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Effects of Gender and School Location on Students' Achievement in Mathematics Olympiad Among Junior Secondary School Students in Kaduna State

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Abstract
This study tried to find gender difference in students' achievement in Mathematics Olympiad among Junior Secondary School students in Kaduna State. It also attempted to find out if the location of Schools affects the students 'achievement in the Olympiad. In order to achieve these, two research questions were asked and two hypotheses were formulated and tested at 0.05 level of significance. The study adopted expo facto research design in which the result of the second round (State level) Mathematics Olympiad of Junior Secondary School of the year 2024 was used. Two hundred and twenty (220) JSS students participated in the first round (Zonal Level) of the Olympiad and were considered as the population of the study while sixty five students (35 male and 30 female) qualified for the second round and their scores in the second round were analyzed using both descriptive and inferential statistics in this study. The findings indicated that Male students achieve more than female students. However, the achievement of the participant from rural school is similar to that of the participants from urban schools as no significant difference was found. The study recommends that parents and teachers should try to bridge the gap between the achievement of male and female students in Mathematics Olympiad.

Keywords; Gender, Location, Mathematics achievement and Olympiad

Introduction

Mathematics Olympiads serve as vital platforms for nurturing analytical thinking, creativity, and problem-solving skills among students. These competitions encourage learners to go beyond the traditional curriculum and engage with complex, non-routine problems, fostering critical thinking and intellectual resilience (De-Lazada & Taylor, 2022; Sujatha & Vinayakan, 2023). Participation in such contests has been shown to enhance cognitive abilities and academic performance, especially in science, technology, engineering, and mathematics (STEM) disciplines (Joseph, 2021; Stevens Institute of Technology, 2022). In Nigeria, the National Mathematical Centre (NMC) has consistently promoted Olympiads as avenues for talent development and international representation (NMC, n.d.; Vanguard News, 2021). In the Nigerian educational context, academic performance is often influenced by socio-demographic variables, particularly gender and geographical location. Numerous studies suggest that male students frequently outperform their female counterparts in mathematics and science-related subjects. This performance gap has been linked to sociocultural factors, gender expectations, and varying levels of encouragement and support (Okonkwo & Yisa, 2020; Solomon, 2021; Quest Journals, 2023). However, contrasting evidence also exists; for example, given equal opportunities and motivation, female students perform at par or even surpass male counterparts in mathematics (Adeyemi & Uche, 2019; Ibrahim & Shuaibu, 2024; ResearchGate, 2024). A global report by UNESCO (2022) similarly noted that girls are now performing at levels equal to boys in mathematics, with the gender gap narrowing across several regions.

Location is another key variable affecting students' academic achievements. Students in urban areas tend to perform better academically due to superior infrastructure, availability of qualified teachers, access to learning materials, and greater exposure to academic competitions like the Mathematics Olympiad (Salihu & John, 2021; Uloku & Emuobor, 2023; Odor, 2024). Rural students, on the other hand, often face significant challenges such as inadequate teaching staff, limited access to enrichment programs, and poor learning environments, all of which

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can negatively impact academic performance (Aliyu & Ibrahim, 2022; Osila, 2022). Recent evidence indicates that while urban students often outperform their rural peers, the effect is not always consistent. Some studies, such as those conducted in Anambra and Nasarawa States, found no statistically significant relationship between location or gender and mathematics achievement (RSIS International, 2025; Educational Research & Development Journal, 2025). International perspectives also highlight related factors such as mathematics anxiety and cultural perceptions, which continue to influence outcomes (D'Addio, 2024; Frontiers in Education, 2023).

Kaduna State provides a rich context for examining these variables, as it comprises both urban and rural areas with diverse socio-economic characteristics. The variation in educational access and resource distribution across the state makes it an ideal setting to explore how gender and location jointly affect students' performance in mathematics competitions. Understanding these influences is crucial for designing inclusive educational interventions aimed at bridging performance gaps and promoting excellence in STEM education for all students in the state (Uloku & Emuobor, 2023; RSIS International, 2025). This study, therefore, seeks to investigate the effect of gender and location on junior secondary school students' achievements in the Mathematics Olympiad in Kaduna State. It aims to provide empirical evidence that can guide educational stakeholders in addressing disparities and fostering a more equitable academic environment.

Statement of the Problem

Mathematics remains a critical subject in the school curriculum, playing a vital role in the development of logical reasoning, problem-solving abilities, and the foundation for careers in science, technology, engineering, and mathematics (STEM). Mathematics Olympiads, in particular, have emerged as important platforms for identifying and nurturing mathematical talent among students. However, despite the recognized importance of these competitions, disparities in students' achievements continue to raise concerns—especially when factors such as gender and school location are considered. In many Nigerian schools, including those in Kaduna State, students' performance in mathematics varies significantly along gender and geographic lines. Research and anecdotal evidence suggest that male students often outperform their female counterparts, which is frequently attributed to societal expectations, gender biases, and unequal encouragement in STEM fields. Simultaneously, students in urban schools tend to have access to better resources, qualified teachers, and extracurricular opportunities such as Olympiad preparation programs, while their rural peers face challenges such as inadequate infrastructure and limited academic support. Kaduna State, with its diverse socio-economic and geographic profile, provides a unique opportunity to investigate how gender and location influence academic performance in competitive mathematics. Yet, there is a noticeable lack of empirical studies that explore the combined effect of these variables on students' achievements in the Mathematics Olympiad at the junior secondary school level within the state. This study, therefore, seeks to fill this gap by examining the extent to which gender and school location affect students' performance in the Mathematics Olympiad. The findings are expected to provide evidence-based insights that can inform educational policies and interventions aimed at promoting equity and excellence in mathematics education across Kaduna State

Aim and Objectives of the Study

The aim of the study was to find the effects of gender and school location on students' achievement in mathematics olympiad among junior secondary school students in Kaduna State. The objectives of the study were to:

1. Determine whether there is a significant difference in Mathematics Olympiad achievement between male and female junior secondary school students.
2. Investigate the effect of school location (urban vs. rural) on the Mathematics Olympiad achievement of junior secondary school students.

Research Questions

The following research questions will be asked in other to guide the study.

1. Is there a significant difference in Mathematics Olympiad performance between male and female students?
2. Does school location (urban vs. rural) influence students' performance in the Mathematics Olympiad?

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Hypotheses

The following hypotheses will be formulated based on research question to be tested at $p \leq 0.05$ level of significance.

$H0_1$: There is no significant difference in performance between male and female students in Mathematics Olympiad at Junior Secondary School level

$H0_2$: There is no significant difference in Mathematics Olympiad achievement between students from urban areas and their counter part from the rural areas

Methodology

This study will adopt a causal-comparative research design (also known as ex post facto design). This design is suitable because it allows the researcher to examine the effects of independent variables gender and school location on the dependent variable students' achievements in the Mathematics Olympiad without manipulating any of the variables. The population for this study comprises all Junior Secondary School (JSS) students in Kaduna State who have participated in the Mathematics Olympiad during the 2024 academic session 220 Junior Secondary School Students This includes students from both urban and rural schools across the three senatorial zones in the state. While the sample were the students that qualified for the second round of the Olympiad sixty-five (65) in number 35 males and 30 females. The primary instrument for data collection is the Mathematics Olympiad performance record sheet, obtained from official competition records, showing students' scores or ranking. The Olympiad questions were set by Professional Examiners and validated by another set of Professors of Mathematics in Ahmadu Bello University, Zaria and Kaduna State University. The examination was supervised and marked by lecturers from tertiary institutions in Kaduna. The Olympiad scores are considered standardized and reliable, as they are based on uniform assessment criteria used in the competition. The results were analyzed using SPSS version 26 in which mean, standard deviation and t test were computed.

Results

Research Question 1: Is there significant difference in students' achievement in Mathematics Olympiad between male and female JSS students in Kaduna State?

To answer this question descriptive statistics of mean, standard deviation and mean difference was used.

Table1: Mean, Standard Deviation and Mean Difference on Gender Achievement

Gender	N	Mean	SD	Mean Difference
Male	35	52.43	16.434	08
Female	30	44.37	15.817	

The results from Table 1 shows that male participants have higher mean than their female counterparts in Mathematics Olympiad (52.43 vs 44.37) which gives the mean difference of 08. However, there is less variability in the scores of the females' participants (15.817 against 16.43). Nevertheless, we can not conclude until the hypothesis is tested.

Research Question 2: Is there significant difference between the achievement of Urban and Rural Participants in Mathematics Olympiad? To answer this question Descriptive statistics of mean, Standard Deviation and Mean Difference were used.

Table 2: Mean, and Standard Deviation of Rural and Urban Participant Achievement.

Source	N	Mean	STD	MD
Urban	55	49.75	15.54	4.50
Rural	10	45.25	21.45	

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The results of the data analysis from Table 2 revealed that Mathematics Olympiad Participants from Urban Area have higher Mean than the participants from the rural area with mean difference of 4.5. More so, the participants from the Urban areas have lower variability in their scores than the participants from the rural area. Yet, decision can not be taken at this level until after the test of hypothesis.

Test of Hypotheses:

Hypothesis 1: There is no significant difference between Male and Female Junior Secondary School Students in Mathematics Olympiad Achievement.

Table 3: T test on Male and Female Achievement in Mathematics Olympiad.

Source	N	Mean	STD	df	T	p	Decision
Male	35	52.43	16.43	63	2.006	0.049	S
Female	30	44.35	15.817				

The results of the t test from Table 3 showed the t value 2.006 >1.96 and p- value 0.049< 0.05 indicate there is significant difference between the performance of male and female students in favor of the male students. Therefore, the null hypothesis is rejected and the alternative hypothesis is required.

Hypothesis 2: There is no significant difference between the achievement of Mathematics Olympiad from the rural and their counterparts from the urban area. To test the hypothesis t test was conducted.

Table 4: T test on Urban and Rural Participants in Math Olympiad Achievement.

Source	N	Mean	SD	Df	T	P	Decision
Urban	55	49.75	15.54	63	-0.622	0.536	NS
Rural	10	45..2	21.45				

The t test results from Table 4 indicated that there is no significant difference between the achievement of rural and Urban participants in Mathematics Olympiad with t=-0.622 <1.96 and p-value 0.536 > 0.05. Consequently, the null hypothesis is retained.

Discussion

This study examined the effects of gender and school location on students 'achievement in mathematics Olympiad among Junior Secondary School Students in Kaduna State. The first finding of the study showed that male students have higher achievement in the Olympiad compared to the female. This finding agrees with the finding of Okonkwo and Yisa (2020) but it disagrees with the findings of Adeyemi and Uche (2019) It is known that the study of gender achievement in Mathematics has been inconclusive for many years. However, the researchers observed that more male participants registered and participated in the Olympiad than their female counterpart. This indicates that male students have higher interest in the participation of the Olympiad this can be a reason for better performance. Not only that, all the overall winners the best four scores are male students this can also support the result of the hypothesis testing.

The second findings of this study revealed that there is no significant difference between the achievement of urban and rural participants in the mathematics Olympiad. This results is in disagreement with the findings of Salihu and John (2021) also that of Aliyu and Ibrahim (2022) who stated that urban students are likely to achieve more in Mathematics Olympiad because rural students are likely to face challenges of qualified teachers and inadequate equipment. Though, more students from urban area registered and participated in the olympaid and more of the urban participants qualified from the first round to second round, there is no statistical difference in between the achievement of the two. One more factor to take note some of the rural participants are not living far from the urban, therefore their schools can be as good as that of urban. In addition to that some of the rural participants are residing near a university and some are from highly educated background as a result of that the urban participant may not have advantages over the ones from rural areas.

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Conclusion

So many factors may affect students' achievement in Mathematics Olympiad such as interest, motivation, preparation to mention a few. However, this study looked at gender and location. The findings show that male students achieve higher than female students at Junior Secondary School Mathematics Olympiad in Kaduna State. However, the achievement of students from rural area is similar to the achievement of students from the urban schools in Mathematics Olympiad.

Recommendations

The following recommendation were made based on the findings:

1. Mathematics teachers and parents of Junior Secondary School students in Kaduna State should try and close the gap between the achievement of Male and Female students in the Olympiad.
2. Mathematics teachers and schools' heads in the rural areas of Kaduna State should encourage more participation of rural students in Mathematics Olympiad
3. Researchers in the state should undertake more research to cover all the three categories that is Primary, Junior Secondary School and Senior Secondary Schools.

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