



Gender Variations in Mathematics Achievement in Nigerian Post-Secondary Institutions

OSSAI, Peter Agbadobi Uloku
Department of Guidance and Counselling,
Delta State University,
Abraka, Nigeria

ABSTRACT

In light of the discrepancies found in reports regarding gender-based differences in achievement in school mathematics, this study aimed to investigate students' mathematics achievement in higher institutions, specifically focusing on gender differences. The study encompassed the entire population of 56 undergraduate students (26 males and 30 females) from the Department of Mathematics at Delta State University, Abraka. The student cohort comprised both Pure Mathematics students and Mathematics Education students who took the course Mathematics 215 (Real Analysis) during the 2017/2018 academic year. This course was considered essential for both categories of students. The researchers collected the students' scores in this course to analyze their performance. To address the research questions, the study employed the mean and coefficient of determination. Hypothesis one was tested using an independent samples t-test at a significance level of .05. Hypothesis two, on the other hand, was examined using the Product Moment Correlation technique at a significance level of .05. The results from both tests indicated that (i) there was no significant difference and (ii) there was no significant relationship in the mathematics achievement of the undergraduate students based on gender. However, it is worth noting that mathematics achievement slightly favored the female undergraduates. Based on the findings, the researcher recommends conducting further studies using different courses or levels within the mathematics discipline and including a broader range of higher learning institutions. This would provide a more comprehensive understanding of gender-based differences in mathematics achievement.

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INTRODUCTION

Given the inconsistencies in reports regarding gender disparities in mathematics achievement, this study aimed to investigate the performance of students in mathematics at higher institutions, specifically focusing on gender differences. While equal opportunities for education are provided by the government at all levels, poor performance in subjects such as mathematics and English language raises questions about the factors contributing to students' underperformance. One such factor

examined in this study is gender and its relationship to mathematics achievement.

The findings on gender differences in mathematics performance are inconclusive. Some researchers suggest that although there may be slight differences in favor of males, these differences are not statistically significant. Other researchers argue that gender disparities in mathematics arise from stereotypes or students' perceptions of the subject. A few studies claim that there is a significant difference in mathematics performance based on gender. Notable

Corresponding author: Ossai, Peter Agbadobi Uloku

✉ agbadobipeter@gmail.com

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researchers supporting the lack of significant gender differences include Umoru (2011), Mohamed and Waheed (2011), Amatobi and Amatobi (2013), and Ossai (2015).

Umoru (2011) conducted a study involving 300 male and female students from co-educational secondary schools in Niger State, focusing on senior secondary school 3 (SS 3) students. The study aimed to examine students' problem-solving skills in mathematics probability. The results showed no significant difference in the operational steps adopted by male and female students. Mohamed and Waheed (2011) conducted a study with a sample size of 195 secondary school students in the Maldives to explore students' attitudes toward mathematics. The results indicated a positive attitude toward mathematics, with no significant difference based on gender. Amatobi and Amatobi (2013) examined gender and attitude differences in students' achievement in English language and mathematics among Nigerian secondary school and higher institution students. The study included a sample of 60 SS 3 students (30 males and 30 females) from senior secondary schools in Imo State. The findings revealed that while the differential performance in mathematics was not statistically significant, males exhibited a more positive attitude toward mathematics compared to females. These findings align with those of Umoru (2011) and Mohamed and Waheed (2011).

Ossai (2015) conducted research on "gender differences in guessing tendencies in mathematics," which further supported the findings of Umoru (2011), Mohamed and Waheed (2011), and Amatobi and Amatobi (2013). The study included a sample of 110 SS 3 students (56 males and 54 females) from selected senior secondary schools in Delta North Senatorial District of Delta State, Nigeria. The students were assessed based on their responses to a 50-item instrument in the May/June 2010 mathematics test conducted by the West African Examination Council (WAEC). The results indicated no significant difference in the mean guessing tendencies in mathematics based on gender, but boys tended to guess more frequently than females.

In contrast to the aforementioned studies, Muthukrishna (2010) and Adeneye (2011), cited by Ejegreh (2018) and Ossai (2014), conducted separate research on gender differences/relationships in mathematics achievement. Muthukrishna's study focused on "gender differences in mathematics achievement" in a primary school in Kwazulu-Natal, with a sample of 70 Grade 6 students from a rural primary school. The findings revealed a gender gap in favor of girls. Adeneye (2011), cited by Ejegreh (2018), conducted a study involving SS 3 students in South-Eastern Nigeria, using mock examination scores from a sample of 880 males and 900 females. The scores were subjected to independent-sample t-test analysis, which showed significant differences in mathematics performance based on gender, favoring male students. Similarly, Ossai (2014) assessed the dimensionality of West African senior school certificate examination multiple-choice test items in mathematics. The study included a sample of 400 students from SS3, selected from Edo and Delta States. The students responded to the WASSCE May/June objective test items in mathematics for 2010, and their scores were correlated with gender using point-biserial statistics. The study demonstrated a significant relationship between the dimensionality of WASSCE May/June test items in mathematics and students' gender.

In summary, the reviewed studies present conflicting perspectives on gender disparities in mathematics achievement. While the overall mathematics achievement may slightly favor males, the statistical significance of these differences remains debatable. It is worth noting that the studies discussed thus far primarily focused on primary and secondary school levels. Limited research exists on gender differentials in mathematics achievement within higher education institutions in Nigeria. Therefore, the present study aims to examine the mathematics achievement of 200-level students.

Statement of the Problem

Studies examining gender differences in mathematics achievement in college/school

Corresponding author: Ossai, Peter Agbadobi Uloku

✉ agbadobipeter@gmail.com

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mathematics have yielded inconsistent findings. Some studies (Ossai, 2015; Inweregguh, 2018) suggest that there is no significant relationship or difference in mathematics achievement based on gender, while others (Elejere et al., 2018; Ossai, 2020; Ossai, 2023) report that males tend to outperform females.

These reports primarily focus on the statistical significance of gender differences in mathematics achievement, particularly in secondary schools in Nigeria. However, there is a lack of understanding regarding the situation in tertiary institutions and universities. Therefore, this study aims to address this research gap and explore gender differences in mathematics achievement at the college/university level.

Research Questions

The following research questions were generated for the study:

1. Is there any difference in the mean mathematics achievement of male and female students?
2. To what extent does gender relate to the mathematics achievement of students?

Hypotheses

The study was guided by the following null hypotheses:

1. There is no significant difference in the mean mathematics achievement of male and female students.

2. There is no significant relationship between gender and the mathematics achievement of students.

METHODOLOGY

Descriptive survey design was used for the study whose population of 56 students consisted of all mathematics pure/mathematics Education Students who took Real Analysis (maths 215) in 2017/2018 academic year. The entire population of 56 students (26 males and 30 females) was considered in the study. The psychometric properties of the instrument were deemed to have been established by the department where the course was taken. Efforts to get them proved unsuccessful. The researcher obtained students' scores on maths 215. The scores were made of examination score (70%) and continuous assessments score (30%). The letter consists of scores cognitive, psychomotor and effective. This is in line with Ossai (2014) and Ossai (2020) regarding the importance of utilising scores from all domains in order to have a time picture of the development of a learner. Mean and co-efficient of determination were used to answer the research questions. Hypothesis one was tested using *t-test* of independent samples. The *product moment correlation* technique was used to test hypothesis two. Both tests were conducted at .05 level of significance.

RESULTS

Research Question 1: Is there any difference in the mean mathematics achievement of male and female students?

Table 1: Mean and standard deviation of students' mathematics achievement by gender

Gender	n	Mean	SD
Male	26	37.6	18.5
Female	30	37.8	16.1

The table shows that the mean and standard deviation of students' mathematics achievement by gender are 37.6 and 18.5 respectively for males and 37.8 and 16.1 respectively for females. This shows a difference of 0.2 points in favour of the females.

Research Question 2: To what extent does gender relate to the mathematics achievement of male and female students?

Table 2: Pearson's r and coefficient of determination of students' mathematics achievement by gender

Corresponding author: Ossai, Peter Agbadobi Uloku
✉ agbadobipeter@gmail.com
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Variables	n	df	r-cal	r ²
Gender	56	54	.006	0.0000044
Mathematics	56			

The table shows that the relationship between gender and mathematics achievement of students is 0.0066; the co-efficient of determination, r^2 , is 0.0000044 which implies that gender accounts for less than one percent of students' achievement in mathematics.

Hypothesis 1: There is no significant difference in the mean mathematics achievement of male and female students.

Table 3: Independent samples of *t-test* analysis of students' mathematics achievement by gender

Gender	n	Mean	SD	df	t-cal	t-crit	Decision
Male	26	37.6	18.5	54	.043	2.00	Not significant
Female	30	37.8	16.1				

$P < .05$

The table shows that the *t*-calculated of 0.043 is less than the *t*-critical of 2.00, at 54 degrees of freedom. The null hypothesis of no significant difference was therefore, accepted.

Hypothesis 2: There is no significant relationship between gender and the mathematics achievement of students

Table 4: Pearson's Product Moment Correlation Analysis of Students' mathematics Achievement by gender.

Gender	n	df	r-cal	r-crit.	Decision
Male	26	54	.0066	.273	Not significant
Female	30				

$P < .05$

The table shows that the *r*-calculated of .0066 is less than the *r*-critical of .273, at 54 degrees of freedom. Consequently, the null hypothesis was accepted.

the findings of Amatobi and Amatobi (2013) and Ossai (2015). Amatobi and Amatobi reported that mathematics performance favored males, while Ossai found that males engaged more in guesswork in mathematics items than females. These results also differ from the studies conducted by Muthukrishna (2010) and Adeneye (2011), as cited by Ejegreh (2018). Muthukrishna's study on gender differentials among primary school pupils in Kwazulu-Natal revealed a gender gap in favor of females, while Adeneye indicated significant achievement in secondary school mathematics favoring males.

DISCUSSION OF FINDINGS

The research findings indicate that the mean mathematics achievement of female students was slightly higher than that of male students. The standard deviations also revealed that scores from female students were closer to the mean compared to male students. Hypothesis one supported these findings, showing no significant difference in the mean mathematics achievement of students based on gender. These results align with previous studies conducted by Umoru (2011), Mohamed and Waheed (2011), Amatobi and Amatobi (2013), and Ossai (2015), which also found no significant differences in mathematics achievement. However, this slight gap in mean mathematics achievement favoring female students contradicts

Regarding research question two, the findings showed that gender accounted for less than one percent of students' achievement in mathematics. The corresponding hypothesis confirmed no significant relationship between students' mathematics achievement and gender. This finding contradicts the study conducted by Ossai (2014) on gender and dimensionality of mathematics test items, which revealed a

Corresponding author: Ossai, Peter Agbadobi Uloku

✉ agbadobipeter@gmail.com

Department of Guidance and Counselling, Delta State University, Abraka.

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significant relationship between gender and the dimensionality of May/June 2010 objective test items in mathematics. Therefore, it suggests that factors other than gender may have influenced students' achievement in real analysis courses.

In summary, the study highlights the slight difference in mean mathematics achievement favoring female students, which contrasts with some previous studies. It also emphasizes that gender accounts for a minimal portion of students' mathematics achievement and suggests that other factors play a more significant role in students' performance in real analysis courses.

CONCLUSION

In conclusion, this study examined the relationship between gender and mathematics achievement among undergraduate students. The findings revealed that, on average, female students had slightly higher mathematics achievement compared to male students. However, this difference was not statistically significant, indicating that gender alone does not significantly influence students' mathematics performance.

These results are consistent with previous studies conducted by Umoru, Mohamed and Waheed, Amatobi and Amatobi, and Ossai, which also found no significant gender differences in mathematics achievement. However, it is worth noting that the present study contradicted the findings of Amatobi and Amatobi and Ossai, who reported that male students outperformed female students in mathematics.

Furthermore, the study demonstrated that gender accounted for less than one percent of students' mathematics achievement, suggesting that other factors play a more substantial role in determining students' performance in real analysis courses. This finding challenges the study conducted by Ossai, which found a significant relationship between gender and the dimensionality of mathematics test items.

Overall, the research adds to the existing body of knowledge by providing insights into the gender differences in mathematics achievement among undergraduate students. It

highlights the need for further investigations to explore additional factors that contribute to students' performance in mathematics at the tertiary level. These findings have implications for educators and policymakers in promoting equal opportunities and enhancing mathematics education for all students, regardless of gender.

RECOMMENDATIONS

It was recommended that studies be conducted using

- (i) Other courses and/or levels in mathematics and
- (ii) Other institutions of higher learning in the country.

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Corresponding author: Ossai, Peter Agbadobi Uloku

✉ agbadobipeter@gmail.com

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✉ agbadobipeter@gmail.com

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