A Comparative Study Impact of Gender and Attitude Differences to Students' Achievement in Mathematics in Taraba State Senior Secondary Schools, Nigeria

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Abstract
This study examined the impact of gender and attitude on student's achievement in Mathematics in Senior Secondary Schools in Jalingo, Taraba State, in North Eastern Nigeria. A random sampling technique was used to select 240 Senior Secondary Schools (final year) students (SS3), for the study. The composition of the sample is made up of 160male students and 800 female students. Data was obtained by the use of instruments which included Student's Mathematics Achievement Test (SMAT), Students' Attitude to Mathematics Questionnaire (SAMQ). It was found that attitude of students towards mathematics, in the studied Schools, has a significant influence on their achievement in mathematics. The gender difference in mathematics achievement was in favour of the boys but was not statistically significant. Boys had more positive attitude than girls and this impacted on boys having relatively better achievement in mathematics than girls. It is recommended that teachers and other stakeholders in the education industry should organize periodic seminars and workshops for students, parents, teachers and Schools administrators designed to promote positive attitudes towards mathematics. Guidance machinery in the Schools should be energized to encourage more female participation in effective mathematics learning.

Key Words: Achievement, Attitude, Education, Gender Learning, Teaching,

1. Introduction

A major problem facing Nigerian secondary education is the poor performance of students in core subjects, especially mathematics and English Language. Without a credit in mathematics the student cannot pursue most science and technology courses at institutions of higher level in Nigeria As it is, Nigeria's quest for technological advancement and economic emancipation is being undermined by the continued poor mathematics achievement of secondary Schools students in external examinations.

It is common knowledge that the economies of the industrialized nations are driven by science and technology. Hence, Nigeria's vision to be among the top 20 world largest economies by the year 2020 (Vision 2020) justifies the emphasis she places on "science, technical and vocational education" (FRN, 2004, p23). As a result students in Nigeria are being encouraged to take up science-related subjects, and one subject that cuts across all the sciences is mathematics.

The issue of poor academic performance of students in Nigeria and northern Nigeria in particular has been much of concern to all and sundry. The problem is so much in the north-east geopolitical zone of Nigeria and this has led to the widely acclaimed fallen standard of education in this region of the country. The enormity and critical nature of educational challenges in this region of the country is evident in the increasing poor performance of students in national examinations such as NECO and WAEC. For example, candidates who obtained credit passes in five subjects and above including English language and Mathematics each year within the last decade have not exceeded 20 percent. The may June WASSCE results in for three years for instance for the 6 states in the north east zone of Nigeria is presented in Table 1:

Table 1

Students' Pass Rate in May/ June WAEC Examination according to States in the North-east Geo-political Zone of Nigeria

State	Year 2011	Year 2012	Year 2013
Adamawa	12.3%	16.8%	14.3%
Bauchi	15.5%	13.2%	15.3%
Borno	11.6%	15.1%	12.4%
Gombe	16.6%	11.8%	10.6%
Taraba	15.4%	18.3%	16.4%
Yobe	10.3%.	9.7%.	9.4%.

Source: WAEC, 2013

Details of the May/June 2014 West African Senior School Certificate Examination have emerged with states in the South-Eastern part of the country leading in the performance chart of candidates who obtained credits in at least five subjects, including English Language and Mathematics (Edigwe, 2014). Conversely, 13 of the 19 states from the North occupy the rear

positions, with only 743 of the 15, 310 candidates from Yobe State obtaining the same result in the examination (Edigwe, 2014). It is worrisome to note that eight out of the 36 states in Nigeria recorded a score less than 10%. These states include Adamawa, Jigawa, Sokoto, Zamfara and Kebbi. Others are Gombe, Bauchi and Yobe. While Adamawa State recorded 8.75% for those who made five credits and above including Maths and English, Jigawa, Sokoto, Zamfara and Kebbi recorded 7.47%, 7.12%, 6.65% and 6.30% respectively. Gombe State recorded 5.68%, Bauchi 5.28% and Yobe, 4.85% (Edigwe, 2014).

The public unhappiness becomes more prominent following the annual releases of the West African Senior School Certificate Examination (WASSCE) results. Students' outcome seems not to match government and parental investment. All stakeholders are concerned about why the system is turning out graduates with poor results. To them, it is questionable whether or not principals and teachers in the public secondary schools are carrying out their role performance effectively. The National Policy on Education (FRN, 2008) states that no education system can rise above the quality of teachers in the system. This probably suggests why Ogunsaju (2004) maintains that the academic standards in all Nigerian educational institutions have fallen considerably below societal expectations. No wonder Bello (2011) corroborated this view that the decline in the quality of education cannot be ignored by anyone who is aware of the significant role of education as an instrument of societal transformation and development.

Today, mathematical methods are applied in most areas of human endeavour and as such mathematics learning plays a fundamental role in economic development of a country. In her match towards scientific and technological advancement, Nigeria needs good performance in mathematics for students at all levels of schooling. Ale and Lawal (2010) stated that the line of demarcation between the developed and the underdeveloped nations is based on their level of mathematical attainment and ingenuity. The poor achievement in mathematics in Nigerian secondary Schools is assuming alarming proportions to the extent that the Nigerian education ministry is worried about the "poor performance always recorded in Mathematics in NECO and SSCE every year" (Edukugho, 2010).

Many factors have been identified by researchers as the causes of the low mathematics achievement among secondary Schools students. Adegboye (2003) believed the main factor that is responsible for poor performance in mathematics is the fear of mathematics, Wikipedia Free Encyclopedia, (2014) stated that students often develop mathematical anxiety in schools, often as a result of learning from teachers who are themselves anxious about their mathematical abilities in certain areas. Attwood, (2014) attributed poor performance in mathematics to parental attitude, interrupted teaching, poor teaching and dyscalculia, STAN, (2002) as cited by Ojimba, (2012) was of the view that prominent causes of poor performance in mathematics are: acute shortage of qualified professional mathematics teachers, exhibition of poor knowledge of mathematics content by many mathematics teachers, overcrowded mathematics classrooms,

students negative attitude toward mathematics, and inadequate facilities and mathematics laboratories. Cassy (2004) found significant differences between the patterns of attitudes towards mathematics expressed by boys and girls in which boys rated their attitudes more positively than the way girls did.

Factors relating to attitude and gender differences in mathematics achievement are among those widely examined in the study of the causes of poor performance in mathematics among students. As Kitetu (2004: 7) puts it,"The imbalance in boys' and girls' participation in schooling was linked to the age-long belief in male superiority and female subordination".A study conducted by Abdullahi (2013) on students' mathematics academic achievement in Ebira secondary Schools showed that subjects' personal factors predicted objective measure of their academic achievement in mathematics. According to the result obtained from this study, students' low or high performance is due to their personality factors, the more the students improved on their self-concepts, determinations, and high interest, the better their performance in mathematics. According to Effandi and Normah (2009), a student needs to think and make decisions using appropriate strategies to solve mathematical problems. They add that students' success in achieving their goals encourage them to develop positive attitudes towards mathematics and other problem solving activities. Positive attitudes are assumed to have significant relationship with students' achievement.

Studies on the impact of gender on mathematics achievement have yet to produce conclusive results. 'Trends in International Mathematics and Science Study' (TIMSS-2003) found no significant difference in the performance of boys and girls in mathematics .However they observed differences between boys and girls in terms of their attitude to the subject and ambition for higher education. Some research findings suggest that certain behavioural traits associated with age and maturity affect mathematics achievement of girls. According to Bevan (2005), the findings from the review of existing research included evidence that girls outperform boys in mathematics up to the beginning of A-level, but that the differences are small, and are not consistent across all components of the subject; attitudes to mathematics vary according to gender; there are significant differences in the expectations of boys and girls regarding their own performance in mathematics; boys and girls differ in their typical learning styles; and that ability grouping impacts differently on boys and girls. Frempong and Ayia (2006) observed that female students are less successful in learning mathematics, due to their low interest and confidence in learning mathematics and their low academic expectation. According to them, girls initially have more positive attitudes towards mathematics than boys do, but as they continue in Schools, girls' attitudes become more negative. This is supported byKaino (2003:4) that boys felt "more comfortable in mathematics classes" while girls were more worried.Kaino (2003:3) found no significant differences in interest for mathematics between girls and boys.

The current situation in Nigeria is that the performance in mathematics at secondary Schools level has been generally poor, but on the average girls tend to perform worse than boys. This raises a serious concern since if the trend is unchecked it will undermine gender equity in Nigerian education system. Thus there is a need for all hands to be on deck to ensure that mathematics achievement improves together with maintaining gender equity at all levels of Nigerian educational system.

The aim of the study is to investigate the influence of students' attitude and gender differences on mathematics achievement in senior secondary schools Jalingo, in North Eastern Nigeria. The findings of the study will provide relevant inputs for improving the poor performances of students in mathematics in a Nigerian Secondary schools.

2. Purpose of the Study

The specific objectives of the study are to:

i. examine the impact of students' attitude towards mathematics on students' achievement in mathematics at Senior Secondary Schools Jalingo, Taraba State, Nigeria.

ii. investigate the relationship between gender differences and students achievement in mathematics at senior secondary schools in Jalingo, Taraba State, Nigeria.

3. Research Hypotheses

To achieve the objectives of the study, the following research hypotheses are formulated as well as tested against observed data at 0.05 level of significance:

Ho 1: There is no significant difference between mathematics achievement of students with positive attitude towards mathematics and mathematics achievement of students with negative attitude towards mathematics in senior secondary schools Jalingo.

Ho 2: There is no significant difference between the mathematics achievements of male students and mathematics achievement of female students in senior secondary schools Jalingo.

4. Methodology

The research design is a descriptive research design focusing on the impact of the independent variables -attitude and gender differences on the dependent variable- students' achievement in mathematics. The population of the study consists of all senior secondary schools students of Jalingo Local Government area of Taraba State, Nigeria. The estimated population of senior secondary school students in Jalingo Local Government Area is 63, 083 (Taraba State Education Service Board TSESB, 2014). The sample consists of two Hundred and Forty (240) students of Senior Secondary Schools in Jalingo made up of One Hundred and Sixty (160) male Senior Secondary Three (SS3) students and Eighty (80) female SS3 students.

The following validated research Instruments were used to collect data for the study:

(i) Student's Academic Ability Test (SMAT).

(ii) Students' Attitude to Mathematics Questionnaire (SAMQ)

The instruments were subjected to face validation by two secondary school teachers who have bachelor's degree in Mathematics Education with a minimum of five years teaching experience. They checked for content coverage and ascertained whether the questions reflected the objectives of the mathematics syllabus for SS3. The teachers agreed that the coverage and questions were in agreement with the objectives of the syllabus. Also, the items in the developed attitude questionnaire was studied carefully and subjected to critical appraisal of three experts; two in the field of Mathematics, Technology and Science Education and one from Educational Measurement and Evaluation from the Taraba State University. The experts were also requested to check for appropriateness of the items for SS3 students, construction and structure of the questions, good reflection of the contents and objectives of the curriculum and clarity of the questions and options. The experts particularly expressed satisfaction with the test items especially with respect to the structure of the questions and comprehensive coverage of the items. The questions also matched the objectives and the items in the curriculum accurately.

A test-retest reliability proof was used to establish the reliability of the SMAT. The SMAT was administered on 40 respondents including subjects drawn from the population but not the direct respondents within the research sample. The split half method was used to estimate the reliability of the SMAT while the reliability of the questionnaire was tested using Cronbach's alpha coefficient method. The reliability (r) alpha (α) value all lay between 0.7 and 0.86 which are considered acceptable. To ensure that the test and questionnaire measure what they intend to measure experts in the field of psychometrics and mathematics education were consulted. The experts established that the instruments were in line with the aim of the research and were valid for the desired outcome. The instruments were administered to the sampled students individually by the researchers. Descriptive statistics including tables, mean and standard deviation were used in the analysis. Chi-square analysis was employed to test research hypotheses in line with the aims and objectives of the study.

5. Results and Discussions

Table 1 is a summary of students' mathematics achievement based on their attitude, while table 2 is a X^2 analysis table for the test of hypothesis one (using the data on table 1).

Table 1: A summary of students' mathematics achievement based on their attitude

Attitude toward mathematics	Mathematics Achievement		
	No of students who scored at least 40%	No of students who scored below 40%	Total
Positive attitude	197	43	197
Negative Attitude	40	177	40
Indifference	3	20	3
Total	240	240	240

Table 2: X^2 analysis table for test of hypothesis one

Observed frequency (FO)	Expected frequency(*fe*)	*fo-fe*	*(fo-fe)*^{2}	*(fo-fe)*^{2}*/fe*
154	11.50	9.50	90.25	7.85
46	11.50	-9.50	90.25	7.85
102	11.00	-10.00	100.00	9.09
100	11.00	10.00	100.00	9.09
35	7.50	0.50	0.25	0.03
45	7.50	-0.50	0.25	0.03
	Calculated X^2	33.94		
	Tabulated X^2	5.991		
	$\alpha = 0.05$			

For the test of hypothesis on a Chi-square (X^2) analysis was used at confidence interval, $\alpha = 0.05$. Since calculated value is greater than the tabulated value, the null hypothesis is rejected. Hence we conclude that there is a significant difference between mathematics achievement of students with positive attitude towards mathematics and mathematics achievement of students with negative attitude towards mathematics in Nigerian Secondary Schools.

Table 3 is a Summary of students' mathematics achievement based on gender difference, while table 4 is a X^2analysis table for test of hypothesis two (using the data on table 3)

Table 3: Summary of students' mathematics achievement based on gender difference

Gender Difference	Mathematics Achievement		
	No of students who scored at least 40%	No of students who scored below 40%	Total
Male	102	58	160
Female	54	26	80
Total	156	84	024

Table 4: X^2 analysis table for test of hypothesis two

Observed frequency (FO)	Expected frequency(FE)	FO-FE	(FO-FE)^2	(FO-FE)^2/FE
51	14.50	2.50	6.25	0.43
27	15.50	-2.50	6.25	0.40

51	14.50	-2.50	6.25	0.43
26	15.50	2.50	6.25	0.40
	Calculated X^2	1.67		
	Tabulated X^2	3.841		
	$\alpha = 0.05$			

Hypothesis Two was tested using Chi-square (X^2) analysis at confidence interval, $\alpha = 0.05$. Since calculated value is less than the tabulated value, the null hypothesis is accepted .Hence we conclude that there is no significant difference between the mathematics achievements of male students and mathematics achievement of female students in Nigerian Secondary Schools.
The result of the respondents' Attitude to Mathematics Questionnaire (SAMQ) Scores indicated that male students had an average of 3.2 indicating slightly above neutral attitude towards mathematics while girls with an average score of 2.9 exhibited on the average a negative attitude towards mathematics. This suggests that the relative higher performance of boys than girls in mathematics is most likely due to their having a more positive attitude towards mathematics than their girl counterparts. In Nigeria, it has been argued that nurture entrenches male dominance over the female gender (Bassey, Joshua &Asim, 2007).

Maliki et al (2009) found that boys performed more than girls in junior secondary Schools examination in Bayelsa state of Southern Nigeria. Atovigba et al (2012) found that the male students performed consistently better than their female counter parts in Nigeria.

6. Conclusion and Recommendations

Findings from this study suggest that students with positive attitude towards mathematics perform better than those with negative attitude on the subject. The difference in mathematics achievement of boys and girls at Senior Secondary Schools in Jalingo metropolis, even though was in favour of the boys was not statistically significant. This suggests that gender difference does not have a major influence on student's achievement in mathematics. Attitude seems to matters most, and in this study male students exhibited more positive attitude towards mathematics than female students. Most students of both genders who had positive attitude towards mathematics performed better on the subject.
The following are the recommendations:

1. Students at Senior Secondary Schools in Jalingo metropolis, Taraba state, in particular, and all the secondary Schools in Nigeria in general, should be motivated to understand that mathematics could be studied and passed just like other subjects, and to appreciate that the subject is an essential tool, a prerequisite for further education and in many vocations.

2. Teachers and other stakeholders in Nigeria's education industry should organize periodic seminars and workshops for students, parents, teachers and Schools administrators designed to promote positive attitudes towards mathematics.
3. The teachers should endeavor to make mathematics teaching interesting, taking into consideration individual differences in ability, background and attitudes.
4. Guidance machinery in the Schools should be energized to encourage more women participation in effective mathematics learning. Stereotyping of mathematics as "male subject" should be discouraged.

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