

Academic Anxiety as Predictor of Students' Academic Achievement in Mathematics in Public Secondary Schools in Anambra State

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Abstrak : The study investigated academic anxiety as a predictor of students' academic achievement in Mathematics in public secondary schools in Anambra State. One research questions and one null hypotheses tested at 0.05 level of significance guided the study. The study adopted a correlational research design. The population of the study consisted of 19,048 SS2 students from 267 public secondary schools in Anambra State. Two instruments were used for data collection: the Academic Anxiety Scale (AAS) and Mathematics Achievement Scale (MAS). The instruments were subjected to face and construct validation. The reliability of the instrument were established Using kuder Richardson formula 20 (K-R20) for Mathematics Achievement Scale (MAS) and Cronbach is Alpha (α) academic Anxiety Scale (AAS) with coefficient values of .771 and .821 respectively. The data were collected by the research assistance who were briefed on how to administer and retrieve copies of the instrument. The completed copies of the questionnaire were collected on the spot. Data collected were analyzed using simple regression. Findings of the study revealed that academic anxiety significantly predicts students' academic achievement in mathematics. It was recommended that schools employ qualified counselors and psychologists who can provide regular counseling sessions to students, especially those identified as having high levels of academic anxiety. This study makes a significant contribution to the understanding of how anxiety impacts students' achievements in mathematics, revealing that anxiety is a critical factor influencing academic achievement. It was also recommended that the educational policymakers in Anambra State develop policies that address academic anxiety as a critical factor in student achievement.

INTRODUCTION

Education has played a key role in the sustainability of human society from long ago and in the education system, academic achievement is an issue that, every year, devotes a huge amount of research to itself and the factors affecting it have attracted the attention of education psychologists, and other education professionals, for years. Education is for preservation, transformation, transfer and advancement of knowledge and it is also devoted to bring changes for the good of the society. The importance of education lies in the fact that it is considered as a key for bolstering human resource for sustainable economy and social change (Karatas, et al 2013). In our world today mathematics education has grown beyond ordinary counting. Mathematics has metamorphosed into statistics, calculus and geometry. The early Babylonians and Egyptians employed mathematical principles in their daily life to achieve a variety of tasks, including building like the pyramids and designing fields with square corners.

Owing to the aforementioned, it is obvious that the importance of mathematics in everyday life cannot be over emphasized. Mathematics is a fundamental part of school curriculum as a subject and acts as a tool for the development of other sciences. Mathematics is essential in every facet of life as numeracy skills become a requirement to function effectively in daily life (Gafoor & Kurukkan, 2015). Mathematics stimulates involvement and success in many careers especially those in the fields of Science, Technology, Engineering, and Mathematics (STEM) (Ferguson et al., 2015). Due to the significance of mathematics in our everyday life, teaching and learning of it is of great importance, but difficulties abound. Many students have fear and loathsome experiences about mathematics which may lead to poor educational outcome. In education, student's educational outcomes and achievement are evaluated and graded using examinations/tests. Testing is common in everyday life as students have to take many highly competitive centralized and high stakes examination such as the Common Entrance Examination (C.E.E.), First School Leaving Certificate Examination (F.S.L.C.E.), Junior Secondary School Certificate Examination (J.S.C.E), Senior Secondary School Certificate Examination (S.S.C.E.), Unified Tertiary Matriculation Examination (UTME), and a host of others.

These series of examinations play a dramatic role in the lives of students and their parents. Tests and examinations at all stages of education, especially at secondary education level have been considered an important and powerful tool for decision making in our competitive society. Student's success is judged by test performance while the best criterion of performance is the sum of the student's academic achievement in all the subjects taken. On the other hand, poor student's academic achievement is a performance that judged by the examinee and some other significant as falling below an expected standard (Mekonnen, 2014). In other words, achievement in these high stakes examinations is crucial for moving from one level of education to another, and also to gain access into prestigious careers. Such practices in most cases, in the view of Ibeawuchi and Iruloh (2017), put considerable pressure on the students. This form of anxiety is known as academic anxiety. The level of anxiety can fluctuate over time in response to both internal and external stimulation.

Ngwoke et al. (2013) succinctly observed that many Nigerian students at all levels exhibit high level of academic anxiety in testing conditions. This often resulted in debilitating anxiety, high proneness to cheating in examination and consequently low student's academic achievement. This form of anxiety is known as academic anxiety. Developing a state of anxiety in academic field may impair attention span, concentration and memory which can result in

having a negative effect on the academic performance of the individual due to formation of false anticipation of threatened self-esteem. If academic anxiety is not properly addressed, it can have many serious and lasting consequences, such as causing a student to procrastinate, perform poorly on schoolwork, fail classes and withdraw from socializing with peers or pursuing activities that interest him. Science instructors, educational psychologists, educational specialists, curriculum designers, and educational psychologists have all consistently looked into the contextual and individual aspects that may be changed to raise students' math proficiency. Academic anxiety is a psychological condition that manifests as fear, varying degrees of worry, and uncertainty prior to, during, and following academic activity. It occurs when someone exhibits signs of anxiety as a result of their homework or the stress that comes with it.

In educational and psychological research, anxiety is recognized as a variable with dual effects on performance. While mild levels can energize individuals, promoting preparation and alertness, excessive anxiety often undermines critical thinking and problem-solving abilities. For teachers, heightened anxiety may reduce clarity of instruction, weaken confidence, and limit classroom engagement. Conversely, when managed effectively, it can act as a motivator, encouraging better planning and responsiveness to student needs. Striking a balance between its positive and negative influences is essential to sustaining teaching effectiveness and overall professional growth in educational settings. Anxiety is defined by Aronson et al., (2019) as a psychological motivator, meaning it propels individuals into action, heightening alertness.

Students grapple with fears, encompassing the dread of failure, fear of being labeled as such, and other stressors that induce tension, nervousness, and impair time management (Alam, 2017). Anxiety is defined as a complex emotional response, which involves feelings of fear, worry, and uneasiness, often accompanied by muscular tension, restlessness, fatigue, and concentration issues (Alemu & Feyssa, 2020). Although appropriate in certain situations, prolonged and excessive anxiety can lead to anxiety disorders (Beilock et al., 2017). Anxiety profoundly influences human personality and behavior, emerging when life pressures become overwhelming. The psychological and physiological facets of anxiety wield substantial impacts on behavior, fostering irritability, unpredictable mood swings, and heightened susceptibility to anger. Anxiety disorders, widespread mental health concerns, are linked to lower academic achievement (Caviola et al., 2022).

Academic anxiety is specifically defined as heightened worry and unease related to educational performance, encompassing concerns about grades, exams, and overall academic achievement (Shahrouri, 2016). In the realm of education, academic anxiety can be described as the emotional distress students experience, including fear of failure and societal judgment, adversely affecting learning engagement (Zhang, 2022). Academic anxiety is characterized as an excessive and persistent stress response to academic challenges, leading to cognitive interference, impaired concentration, and hindered problem-solving abilities (Fishstrom et al., 2022). Academic anxiety can be understood as a form of performance-related nervousness, manifesting in students as they face evaluative situations, potentially hindering optimal cognitive functioning. Academic anxiety, like other forms of anxiety, is one of the most pervasive reactions that individuals have to stress. Academic anxiety reflects in students' performance at a different point in time, especially when undertaking a test, or an examination (Habibullah & Ashraf, 2013). Some anxieties are normal and often help someone to stay mentally and physically alert. Too much anxiety can result in emotional or physical distress,

difficulty concentrating and emotional worry, which influence the student's academic achievement negatively.

Student academic achievement refers to the level at which a student meets established educational goals. It reflects the outcomes of learning and the degree to which specific academic objectives have been attained. Academic achievement is crucial as it opens doors to competitive opportunities and prepares students for future careers. It also significantly influences their chances of gaining university admission and securing employment (Caviola et al., 2021). A primary measure of academic success is students' performance in tests and examinations, which serves as an indicator of their mastery of subject content (Brandt et al., 2020). Given the importance of academic achievement, particularly in core subjects like mathematics, it becomes essential to examine factors that may influence it. Academic anxiety, a common issue among students, is one such factor that can hinder performance.

Statement of the Problems

Mathematics as a science subject has a lot of complexities that put a lot of students on constant fear during examination. Performance in Mathematics has continued to be poor in national examination in spite of the numerous studies which have been conducted with aim of improving the student's academic achievement in the subject. This problem has posed a major threat to the teaching/learning environment. Most of the studies done previously have focused on factors like attitude towards Mathematics by students, teachers' attitude towards learners' abilities, insufficient teaching and learning resources, and unsuitable teaching methodologies as factors that influence Mathematics student's academic achievement. In learning, cognition is determined and influenced by affective factors. Among the affective factors, academic anxiety may be affective factor which also influences learning. Anxiety can have detrimental effects on both the individual and the organization.

In Anambra State's public secondary education system, the pervasive struggle with mathematics is compounded by the often-neglected factor of academic anxiety. The specific problems arising when the needs related to academic anxiety are unmet are interconnected and impactful. Firstly, a lack of exploration into the impact of academic anxiety on academic achievement leaves educators without strategies to address underperformance, perpetuating a cycle of struggling students. Therefore, this study seeks to explore academic anxiety as a predictor of students' academic achievement in mathematics in Anambra State's public secondary schools.

Research Questions

The study was guided by the following research questions:

1. What is the predictive value of variation in students' academic achievement in Mathematics that can be predicted by academic anxiety?

Hypotheses

The following null hypotheses were formulated to guide the study at 0.05 level of significance.

1. There is no statistically significant variation in students' academic achievement in mathematics that can be predicted to academic anxiety.

METHOD

This study adopted correlational research design. Correlational research is a type of non-experimental research method in which a researcher measures two variables, understands and assesses the statistical relationship between them with no influence from any extraneous variable. Correlation research design was adopted because the study seeks to determine the predictive value of variation in students' academic achievement in Mathematics that can be predicted by academic anxiety. The research was conducted in Anambra State, Nigeria, which was chosen based on its strong academic preparedness. Over the past five years, the state has consistently secured positions one to five in the WAEC standards. Anambra State is located in the southeastern region of the country. Anambra State is bounded by Delta State to the west, Imo State to the south, Enugu State to the east and Kogi State to the north. Anambra State is primarily inhabited by Igbo ethnic group (98%) and a smaller Igala population (2%). Anambra State covers an area of 4,416sqKm, has tropical rain forest vegetation, humid climate with population of 4,055,048 people, according to 2006 census. Anambra State, located in southeastern Nigeria, is made up of 21 local government areas, with Awka serving as the state capital. Awka is well known for its traditional craft industries, particularly blacksmithing and wood carving. In terms of educational administration, the state is divided into six education zones to enhance effective coordination and development of the education sector.

The Aguata Education Zone comprises Aguata, Orumba North, and Orumba South Local Government Areas. The Awka Education Zone includes Awka North, Awka South, Njikoka, Anaocha, and Dunukofia. The Nnewi Education Zone covers Nnewi North, Nnewi South, and Ekwusigo. The Ogidi Education Zone is made up of Idemili North, Idemili South, and Oyi. The Onitsha Education Zone encompasses Onitsha North, Onitsha South, and Ogbaru. Finally, the Otuocha Education Zone consists of Anambra East, Anambra West, and Ayamelum Local Government Areas. The people of Anambra State are predominantly engaged in commerce, academia, and industrial ventures.

The study encompassed the entire population of 19,048 male and female students enrolled in senior secondary two (SS II) across all public secondary schools in Anambra State. This population is made up of 8505 males and 10,575 females out of 133,334 students in 267 public secondary school in six (6) Education Zones in Anambra State (PPSSCE, 2022). The choice of this class of students for this study was because they are not new to their school and they are not examination class and will be available for the study. Also, SSII is where students are being prepared for exposure to external examinations such as West African Senior Secondary School Certificate Examination (WASSCE) National Examination Council (NECO), Joint Admission and Matriculation Board (JAMB) and so on.

The sample size for this study comprises 400 students. Simple random sampling technique gives each element in the population equal and independent chance of being included in the sample. Simple random sampling technique was used to select three zones (namely Nnewi, Ogidi, and Onitsha) out of six education zones in Anambra State (namely Aguata, Awka, Nnewi, Ogidi, Onitsha and Otuocha). In each of the three Zones, simple random sampling technique was used to select five public secondary schools. In each of the selected schools, stratified random sampling technique was used due to gender, location and place of residence. The sample size of the study comprised 133 students from Nnewi, 134 students from Ogidi, and 133 students from Onitsha education zones respectively. Detailed sample

distribution across gender, school location and place of residence is shown in the appendix 2, page 132.

The data collection instruments utilized in this study included the Academic Anxiety Scale (AAS) and Mathematics Achievement Scale (MAS). Academic Anxiety Scale (AAS) adapted from Oluoch, Aloka and Odongo (2018) is made up of two sections. Section A contains the demographic data of respondents such as name of school, sex, location and place of residence while section B contains the questionnaire based on research questions with response format of Very High Extent (VHE = 4 points), High Extent (HE =3 points), Low Extent (LE=2 points) and Very Low Extent (VLE=1 point).

Mathematics Achievement Scale (MAS): This test was adapted from Chukwu (2014) in order to assess the level of acquisition of geometrical concepts of the students. It covered the following topics (Plane geometry, Menstruation, Trigonometry) in geometry taught in SS2 up to the third term of the school year. It consists of 20 item multiple-choice questions with 4 options A-D and was constructed to cover three taxonomy of learning objectives (cognitive, affective and psychomotor domains). The table of specification for the construction of MAS is shown in the Appendix 4. The test items were scored manually. Each correct answer attracted one mark while, a wrong answer was scored zero. The level of achievement of a student is taken to be the student's total test score.

The face and construct validity of Academic Anxiety Scale (AAS) and Mathematics Achievement Scale (MAS) were determined. The researcher did this by consulting three experts which include two educational psychometrics and an educational psychologist in the Department of Educational Foundations Chukwuemeka Odumuegwu Ojukwu University Anambra State who examined and made necessary corrections and remark.

Construct validity of the instrument was explored using Principal Component Analysis (PCA) approach. The Kaiser - Meyer - Olkin (KMO) value which is used as a measure of sampling adequacy was obtained as 0 .787. The higher value of this result which was greater than .500 indicated the number of respondents in the study was large enough to perform the PCA. According to Bartlett's test of Sphericity which is used to check whether the data come from multivariate normal distribution or not was applied and the result was found to be significant (chi-square = 1189.939, $p < .000$). A total of six (6) factors having eigenvalues higher than 1 were obtained according to Kaiser's criterion of 1. The six factors were responsible for 12.044%; 22.032%; 31.276%; 39.387%; 46.348%; 53.050% of the total variance respectively. Visual inspection of the screen plot also confirmed the factorial structure of the instrument. Items with factor loading lower than .400 were expunged from the instrument.

The instruments were trial tested in a public secondary school in Enugu State. This was because the study was carried out in Anambra State so as to ascertain its true consistency and dependability. The researcher administered copies of the instruments to 30 SS11 mathematics students in the public secondary school. The data obtained were used for the calculation of the reliability indices. Kuder Richardson formula 20 (K-R20) was used in the calculation of the reliability index of Mathematics Achievement Scale (MAS) while Cronbach's Alpha (α) was used in the calculation of the reliability indices of Academic Anxiety Scale (AAS). The reliability indices yielded showed the questionnaire to reach acceptable reliability. $\alpha = .821$ for Academic Anxiety Scale (AAS) and $\alpha = .771$ for Mathematics Achievement Scale (MAS).

The researcher employed a direct delivery and retrieval method in administering the instruments. The researcher briefed seven research assistants who were instructed on the relevance of the study and method of administering the instruments to avoid faking. A total of 400 copies of questionnaire were distributed to the respondents, after which 396 were retrieved and used for data analysis giving 99% return rate. The data generated was analyzed using simple regression analysis to answer the research questions and simple regression to test the null hypotheses at 0.05 level of significance using Statistical Package for Social Science (SPSS) Version 26. Research question was interpreted using real limit of numbers as cited by Nworgu (2015) .01- 0.39 – weak prediction , 0.40 – 0.59 – moderate prediction, 0.60 – 0.99 – strong prediction, For Hypotheses, if p-value is less than or equal to 0.05 alpha level ($p \leq 0.05$), the H_0 will be rejected, but if p-value is greater than 0.05 alpha level, the H_0 will not be rejected.

RESULTS

Research Question I

What is the predictive value of variation in students' academic achievement in Mathematics that can be predicted by academic anxiety?

Table 1.

Simple Regression Analysis of the Variation of Students' Academic Achievement in Mathematics that Can Be Predicted to Academic Anxiety.

Model	R	R	Adjusted	Std Error	Change	Statistics		Sig. F	
		Square	R	of the	R ²	F	df ₁		df ₂
			Square	Estimate	Change	Change			
1	.406	.165	.163	11.31489	.165	.323	1	398	.009

Predictor: (Constant), Academic Anxiety

Table 1 showed the regression analysis for the variation in students' academic achievement in Mathematics that can be attributed to academic anxiety. The result showed that when the scores from the responses of students on academic anxiety were correlated with their academic achievement scores in Mathematics, a correlation coefficient (R) of 0.406 with associated coefficient of determination (R²) of 0.165 were obtained. This coefficient of determination (R²) of 0.165 denoted 16.5% variation in students' academic achievement in Mathematics can be attributed to academic anxiety.

Hypothesis I

There is no statistically significant variation in students' academic achievement in mathematics that can be predicted to academic anxiety.

Table 2.

Regression ANOVA Test of Significance For the Variation In Students' Academic Achievement In Mathematics That Can Be Predicted to Academic Anxiety.

<i>Model</i>		<i>Sum of Squares</i>	<i>df</i>	<i>Mean square</i>	<i>F</i>	<i>Sig</i>	<i>Decision</i>
1	Regression	41.395	1	41.395	.323	0.009	Sig.
	Residual	50954.605	398	128.027			
	Total	50996.000	399				
Dependent Variable: Students academic achievement predictor: (Constant), Academic anxiety							

Result in Table 2 depicted that the variation in students' academic achievement in mathematics that can be attributed to academic anxiety is significant ($F(1,398) = .323, P = 0.009$). This gave the fact that the associated probability value of 0.009 when compared with 0.05 level of significance at which the hypothesis was tested was found to be significant because 0.009 was less than 0.05. Hence, the null hypothesis was rejected, and the inference drawn was that academic anxiety was a significant factor for predicting students' academic achievement in mathematics in public secondary schools in Anambra State.

Discussion

The relationship between academic anxiety and students' achievement in mathematics has been a subject of extensive research with varying findings depending on the context, population, and methods used. In the current study conducted in public secondary schools in Anambra State, it was observed that academic anxiety significantly impacts students' achievement in mathematics. The findings indicate that academic anxiety accounted for a statistically significant portion of the variance in students' academic achievement in Mathematics. Specifically, the correlation coefficient (R) and the coefficient of determination suggest that academic anxiety explained 16.5% of the variation in Mathematics achievement among students. This finding agreed with Agbor et al (2020), who found that anxiety contributed to the performance variance in secondary school mathematics results. In contrast, Cooper and Robinson (2021) reported a higher predictive value which they attributed to differences in cultural attitudes toward mathematics learning.

The analysis further revealed that the variation explained was statistically significant, as evidenced by the regression ANOVA results in Table 6, $F(1,398) = 0.323, p = 0.009$. Since the p-value was less than 0.05, the null hypothesis was rejected, affirming that academic anxiety significantly predicts students' achievement in mathematics. This finding is consistent with the work of Caviola et al, (2021), who also observed a significant negative correlation between anxiety and mathematics performance, concluding that anxiety acts as a performance-inhibiting factor. Similarly, in a related study, Çağırğan and Soytürk (2021) emphasized that

high anxiety levels impair problem-solving accuracy and speed, thus reducing overall achievement scores.

However, in contrast, Cooper and Robinson (2021) found no significant predictive relationship between academic anxiety and mathematics achievement in a sample of students from rural schools in Enugu State. They suggested that limited exposure to standardized testing in rural areas may reduce performance pressure, thereby weakening the anxiety–achievement link. This contrasts with the present study, where the public secondary school setting in Anambra State possibly exposes students to competitive academic environments, thus amplifying the role of anxiety.

Furthermore, the adjusted R^2 value of 0.163 indicates a minimal shrinkage from the R^2 value, implying a stable predictive model. This aligns with findings from Carroll and Iles (2016), who reported similar stability in predictive strength when assessing test anxiety effects across multiple academic subjects. In another related study, Xiao (2013) observed that academic anxiety’s predictive effect was stable across both male and female student groups, although the intensity varied.

From an educational psychology perspective, the 16.5% variance explained suggests that while academic anxiety is a significant factor, other variables—such as instructional quality, socio-economic background, and study habits—account for a larger proportion of the performance gap. This observation supports the findings of Bimayu et al (2020), who stressed that interventions targeting both emotional regulation and cognitive skill-building are more effective than focusing solely on anxiety reduction.

CONCLUSION

The study on sought to determine the extent to which academic anxiety influences students’ performance in mathematics, as well as to examine variations in achievement across gender, school location, and place of residence (boarders and non-boarders). The findings revealed that academic anxiety significantly predicts students’ achievement in mathematics, indicating that higher levels of anxiety are generally associated with lower performance. This underscores the fact that emotional and psychological factors are as crucial as cognitive abilities in determining learning outcomes, particularly in a subject like mathematics that is often perceived as challenging.

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