

Sex Differential and Students' Academic Performance in Mathematics in Sapele Local Government Area of Delta State, Nigeria

Fegha Evelyn Ilogho, Ph.D

*Department of Guidance and Counselling
Faculty of Education
Adekunle Ajasin University, Akungba-Akoko
Ondo State, Nigeria
feghaevelyn@gmail.com*

Abstract

The study sought to identify sex differences in the academic performance of students in mathematics. The study was guided by three research questions and two hypotheses. The population consists of both male and female students and teachers of mathematics. A sample size of 360 was randomly selected from Sapele Local Government Area of Delta State. A fifty (50) multiple choice items of Mathematics Achievement Test (MAT) was adapted to get information on academic performance. The data were analysed using descriptive and inferential statistics of t-test; the hypotheses were tested at 0.05 level of significance. The study revealed poor performance in mathematics, that boys perform better than girls, and that there was significant difference in the performance of male and female students in mathematics. Again the study showed that there was no significant difference between male and female teachers and academic performance of students in mathematics. Based on the findings, it was recommended that there should be improvement in the teaching and learning of mathematics and government should provide adequate funds for the mathematics teachers to undergo in-service training to enhance teaching in the school thus improving the academic performance of students.

Keywords: sex, differences, students, Academic, performance, mathematics

Introduction

It has become increasingly obvious that performance in mathematics all over Nigeria and the standard of evaluating mathematics is far beyond satisfactory, especially at the primary and secondary school levels. No wonder as a nation, our technological growth is still far below expectation in scientific and technological development. Hassan (2002) cited in Awe (2019) opined that mathematics as a subject is now universally recognized and accepted as indispensable to self-reliance and sustainable development of any nation because of its perceived functional utility. He warned that any nation

seeking to develop a strong level of science and technology must pay attention to the teaching and learning of mathematics.

Mathematics is seen as the bedrock of all scientific and technological breakthroughs. No students can do well in science and technology without good knowledge in mathematics. The usefulness of mathematics to Nigeria as a nation cannot be overemphasized as it is a major requirement for technological development. Mathematics is the science of space and numbers. It is concerned primarily with the logical study of numbers and relationship using various forms of analysis and special symbols. Mathematics is unique and it is a science that is not dependent on experiment. It places emphasis on logical structure, demands, precision and expression. Its bases are abstract and its development leads to results which may be of no obvious practical value. Nevertheless it is the language of science.

Mathematics was first developed as a useful system for solving certain problems that could not be solved by other means. Hence Willoughby (1970) said that mathematics is needed in day to day life. Everybody needs mathematics, even one who wants to be a street trader will definitely need mathematics. A scientist, an accountant, banker, businessman or even a lawyer makes use of mathematics. Monde (2007) described mathematics as an indispensable medium by which science experiences, formulates and communicates itself.

Despite the usefulness and importance of mathematics, the results from most schools in mathematics at the Senior Secondary School Certificate Examination (SSCE) in the federation remain dismal. According to Mbugun, Kibet, Muthaa and Nkinke (2012), performance of students in mathematics has continuously been poor and the poor performance is caused by understaffing, inadequate teaching/learning materials, lack of motivation and poor attitudes by both teachers and students. Monde (2007) in her study on analysis of student's academic performance in mathematics among senior secondary school students also observed that performances of students is poor and constitute a problem not only to students, teachers and parents but also to states and federal government. Mohammed (2015) in Awe (2019) asserted that many students see mathematics as a difficult subject, which leads to mass failure in the subject in external examination. Ogunwuyi (1982) in Ilogho (2015) blamed the high failure rate in school examination on the high level of illiteracy among parents. According to him, parents never ascertain the level of performance of their wards morally and academically; examine their wards' report cards nor go through their class work to verify how much the child is absorbing and guess in what direction the parents can be

of help to the children. He strongly indicts parents for neglecting their children and that out of twenty-four hours in a day, the pupil spends about one quarter with the teacher in school. Korau (2006) argued that the reason for failure or poor performance of students in mathematics from year to year is ascribed to inadequacy in one or all these areas namely, the nature of the subject, learners' factor and the teachers' factor. According to him, several variables ranging from the learners themselves, teachers, lack of textbooks, curricular and school environment are responsible for students' poor performance in mathematics.

Ogunde (1984) in Ilogho (2015) observed in his writing that many people using the expression that mathematics is 'hard' make students run away from the subject, thereby causing lack of interest in mathematics. This lack of interest leads to weakness in the subject area resulting to continuous poor performance year in year out. Accordingly, poor performance will continue to affect the number of students in the physical sciences, engineering and medicine and other related discipline in higher institutions. This may lead to low productivity of technological manpower and Nigeria as a country will continue to remain underdeveloped. Sonde (1985) in Ilogho (2015) asserts that critics are of the view that the problem with mathematics is varied and concludes that it is important to seek the causes. Similarly, Udonsa (2015) observed consistent poor performance of students in Senior Secondary School Certificate Mathematics and attributed such to large class size, lack of effective teaching materials and unqualified mathematics teachers.

Ilogho (2015) identified causes of poor performance in mathematics as:

- Students regard mathematics as a jigsaw puzzle, as something baffling. This defeatist and inability attitude leads to a vicious cycle of false fear. Being psychologically defeated, they proceed to not showing interest in the subject. The students already have a wrong impression about mathematics that no matter what effort the teachers make to enhance interest, it always leads to negative result.
- The problem of the mathematics teacher is another major issue. Teacher's attitude to the subject is not encouraging. It is perceived that some teachers do not even know the subject, much less how to approach or teach it.

Osigwe (1999) in Monde (2007) corroborated this when he expressed the view that mass failure of students in mathematics can be attributed to some peculiar problems facing the students in various schools today. He identified these problems as finance, poor learning environment, dearth of teachers, and non-motivation of teachers by most state governments and finally, exodus from the teaching profession to other sectors of

the economy for better status and self-realization. Monde (2007) observed that the methods/approaches used by teachers can also affect the performances of the students in mathematics. She buttressed this by saying this group of teachers simply mystifies the subject by helping to spread the tale that mathematics is esoteric thereby instilling fear into the lazy and confused students.

Abubakar and Oguguo (2011) and Sosnowski (2017) assert in their discoveries that students do not solve problems in their spare time. Practices and repetition, they said, are very essential tools for learning of mathematics because the more we do something the more it becomes part of our total abilities. They declared that in this regard, no matter the approach to the teaching of the subject, the students could never achieve success.

One major variable to be considered in this study is the influence of sex on students' performance in mathematics. Sex is the range of physical, mental and behavioral characteristics pertaining to, and differentiating between, masculinity and femininity. According to Lee (2001), sex is described as attribute that differentiates feminine from masculine.

Kpolove, Joe and Okoto (2014) conducted a study in which they tried to find out whether there was a difference in the mathematical attitudes of boys and girls at the secondary school level. They did this by administering attitude questions designed to enable each child to be rated according to interest in mathematics, anxiety about mathematics and perceived usefulness of mathematics. The result showed that for girls, no correlation was found between attitude and mathematics. Problem solving through substantial correlation was found for boys. They therefore concluded that there was a random distribution of attitude and ability for girls but not for boys. One can infer from the above that this identified reason may account for why girls like to move from preferred career choices simply because of mathematics requirement than boys.

Another problem that confronts the mathematics teacher is the management of students' time in the social media and watching of television. Coupled with the attendant problem of school and classroom overpopulation, there is little the mathematics teacher can do to turn around the performance of students in the subject even if he/she holds a doctorate degree in mathematics. This is where some of the blame go to the parents/guardians for their inability to monitor and curb the excesses of their wards pertaining to their attitude towards their studies. There appears to be more opportunities available to students of today in form of private coaching and

lesson, yet none of the results of these efforts, either on the part of the boys or girls, is tangible. This is why it has been difficult to quantify mathematics performance of student's according to sex.

It is evident from available literature and experiences that performance in mathematics and indeed any discipline, be it for boys or girls, depends on ability and hard work. It is therefore not easy a task to state categorically whether boys really perform better than girls. Karigi (2015) cited in Awe (2019) asserted that the difference in the performance of boys and girls is small and depends on which mathematics outcome is looked at; and that it only depends on how diligent and hard working the student might be. This implies that the general attitude of students towards the learning of mathematics affects their performance in mathematics. Asante (2010) reported that there are no significant gender differences in mathematics performance between the ages of 6 and 11 and of 12 and 19 for mathematics calculation, geometric concepts, basic mathematics concept, and addition error factors.

Again, Kaufman, Kaufman, Liu and Johnson (2009) observed that gender differences in mathematics performance have thus been studied extensively, but results do not support a ubiquitous viewpoint that males outperform females throughout development. Also Linberg, Hyde, Linn and Petersen (2010) carried out two analyses of large data sets of United States' adolescents from the 1990s and 2000s; they observed no significant differences in mathematics performance between males and females. According to Edward (2012) and Daramola (2007), their studies found out that though there was a disparity in the performance of boys and girls, it was not significant. Reynolds, Scheiler, Hajovsky, Schwartz and Kaufman (2015) found that female students generally receive higher grades in mathematics courses, but their scores on high-stakes standardized tests are often lower than those of male students.

It is observed that performance in mathematics and indeed any discipline is dependent on ability and hard work. Karigi (2015) asserts that the difference in the performance of boys and girls is small and depends on which mathematics outcome is looked at, and that it only depends on how diligent and hard working the student might be. According to them, a number of different potential explanations exist for why these small sex differences persist. These factors are attitudes and values, problem solving strategies and gender stereotype. However, Kolawole (2011) examined gender differences in candidates' performance in mathematics and found that the boys perform better than the girls. Eitle (2005) asserted that boys outperform girls in performance in mathematics examination. Asante (2010) also observed that there was

significant difference between mathematics performance of boys and girls. He said that sex differences in mathematics performance and ability remain a concern as scientists seek to address the low representation of women at the highest levels of mathematics, the physical and engineering fields.

Statement of Problem

An important aspect of an educational programme is that which concerns the performances of learners. While in-depth appraisal of our educational programme seems cumbersome and rather discouraging due to an obvious depth of work, the general performance of secondary school students in mathematics in recent years is disheartening. There is no doubt that this dismal performance of students in mathematics has become a source of great concern to many educational planners, evaluators, parents and teachers. Therefore this study sought to look at the performance of students in mathematics based on sex of both students and teachers. In the light of this, the study was directed towards providing answer to the following questions to elicit information that will help to guide the investigation and accomplish the objectives of this study.

Research Questions

1. What is the performance of students in mathematics based on sex?
2. Is there any difference in the performance of students in mathematics based on sex differentiation?
3. Does the sex of the mathematics teacher have any influence on the performance of students in mathematics?

Research hypotheses

Ho1: There is no significant difference in the performance of students in mathematics based on sex.

Ho2: There is no significant influence of the sex of the mathematics teacher on the performance of students in mathematics.

Methodology

The study adopted descriptive survey design which investigated the performance of secondary school students in mathematics. The population consists both male and female students and teachers. Twelve post-primary schools in Sapele Local Government Area of Delta state was selected for the study out of fifteen schools in the local government. The sample consisted of thirty (30) respondents from each school, giving a total of three hundred and sixty respondents in the study.

A structured standardized multiple choice test in mathematics (MAT) was adopted from Monde (2007). The MAT contains fifty (50) multiple choice items in mathematics in eight content areas drawn from the mathematics syllabus. The reliability coefficient of the instrument was 0.76. The instrument was administered personally by the researcher during school hours. The class teachers of the classes tested assisted the researcher. This was done to make the test environment comfortable and to avoid cheating. After the students got seated, they were informed of the purpose of the test. At this point, the test was administered to the students. Based on the nature of data generated from the scores of the test administered, mean and t-test statistics were used in analysing the data.

Presentation of results

Research Question one: What is the performance of students in mathematics based on sex?

To answer the above question the test norms were calculated and it is presented in table one.

Table 1: Student's performance in mathematics based on sex

Test norms	Male	Female
Mean	21.2	17.4
Median	23.1	16.9
Mode	15.0	17.5
Highest score	33.0	33.0
Lowest score	13	10
Range	20	23
Variance	19.1	19.3
Standard error of measurement	2.19	2.20
Number of testees	190	170

From Table 1, the performance of students on the basis of sex in mathematics is not encouraging as the highest mean score is 21.2 which is low. The table also revealed that the mean score for male students (21.2) is above the female mean score (17.4).

Research Question two: Is there any difference in the performance of students in mathematics based on the sex of students?

Ho1: There is no significant difference in the performance of students in mathematics based on sex.

Table 2: t-test analysis showing the performance of students in mathematics based on sex of students

Group	N	Mean	Standard Deviation	Df	t-cal	t-crit	Remarks
Male	190	21.2	5.3	358	7.62	1.65	Rejected
Female	170	17.4	4.6				

P < 0.05 level of significance

From table 2, t-calculated (7.62) is greater than t-critical (1.96) meaning that there is significant difference in the performance of students in mathematics based on sex. There is also disparity in the mean score of boys (21.2) and girls (17.4). This implies that the null hypothesis is rejected.

Research Question three: Does the sex of the mathematics teacher have influence on the performance of students in mathematics?

Ho2: There is no significant influence of the sex of the mathematics teacher on the performance of students in mathematics.

To answer the above question and test the hypothesis, t-test analysis was carried out on the data and the result is presented in table 3.

Table 3: t-test analysis showing performance of students based on sex of teachers

Group	N	Mean	S.D	Df	t-cal	t-crit	Remarks
Female teacher	240	19.0	5.6	358	1.90	1.96	Accepted
Male teacher	120	20.8	3.7				

Table 3 showed the t-calculated of 1.90 is less than t-critical of 1.96. The null hypothesis is therefore accepted. This implies that the sex of the mathematics teacher male or female does not have significant influence on the performance of students in mathematics.

Discussion of findings

The findings revealed that the performance of students in the test is poor with 19.3 as the overall mean score; only about 39% of the students passed which is not encouraging. The median of the test is 15.1 which implies that the representative of the central location is 15.1. This is a poor result. It follows that certain factors have contributed to the poor performance of students in mathematics. This finding is in line with Ogunwuyi (1982) in Ilogho (2015) who blamed the high failure rate in school examination on the high level of illiteracy among parents. According to him, parents never ascertain the level of performance of their wards morally and academically; examine their wards' report cards nor go through their class work to verify how much the child is absorbing and guess in what direction the parents can be of help to the children. He strongly indicts parents for neglecting their children and that out of twenty-four hours in a day, the pupil spends about one quarter with the teacher in school. Mbugun, et al (2012) also supported the findings and asserted that it has been discovered that students do not solve problems in their spare time which leads to poor performance in mathematics. Practices and repetition, they said, are very essential tools for learning because the more we do something the more it becomes part of our total abilities. They declared that in this regard, no matter the approach to the teaching of the subject, the students could never achieve success.

From Tables 2 and 3, it was discovered that boys perform better than girls, and there was significant difference in their performance in mathematics. This finding is in line with Kolawole (2011) and Eitle (2005) who observed in their different studies that boys perform better than girls in mathematics examination. Similarly, Udonsa (2015) in his study admitted consistent poor performance of students in senior secondary certificate mathematics and attributed the poor performance to large class size, lack of effective teaching materials and unqualified mathematics teachers. Furthermore, Edward (2012) found that girls obtained lower grades in mathematics than did boys, and that males are academically better than the females in mathematics and sciences. The finding however disagrees with Asante (2010) who reported that there are no significant gender differences in mathematics performance between the ages of 6 and 11 and of 12 and 19 for mathematics calculation, geometric concepts, basic math concept, and addition error factors.

The findings also revealed that sex of the teacher has no significant influence on the performance of students in mathematics. Whether the teacher is female or male has nothing to do with the academic performance of students in mathematics. No teacher

can do a good and thorough job of teaching mathematics unless he is willing to make careful analysis in making preparation and in conducting the work of the class.

Conclusion and Recommendation

The main aim of this study was to determine the performance of students in mathematics based on sex of the students and mathematics teachers. From the findings, the following conclusions were made: that there was low performance of students in mathematics, there was a significant difference between the performance of boys and girls in mathematics, sex differences of teachers was not a factor affecting students' performance in mathematics. Based on the conclusion therefore, it was recommended that government should provide adequate funds and the necessary facilities for in-service training of mathematics teachers. This would facilitate effective teaching and learning in schools which would in turn lead to good performance of students. In addition, female students should be stimulated to have more interest in mathematics.

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