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Self-Efficacy and Test Anxiety as Predictors of Achievement in Uni-Dimensional Mathematics Objectives Test: A Study of Secondary School Students in Calabar, Nigeria

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Abstract

This study examined the influence of self-efficacy and test anxiety on mathematics achievement among Senior Secondary School One (SSSI) students in Calabar Metropolis, Cross River State, Nigeria. An ex post facto research design was adopted, involving a sample of 309 students selected through stratified random sampling. Data were collected using a structured questionnaire and a standardized Uni-Dimensional Mathematics Objectives Test. Two hypotheses were tested using the One-Way ANOVA statistical technique. Results indicated that self-efficacy had a significant positive impact on students' achievement in mathematics, while test anxiety was found to significantly impair mathematical performance. The findings underscore the importance of psychological factors in academic success and highlight the need for interventions at both the instructional and institutional levels. The study recommends that educators implement teaching strategies that bolster students' self-efficacy while minimizing test anxiety. Furthermore, schools are advised to introduce structured programs targeting anxiety reduction, such as relaxation techniques, mindfulness practices, and effective test-taking

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strategies. These measures are essential for enhancing mathematics achievement and overall academic outcomes in senior secondary education.

Keywords: Self-efficacy; Test anxiety; Predictors; Achievement; Mathematics; Objectives test

INTRODUCTION

Mathematics is a fundamental pillar of Science, Technology, Engineering, and Mathematics (STEM) education, serving as a critical tool for problem-solving, logical reasoning, and innovation (Marzuki, *et al.,* 2024). As a core subject in secondary education, mathematics equips students with analytical skills necessary for careers in engineering, medicine, data science, and other technologically driven fields.

The level of students' achievement in mathematics has far-reaching implications for national development, as proficiency in the subject enhances workforce competence, scientific research, and industrial advancements. Countries with strong mathematical education systems tend to experience rapid technological growth and economic progress, reinforcing the need for improved mathematics education to drive sustainable development and global competitiveness. Hence, Mathematics is considered a corner stone of education (Akpalu, *et al.,* 2025).

In Nigeria, mathematics plays a central role in the national educational curriculum, yet students' performance in the subject remains a persistent concern. Despite its significance in shaping future careers and contributing to national growth, many students struggle with mathematics, often due to factors such as low self-efficacy and high levels of test anxiety (Eze & Nwafor, 2022). These psychological factors can hinder students' ability to perform to their full potential, leading to poor academic outcomes that affect their career choices and, ultimately, the country's technological and scientific advancement. Improving students' achievement in mathematics is therefore critical, as it directly influences the nation's ability to produce skilled professionals in various STEM fields, contributing to the nation's economic development and innovation capacity (Adebayo & Okeke, 2020).

The constructs of self-efficacy and test anxiety are pivotal in understanding students' academic achievement in mathematics. It is one of the personal contributory factors that

determine students success in mathematics (Zakariya, 2022). Self-efficacy is therefore an individual's belief in their ability to successfully execute tasks and achieve specific goals.

In the context of mathematics, students with high self-efficacy are more likely to approach mathematical problems with confidence, persistence, and effective problem-solving strategies. Conversely, students with low self-efficacy may avoid challenging tasks and may give up easily in the face of difficulties, which negatively impacts their academic performance (Odiri, 2020).

On the other hand, test anxiety refers to the physiological and psychological responses experienced by students when faced with formal assessments. It often manifests as nervousness, fear of failure, and worry about performance, which can impair students' ability to think clearly and perform optimally during tests. Test anxiety has been shown to decrease students' focus and concentration, leading to subpar academic outcomes (Ogunleye & Adebayo, 2022). Together, these two constructs (self-efficacy and test anxiety) play a significant role in shaping students' approach to learning and their achievement in mathematics, making them essential factors to explore in understanding and addressing students' struggles with the subject.

The choice of Calabar Metropolis, Cross River State, Nigeria for this study is essential due to ongoing concerns about students' performance in mathematics. Enamhe, et al., (2024) reechoed this worrisome situation in Cross River when it was observe previous results showing poor performance in mathematics thereby causing "worry and heart ache to parents, school administrators, government, Non- Governmental organizations(NGOs), teachers and students themselves because the poor performance in mathematics has jeopardize the hope of many students from gaining admission into tertiary institutions"

While self-efficacy and test anxiety are known to influence academic achievement, their specific impact on Uni-Dimensional Mathematics Objectives Tests within this context remains underexplored. This study will provide insights that can help educators and policymakers develop strategies to boost students' confidence, reduce anxiety, and enhance mathematics achievement, ultimately improving learning outcomes and fostering interest in STEM-related fields.

Problem Statement

Despite the importance of mathematics in secondary education, students' performance in the subject is increasingly poor and worrisome in both internal and external examination

among the students in Nigeria Ogar, *et al.,* 2024). Reports from West African Examination Council (WAEC) and National Examination Council (NECO) highlight persistent underachievement, raising concerns about the factors influencing students' success.

While instructional methods have been widely studied, psychological factors such as self-efficacy and test anxiety may also play a critical role in shaping students' achievement in Uni-Dimensional Mathematics Objectives Tests. Low self-efficacy can lead to avoidance of mathematical tasks, while high test anxiety disrupts concentration and recall, both negatively affecting achievement. However, limited research has examined their combined impact within Calabar Metropolis, Cross River State, Nigeria. This study seeks to fill this gap by investigating how these psychological constructs predict students' mathematics achievement, providing insights for educators and policymakers to enhance learning outcomes.

Research Objectives

The main purpose of the study was to examine Self-Efficacy and Test Anxiety as Predictors of Senior Secondary School Students' Achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State-Nigeria. Specifically, the objectives were, to:

i. examine the relationship between self-efficacy and Senior Secondary School Students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria;

ii. determine the influence of test anxiety on Senior Secondary School Students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria.

Research Questions

i. What is the relationship between self-efficacy and senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria?

ii. To what extent does test anxiety influence senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria?

Research Hypotheses

The following null hypotheses guided the study:

H_{01}: There is no significant relationship between self-efficacy and senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria.

H_{02}: Test anxiety has no significant influence on senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria.

Literature Review

Self-Efficacy and Senior Secondary School Students' Achievement in Mathematics

Self-efficacy, defined as an individual's belief in their ability to accomplish specific tasks (Bandura, 1997), plays a crucial role in senior secondary school students' achievement in mathematics. Students with high self-efficacy engage actively in problem-solving, persist in challenging tasks, and adopt positive learning strategies, which enhance their academic performance (Usman & Akpan, 2021). Conversely, low self-efficacy students often experience anxiety, avoid difficult problems, and demonstrate reduced effort, leading to poor achievement (Adebayo & Okeke, 2020). Research suggests that self-efficacy significantly predicts mathematics achievement independent of cognitive ability, as students with strong confidence in their skills are more likely to set realistic goals, employ effective study techniques, and seek academic support when needed (Ogunleye & Ijeoma, 2019). Teachers also influence students' self-efficacy through instructional strategies, positive reinforcement, and creating supportive learning environments that foster confidence in mathematical abilities (Adeyemi & Salisu, 2021). By strengthening students' self-efficacy through targeted interventions, their mathematical competence and overall academic success can be significantly improved (Eze & Nwafor, 2022).

Odiri (2020) examined the relationship between students' self efficacy and their achievement in mathematics. The method used for the study was correlation design. Samples of 500 students were randomly selected from 25 public secondary schools in Delta central Senatorial District. Questionnaires were drawn to gather data on students' self efficacy, while students' results in mathematics were collected from their various schools to gather data on achievement in mathematics. Two research questions and two hypotheses

were formulated to guide the study. All hypotheses were tested at the 0 .05 level of significance by using linear regression and ANOVA. The following are the major findings: There was a significant relationship between students' self efficacy and mathematics achievement. There was a significant difference in mathematics achievement between high self efficacy and low self-efficacy.

In a related study, Ayotola and Adedeji (2009) investigated the relationship between Mathematics Self-Efficacy and achievement in Mathematics. Three hundred and fifty-two (352) Senior Secondary 2 students in Oyo State were used for the study. Three hypotheses were used. The results show no significant difference between male and female achievement in Mathematics. Also, no significant difference was also obtained between male and female Mathematics Self-Efficacy and Mathematics achievement. The paper recommend that teacher should find ways of enhancing Mathematics Self- Efficacy in student and should place emphasis on student's confidence to succeed in Mathematics achievement.

Test anxiety and Senior Secondary School Students' Achievement in Mathematics

Test anxiety, characterized by excessive worry and nervousness in evaluative situations, significantly affects senior secondary school students' achievement in mathematics. High levels of anxiety can impair concentration, reduce working memory, and hinder problem-solving skills, leading to poor academic performance (Okon & Eze, 2021). Mathematics, being a subject that requires logical reasoning and sequential thinking, is particularly impacted by test anxiety, as students under stress may struggle to recall learned concepts and apply them effectively (Ogunleye & Adebayo, 2022). Addressing test anxiety through effective coping strategies, such as relaxation techniques and confidence-building activities, can help students improve their academic outcomes in mathematics.

Yakubu, *et al.* (2019) investigated the relationship between Mathematics test anxiety and achievement of SS3 students in Kafanchan Educational Zone, Kaduna state. Results revealed that; there was a negative relationship between test anxiety and achievement of students in Mathematics and that there was no significant difference in the mean achievement scores of male and female students. Another study by Ilo and Unachukwu (2024) 'investigated test anxiety as predictor of academic achievements of secondary school students in Anambra State' found that test anxiety is a predictor of academic achievement of students in English language and Mathematics.

Yarkwah, *et al.* (2024) explored the effect of test anxiety on students' academic performance in mathematics at the senior high school level. The results showed a significant negative correlation between anxiety levels and academic performance. Female students were found to have higher levels of test anxiety compared to male students. Teachers should priorities improving students' comprehension of mathematical concepts and create a nurturing learning atmosphere that promotes experimentation and minimizes the fear of making mistakes. Accordingly, Yasdani, *et al.* (2024), argued that the higher levels of test anxiety, does correspond to lower achievement in mathematics. Hence, Benson (2025) recommended the adoption of specialized teaching methods and other psychological interventions within pedagogical practices to help reduce anxiety and improve performance in mathematics.

METHODOLOGY

This study adopted a descriptive survey design with an ex post facto approach to examine the relationship between self-efficacy, test anxiety, and students' achievement in a Uni-Dimensional Mathematics Objectives Test (UMOT) focused on algebra, consisting of 30 items. The population comprised 3,094 Senior Secondary School One (SS1) students from 26 public secondary schools in Calabar Metropolis, covering Calabar South and Calabar Municipal Local Government Areas. Specifically, Calabar Municipal had 941 male and 1,227 female students, while Calabar South had 403 male and 523 female students. A sample of 309 students, representing approximately 10% of the total population, was selected using a stratified random sampling technique to ensure proportional representation of male and female students from both Local Government Areas. Data collection was carried out using two instruments: the Self-Efficacy and Test Anxiety Questionnaire (SETAQ), a structured questionnaire assessing students' levels of self-efficacy and test anxiety in mathematics, and the UMOT, a researcher-developed mathematics test designed to measure students' competencies in algebra in a structured and standardized manner. The instruments were validated by experts in measurement and evaluation, who reviewed the items for clarity, relevance, and appropriateness, and their feedback informed necessary modifications. To ensure reliability, a pilot study was conducted with 30 students from a school in Ikom Urban, outside the study area. The Cronbach's Alpha method was used to determine the internal consistency of the instrument, yielding a reliability coefficient of

0.85, indicating a high level of reliability. Data collected were analyzed using One-Way Analysis of Variance (ANOVA) to examine the relationship between the independent variables (self-efficacy and test anxiety) and the dependent variable (academic achievement in mathematics) among secondary school students.

RESULTS

The analysed data from the study are presented in the tables below:

Hypothesis One: There is no significant relationship between self-efficacy and senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria.

Table 1: Summary of ANOVA analysis of the relationship between self-efficacy and senior secondary school students' achievement in Mathematics (N=309).

Self-Efficacy Level			N	Mean	SD
Low			102	24.78	6.532
Average			108	28.45	7.120
High			99	31.92	6.875
Total			309	28.38	7.103
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	512.294	2	256.147	5.210	0.006
Within Groups	14984.219	306	48.979		
Total	15596.513	308			

*p>.05, df= (2, 306), critical f=3.00

Table 2: Fishers' LSD post hoc test analysis on the influence of self-efficacy on students' academic achievement in Mathematics (N=309).

Available	High (n=99)	Moderate (n=108)	Low (n=102)
High	31.92[a]	3.47[b]	7.14[b]
Average	2.56[c]	28.45	3.67
Low	1.89	1.76	24.78
		MSW=48.98	

P < 0.05

a=Group mean along the principal diagonal

b=Mean differences above the principal diagonal

c=t-values above the principal diagonal

The hypothesis was tested using One-Way Analysis of Variance (ANOVA) at a 0.05 level of significance and 2, 306 degrees of freedom. The result in Table 1 indicated an F-value of 5.210, df = 2, 306, and $p < 0.05$, showing that self-efficacy has a statistically significant influence on students' academic achievement in mathematics. Based on this result, the null hypothesis is rejected, indicating a significant influence of self-efficacy on students' achievement. The post-hoc multiple comparison results in Table 2 indicate that among the three groups, students with high self-efficacy significantly outperformed those with moderate and low self-efficacy. Similarly, students with moderate self-efficacy performed significantly better than those with low self-efficacy.

Hypothesis Two: Test anxiety has no significant influence on senior secondary school students' achievement in a Uni-Dimensional Mathematics Objectives Test in Calabar Metropolis, Cross River State, Nigeria.

Table 3: One-Way Analysis of Variance (ANOVA) of the Influence of Test Anxiety on Students' Academic Achievement in Mathematics (N=309).

Test Anxiety Level			N	Mean	SD
Low			107	32.15	6.981
Average			104	28.62	7.432
High			98	25.04	6.738
Total			309	28.60	7.276
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	625.317	2	312.659	6.435	0.002
Within Groups	14890.742	306	48.676		
Total	15516.059	308			

*p>.05, df= (2, 306), critical f=3.00

Table 4: Fishers' LSD post hoc test analysis on the influence of test anxiety on students' academic achievement in (N=309).

Available	Low Anxiety (n=107)	Moderate (n=108)	Low (n=102)
Low Anxiety	32.15a[a]	3.53[b]	7.11[b]
Moderate Anxiety	2.78[c]	28.62	3.58
High Anxiety	1.99	1.46	25.04
		MSW=48.68	

MSW = 48.98, P < 0.05

a=Group mean along the principal diagonal

b=Mean differences above the principal diagonal

c=t-values above the principal diagonal

The hypothesis was tested using One-Way Analysis of Variance (ANOVA) at a 0.05 level of significance and 2, 306 degrees of freedom. The result in Table 3 showed an F-value of 6.435, df = 2, 306, and $p < 0.05$, indicating a statistically significant influence of test anxiety on students' academic achievement in mathematics. Consequently, the null hypothesis is rejected, confirming that test anxiety significantly affects students' mathematics performance.. The post-hoc multiple comparison test results in Table 4 provide further insights into the significant differences in mathematics achievement among students with varying levels of test anxiety. The mean differences and t-values indicate that students with low test anxiety (Mean = 32.15) performed significantly better than those with moderate (Mean = 28.62) and high test anxiety (Mean = 25.04). The comparison between low and moderate test anxiety groups shows a mean difference of 3.53, which is statistically significant ($p < 0.05$), suggesting that moderate levels of test anxiety negatively impact students' academic performance compared to those with low anxiety. Similarly, a mean difference of 7.11 between low and high anxiety groups further confirms that high test anxiety is associated with significantly lower academic achievement. Furthermore, the comparison between moderate and high anxiety groups shows a mean difference of 3.58, which is also statistically significant ($p < 0.05$), reinforcing the pattern that as anxiety increases, academic achievement decreases. The t-values in the upper diagonal of the table indicate that the differences between low and high anxiety groups are the most

pronounced, suggesting that test anxiety has a substantial impact on students' ability to perform well in mathematics.

DISCUSSION

The findings of the study revealed that self-efficacy had a significant influence on senior secondary school students' achievement in mathematics, aligning with findings of Yarkwah, *et al.* (2024); Yasdani, *et al.* (2024); Benson (2025), etc. Self-efficacy, as described by Bandura (1997), refers to an individual's belief in their ability to successfully perform specific tasks, and this belief significantly impacts students' approach to learning mathematics. Students with high self-efficacy demonstrate persistence, employ effective problem-solving strategies, and engage actively in mathematical tasks, leading to improved academic performance (Usman & Akpan, 2021). Conversely, those with low self-efficacy often exhibit avoidance behaviours, increased anxiety, and reduced effort, which negatively affect their achievement (Adebayo & Okeke, 2020). The study by Odiri (2020) further supports these findings, demonstrating a significant positive relationship between students' self-efficacy and mathematics achievement, emphasizing that students with high self-efficacy consistently outperform those with low self-efficacy. Similarly, the research by Ayotola and Adedeji (2009) found that while there was no significant gender difference in self-efficacy and mathematics achievement, fostering students' confidence in their mathematical abilities remains crucial for improved performance. These findings highlight the need for educational strategies that enhance self-efficacy, such as providing constructive feedback, setting achievable learning goals, and creating a supportive classroom environment. By reinforcing students' confidence in their mathematical abilities, teachers can help improve overall academic achievement in mathematics.

The findings of this study indicated that test anxiety significantly influenced senior secondary school students' achievement in mathematics, which aligns with existing literature. Test anxiety, often manifested as excessive worry and nervousness in evaluative situations, can impair students' cognitive processes, including concentration and working memory, ultimately leading to poor academic performance (Okon & Eze, 2021). Given that mathematics requires logical reasoning and structured problem-solving, students experiencing high anxiety may struggle to recall concepts and apply them effectively, further exacerbating their difficulties in the subject (Ogunleye & Adebayo, 2022). The study

by Yakubu, *et al.* (2019) supports these findings, demonstrating a significant negative relationship between test anxiety and mathematics achievement, as students with higher anxiety levels performed worse in mathematics assessments. Similarly, Yarkwah, *et al.* (2024) found that fear of failure, exam preparedness, and instructional quality contributed to mathematics test anxiety, with female students experiencing higher anxiety levels than their male counterparts. These findings highlight the importance of implementing strategies to manage test anxiety, such as relaxation techniques, confidence-building exercises, and supportive teaching methods. Teachers should prioritize fostering a positive learning environment that reduces fear of failure and encourages conceptual understanding, which can help students perform better in mathematics despite test-related anxiety.

CONCLUSION

The findings of this study have established that both self-efficacy and test anxiety significantly influence senior secondary school students' achievement in mathematics. Students with high self-efficacy tend to exhibit greater persistence, employ effective problem-solving strategies, and demonstrate higher academic performance, whereas those with low self-efficacy often struggle with mathematical tasks due to a lack of confidence in their abilities. Conversely, test anxiety negatively impacts students' cognitive functions, leading to impaired concentration, reduced working memory, and lower achievement in mathematics. These findings underscore the critical role of psychological factors in shaping students' academic outcomes, emphasizing the need for targeted interventions to enhance self-efficacy while mitigating test anxiety.

Addressing these psychological factors is crucial for improving students' mathematical performance and overall academic success. Schools, teachers, and educational policymakers must implement strategies that foster a supportive learning environment, boost students' confidence in their mathematical abilities, and equip them with coping mechanisms to manage test anxiety. Without such interventions, students may continue to struggle with mathematics, which could ultimately limit their academic and career opportunities in science, technology, engineering, and mathematics (STEM) fields.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Teachers should adopt instructional strategies that encourage mind-set of growth, such as providing positive reinforcement, using differentiated teaching methods, and incorporating collaborative learning activities.
2. Teachers should create opportunities for students to engage in real-world problem-solving tasks that can also boost their self confidence in applying mathematical concepts.
3. Schools should implement mentorship programs where high-achieving students can support their peers, fostering a culture of academic resilience and motivation.
4. Teachers should prioritize fostering a positive learning environment that reduces fear of failure and encourages conceptual understanding, which can help students perform better in mathematics despite test-related anxiety.
5. Schools should introduce structured test anxiety management programmes that include relaxation techniques, mindfulness exercises, and effective test-taking strategies.
6. Counselling services should be made available in schools to help students develop coping mechanisms to help reduce anxiety and enhance performance in mathematics.
7. Policymakers should also integrate psychological support into the curriculum by training teachers to recognize and address students' emotional and academic needs.

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