

THE EFFECTS OF MATHEMATICS ANXIETY ON THE ACHIEVEMENT OF SENIOR SECONDARY TWO STUDENTS IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE

By

Jerry Z.Y, Desmond B.B, Rose Z.

Department of Science and Technology Education University of Jos, Nigeria & Department of Computer Science University of Jos, Nigeria. yaksman1245@gmail.com,

Abstract

Mathematics has been viewed as a tough subject due to factors like anxiety and methods used for teaching. Anxiety itself has resulted to poor performance in the subject Mathematics. This study was designed to investigate the effects of Mathematics anxiety on the achievement of senior secondary two (SS2) students in Jos North Local Government Area of Plateau State. The study was guided by one research question and one hypothesis. The hypothesis was formulated based on the research question and was tested at 0.05alpha level of significance. Survey research design was adopted for the study. A sample of 120 senior secondary two students was selected from a population of 4234 for the study. Two instruments were used in gathering data for the study. The instruments were; the Mathematics Anxiety Scale Questionnaire (MASQ) adopted from Driscoll and Mathematics Achievement Scores (MAS). The MASQ instrument were 4-point Likert type Scales. The data collected were analyzed using SPSS software. Mean and standard deviation were used to answer the research question while chi-square for testing independence was adopted to test the hypothesis. The findings showed that Mathematics anxiety exists among senior secondary two students and has great effects on their achievement in Mathematics. The findings also revealed that there is a significant relationship between anxiety and students' achievement in Mathematics. The educational implications were pointed out and the following recommendations were made; The Government through the ministry of education should direct teachers to identify Mathematics anxiety among Secondary School Students develop means of helping them overcome the anxiety for effective teaching and learning of mathematics in schools, workshops or refreshed courses should be organised for all Mathematics teachers annually at National, State and local offices level so as to guide mathematics teachers to create positive attitude toward Mathematics for effective teaching and learning of Mathematics, teachers should always find ways of creating and sustaining students interest in Mathematics, among others.

Keywords: *Senior secondary, school, Mathematics, anxiety, Achievement.*

1. Introduction

The fear of learning and comprehension of Mathematics by students has gained a remarkable attention from educational researchers over the years (Yakubu, 2018). Yakubu again stated that Mathematics will always remain to have positive effects on the lives of humans though the attempt to find answers to questions is not disputable everywhere, every day and every time, Everyone is involved including both housekeepers and labourers with application of Mathematics.

Mathematics is tagged father of all sciences; nevertheless it suffers some major setbacks (Umar, 2011). Umar also noted that one of the major setbacks is Mathematics anxiety and the extent it affects students' learning performance in Mathematics. Outside the school walls, Mathematics is often associated with pain and frustration by many. These are issues of the negative experiences associated with Mathematics.

Mathematics anxiety has been defined by Tobias, (2006) as feelings of tension and fear that interferes with the manipulation of numbers and the solving of Mathematical problems in a wide variety of ordinary life and academic problem or situation. Due to Mathematics anxiety many students get scared of Mathematics concepts and symbols and this to a large extent has effect on students' performance in Mathematics (Suinn, 2010). He opines that poor performance

of students in Mathematics has left a wrong impression about learning mathematics and understanding Mathematics which has gone a long way in affecting students' self confidence in the subject and that at this stage, Mathematics becomes a nightmare to many and of course it becomes their worse subject in the school. The question that often arises is 'what causes Mathematics anxiety'? Is it the parents' perception or teachers themselves? Or better still the circumstances surrounding school environment and the student? Most at times, anxiety develops as a result of fear and expectation (Mkpaoro, 2006). Mkpaoro again noted that fear is a basis of all anxiety and to a certain level it is absolutely necessary for our survival, it is only a disease when it becomes all consuming, and without objectiveness.

Anxiety, while studying Mathematics, is a major predictor of academic achievement in the subject (McCraty, 2007). Little is known that there exist a possible association between high level of anxiety and low academic performance among students. Researchers such as Gitome,(2003), Aronen(2007) and McCraty,(2007) revealed that high levels of anxiety influence on the decrease of working memory, distraction, and reasoning in students. Tobias (2006) has recognized that anxiety plays significant role in student's learning and academic performance; moreover anxiety has been known to have both facilitating and debilitating effects on academic achievement.

Haralson, (2002) and Sheffield and Hunt, (2006) indicated that with Mathematics anxiety, like any kind of anxiety, people may have some physical symptoms such as feeling faint, shortness of breath, headache, shakiness, dry mouth, cold sweats, strong heart beat and excessive perspiration. Moreover, there are several psychological symptoms of math anxiety such as negative self-talk, panic or fear, worry and apprehension, desire to flee the situation or avoid it altogether. Furthermore, they can have feelings of mental disorganization, incoherent thinking, feeling of failure or worthlessness, extreme tension and nervous, and inability to recall material studied. Additionally, Sheffield and Hunt, (2006) supported the notion that math anxiety has a direct impact on performance on Mathematics tasks. Therefore, math anxiety is experienced as an emotional reaction to situations requiring or involving mathematics that interferes with the capability to successfully perform Mathematical operations. Students who have Mathematics anxiety and believe they are not capable of completing mathematical problems may avoid taking any Mathematics course or at least taking one in a timely manner within a college course of studies.

Yakubu, (2018) stated that Mathematics anxiety is usually linked to prior negative Mathematics experience. These could include being punished by present or past teachers for failing to solve mathematics concepts, having a bad grade on Mathematics in school, lack of encouragement from parents or teacher, and/or lack of positive role models. These prior negative experiences with math are often transferred to new situations and result in a lack of understanding of Mathematics. Haralson, (2002) stated that few mathematics classes are structured in such a way as to relieve anxiety. There will always be time limits, right answers and competition, and the fear of looking or feeling "stupid" in front of the others. Cornell, (1999) listed several ways of teaching that contributed to math anxiety. These included teachers' assumptions about students' knowledge, teacher use of obscure vocabulary of math without enough explanation of meaning of the terminology being used (e.g., divisors, integers, quotients, multipliers) and incomplete instructions. Students often feel frustration because of the lack of explanation in the sub-steps of mathematical procedures. Additionally, too many skill and drill exercises contribute to anxiety and perceptions of senselessness, which in turns leads to frustration at not being able to keep up with the class. The sequential nature of mathematics instruction becomes difficult if a student did not immediately grasp the procedures or concepts being taught at a specific point in time (Brady & Bowd, 2005). Therefore, issues such as the overemphasis on rote memory and the fact those

Mathematics instructions is often presented in isolation, as an end in itself, and with little connection to the real life contribute to math anxiety and subsequent Mathematics failure.

Jackson and Leffingwell, (1999) studied the role of instruction in creating mathematics anxiety in students from kindergarten through high school. The study found that 16% of the participants had negative experiences with math teaching as early as grades three and four. For instance, students stated that they experienced difficulty in areas such as working with parts of numbers, that is fractions, rather than whole numbers which was stressful. Moreover, some math instructors were characterized as being either hostile or insensitive. Teacher behavior included exhibiting anger when students ask for extra assistance, or pointing out student errors to the entire class. Gender bias also emerged as a factor as some instructors reportedly indicated that girls do not need math or girls were ridiculed more often than boys and received less additional assistance when they encountered difficulty. Additionally, Jackson and Leffingwell, (1999) reported that 26% of the students surveyed at the high school level stated they encountered many of the same problems. These included angry behavior from teachers, gender bias, communication and language barriers, and the quality of instruction as some teachers depended completely on the work sheets, explain quickly or gave poor explanations and expected every student to grasp concepts easily

For many, negative experiences associated with learning math remain throughout their adult lives and can impact career choices. Jones, (2001) concluded that millions of adults are blocked from professional and personal opportunities because they fear or perform poorly in mathematics. This may seem reasonable within the general labor market, but research has found that it also extends to career choices determined by majors in college. Jones (2001), conducting research at the University of Florida, found that 25.9% of the students studied had a moderate to high need for help with math anxiety. Its prevalence varies by major at the college level, with those who are anxious avoiding majors that require math skills (LeFevre, Kulak, and Heymans, 1992).

Yakubu, Bisandu, and Datri, (2019) carried out a study to investigate the relationship between Mathematics test anxiety and achievement of SS3 students in Kafanchan Educational Zone, Kaduna state on a sample of 420 senior secondary three students, comprising 210 male students and 210 female students were used for the study. The results from their study revealed that; there was a negative relationship between test anxiety and achievement of students in Mathematics and there was no significant difference in the mean achievement scores of male and female students

It is therefore in a bid to authenticate the results of the aforementioned researchers that this present study was geared towards establishing the effects of Mathematics anxiety on the achievements of students in Mathematics in a different location.

1.2. STATEMENT OF THE PROBLEM

There is generally poor achievement by students in Mathematics and this has been a thing of great concern to Mathematics educators, parents and government. This is in line with the observation of the Mathematical Association of Nigeria (MAN) in Umar (2011). Umar stated that concern over the continual poor performance of candidates in Senior School Mathematics Examinations. The examinations are those conducted by West African Examinations Council (WAEC), National Examination Council (NECO), National Business and Technical Examination Board (NABTEB) and Joint Admission Matriculation Board (JAMB). MAN position according Umar is contained in a communiqué issued at the end of its 50th Annual Conference in Asaba, signed by the President of the association,

(Umar, 2011). MAN in Umar again stated that Mathematics educators have put in efforts aimed at identifying the major problems associated with poor achievement in secondary school Mathematics by emphasizing that the teaching of Mathematics should be student centered and that the proper use of instructional materials should be adhered to by all Mathematics teachers. Curriculum developers revised the senior secondary schools Mathematics curriculum which now includes topics such as calculus, modular arithmetic among others all in an attempt to eradicate exams malpractice among students and the negative view of students towards Mathematics so as to improve the overall performance/achievements of students. Despite all these noble efforts, the academic achievement of students in Mathematics is still poor. This assertion is backed up by the Third International Mathematics and Science Study (TIMSS) which was the largest study of educational achievement ever undertaken. The study, in 1994 revealed that “there had been a decline in students’ achievement in Mathematics and that many senior school students are scared of the subject”.

The second problem is that most of the students experience some level of anxiety whenever test in the area of Mathematics in particular is given to them or during a Mathematics examination. However when anxiety begins to affect performance in examination, it has become a problem. The test situation is experienced by almost all members of our society and more over the academic lives of people are very frequently affected by their test performance. We live in a test giving and test conscious culture.

The problem of this study is to find out if the results of the above study can be seen to be same in other locations or states in Nigeria when considering co-educational public senior secondary schools for generalization purposes and to identify means of tackling Mathematics anxiety among students for the progress of our educational and the nation at large since mathematics is applicable in all spheres of life (Yakubu, 2018). Hence the researcher carried out this study to find out the effects of Mathematics anxiety and its implication on the achievement among Senior Secondary two Students in Jos North Local Government Area of Plateau State.

1.3.PURPOSE OF THE STUDY

The purpose of this study was to determine the effects of Mathematics anxiety on the Mathematics achievement of SS2 students’ in Jos North Local Government Area of Plateau State. Specific objectives are:

1. To determine the extent at which anxiety affects students’ Mathematics achievement.
2. To suggest ways of raising students’ interest in Mathematics.

1.4. RESEARCH QUESTION

The following research question shall direct the study.

1. To what extent does anxiety affect students’ achievement in Mathematics?

1.5.HYPOTHESIS

The hypothesis was tested on a 0.05 level of significance.

HO₁: There is no significant relationship between anxiety and students’ performance in Mathematics.

2. METHODS AND PROCEDURE

The study adopted a survey research design to enable the researcher established the effects of Mathematics anxiety on performance of senior secondary two Mathematics students.

The targeted group for this study comprised of all co-educational Governments owned senior secondary schools in Jos North Local Government Area of Plateau State. The population for the study consisted of all 4234 Senior Secondary two students within Jos North Local Government Area of Plateau State. Random sampling technique was adopted in selecting 120 students made up of 30 from each of the four selected Secondary Schools used for this study. Two instruments were used for data collection. A Mathematics Anxiety Scale Questionnaire (MASQ) adopted from Driscoll structured to elicit information required by the research question and it was based on a four-point likert scale; Strongly Agree – SA = 4, Agree – A = 3, Disagree – D = 2 and Strongly Disagree – SD = 1 for negatively cued items while for positively cued items it was Strongly Agree – SA = 1, Agree – A = 2, Disagree – D = 3 and Strongly Disagree – SD = 4. The instruments has two sections, A and B. section A dealt with respondents demographic data while section B dealt with questions relating to students Mathematics anxiety.

The Mathematics teachers of the respective schools helped in the selection process and during the administration of the MASQ to the participants to assess prevalence of Mathematics anxiety. The rule used to distinguish between significance and insignificance of the responses was the average four-point scale which is 2.50. Any mean score up to 2.50 and above is regarded positive while any mean score below 2.50 is regarded negative.

The data on achievement was obtained from existing school records. Achievements were measured by using scores already awarded for the students’ mock examination which was the reason the researcher selected SS2 for the study because all co-educational Governments owned senior secondary schools in Jos North Local Government Area of Plateau State do sat for mock examination in SS2. The researcher personally visited and distributed the questionnaire to respondents.

3. DATA ANALYSIS AND RESULT

The data collected for the study were analysed using average percent and Chi-square statistics. The research question was answered using mean and standard deviation while the research hypothesis was analysed using chi-square statistics.

All analysis was done using SPSS package

Research question 1: To what extend does anxiety affects students’ performance in Mathematics?

Table 1: Mean score and Standard Deviation of SS2 students on the extend Mathematics anxiety affects students’ performance in the subject

S/NO	ITEM STATEMENT	\bar{X}	SD	DECISION
1	I do panic during a Mathematics class/test	3.90	0.14	SA
2	Whenever I am faced with any Mathematics test, I do feel defeated	3.81	0.18	A
3	My mind goes blank during a Mathematics test	3.72	0.54	SA
4	I experience headache during Mathematics class/test	2.91	1.12	SA
5	I shiver and feel tensed up during Mathematics test	3.62	0.43	A
6	I don’t do well in my Mathematics exams/test because of how I feel about the subject	3.49	0.82	SA
7	My heartbeats faster during Mathematics test than during other subjects	3.22	0.90	SA
8	I make mistakes on easy questions during Mathematics	3.07	0.63	A

9	Whenever I am faced with any Mathematics test, I do feel defeated	2.89	0.64	SA
10	I never seem to be fully prepared to take Mathematics test	3.13	0.57	SA
11	My previous score in Mathematics test makes me scared of Mathematics classes/test	2.56	0.87	A
12	The nature of Mathematics makes me feel insecure	2.56	1.12	A
13	I reason properly during Mathematics test	2.65	0.90	D
14	I do not have trouble sleeping the night before a Mathematics test	2.58	0.72	SD
15	I do not get nervous during Mathematics test	2.51	2.29	SD

The data presented in table 1 revealed that there are fifteen statements on mathematics anxiety of which items 1 to 12 are negatively cued items while items from 13 to 15 are positively cued which by table 1 shows students agreeing that Mathematics anxiety to a large extent exist among them because all the statements have means scores greater than the cutoff point of 2.50. This implies that all students generally agreed that Mathematics anxiety exist among students and has great effects on their achievements in Mathematics.

Hypothesis HO₁: There is no significant relationship between anxiety and students' achievement in Mathematics.

Table 2: Chi-square summary of relationship between Mathematics anxiety and achievement of SS2 students in mathematics

Achievement	Effects of Mathematics Anxiety		Df	α	X ² (cal.)	X ² (crti.)	Decision
	Positive	Negative					
Pass	27(14.6)	11(23.6)	2	0.05	27.646	3.841	Reject Ho
Fail	19(31.4)	63(50.6)					

Table 2 shows an analysis of the relationship between Mathematics anxiety and achievement scores of SS2 students in Mathematics which was done using SPSS with the following results: X_{cal}= 27.646 and X_{crit} = 3.841. Since X-calculated (27.646) is greater than X-critical (3.841), the null hypothesis is rejected; this implication shows that there is a high negative relationship between test anxiety and achievement of students in Mathematics.

4. DISCUSSION OF FINDINGS

The outcome of this study showed that Mathematics anxiety exists among senior secondary two students and has effects on their achievements in the subject. The agreement in items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 which are negative items and the disagreement in items 13, 14, 15 which are positive items in table 1 shows Mathematics anxiety and students achievements in the subject are related. This is in agreement with Cassady and Johnson, (2002) according to their findings a moderate physiological arousal is associated with high examination performance. At this point it is worthwhile to state that an over anxious students always struggle to success.

The result agree to the findings of Nadeem, et tal (2012), who in the in depth investigation of their findings obtained results that revealed that anxiety has its very high impact on students' achievement. They concluded that there is negative relationship between anxiety and achievement, which means that if one factor increases, the other will decrease. In other words, when anxiety test increases, achievement decreases and vice versa. Table 2 shows that the calculated value of X²=27.646 is greater than the critical value of X² = 3.841. Therefore the

researcher rejects the null hypothesis and the alternative hypothesis that there is a significant relationship between anxiety and students' achievement in Mathematics is accepted. This is an indication that the higher the level of Mathematics anxiety, the lower the achievement of students in Mathematics. The finding is consistent with the findings of Ashcraft & Kirk (2001), Bower (2001). The result also agrees with the findings of Yakubu et al (2019) that there exist a high negative significant relationship between test anxiety and achievement of students in Mathematics. They thus stated that the negative relationship between the students' test anxiety and achievement means that as test anxiety increases, there is a corresponding decrease in achievement. This result confirmed the previous finding of Thomas (2014), Adeyemi and Adu (2012) and Umar (2011) among others who established that teacher qualifications have influence on students' academic performance. The finding is in disagreement with the finding of Edu, Edu, and Kalu (2012). This is an indication that the higher the anxiety level, the lower the achievement of students in Mathematics.

5. CONCLUSION

The purpose of this study was to determine the effects of Mathematics anxiety on the achievement of senior secondary two students in Jos North Local Government Area of Plateau State. The following conclusions were arrived at; that Mathematics anxiety is highly and negatively related with achievement by this, the researcher means that the presence of high Mathematics anxiety entails low achievement. This means that students who have high Mathematics anxiety tend to achieve low in Mathematics and vice versa.

5.1. RECOMMENDATIONS

From what the researcher discovered during the field work and the results of the analysis and conclusion, the researcher recommends that:

1. The Government through the ministry of education should direct teachers to help identify Mathematics anxiety among Secondary School Students and develop means of helping them overcome anxiety for effective teaching and learning of Mathematics.
2. Workshops or refreshed courses should be organised for all Mathematics teachers annually at National, State and local offices level so as to guide Mathematics teachers to create positive attitude toward Mathematics for effective teaching and learning of Mathematics.
3. School administrators should be encouraged by the state Government to organise workshops for parents in order help their children develop positive attitude toward Mathematics.
4. Curriculum planners should devise a means of bringing new ideas into the Mathematical curriculum that will make the teaching and learning of Mathematics interesting for both teachers and students.
5. Government and other owners of schools should try to take good care of their teachers so as to motivate the teachers in given the best to the students while teaching Mathematics to avoid cases where teachers become reasons why students have high anxiety level.

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