PREDICTING ACADEMIC ACHIEVEMENT USING MATHEMATICS ANXIETY AMONG SENIOR SECONDARY SCHOOL STUDENTS'

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ABSTRACT

This study investigated Mathematics anxiety as predictor of academic achievements of Senior Secondary School Students. Three research questions guided the study. The study adopted a descriptive survey design. The population of the study consists of three hundred (300) students in public senior secondary school in Ijebu-Ode Local Government Area of Ogun State. Two instruments were used for this study. The instruments are (i) Mathematics Anxiety Scale (MAS) and Mathematics Achievement Test (MAT). The data collected were analyzed using multiple regressions analysis. The finding of the study showed that Mathematics anxiety predicts students' academic achievement. The findings also revealed that gender significantly predicts students' academic achievement in Mathematics. Based on the findings, it is concluded that Mathematics anxiety is a predictor of both male and female students' academic achievement, it is therefore recommended among others that Mathematics teachers should be trained periodically in order to have ideas of innovative approaches of teaching Mathematics to avoid Anxiety in secondary school.

Keywords: Academic achievement, Anxiety, Gender, Predicting, Mathematics

INTRODUCTION

Mathematics is a core science subject and a tool for the development of any science based discipline (Fajemidagba *et al.,* 2012). This particular fact has always created the impression that the learning of Mathematics is exclusively reserved for science students. The truth remains that the need for the learning of Mathematics has now gone beyond Mathematics for only school student. But now, Mathematics is for life, hence, it now cuts across every sphere of life, given the level of sophistry in digitalization, scientific and technological advancement as the predominant trend in our society (Olaniyan, 2023).

Mathematics is a science of magnitude and number that is very useful virtually in all subject areas (Schenkel, 2020). This is because all fields of studies are dependent on it for problem solving and prediction of outcomes. Competency in Mathematics learning is vital to any individual and nation in domestic and business deals, scientific discoveries, technological breakthrough, problem-solving and decision making in different situations in life (Waikato, 2018). Researchers' have stressed that Mathematics is indispensable because it has substantial use in all human activities and in other school subjects, (Eraikhuemen & Ahunsi, 2014). Despite the importance of Mathematics, students' academic achievement worsens as years go by. For Mathematics education to be meaningful, the students' achievement should be paramount.

Unfortunately, students' achievement in this important subject is usually not good at secondary levels of education in sub Saharan Africa (Schenkel, 2020). The conceptions, attitudes, and expectations of students regarding Mathematics and Mathematics teaching have been considered to be very significant factors underlying their school experience and achievement

(Ochwo, 2020). In many cases, students have been found to approach Mathematics as procedural and rule-oriented. This prevents them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject (Roh, 2019).

Academic achievement is commonly measured through examinations or continuous assessments but there is no general agreement on how it is best evaluated or which aspects is most important procedural knowledge such as skills or declarative knowledge such as facts. A school with more academic achievements would receive more money than a school with less achievement (Amanda Szabo-Reed, 2018). High achievement in Mathematics is seemed to be associated more with males than females. This has led many people to believe that Mathematics is male domain (Gappi, 2013). In contrast, people who hold this view roughly equate Mathematics achievement with gender.

Gender in this context refers to males and females secondary school students who offer Mathematics. The place of gender cannot be ignore when studying issue related to schools, has gender differences in Mathematics teaching, learning and achievement have been explained on different basis (Rahmon *et al.,* 2021). To many people "MATH" is a scary four-letter word; they do not like it or feel that they are good at it. The decline in achievement in Mathematics by students in senior schools has created anxiety in students and has strengthens the perception that they are weak in Mathematics. This response will ultimately be a belief that has to change. Majority of students experience Mathematics anxiety since elementary school to their current stage. The construct of Mathematics anxiety typically refers to the emotional and mental distress that occurs in some students while attempting to understand Mathematics. Though in practice, it is somewhat ill defined. It can have detrimental effects for senior school students including feeling of nervous tension, fear of rejection, and stress (Truttschel, 2016).

Green and Allerton (2019) described mathematics anxiety as the state of mind developed through personal experience, and individual emotional response to these experiences. They further explained that, negative feelings towards learning of Mathematics arise as a consequence of a range of encounters relating to the way Mathematics is presented, taught and learnt by individuals. Sheffield and Hunt (2017) opined that, Mathematics anxiety is the feeling of anxiety that some individuals experience when facing mathematical problems. They further assert that, like other form of anxiety, students may feel their heart beat more quickly or strongly, they may believe that they are not capable of completing mathematical problems, and avoid attempting Mathematics courses.

Among all the negative effects of anxiety in Mathematics, what is more discussed than others are the negative relationship between Mathematics anxiety and achievement in Mathematics. This negative relationship describes research findings that students with high level of math anxiety, gain low level of success (Putwain & Daniels, 2017). The negative effects of anxiety on students' achievement in Mathematics have gained a remarkable attention from researchers for several years. Bessant (2019) indicates that mathematics anxiety shows a multi-dimensional structure and contains three dimensions. These dimensions are: Mathematics exam anxiety, numeric anxiety and abstraction anxiety.

Observation has shown that Mathematics anxiety has become one of the factors contributing to the decline of the academic achievements of the students (John, 2023). Therefore, this paper focuses on predicting academic achievement using Mathematics anxiety among the public senior secondary school students. The general objective of this study is to predict students'

achievement among the public senior secondary school using Mathematics anxiety. However, the specific objectives of this study are to:

1. Examine the extent of Mathematics anxiety on students' academic achievement among the public senior secondary school students.
2. Examine the extent of Mathematics anxiety on male students' academic achievement among the public senior secondary school students.
3. Examine the extent of Mathematics anxiety on female students' academic achievement among the public senior secondary school students.

Three research questions were raised, in order to achieve the stated objective, which include the following:

1. To what extent will Mathematics anxiety predicts students' academic achievement among senior secondary school students?
2. To what extent will Mathematics anxiety predict male students' academic achievement among senior secondary school students?
3. To what extent will Mathematics anxiety predict female students' academic achievement among senior secondary school students?

METHODOLOGY

This study used a descriptive survey research design, and the sample of 300 SS2 students from six public senior secondary schools in Ijebu-ode Local Government Area, Ogun State, was chosen using a simple random sampling technique. The sample is made up of both male and female students (mixed school).

Instrumentation

Two instruments were used in this study to elicit information from the respondent. The instruments are (i) Mathematics Anxiety Scale (MAS) and (ii) Mathematics Achievement Test (MAT). The Mathematics Anxiety Scale was divided into two sections. The first section requires the participants' demographic information. This include age, gender, class etc. The second section comprises of items in relation to the research objectives which the students will respond to the instrument by indicating their agreement level on a four point type scale such as Strongly Agee, Agree, Disagree and Strongly Disagree. The copies of the instrument were given to experts in the field of psychology education for comments on the adequacy of items in terms of clarity of language and relevancy of items, their contributions and suggestions were used to improve the quality of the instrument. The validated instrument was trial tested on fifty (50) students from another school different from the sample for the research, the reliability coefficient using Cronbach alpha reliability coefficient was estimated to be 0.82.

The MAT consists of 20 items to assess students' academic achievement in Mathematics. This instrument is a multiple choice test consisting of 20 items with four options per question. The questions selected are from New General Mathematics Senior Secondary School Two (SS 2). The 20-items MAT was administered on a sample of 50 SS 2 students in another school different from the sample. From the students' responses, a reliability coefficient of 0.72, using the split half method was obtained while the face and content validity of instrument was determined by experts in Mathematics Education which confirmed the usability of the instrument for eliciting the needed responses from the respondent.

The selected schools were visited by the researchers and permission was taken from the school authority then the respondents were briefed on the purpose of the study and clarification was

made on the importance of the study. The mathematics teachers in each school assisted to ensure the instruments are filled correctly as the respondents were assured of the confidentiality of their responses. The data collected was analyzed using multiple regression analysis.

Data Analysis

Table1: Analysis of Respondents' Age

Age	**Frequency**	**Percentage**
10-15yrs	114	38.0%
16-20yrs	126	42.0%
21-35yrs	60	20.0%
Total	300	100%

The above table shows that 38% of the respondents are of the age range of 10-15yrs, 42% of the respondents are of the age range of 16-20yrs while 20.0% of the respondents falls in the age range of 21-35 years. The result shows that majority of the respondents falls within the age range of 10-15yrs.

Table 2 Analysis of Respondents Sex

SEX	FREQUENCY	PERCENTAGE
MALE	165	55%
FEMALE	135	45%
TOTAL	300	100%

The above table shows that 55% of the respondents are male while 45% of the respondents are female. The result shows that majority of the respondents are male.

Research Question

RQ1: To what extent will mathematics anxiety predicts students' academic achievement among senior secondary school students?

Table 3: Regression Analysis of Research Question Two

MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Mathematics Anxiety	0.212	0.053	0.048	0.049672

ANALYSIS OF ANOVA

Model	Sum of square	df	Mean Square	F	Sig
Regression	3.812	1	3.812		
Residual	74.572	317	0.314	17.457	0.000
Total	78.277	318			

The result in table 3 reveals that Mathematics anxiety significantly predict students' academic performance ($R=0.212$, $F=17.457$, $p<0.05$) .The table further revealed that the R square value of 0.048, adjusted R- square of 0.048 was obtained as regression coefficients. This implies that

the independent variables (Mathematics anxiety) are accounted for 53% (R square= 0.053). Since 0.00 < 0.05, it therefore implies that mathematics anxiety predicts students' academic achievement among senior secondary school students.

RQ2: To what extent will mathematics anxiety predict male students' academic achievement among senior secondary school students?

Table 4: Regression Analysis of Research Question Two

R = 0.283
R2 =0.080
Multiple R2(adjusted)=0.079
Standard error of estimate=0.566

Analysis of variance

Model	Sum of square (SS)	df	Mean square	F	Sig.
Regression	16.667	1	16.667	52.070	0.000[b]
Residual	190.773	596	0.320		
Total	207.440	597			

The table shows that independent variable (mathematics anxiety) will significantly predict male students' academic achievement among senior secondary school student, this is shown by the value of R =.283 and R^2 (adjusted) =.079, P = .000. However, the result shows that mathematics anxiety will predict male students' academic achievement among senior secondary school students

(P<0.05).

RQ3: To what extent will mathematics anxiety predict female students' academic achievement among senior secondary school students?

Table 5: Regression Analysis of Research Question Three

R = 0.203
R^2 =0.041
Multiple R^2(adjusted)=0.040
Standard error of estimate= .578

Analysis of variance

Model	Sum of square (SS)	df	Mean square	F	Sig.
Regression	8.540	1	8.540	25.590	0.001[b]
Residual	198.900	596	0.334		
Total	207.440	597			

The table shows that independent variable (mathematics anxiety will predicts academic achievement in mathematics, this is shown by the value of R =.203 and R^2 (adjusted) =.041, P = .001. However, the result shows that mathematics anxiety will predict female students' academic achievement among senior secondary school students (P<0.05).

DISCUSSION OF FINDINGS

The study examined the impact of mathematics anxiety on senior secondary school students' academic performance. Findings revealed that mathematics anxiety predict students' academic achievement among senior secondary school. The findings of the study correlate with the findings of Buckley *et al.* (2016) when they found that students avoid Mathematics lessons because of their anxiety towards it resulting in poor performance in mathematics.

Findings also revealed that mathematics anxiety will predict male students' academic achievement among senior secondary school. This result is in harmonious with the findings of Hillsdale *et al.,* (2016) whose findings showed that there is no gender difference of students' performance in mathematics as a result of anxiety. They argued that anxiety affects male students' academic achievement in mathematics the same way it affects female

Lastly from the study, it was revealed mathematics anxiety will predict female students' academic achievement among senior secondary school. The result is in-line with Srivastava, *et al.,* (2016) mathematics anxiety among secondary school students is in relation to gender academic achievement, suggesting that mathematics anxiety is passed on from year to year from junior to senior high school among girls.

CONCLUSION

The following conclusions were drawn based on the findings of the study that:

1. The findings revealed that mathematics anxiety is a predictor of students' academic achievement in Mathematics among senior secondary schools in Ijebu ode local government area of Ogun State. Hence when students possess high anxiety it will affect the academic outcome that is low in achievement
2. The findings also showed that gender has significant influence on student's achievement and the interaction between gender and mathematics anxiety has significant influence on senior secondary school student's academic achievement.

RECOMMENDATIONS

It is therefore recommended that selected preventive activities can be proposed at senior secondary schools to target students with academic problems by the school administrators and teachers. Also, Mathematics Teachers should be trained periodically in order to have ideas of innovative approaches of Teaching Mathematics to avoid Anxiety. More so, further research can be carried out in other subject areas and more students variables can be considered alongside.

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