

The influences of gender and attitude differences to students' achievement in mathematics in Nigerian secondary schools: a case study of Comprehensive Secondary School Amurie-Omanze in South Eastern Nigeria

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Abstract

This study examined the influences of gender and attitude on student's achievement in Mathematics at Comprehensive Secondary School Amurie-Omanze, Imo State, in South Eastern Nigeria. A random sampling technique was used to select 60 Senior Secondary School (final year) students (SS3), for the study. The composition of the sample is made up of 30 male students and 30 female students. Data was obtained by the use of instruments which included Student's Academic Ability Test (SAAT), Students' Attitude to Mathematics Questionnaire (SATMQ) and structured interview. It was found that attitude of students towards mathematics, in the studied school, 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 school administrators designed to promote positive attitudes towards mathematics. Guidance machinery in the school should be energized to encourage more female participation in effective mathematics learning.

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

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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 school 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.

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 march towards scientific and technological advancement, Nigeria needs good performance in mathematics for students at all levels of schooling. However the poor performance of students in mathematics at the end of secondary education over the past decade (Umoinyang, 1999) is a big challenge to policy makers and stakeholders in Nigerian educational system. 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 school students. These include shortage of qualified staff (Ale, 1989), poor facilities, lack of equipment and instructional materials (Odogwu, 1994), crowded classrooms (Alele-Williams, 1988), poor attitude of students towards mathematics (Aiken 1976); poor reading habit, mathematics anxiety, culture/beliefs, gender difference among others.

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. According to Ma and Kishor (1997) the variable ‘attitude’ is one of the most potent factors that relates to achievement. Borasi (1990) adds that the conceptions, attitudes, and expectations of students regarding mathematics and mathematics teaching have been considered to be very significant factor underlying their school experience and achievement. Patton et al. (1997) propose that learning to solve problems is a primary objective in learning mathematics, as problems are an inevitable fact of life. 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 behavioral traits associated with age and maturity affect mathematics achievement of girls. According to these findings girls’ confidence to study mathematics tends to match that of boys in the primary school years but this confidence deteriorates more rapidly as they go through secondary school (Brush, 1990; Heller and Parsons, 1981). 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 school, girls’ attitudes become more negative. This is supported by Swetman (1995) who posited that girls develop negative attitudes towards mathematics as they grow older. However some other studies (Geary, 1994; Tate, 1997) also reported no significant gender differences in mathematics abilities and achievement.

The current situation in Nigeria is that the performance in mathematics at secondary school 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 at comprehensive secondary school Amurie-Omanze in South 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.

The specific objectives of the study include the following:

- i. Examine the influence of students’ attitude towards mathematics on students’ achievement in mathematics at Comprehensive Secondary School Amurie-Omanze, Imo State, Nigeria.
- ii. Investigate the relationship between gender differences and students achievement in mathematics at Comprehensive Secondary School Amurie-Omanze, Imo State, Nigeria.
- iii. Make recommendation for improving the teaching/learning of mathematics in Nigerian secondary schools.

In keeping with objectives of the study, the following research hypotheses are formulated as well as tested against observed data:

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 at Comprehensive Secondary School Amurie-Omanze.

Ho 2: There is no significant difference between the mathematics achievements of male students and mathematics achievement of female students at Comprehensive Secondary School Amurie-Omanze.

2. Methodology

2.1 Research Design

The research design is an ex-post – facto descriptive study focusing on the relationship between the independent variables -attitude and gender differences and dependent variable- students' achievement in mathematics.

2.2 Population of the Study

The population of the study consists of all Senior Secondary School Students of Isu Local Government area of Imo State, Nigeria.

2.3 Sample Size and Sampling Technique

The sample consists of sixty (60) students of Comprehensive Secondary School Amurie-Omanze made up of thirty male Senior Secondary Three (SS3) students and thirty female SS3 students.

2.4 Research Instruments

The following validated research Instruments were used

- (i) Student's Academic Ability Test (SAAT).
- (ii) Students' Attitude to Mathematics Questionnaire (SATMQ) which was prepared using the Likert scale (appendix 1).
- (iii) Structured interview guides for students which addressed some variables of the study, focusing on mathematics achievement.

2.5 Data Reliability and Validity

.A test-retest reliability proof was used to establish the reliability of the instruments. The instrument was administered on 20 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 test 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.

2.6 Procedure for Data Collection

The questionnaire instrument was administered to selected number of students individually by the researcher and his trained assistants. Tests were administered to students in different class rooms. The students, teachers and the administrators were interviewed at the school to collect some primary data. School academic records were checked for relevant information.

2.7 Procedures for Data Analysis

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.

3. 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		Total
	No of students who scored at least 40%	No of students who scored below 40%	
Positive attitude	21	2	23
Negative Attitude	1	21	22
Indifference	8	7	15
Total	30	30	60

Source: Field survey.

Table 2: X² analysis table for test of hypothesis one

Observed frequency (FO)	Expected frequency (fe)	fo-fe	(fo-fe) ²	(fo-fe) ² /fe
21	11.50	9.50	90.25	7.85
2	11.50	-9.50	90.25	7.85
1	11.00	-10.00	100.00	9.09
21	11.00	10.00	100.00	9.09
8	7.50	0.50	0.25	0.03
7	7.50	-0.50	0.25	0.03
Calculated X ²				33.94
Tabulated X ² α = 0.05				5.991

For the test of hypothesis one a Chi-square (X²) analysis was used at confidence interval, α = 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 X² analysis 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		Total
	No of students who scored at least 40%	No of students who scored below 40%	
Male	17	13	30
Female	12	18	30
Total	30	30	60

Source: field survey

Table 4: X² analysis table for test of hypothesis two

Observed frequency (FO)	Expected frequency (FE)	FO-FE	(FO-FE) ²	(FO-FE) ² /FE
17	14.50	2.50	6.25	0.43
13	15.50	-2.50	6.25	0.40
12	14.50	-2.50	6.25	0.43
18	15.50	2.50	6.25	0.40
Calculated X ²				1.67
Tabulated X ² α = 0.05				3.841

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 (SATMQ) 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 a study carried out at two secondary schools in Benue State of Northern Nigeria, Olawoye (1988) asserted that Nigerian girls have negative attitude towards mathematics. Maliki et al (2009) found that boys performed more than girls in junior secondary school examination in Bayelsa state of Southern Nigeria. Atovigba et al (2012) found that the male students performed consistently better than their female counterparts in Nigeria.

4. 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 Comprehensive Secondary Amurie-Omanze, 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 matter 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 Comprehensive Secondary School Amurie-Omanze, Imo 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 school 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 school should be energized to encourage more women participation in effective mathematics learning. Stereotyping of mathematics as "male subject" should be discouraged.

References

- Aiken, L.A. (Jr.) (1976). Update on attitudes and other affective variables in learning mathematics. *Review of Educational Research*, 61: 880-815.
- Ale, S.O. (1989). School mathematics in the 1990's some major problems for developing countries. *International Journal of Mathematical Education in Science and Technology*, 20(5).
- Allele- Williams, G. (1988). Keynote address delivered at the silver Jubilee meeting of mathematics Association of Nigeria (MAN). *Abacus*, 18(1).
- Atovigba M., Michael V. Okwu E and Ijenkeli. E. (2012). Gender Trends in Nigerian Secondary School Students' Performance in Algebra. *Research Journal of Mathematics and Statistics* 4(2):42-44.

- Borasi, R. (1990). The invisible hand operating on mathematics instruction: students' conceptions and expectations. In T.J.Cooney (ed.), *Teaching and learning mathematics in the 1990s* (NCTM Yearbook). 174-182. Reston: NCTM.
- Brush, G (1980). Encouraging girls in mathematics: the problem and the solution. Cambridge: MA, ABT Associates.
- Edukugho (2010) Federal Government moves to tackle poor results in NECO , SSCE Exams-Rufia, Vanguard , June 3. Retrieved from <http://www.vanguardngr.com/2010/06/fg-moves-to-tackle-poor-result-in-neco-ssce-exams-rufai/>
- Effandi Zakaria and Normah Yusoff. (2009). Attitudes and problem-solving skills in algebra among Malaysian college students. *European Journal of Social Sciences*, 8, 232-245.
- Frempong, G. & Ayia, J.K. (2005). Equity and quality mathematics education within schools: Findings from TIMSS data for Ghana'. *Proceedings of the 31st Annual IAEA Conference of International Association for Educational Assessment (IAEA). Ghana.*
- FRN (2004).*National Policy on Education* (4th Ed). Federal Republic of Nigeria.
- Geary DC (1994). Children's mathematical development. Washington DC7 American Psychological Association.
- Heller, K. & Parsons, J (1981). Sex differences in teachers' evaluation feedback and students' experiences for success in mathematics, *Child Development*, 52, 1015-1019.
- Ma, X., & Kishor, N. (1997). Assessing the relationship between attitude toward mathematics and achievement in mathematics:A meta-analysis.*Journal for Research in Mathematics Education*, 28, 26-47.
- Odogwu, H.N. (1994). Primary secondary teachers and the teaching of time concept in schools. *Education Today*, 7(2).
- Patton, J. R., Cronin, M. E., Basset, D. S. & Koppel, A. E. (1997). A life skills approach to mathematics instruction: Preparing students with learning disabilities for real-life mathematics demands of adulthood. *Journal of Learning Disabilities*. 30, 178-187.
- Olawoye FA (1988). Low participation of girls in Science, Technology and Mathematics (STM) education and strategies for improvement. A paper presented at the Kwara and Niger states' workshop on promoting Science, Technology and Mathematics education among girls and women, held at Education Resource Centre, Ilorin, Kwara State, Nigeria.
- Maliki A.E.,Ngban A. N. and Ibu J. E.(2009).Analysis of students' performance in Junior Secondary School Mathematics Examination in Bayelsa State of Nigeria. *Stud Home Comm Sci*, 3(2): 131-134.
- Ruble D, Nakamura C (1972). Task orientation versus social orientation in young children and their attention to relevant social cues. *Child Development*, 43: 471-480
- Saracho O (1985a). A modification of the ABC scale. *J. Personal. Assess.* 49: 154-155.
- Saracho O (1985b). Young children's play behavior and cognitive slyle. *Early Child. Development Care*, 22: 1-18.
- Saracho O (1986). Validation of two cognitive measures to assess field- dependence/independence. *Percept. Motor Skills*. 63: 255-263.

Swetman, D. (1995). Rural elementary students' attitudes toward Mathematics. *Rural Educator*, 16(30). 20-22, 31

Tate WF (1997). Race–ethnicity, SES, gender, and language proficiency trends in mathematics achievement: An update. *J. Res. in Math. Edu.* 28(6), 652– 679.

Umoinyang, I., E. (1999). *Student Socio-Psychological Factors as determinants of achievement in senior secondary mathematics*. (Unpublished Ph.D. Thesis). University of Ibadan, Ibadan.

Appendix 1

Students' Attitude to Mathematics Questionnaire (SATMQ)

This questionnaire is intended to generate data for an educational research purpose only. We are interested in your ideas about mathematics and the study of mathematics. Your answers to the questions that follow will help us understand what you think or feel about mathematics and study of mathematics. This questionnaire is not something to be graded and your answers are completely anonymous. Please tell us what you *really* think by putting a in the box corresponding to Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), or Strongly Disagree (SD). Please do not sign your name.

Thank you for your help!

Gender (check): male/female.

S/NO	Question	SA	A	U	D	SD
1	Mathematics is the most useful subject of all					
2	It takes me too much time to understand any idea in mathematics.					
3	Mathematics is enjoyable and stimulating to me.					
4	Mathematics is not important in everyday life.					
5	In mathematics you can be creative and discover things by yourself.					
6	I have never liked mathematics, and it is my most dreaded subject.					
7	There is nothing creative about mathematics; it's just memorizing formulas and things.					
8	Students who have understood the mathematics they have studied will be able to solve any assigned problem in five minutes or less.					
9	I try to learn mathematics because it helps develop my mind and helps me think more clearly in general.					
10	Everything important about mathematics is already known by mathematicians.					
11	Mathematics makes me feel uneasy and confused.					
12	Mathematics is needed in every day life.					
13	Mathematics can be understood if time is devoted at studying it.					
14	Mathematics thrills me, and I like it better than any other subject					
15	Mathematics is less important to people than art or literature.					
16	Mathematics is not important for my chosen profession.					
17	Mathematics class is always boring					
18	Unless you are gifted you can never understand mathematics.					
19	Mathematics is needed in designing practically everything.					
20	I am interested and willing to acquire further knowledge of mathematics.					
21	Boys need mathematics more than girls.					
22	Real mathematics problems can be solved by common sense instead of the mathematical rules you learn in school.					
23	The skills I learn in mathematics class will help me in other subjects					
24	Studying mathematics strengthens my thinking ability and gives me pleasure					