessed the influence of school location and interest on secondary school students' academic achievement in mathematics in Niger state, Nigeria. Correlation Survey design was adopted for the study. The target population for this study consisted of 5,368 (2,705 males and 2,663 females) JSS 1 students in the 2012/2013 academic session from 92 public and private Junior Secondary Schools in Zone 'B' of Niger State. The sample of this study consisted of 361 (265 students in urban area and 96 students in rural areas) and multi-stage stratified random sampling technique was employed in the selection. Two instruments were developed for the study which consisted of an Inventory on Students' Interest in Mathematics (ISIM) and a Mathematics Achievement Test (MAT). Descriptive statistics (mean and Standard Deviation), biseria correlation and its associated simple regression of Ordinary Least Squares (OLS) method were used to establish relationship between the variables and to test null hypothesis at the 0.05 level of significance. The instruments were validated and the reliability coefficient was established using the test-retest method. The data obtained were analyzed using mean with the criterion mean set at 2.5. The findings of the study revealed that there is a significant relationship between interestand urban students' achievement in mathematics; and significant relationship between interest and rural students' achievements in Mathematics test. Based on the findings of the study, it was recommended amongst other things that Government should provide incentives that will attract qualified teachers in having interest in teaching in the rural areas and parents in rural areas should help their children to maintain interest in mathematics. This can be done through adopting good strategies.**

Keywords: **Mathematics, Students' Interest, Students' Achievement, School Location**

I. INTRODUCTION

Mathematics is a subject that affects every aspect of human life at different levels. Mathematics is seen by the society as the foundation of all sciences, technology and modern development, and for any nation to survive and develop, that nation has to improve its technology which could be achieved through the effective teaching and learning of Mathematics (Agwagah & Gimba, 2013). Mathematics is seen as science of structure, order and relation that evolves from counting, measuring and describing the shapes of objects. It deals with logical reasoning and quantitative calculations. Mathematics nurtures the power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem-solving ability and even effective communication skills. Alechenu, (2012) described mathematics as the "queen" of the sciences without which it would be difficult for people to study other sciences like physics, chemistry, biology and computer science/Information Technology. Unfortunately, students' achievement in mathematics over the years has not been encouraging at all levels of education in Nigeria (primary, secondary and tertiary) (Alechenu, 2012). Several factors such as attitude of students and teachers, interest of students towards learning any concept in mathematics, study habit, teachers' qualification, teaching methods, school environment, government policy, school location, and family types have been identified in several studies as factors influencing students' academic achievement (Akomolafe & Olorunfemi- Olabisi, 2011).

Location of schools asa factor that affects students' achievement in mathematics can be examined. Ntibi and Edoho (2017) refer to a particular place, in relation to other areas in the physical environment (urban and rural) where the school is sited. In Nigeria, rural life is uniform, homogenous and less complex than that of urban centers with cultural diversity which often are suspected to affect students' academic achievement. The rural areas are less favoured in the distribution of educational facilities and teachers. Akpan in Akissani *et al.,* (2019) opined that schools in urban areas have electricity, water supply, more qualified teachers, more learning facilities and infrastructure. Supporting this Ezike in Akissani *et al.,* (2019) stated that urban areas are those with high population density while rural areas are those with low population, subsistence mode of life, monotonous and many burdens. Alordiah *et al.* (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 in rural areas is the native language of that particular area being used as medium of instruction in schools. This can greatly affect students' performance in mathematics since it is in the English language that mathematics is taught and assessed in schools. Urban schools have advantages such as availability of resources, library facilities, good environment

and qualified teachers. However, one of the greatest advantages of rural schools is the tendency to have smaller classes which promises increased student interaction and evaluation and providesgreater flexibility in teaching strategy.

Statement of the Problem

School location and interest have been identified as some of the factors that influence students' academic achievement in mathematics. Some of the findings of the studies discovered in the past show that there is a significant influence of these variables on students' academic achievement. Previous studies on the effect of these variables on academic achievement are inconclusive. Therefore, there is the need to continue to find out the influence on students with regard to location and interest in academic achievement in mathematics. The poor academic achievement could affect individual students who would be discouraged and subsequently lose interest completely in mathematics which is fundamental to individual existence. It is the belief of most students that mathematics cannot be understood like other subjects unless it is memorized. The interest in raising the level of achievement in Mathematics has been a major concern to researchers in recent times, and this study investigates the interaction/relationships between students' interest towards learning and mathematics achievement vis-à-vis school location (urban and rural) in geopolitical zone 'B' of Niger state, Nigeria.

Purpose of the Study

The purpose of the study is to assess the influence of school location and interest in secondary school students' academic achievement in mathematics in geopolitical zone 'B' of Niger State, Nigeria. Specifically, the objectives of the study are:

1. To estimate the relationship between urban school students' interest and achievement in Mathematics
2. To estimate the relationship between rural school students' interest and achievement in Mathematics

Research Questions

The following research questions were raised to guide the study:

1. What is the relationship between urban school students' interest and achievement in mathematics?
2. What is the relationship between rural school students' interest and achievement in mathematics?

Null Research Hypothesis

The following hypotheses will be tested at the 0.05 level of significance:

HO_1: There is no significant relationship between urban school students' interests and achievement in Mathematics test.

HO_2: There is no significant relationship between rural school students' interests and achievement in Mathematics test.

II. RESEARCH METHODOLOGY

Research Design

The study adopted correlation survey design. Emaikwu (2012) viewed correlation survey as the type of study that seeks to establish relationship between two or more variables. This design is considered suitable because the study is concerned with conditions or relationships that exist among interest and achievement. The study was on the relationship between the dependent variable (students' achievement in Mathematics test) and the independent variables (students' interest)

Population

The target population for this study consisted of 5,368 (2,705 males and 2,663 females) JSS 1 students in 2012/2013 academic session from 92 public and private Junior Secondary Schools in Zone 'B' of Niger State. The population was made up of 2,705 male students and 2,663 female students from public and private schools in urban and rural areas of the zone. The common characteristic of the population was that they were all JSS 1 students that offered Mathematics as a compulsory subject.

Sample and Sampling Technique

The sample of this study consisted of 361 **(**265 students in urban area and 96 students in rural area**)**students in the2012/2013 academic session from 12 Junior Secondary Schools in geo-political zone 'B' of Niger State. The multi-stage stratified random sampling technique was employed to select the 12 schools for the study from 92 Junior Secondary Schools in Zone 'B' of Niger State. At the first stage, geo-political zone 'B' was randomly selected for the study from the three geo-political zones of Niger State. At the second stage, the 92 Junior Secondary schools in zone 'B' was stratified along school location (urban and rural) and 3 Junior Secondary Schools from each stratum was randomly selected for the study making a total of 12 Junior Secondary Schools. At the third stage, 361 students were randomly selected from the 12 Junior Secondary Schools; students were stratified before simple random sampling was employed.

The lucky dip method of random sampling was used in all the stages of sampling. Serial numbers of the elements in the sampling frame was recorded on pieces of papers folded and mixed thoroughly before respondents were asked to pick once without replacement. This technique gives the respondents equal opportunity of being selected thereby, reducing the biased effect that may interfere with the validity and reliability of the study. (See Table 1 for details of the sample) size.

Table 1: Sample Distribution of the Study by School Type School Location and Gender

S/N	Name of School	School Type	School Location	Number of Students		Total
				Male	Female	
1	JSS Diko	Public	Urban	20	20	40

2	JSS Kwasau	Public	Urban	35	38	73
3	JSS Madalla	Public	Urban	22	20	42
4	JSS Mutumdaya	Public	Rural	10	10	20
5	JSS Gwam	Public	Rural	12	10	22
6	JSS Maikujeri	Public	Rural	11	11	22
7	JSS Hudal Islam College	Private	Urban	15	15	30
8	Niger Baptist High School	Private	Urban	8	7	15
9	Mawo Comprehensive School	Private	Urban	20	20	40
10	Our Lady School Suleja	Private	Urban	13	12	25
11	Bapist School Paiko	Private	Rural	10	11	21
12	Christ the King Junior Seminary Gwada Village	Private	Rural	6	5	11
Total				182	179	361

Instrumentation

The researcher personally developed two instruments for the study which consisted of an Inventory on Students' Interest in Mathematics (ISIM) and a Mathematics Achievement Test (MAT). ISIM contains 20 items that reveals students' interest in Mathematics based on Likert type scale of Strongly Agree (4-points), Agree (3-points), Disagree (2-points) and Strongly Disagree (1-point). This instrument was structured in such a way that every item elicited some level interest which was scored and summed up. The marks of every item gave a total for every student. The lowest mark for each and every item of the ISIM was 1 mark and for 20 items the minimum score for the lowest level of interest was 20 marks. Therefore, the highest and lowest scores of the inventory were 80 and 20 respectively. The criteria set for the interest inventory was that any student that scored within the range of 20 – 30 (low interest), 31 – 65 (moderate interest) and 66 – 80 (high interest). Mathematics Achievement Test (MAT) was made up of 20 multiple-choice items with four options A, B, C and D. Each item had one correct option (the key) and three distracters. Every item attracted one mark making the highest scorer who got all the items correct to have 20 marks and lowest scorer 0. The scores harvested from the MAT were converted to percentages using these criteria: Excellent (70-100), Very Good (60-69), Good (50-59), Pass (40-49) and Fail (0-39). Each instrument had section 'A' consisting of essential bio-data that would serve as secondary independent variables, while the MAT and ISIM constituted Section B.

Validation of the Instruments

Content validity was ensured for Mathematics Achievement Test (MAT) by developing a test blueprint or table of specification based on the Benjamin Bloom's taxonomy of educational objectives in the cognitive domains (as cited in Anikweze, 2011) constituting of: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation as presented in Table 2.

Table 2: Table of specifications for 20 items Mathematics Achievement test for JS 1 students

S/N	Content Area	Time	Know 10%	Comp 40%	App Anal. 45% 5%	Syn.	Eva.	Total Items	%
1	Simple equation	2 hours	1	1	2 –	_	_	4	20%
2	Plane shape	2 hours	1	1	2	_	_	4	20%
3	Fraction	2 hours	_	2	2 –	_	_	4	20%
4	Algebraic simplification	2 hours	_	1	2 1	_	_	4	20%
5	Statistics	2 hours	_	3	1 –	_	_	4	20%
Total Items		10 hours	2	8	9 1	_	_	20	100%

The content validity was established for MAT instrument by using the table of specifications (Table 2) in order to have adequate representative samples from all aforementioned five topics. Also, face validity was established for the 20-item MAT instrument by subjecting it to the two experts' judgment using validation form of 20 items which gave logical consensus of 0.72 indexes. The two experts were from the Department of Mathematics and Statistics, Federal University of Technology, Minna, Niger State, and the Department of Educational Foundations, Nasarawa State University, Keffi. They validated the instruments by checking for appropriateness and relevanceof the items, adequacy and agreement with the blueprint,andclarity of expression and size of print.

For the of 20 items Inventory on Students' Interest in Mathematics (ISIM), the same processwasapplied for MAT to get face validity as earlier explained. It was adopted to get logical consensus index of 0.76.

Reliability of the Instruments

Inventory on Students' Interest in Mathematics (ISIM) and a Mathematics Achievement Test (MAT) werepilot-tested on a small portion of the population who were not part of the sampled respondents. The instruments were pilot-tested on 20 students. The harvested scoreswere used to determine the reliability of the instruments. Cronbach Coefficient Alpha method of estimating reliability was employed to compute coefficients of internal consistency. This was considered suitable because Cronbach Coefficient Alpha isa more general method of estimating internal consistency for instruments with

scales that provide responses on a continuum of 'Strongly Agree, Agree, Strongly Disagree and Disagree' (Emaikwu, 2011). The reliability coefficients indices were 0.82 and 0.79 for ISIM and MAT respectively. Item difficulty index of 0.50 (average for all items) for MAT was obtained. Finally, item discriminating power for MAT was computed to be 0.40 (average for all items).

Administration

With the developed and validated 20-item test, 20 items of interest inventory and answer sheetswere administered to the students with the assistance of their teachers in the form of Continuous Assessment (C.A.) test. The researcher supervised the work of the teachers and students. The researcher also made sure that the questions were given to the teachers at the exact time for the test so as to increase the accuracy of the results.

The ISIM was administered first to students after proper guidance on bio-data and students were left alone to choose the optionsthat best suited their level of interest out of Strongly Agree, Agree, Disagree and Strongly Disagree in the inventory by ticking. After 30 minutes the students indicated that they had finished and they were asked to pass the instruments forward from back for collection immediately. The MATwas administered after ISIM, and 10 minutes was given to fill out the bio-data before attemptingthe 20 item questions within the1 hour allocated time.

The students were left alone to choose from the available 4 options which consisted of3 distracters and 1 key (answer) labeled A, B, C and D by shading onthe answer sheet attached to the instrument. The students were finally asked to pass them forward for collection.

Twenty minutes was allotted for the test takers to go over their work to make all necessary corrections.

Procedure of Data Analysis

Biserial correlation was used for relating private and public students' interests with their mathematics achievement under research questions.

The regression equation of Ordinary Least Squares (OLS) method, Biserial Correlation, t-Test statistics and Analysis of Variance (ANOVA) were used for establishing existence and strength of relationships among private and public students' interest and their achievements in mathematics, and tested at 0.05 level of significance.

III. RESULTS AND DISCUSSION

Research Question One:

What is the relationship between urban students' interest and achievement in Mathematics?

Table 3: Biserial Correlation Coefficient for the Relationship between Urban School Students' Interest and Achievement in Mathematics

Variable	n	r_b	R^2
Urban Students' Interest in Mathematics Achievement in Mathematics	265	0.69	0.48

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Table 3 shows the Biserial Correlation Coefficient for the relationship between urban school students' interests and achievement in Mathematics. Correlation coefficient of 0.69 was obtained for interest and urban school students' achievement in Mathematics test, signifying a positive relationship between urban school students' interest and their achievement in Mathematics test. The coefficient of determination of 0.48 indicated that 48% of variation in urban school students' scores in Mathematics is explained by their interest in Mathematics.

Table 4: Biserial Correlation Coefficient for the Relationship between Rural School Students' Interest and Achievement in Mathematics

Variable	n	r_b	R^2
Rural Students' Interest in Mathematics Achievement in Mathematics	96	0.71	0.50

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Table 4 shows the Biserial Correlation Coefficient for the relationship between rural school students' interests and achievement in Mathematics. Correlation coefficient of 0.71 was obtained for interest and rural school students' achievement in Mathematics test, signifying a positive relationship between rural school students' interest and their achievement in Mathematics test. The coefficient of determination of 0.50 indicated that 50% of variation in rural students' scores in Mathematics is explained by their interest in mathematics.

Testing of Null Hypothesis

HO_1: There is no significant relationship between urban students' interest and achievement in mathematics.

Table 5: Regression Equation, Biserial Correlation Coefficient and t-test of Significance for Urban Students' Interest Scores and their Achievement in Mathematics

Table 5a: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.694[a]	0.482	0.416	0.19850
a. Predictors: (Constant), urban interest				

Table 5b: ANOVA Table

ANOVA[b]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	330.674	1	330.674	893.062	0.000[a]
	Residual	132.927	264	0.370		
	Total	463.601	265			
a. Predictors: (Constant), Urban sch. interest						
b. Dependent Variable: achievement						

Table 5c: Table of coefficients for variables

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.88	0.056		1.910	0.301
	Urban interest	0.501	0.045	0.845	29.884	0.000

a. Dependent Variable: achievement

The regression equation is as follows:

$M_u = 6.88 + 0.501 (I_u)$

Where: M_u = Mathematics Achievement, I_u= Rural School Students' Interest Scores

Table 5 showed the regression equation, correlation and t-test results for urban students' interests and achievement in Mathematics test. The structured straight line regression equations relating urban students' interests and achievement in Mathematics test is $M_u = 6.88 + 0.501 (I_u)$ (Table 5c). It shows that the estimate of the slope of M_u is positive, which implies a direct relationship between the dependent variable (M_u) and independent variable (I_u). The regression result also indicated that for a unit increase in urban students' interest in Mathematics, their achievement in Mathematics will increase by about 0.50.

Correlation coefficient of 0.694 (Table 5a) was obtained for urban students' interests and achievement in Mathematics test, signifying a positive relationship between urban students' interest and their achievement in Mathematics test. The coefficient of determination of 0.482 indicated that 48% of variation in urban students' achievement in Mathematics is explained by their interest in the subject. Furthermore, at 0.05 level of significance and degree of freedom of 264, the t-test value of 1.910 (Table 5c) which is greater than the critical value of 1.645 was obtained. Therefore, since the calculated value of t-test is greater than the critical value, the null hypothesis of no significance is rejected. Hence, there is a significant relationship between urban school students' interests and their achievement in Mathematics test.

HO_2: There is no significant relationship between rural students' interest and achievement in mathematics.

Table 6: Regression Equation, Biserial Correlation Coefficient and t-test of Significance for Rural Students' Interest Achievement and their Achievement in Mathematics

Table 6a: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.710[a]	0.504	0.502	0.19850

a. Predictors: (Constant), rural interest

Table 6b: ANOVA Table

ANOVA[b]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	330.674	1	330.674	893.062	0.000[a]
	Residual	132.927	94	0.370		
	Total	463.601	95			
a. Predictors: (Constant), rural interest						
Dependent Variable: achievement						

Table 6c: Table of coefficients for variables

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.39	0.076		1.812	0.301
	rural interest	0.491	0.045	0.845	29.884	0.000

a. Dependent Variable: achievement

The regression equation is as follows:

$M_r = 6.39 + 0.491 (I_r)$

Where: M_r = Rural School Students' Achievement in Mathematics, I_r = Rural School Students' Interest Scores

Table 6 shows the regression equation, correlation and t-test results for rural students' interests and achievement in Mathematics test. The structured straight line regression equation relating rural students' interests and achievement in Mathematics test is $M_r = 6.39 + 0.49 (I_r)$ (Table 6c). It reveals that the estimate of the slope of M_r is positive, which implies a direct relationship between the dependent variable (M_r) and independent variable (I_r). The regression result also indicated that for a unit increase in rural students' interest in Mathematics, their achievement in Mathematics will increase by approximately 0.49 (Table 6c).

Correlation coefficient of 0.71 (Table 6a) was obtained for rural students' interests and achievement in Mathematics test, indicating a positive relationship between rural school students' interest and their achievement in Mathematics test. The coefficient of determination of 0.504 (Table 6a) indicated that about 50% of variation in rural school students' achievement in Mathematics is explained by their interest in the subject. Furthermore, at 0.05 level of significance and degree of freedom of 95, the t-test value of 1.812 (Table 6c) which is greater than the critical value of 1.645 was obtained. Therefore, since the calculated value of t-test is greater than the critical value, the null hypothesis is rejected, hence there is a significant relationship between rural school students' interests and achievement in Mathematics test.

IV. SUMMARY OF FINDINGS

The major findings obtained in this study are summarized as follows:

The regression result indicated that for a unit increase in urban students' interest in Mathematics, their achievement in Mathematics increased by 0.50, while for a unit increase in rural students' interest in Mathematics, their achievement in Mathematics increased by 0.49. There is a significant relationship between interests and urban students' achievement in mathematics; and significant relationship between interests and rural students' achievements in Mathematics test.

V. DISCUSSION OF RESULTS

The regression analysis indicated that for a unit increase in urban school students' interest in Mathematics, their achievement in the subject will increase by 0.50, while for a unit increase in rural students' interest in Mathematics, their achievement will increase by 0.49. The results also revealed that students in urban schools are likely to excel in Mathematics more than students in rural schools even at the same level of interest in the subject, even though the students in rural schools seems to have more interest in Mathematics than students in urban schools on the basis of theb iserial correlation results. The result is in line with the findings of the study carried out by Okereke and Onwukwe (2011), Agbaje and Awodun (2014), Musa *etal*. (2016) and Nnenna and Adukwu (2018) who reported that the performance of urban students is quite higher than that of the students in the rural areas. This is contrary tothose of Okorie and Ezeh (2016) who observed that the rural students achieved higher and better results than their urban counterparts. In the researcher's view, the urban students may have performed better than the rural students as a result of teachers not willing to go to rural schools to teach. Also, students in the rural areas spend so much time on the farm work at the expense of the time they should spend on their study. In addition, the urban schools are constantly supervised by ministry officials as against the rural schools. This implies that students from rural schools who may have the same ability as students from urban schools are limited by some factors that prevent them from being their best in their academic studies.

VI. CONCLUSIONS

The results of this study reveal that interest generally influences the students' achievements in Mathematics. There is a significant relationship between interests and students' achievement in Mathematics test by school location. The results also demonstrate that there may be other factors (e.g. environment, quality of teaching, attitude and availability of teaching aids) that contribute to student's achievement in Mathematics.

VII. RECOMMENDATIONS

Based on the findings of this study, the following is recommended:

Government should provide incentives that will attract qualified teachers to have interest in teaching in the rural areas.

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