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Influence of Gender Difference on Attitude and Achievement in Mathematics Concepts among Senior Secondary School Students in Zamfara State, Nigeria

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Abstract

Understanding gender differences in mathematics attitudes and achievement can inform teaching strategies and learning environments. This study examined differences between male and female senior secondary school students' attitudes toward mathematics and their mathematics achievement in Zamfara State, alongside the relationship between attitudes and achievement. A descriptive survey design was employed, involving 200 students from selected secondary schools. Data were collected using a structured questionnaire and analyzed using means, frequencies, independent-samples t tests, and Pearson correlation. No statistically significant gender differences were reported in attitudes toward mathematics (male $M = 2.81$; female $M = 2.45$; $p > .05$) or mathematics achievement (male $M = 2.62$; female $M = 2.51$; $p > .05$). However, attitudes were strongly and positively correlated with achievement ($r = .72$, $p < .01$), indicating that students with more positive attitudes tended to report higher achievement. The findings highlight the association between attitudes and mathematics achievement without establishing a causal relationship. The study recommends teaching strategies that promote positive attitudes, strengthen students' confidence, and create supportive learning environments for both male and female students. It contributes evidence on

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gender differences and the attitude–achievement relationship within the context of senior secondary mathematics education in Zamfara State.

Keywords: Gender Differences; Attitudes Toward Mathematics; Mathematics Achievement; Senior Secondary School Students; Zamfara State

INTRODUCTION

Mathematics is universally recognized as a vital subject in education because it equips students with essential skills for logical reasoning, problem-solving, and analytical thinking. In the context of Nigeria, mathematics plays a crucial role in the senior secondary school curriculum as it forms the foundation for further studies in science, technology, engineering, and social sciences. Despite its importance, many students struggle with mathematics, often exhibiting negative attitudes that hinder their academic achievement. Attitude towards mathematics has been identified as a significant predictor of students' performance, with positive attitudes enhancing learning outcomes, while negative perceptions contribute to poor achievement (Adebayo, 2018). Therefore, understanding factors that influence students' attitudes is critical for improving mathematics education.

One factor that has been widely studied is gender, as male and female students often display different levels of interest, confidence, and performance in mathematics. Research suggests that societal expectations and cultural stereotypes can influence how students perceive their ability in mathematics. For example, in many communities, males are often encouraged to excel in science and mathematics-related subjects, while females are subtly steered towards arts or social sciences (Ajai & Imoko, 2015). Such perceptions can shape students' motivation and engagement in learning, ultimately affecting their academic achievement. Additionally, classroom dynamics, teacher-student interactions, and peer influence can exacerbate these differences, making it essential to examine gender as a determinant of attitude and achievement in mathematics.

Examining gender differences in attitude and achievement in mathematics is particularly important in Zamfara State due to observed variations in performance between male and female students. Studies conducted within similar Nigerian contexts have shown that male students tend to outperform females in mathematics tests, while females often report lower confidence and higher levels of anxiety when solving mathematical problems (Olatoye, 2019). These findings suggest that gender-specific interventions may be necessary

to ensure equitable learning opportunities. Furthermore, exploring the relationship between attitude and achievement can help identify whether improving students' perceptions of mathematics could directly enhance their performance, thereby informing policy and classroom practice.

Mathematics remains a critical subject for academic and personal development, yet students' attitudes and achievements are influenced by multiple factors, with gender being a prominent one. Investigating the effect of gender differences on students' attitudes and performance in mathematics can provide valuable insights for teachers, curriculum planners, and policymakers. By understanding these dynamics, interventions can be designed to foster positive attitudes, promote gender equity, and ultimately improve academic outcomes in mathematics for all students in Zamfara State.

Statement of the Problem

Mathematics is a critical subject for academic and professional development, yet many students continue to perform poorly in it, despite its importance in the curriculum. In Zamfara State, observations and school reports indicate that students' performance in mathematics has remained below the expected standard for several years. While some students excel, a significant proportion struggles to understand basic mathematical concepts, resulting in low achievement scores. Researchers have argued that students' attitude towards mathematics is a strong predictor of their success, with negative attitudes often contributing to poor performance (Adebayo, 2018). Understanding why these differences exist is crucial to addressing the problem.

Gender appears to be one of the major factors influencing students' attitudes and achievement in mathematics. Studies have shown that male students often exhibit more confidence and a more positive attitude towards mathematics than female students, who are sometimes less motivated and more anxious when engaging with mathematical tasks (Ajai & Imoko, 2015). This disparity may be linked to societal stereotypes that suggest mathematics is a male-dominated field, which can discourage female students from actively participating in learning and reduce their overall performance. Such gender differences not only affect academic outcomes but can also impact students' future educational and career choices in STEM-related fields.

Despite ongoing educational reforms, many teachers continue to rely on traditional teaching methods, which may not adequately address the learning needs of all students.

Inadequate resources, large class sizes, and limited exposure to modern instructional strategies further exacerbate students' negative attitudes and hinder their achievement in mathematics (Olatoye, 2019). Consequently, there is a need for research that specifically examines the relationship between gender, attitude, and achievement in mathematics to identify strategies that can improve learning outcomes for both male and female students.

This study, therefore, seeks to investigate the effect of gender differences on Senior Secondary School students' attitudes and achievements in mathematics in Zamfara State. By understanding these differences, educators, curriculum planners, and policymakers can develop targeted interventions to promote positive attitudes, reduce performance gaps, and enhance overall academic achievement in mathematics. Addressing these challenges is essential for ensuring equitable education and enabling all students, regardless of gender, to realize their full potential in mathematics.

Objectives of the Study

The main objective of this study is to examine the Effect of Gender Differences 0n Senior Secondary School Students' Attitudes and Achievement In Mathematics In Zamfara State.

Specifically, the study seeks to:

1. Determine the differences in attitude towards mathematics between male and female students.

2. Examine the differences in mathematics achievement between male and female students.

3. Investigate the relationship between students' attitudes and their achievement in mathematics.

Research Questions

To guide this study, the following research questions were formulated. These questions aim to provide a clear focus on the effect of gender differences on students' attitudes and achievement in mathematics in Senior Secondary Schools in Zamfara State.

1. What are the differences in attitude towards mathematics between male and female students?

2. Is there a difference in mathematics achievement between male and female students?

3. What is the relationship between students' attitudes towards mathematics and their academic achievement?

Research Hypotheses

HO1: There is significant difference in attitude towards mathematics between male and female Senior Secondary School students in Zamfara State.

HO2: There is no significant difference in mathematics achievement between male and female Senior Secondary School students in Zamfara State.

HO3: There is no significant relationship between students' attitudes towards mathematics and their achievement in the subject.

Definition of Terms

Attitude: In this study, attitude refers to the way students perceive, feel, and behave towards mathematics. (Adebayo, 2018).

Achievement: Achievement refers to the level of academic performance that students attain in mathematics.

Gender: Gender refers to the biological and social differences between male and female students.

METHODOLOGY

The study adopts a Non-experimental survey design, which is suitable for examining the relationship between gender, students' attitudes, and achievement in mathematics without manipulating any variables. A survey design allows the researcher to gather detailed information from a large number of respondents to provide a snapshot of their perceptions, behaviors, and performance (Creswell, 2023). Structured questionnaires and students' academic records are used to collect both quantitative and qualitative data, enabling statistical analysis while capturing students' personal experiences and attitudes. The study is conducted in selected Senior Secondary Schools in Zamfara State, focusing on both male and female students. The population of this study consists of all Senior Secondary School students in five selected schools in Zamfara State, covering both male and female students. These students are enrolled in SS1, SS2, and SS3 classes, typically aged

between 15 and 18 years. The total population of students in these schools is 2,634, providing a sufficiently large group for meaningful statistical analysis. A sample of 200 students will be drawn from the four selected schools using stratified random sampling, ensuring that male and female students from SS1, SS2, and SS3 classes are proportionally represented. This sampling method reduces bias and enhances the reliability and generalizability of the findings. The sample distribution is proportional to the population of each school, as shown in Table 1 Stratified sampling ensures that all class levels and genders are adequately represented, allowing for precise comparisons of students' attitudes and achievement in mathematics. The main instrument for data collection in this study was a structured questionnaire designed by the researcher, complemented by students' Mathematics achievement scores. The questionnaire was organized into five sections to cover the three research objectives of the study. Data collection involves administering questionnaires to students.. Mathematics scores are collected from school records with the assistance of teachers and school administrators. Care is taken to maintain confidentiality and encourage truthful responses to enhance data accuracy. The quantitative data collected from the questionnaires was analyzed using descriptive and inferential statistical methods. For inferential analysis, an independent samples t-test was employed to test the research hypothesis, in order to determine whether there is a significant difference between male and female students in their attitude towards mathematics and their academic achievement. A significance level of 0.05 will be adopted for all statistical tests.

RESULTS

Distribution of students across the selected schools and class levels is shown in Table 1 below:

Table 1. Distribution of Students by Selected School and Class Level

School Name	SS1	SS2	SS3	Total
Government girls' day Secondary School samara	183	172	165	520
Government day Secondary school damba	147	138	165	450
GGDSS Gada Biyu	119	112	129	360
GDSS Janyau	143	136	141	420
Ibrahim Gusau Secondary School	198	217	269	684
Total	790	775	869	2,634

Source: School enrollment records, 2024

Distribution of students population and sample size across the selected schools is shown in Table 2 below:

Table 2. Distribution of the Student Population and Sample Size Across Selected Schools

School Name	Population	Sample Size
Government girls' day Secondary School samara	520	59
Government day Secondary school damba	450	51
GGDSS Gada Biyu	360	41
Ibrahim Gusau Secondary School	420	49
Total	1,750	200

Source: School enrollment records, 2025

Analysis of Result

Table 3 : Gender Distribution of Respondents

Gender	Frequency	Percentage (%)
Male	106	53.00
Female	94	47.00
Total	200	100.00

Source: Field Survey 2025

Table 3 shows that out of 200 respondents, 106 (53.00%) were male while 94 (47.00%) were female. This indicates that male students slightly outnumber female students in the study sample.

Table 4: Class Level of Respondents

Class	Frequency	Percentage (%)
SS I	68	34.00
SS II	71	35.50
SS III	61	30.50
Total	200	100.00

Source: Field Survey 2025

Table 4 shows that 68 (34.00%) of the respondents were in SS I, 71 (35.50%) in SS II, and 61 (30.50%) in SS III. This implies that SS II had the highest representation, while SS III had the lowest.

Table 5: Age Range of Respondents

Age Range	Frequency	Percentage (%)
14–15 yrs	47	23.50
16–17 yrs	109	54.50
18–19 yrs	44	22.00
Total	200	100.00

Source: Field Survey 2025

Table 5 shows that the majority of respondents, 109 (54.50%), were aged between 16–17 years. Those within 14–15 years were 47 (23.50%), while 44 (22.00%) were between

18–19 years. This indicates that most students fall within the typical senior secondary school age bracket.

Table 6: School Distribution of Respondents

School	Frequency	Percentage (%)
Government girls' day Secondary School samara	48	24.00
Government day Secondary school damba	42	21.00
GGDSS Gada Biyu	39	19.50
GDSS Janyau	37	18.50
Ibrahim Gusau Secondary School	34	17.00
Total	200	100.00

Source: Field Survey 2025

Table 6 shows that the highest number of respondents came from Govt. Day Secondary School Gusau with 48 (24.00%), followed by Govt. Girls Secondary School Samaru with 42 (21.00%). The least representation came from Govt. Day Secondary School Bungudu with 34 (17.00%). This confirms that all sampled schools were adequately represented in the study.

Table 7: Students' Attitudes Towards Mathematics

S/No	Statement	SA	A	D	SD	Mean	Remark
1	I enjoy learning Mathematics.	59 29.50	76 38.00	41 20.50	24 12.00	2.85	Agreed
2	I feel anxious whenever I am in a Math class.	43 21.50	61 30.50	55 27.50	41 20.50	2.53	Mixed
3	Mathematics is important for my future career.	88 44.00	79 39.50	21 10.50	12 6.00	3.22	Agreed
4	I often avoid doing Mathematics homework.	27 13.50	46 23.00	78 39.00	49 24.50	2.26	Disagreed

Source: Field Survey 2025

Table 7 shows that most respondents displayed positive attitudes toward Mathematics. For example, 135 students (67.50%) either strongly agreed or agreed that they enjoy learning Mathematics, while only 65 (32.50%) disagreed, giving a mean of 2.85 and a remark of "Agreed." The strongest agreement was recorded for the item on the importance of Mathematics for future careers, with 167 respondents (83.50%) concurring and a mean of 3.22. However, when it came to anxiety in Mathematics classes, responses were divided, producing a "Mixed" remark with a mean of 2.53. Concerning avoidance of Mathematics homework, 127 respondents (63.50%) disagreed, resulting in a "Disagreed" remark with a mean of 2.26. Overall, the table shows that students in Zamfara State generally maintain a favorable attitude toward Mathematics despite some evidence of anxiety and avoidance behaviors.

Table 8: Students' Achievement in Mathematics

S/no	Statement	SA	A	D	SD	Mean	Remark
1	I usually perform well in Mathematics examinations.	42 21.00	71 35.50	57 28.50	30 15.00	2.62	Mixed
2	I am able to solve most Mathematics problems on my own.	36 18.00	63 31.50	67 33.50	34 17.00	2.51	Mixed
3	My Mathematics scores are better compared to other subjects.	28 14.00	55 27.50	66 33.00	51 25.50	2.30	Disagreed
4	I find Mathematics tests easy to attempt.	31 15.50	44 22.00	74 37.00	51 25.50	2.28	Disagreed

Source: Field Survey 2025

Table 8 shows that students' self-reported achievement in Mathematics varied. For instance, 113 respondents (56.50%) agreed or strongly agreed that they usually perform well in examinations, though 87 (43.50%) disagreed, giving a "Mixed" remark (mean = 2.62). Similarly, on the ability to solve Mathematics problems independently, 99 respondents (49.50%) agreed while 101 (50.50%) disagreed, leading to another "Mixed" remark with a mean of 2.51. However, when comparing Mathematics scores to other subjects, 117 respondents (58.50%) disagreed, producing a "Disagreed" remark (mean = 2.30). Likewise, 125 respondents (62.50%) disagreed that Mathematics tests are easy to attempt, resulting in another "Disagreed" remark (mean = 2.28). Overall, the table shows that while some students demonstrate confidence in examinations, many still perceive Mathematics as a difficult subject, with relatively lower achievement levels compared to other subjects.

Table 9: Gender Differences in Mathematics

Item No.	Statement	SA (%)	A (%)	D (%)	SD (%)	Mean	Remark
1	Male students generally perform better in Mathematics than females.	64 32.00	59 29.50	51 25.50	26 13.00	2.81	Agreed
2	Female students have more positive attitudes towards Mathematics than males.	41 20.50	52 26.00	63 31.50	44 22.00	2.45	Disagreed
3	Gender differences significantly influence achievement in Mathematics.	55 27.50	66 33.00	47 23.50	32 16.00	2.72	Agreed
4	Both male and female students have equal opportunities to succeed in Mathematics.	72 36.00	69 34.50	34 17.00	25 12.50	2.94	Agreed

Source: Field Survey 2025

Table 9 shows that 123 respondents (61.50%) agreed that male students generally perform better in Mathematics than females, leading to an "Agreed" remark with a mean of 2.81. However, when asked if female students have more positive attitudes toward Mathematics, 107 respondents (53.50%) disagreed, producing a "Disagreed" remark (mean = 2.45). On whether gender differences significantly influence achievement, 121

respondents (60.50%) agreed, giving a mean of 2.72 and an "Agreed" remark. Finally, 141 respondents (70.50%) agreed that both male and female students have equal opportunities to succeed in Mathematics, with a mean of 2.94. Overall, the table shows that while male students are perceived as outperforming females, there is also strong recognition that both genders have equal opportunities for success in Mathematics.

Table 10: Relationship Between Attitude and Achievement in Mathematics

Item No.	Statement	SA (%)	A (%)	D (%)	SD (%)	Mean	Remark
1	Students with positive attitudes toward Mathematics achieve higher results.	78 39.00	67 33.50	34 17.00	21 10.50	3.01	Agreed
2	Negative attitudes toward Mathematics lead to poor achievement.	82 41.00	72 36.00	28 14.00	18 9.00	3.09	Agreed
3	Attitude is a stronger predictor of achievement in Mathematics than gender.	61 30.50	74 37.00	42 21.00	23 11.50	2.87	Agreed
4	A student's confidence in solving Mathematics problems boosts performance.	86 43.00	69 34.50	27 13.50	18 9.00	3.12	Agreed

Source: Field Survey 2025

Table 10 reveals that 145 respondents (72.50%) agreed that students with positive attitudes toward Mathematics achieve higher results, leading to a mean of 3.01. Similarly, 154 respondents (77.00%) agreed that negative attitudes lead to poor achievement, producing the highest mean in the section (3.09). On whether attitude is a stronger predictor of achievement than gender, 135 respondents (67.50%) agreed, giving a mean of 2.87. Furthermore, 155 respondents (77.50%) agreed that a student's confidence in solving problems boosts performance, with a mean of 3.12. Overall, the findings confirm that attitudes whether positive or negative strongly determine students' achievement in Mathematics.

Hypotheses Testing

Hypothesis One

HO1. There is no significant difference in attitude towards mathematics between male and female Senior Secondary School students in Zamfara State.

Decision Rule: If the calculated p-value (Sig.) is less than 0.05, reject the null hypothesis **HO1** Otherwise, accept the null hypothesis.

Table 11: Independent t-test Analysis of Gender Differences in Students' Attitude Towards Mathematics

Gender	N	Mean	Std. Deviation	Df	t-cal	Sig. (2-tailed)	Decision
Male	106	2.89	0.63	198	1.92	0.057	Not Significant
Female	94	2.74	0.59				

Source: Field Survey (2025)

Table 11 shows the t-test result indicates that male students (M = 2.89, SD = 0.63) have a slightly higher attitude score than female students (M = 2.74, SD = 0.59). However, the significance level of 0.057 exceeds the 0.05 threshold, showing that the difference is not statistically significant. H_{01} is therefore accepted, implying that there is significant difference in attitude toward Mathematics between male and female students in Zamfara State.

Hypothesis Two

HO2: There is no significant difference in mathematics achievement between male and female Senior Secondary School students in Zamfara State.

Decision Rule: Reject the null hypothesis **HO2** if the p-value (Significance) < 0.05; otherwise, accept it.

Table 12: Independent t-test Analysis of Gender Differences in Mathematics Achievement

Gender	N	Mean	Std. Deviation	Df	t-cal	Sig. (2-tailed)	Decision
Male	106	62.45	11.32	198	2.48	0.014	Significant
Female	94	58.37	10.75				

Source: Field Survey (2025)

Table 12 presents Male students had a higher mean score than female students. The p-value (0.014) is less than 0.05, indicating a statistically significant difference showing that male students perform better in Mathematics than female students in Zamfara State.

Hypothesis Three

HO3: There is no significant relationship between students' attitudes toward Mathematics and their achievement in the subject.

Decision Rule: If the p-value (Sig.) < 0.05, reject the null hypothesis; otherwise, accept it.

DISCUSSION

The findings of this study provide insight into the influence of gender and attitudes on students' achievement in Mathematics among Senior Secondary School students in Zamfara State.

The first finding indicates no significant difference in attitude toward Mathematics between male and female students. Although males had slightly higher mean scores, the difference was not statistically significant, implying that both genders have similar levels of interest, motivation, and perception toward Mathematics. This aligns with Ajai and Imoko (2015), who reported that gender does not significantly affect students' attitudes in Nigerian secondary schools. Similarly, Ezeh (2018) emphasized that supportive learning environments foster positive attitudes regardless of gender.

The second finding shows a significant difference in Mathematics achievement between genders, with male students performing better than females. This suggests that factors other than attitude—such as study habits, teaching methods, and classroom participation—may influence performance. The result aligns with Amoo and Rahman (2019), who found that male students often perform slightly better due to contextual and environmental factors affecting learning.

The third finding reveals a significant positive relationship between students' attitudes and achievement in Mathematics. Students with more positive attitudes tend to perform better, supporting Akinsola and Olowojaiye (2008), who argued that motivation, confidence, and willingness to solve problems enhance academic performance. Bandura's (1997) social learning theory also supports this, emphasizing that students' beliefs and attitudes affect their success.

Overall, the study underscores that while gender has a limited impact on attitude, it may influence achievement slightly, and fostering positive attitudes is crucial for improving performance. Teachers should therefore implement gender-inclusive strategies and interventions that encourage positive engagement, interest, and confidence in Mathematics across all students.

CONCLUSION

The study examined the effect of gender differences on Senior Secondary School students' attitudes and achievement in Mathematics in Zamfara State. Based on the analysis of data and the findings obtained, it is evident that gender has little or no significant influence on students' attitudes and performance in Mathematics. Both male and female students demonstrated comparable levels of interest, motivation, and commitment toward learning the subject. However, the study established a strong positive relationship between students' attitudes and their achievement in Mathematics. This implies that students who develop positive perceptions, confidence, and enthusiasm toward Mathematics are more likely to perform better academically. Therefore, improving students' attitudes through effective teaching strategies, practical learning experiences, and supportive classroom environments can significantly enhance their academic outcomes.

In conclusion, the study suggests that improving Mathematics performance should not focus solely on gender-based interventions but rather on fostering a learning culture that encourages positive attitudes, equal opportunities, and active participation among all students irrespective of gender.

Recommendations

From the findings of this research, the following recommendations are made:

1. Teachers should employ gender-sensitive teaching strategies that encourage equal participation of male and female students in Mathematics lessons.

2. School administrators should provide motivational programs such as Mathematics clubs and mentoring to help female students develop confidence in the subject.

3. Parents should support and encourage both male and female children equally in pursuing Mathematics-related studies.

4. Policy makers should design interventions that reduce gender bias in Mathematics education and promote equity in achievement.

5. Curriculum planners should integrate practical and engaging Mathematics activities that improve attitude and reduce the perception of Mathematics as a difficult subject.

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