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Mathematics Anxiety and Academic Achievement in Some Selected Senior Secondary Schools in Southwestern Nigeria

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Abstract: The study found out, the relationship between Mathematics anxiety and student academic achievement in some selected secondary schools in Southwestern Nigeria. The study adopted the descriptive survey design and simple percentages were used in analyzing the data. Two validated instruments were used in collecting data for the study. The subject of the study was made up of 1750 senior secondary school students selected from 2 secondary schools in each of the Senatorial districts in Southwestern part of Nigeria. The results showed that many of the students were afraid of Mathematics, because of the fear of the subject and the fear of failing tests. The findings also revealed that majority of the students don't know how to study for Mathematics tests. It was recommended that stakeholders should organize propaganda in the media to educate parents, students and the general public about Mathematics to allay their fear of the subject.

Key words: Mathematics anxiety, academic achievement, senior secondary school, Southwestern Nigeria

INTRODUCTION

Anxiety is stress, tension and strain brought into one's body and mind. It can be of two types-somantic that involves the loss of control of the body, having sweaty palms, pain in the neck or sick to the stomach, which involves loss of concentration, having negative self-talk, feelings of doubt or mind wanders from test (Noting, 2006). Hurlock (1972) defined anxiety as a painful uneasiness of mind concerning impending or anticipated ills. It is marked by apprehension, uneasiness and apprehension from which, the individual cannot escape. It is accompanied by feeling of helplessness because the anxious person feels blocked, unable to find a solution to his problem. Anxiety causes an individual to borrow from future problems and therefore, suffers the present fear.

Tobias (1993) defines mathematics anxiety as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations and can cause one to forget and loose one's self-confidence. Test anxiety is a learned behaviour, which can be unlearned. Some things that can create test anxiety are: parents, friends or teachers that may pass their bias to the student to make them believe that there is a connection between grade and self-worth, fear of alienating parents, family or friends due to poor grades, anxiety that may be due to not feeling that they are not in control. The cognitive theory of test anxiety (Meichenbau and Butler, 1980; Sarason, 1975; Wine, 1980; Umoinyang, 1999) has three common components that are very important to consider in a study like this. The first is that high level of test anxiety is believed to adversely influence students' self-appraisals of evaluative situation. Secondly, test-anxious students are prone to engage in more negative thoughts (negative internal dialogue) during evaluative tasks. Thirdly, students performance attributions are believed to be influenced by high levels of test anxiety.

Bamidele (2005) in his study mathematics not dreadful subject stated that in Nigerian schools, students general impression is that mathematics is a dreadful subject. But ironically, this subject is the basis for scientific and technological advancement of any country. This was corroborated by Prof. Samuel Ale that the subject is rather an interesting one hence, the establishment of the National Mathematical Center (NMC) in Abuja, Nigeria. The main objectives of the NMC was to improve on the teaching and learning of mathematics; to develop interest in the mathematical sciences; to enable researchers in the mathematical sciences to come together for more advanced work by organizing workshops not only for Nigeria, but also for West Africa, Africa and the world at large.

Mathematics is more challenging for some students than others and a student with problems in that subject finds ways to continue to do poorly. Bad study habits, low confidence on days of mathematics tests and poor self-esteem inhibit academic potential and can snowball into a lifelong phobia for mathematics, which can spread to other areas of life. An atmosphere that is conducive to the learning process, which is more than just a physical space with good lighting, can help to solve some of the

anxiety student experience in mathematics test (Xin, 1999). Learning is maximized when students and teachers share a strong rapport, when students are safe, trusted and respected and when students believe in themselves. When, students get the opportunity to learn in a supportive environment like this, their test scores, self-esteem and confidence are built up. They experience a shift in learning from drudgery to joy. Unfortunately, many of the learning environments are not optimized the way the programmes are and students suffer from poor self-esteem as a result of this. When a student's confidence is low, test-taking anxiety is the mind's natural response especially in mathematics. This should not be so. The teacher should help students discover their potentials and thereby improve their self-confidence and hence test anxiety will become a thing of the past.

In an study, titled math ability: nature versus narture it was said that we are not born with a fear of mathematics rather it is a learned behaviour. This learned behaviour is what we call mathematics anxiety and it is the way we react to mathematics. Mathematics has such a negative connotation that it can induce emotional stress. No other subject unleashes such anxiety. It usually begins in early childhood due to a negative experience with mathematics and mathematics teachers. While some people are filled with anxiety when we talk of mathematics, others seem to be at home with it. This has generated a lot of debate as to whether boys are better at mathematics than girls or that some individuals are born with an innate ability to do mathematics, while others seem to be born with an inability to comprehend it. This debate has led to the nature versus nurture in mathematical ability.

Mathematics anxiety and test anxiety in mathematics refer to a state of uneasiness and distress about mathematics and the taking of mathematics tests. Mathematics or tests in mathematics provide a very real cause or threat especially, to students, who have not learned how to cope with them. In particular, a student who have not prepared for a test by doing all the homework will have the fear of failing the test. While excessive fear is certainly destructive and painful, a reasonable amount of fear in certain situations is beneficial. In the school as we study for examinations, a reasonable amount of fear is beneficial, providing motivation to increase learning in order to perform well in the examinations. Excessive anxiety results in low self-esteem and poor academic performance. According to the America Heritage definition of fear, which is extreme reverence or awe as towards a supreme power, fear can be extremely beneficial. In order to have reverence or awe for mathematics, by this definition, one has to really understand it. Most people who fear mathematics do so because, they do not know the subject. On the contrary, someone who has spent long hours studying and learning mathematics develops this reverential fear for mathematics. The secret behind this is hours and hours spent with the subject that allows one to know and respect the subject in its deepest parts (Rapalje, 2006).

Research has confirmed that pressure of timed tests and risk of public embarrassment has long been recognized as sources of unproductive tension among many students (Spikell, 1993). He went further to say that three practices that are regular part of the traditional mathematics classroom, which cause great anxiety in many students are imposed authority, public exposure and time deadlines. Even though, these are regular part of the traditional mathematics classroom, they cause great deal of anxiety. It is therefore, important that teaching methods must be re-examined to include less lecture and more student directed classes and more discussion. The teacher should design their classroom in such a way that will make student feel more comfortable. Incorrect responses must be handled in a positive way to encourage student participation and enhance student confidence.

Naylor (1994) observed that test-taking anxiety is significant for both educators and students. In so far as it acts to distort performance, it is a source of measurement error, which affects both the reliability and validity of tests. While, some researchers saw anxiety as an ailment of the central nervous system, Trounce (1985) was of the opinion that anxiety is a very common symptom and a certain amount is useful to the individual as it acts as a stimulant and increases efficiency. Trounce also believes that too much anxiety have reverse effect and can interfere with the patient's life. Tobias as cited in Olatoye and Afuwape (2003) suggested that test anxiety may be a function of poor study habits or deficient skills of test-taking which themselves have harmful effects on performance. Findings from other studies (Denney, 1980; Tryon, 1980; Naylor, 1994) have suggested that although, test-anxiety may be reduced or controlled, anxiety does not necessarily enhance performance even though test-taking anxiety and performance are significantly related. Naylor (1994) noted that study skill and examination techniques appear to be salient in knowledge testing. Reducing test anxiety therefore is not a substitute for learning. It may be that where the worry component in test-anxiety results from inadequate preparation, this is the more important component in terms of effects on performance.

From the various views of research reports above, the present study would be interested in looking at how test anxiety (testphobia) can affect the performance of students in mathematics.

Research questions: The following research questions are answered in the study:

- How do students rate themselves in terms of failure or success in Mathematics tests?
- What are the reactions of students to success or failure in Mathematics tests?
- What are the things that make students to be afraid of Mathematics tests?
- What are the factors that make students perform well in Mathematics test?

MATERIALS AND METHODS

Participants: The participants for the study were 1750 senior secondary two students randomly selected from two secondary schools from each of the senatorial districts in the Southwestern part of Nigeria to make a total of 36 schools.

Instruments: Two instruments were used for data collection. These were: Mathematics Achievement Test (MAT) and Testphobia Questionnaire for Students (TQS).

Mathematics Achievement Test (MAT): This test was developed by the researcher in order to assess the level of acquisition of mathematical concepts of the students. It covers the main topics of mathematics taught in SS2 up to the third term of the school year. It consists of 40 item multiple-choice questions with 4 options A-D and was based on three cognitive levels-knowledge, understanding and application. The table of specification for the construction of MAT is shown in Table 1.

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 was taken to be the student's total test score.

MAT was trial tested on 50 SS II students in three different schools in Ibadan metropolis. Kuder- Richardson formula KR-20 was used to determine the reliability coefficient. The value obtained was 0.74. The average difficulty index obtained was 0.45, which shows that the instrument was neither too difficult nor too simple.

Table 1: Specification for MAT

Topics	Knowledge No. of item 30%	Understanding No. of item 47%	Application No. of item 23%	Total No. of items
Mensuration (22)	4	4	2	10
Numbers and numeration (16)	2	3	2	7
Plane geometry (20)	2	4	2	8
Equations and inequalities (12)	1	1	1	3
Algebraic expressions (14)	2	3	1	6
Statistics and probability (16)	1	4	1	6
Total	12	19	9	40

Testphobia Questionnaire for Students (TQS): This was developed by the researcher. It consists of 9 items that deal with the students school, state, local government area, gender, age, date of birth, how often they speak English at home, language spoken by their family at home (items 1-5); questions on the fear of mathematics and test in mathematics like I am always afraid of mathematics test because…, I can do well in mathematics test if…. with the options Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) are contained in the questionnaire (items 6-9). The responses to TQS were scored using 4, 3, 2, 1 for strongly agree to strongly disagree.

This instrument was trial tested on 50 SSII students in some schools in Ibadan metropolis and the Cronbach alpha coefficient was calculated to be 0.85.

RESULTS AND DISCUSSION

On the question on how do students rate themselves in terms of failure or success in Mathematics tests, 675 students representing 38.5% were not afraid to ask questions in mathematics class, while 1075 students representing 61.5% were afraid of asking questions in mathematics class. A 717 students representing 41% do not fear mathematics test more than any other tests while, 1042 students representing 59% fear mathematics test more than any other tests. A 572 students representing 32.7% do know how to study for mathematics tests, while 1178 students representing 67.3% do not know how to study for mathematics tests. A 1282 students representing 73.3% are afraid when it is time for mathematics lesson, while 468 students representing 26.7% are not always afraid when, it is time for mathematics lesson.

On the question on what are the reactions of students to success or failure in Mathematics tests, 1547 students representing 88.3% believed that they cannot succeed in mathematics tests, while 203 students representing 11.7% believed that they can succeed in mathematics tests. A 1454 students representing 83% do not begin with easy questions first when taking a mathematics test, while 296 students representing 17% do otherwise. A 1326 students representing 75.8% do not ask questions when, they are confused in mathematics class while, 424 students representing 24.2% do ask questions when, they are confused in mathematics class. 1319 students representing 75.4% do not develop memory techniques to remember mathematics concepts while, 431 students representing 24.6% do develop memory techniques to remember mathematics concepts.

On the question on what are the things that make students to be afraid of Mathematics tests, 639 students representing 45.5% are of the view that mathematics is not too hard for them while, 1111 students representing 63.5% are of the view that mathematics was too hard for them. A 776 students representing 44.4% do not find it difficult to study mathematics alone while 974 students representing 55.6% do find it difficult to study mathematics alone. A 417 students representing 23.9% do like mathematics at all while majority of the students (1333) representing 76.1% do not like the subject mathematics. A 1049 students representing 59.9% are not good at solving mathematics problems, while 701 students representing 40.1% are good at solving mathematics problems.

On the question on what are the factors that make students perform well in Mathematics test, 1489 students representing 85.1% can not work at several problems in mathematics before any test in mathematics, while few of the students (261) representing 14.9% can work at several problems in mathematics before any test in the subject. 1395 students representing 79.7% do not cover all the necessary areas for the test in mathematics while, 355 students representing 20.3% do cover all the necessary areas for the test in mathematics. Majority of the students (1297) representing 74.1% do not remain calm, relaxed and positive about their success in any mathematics test while, 453 students representing 25.9% are always calm, relaxed and positive about their success in any mathematics test. 1357 students representing 77.5% do not answer the test questions well in a mathematics test while, 395 students representing 22.5% do answer the test questions well in a mathematics test.

Mathematics anxiety and the fear of test (testphobia) from the findings above are attributed to the nature of the subject. There are varied views of research findings that inadequate preparation for test in mathematics can cause anxiety for test in the subject even as test-anxiety may be reduced or controlled, anxiety does not necessarily enhance performance even though test-taking anxiety and performance are significantly related. The implication of the findings is in accordance with the findings of Noting (2006) and Spikell (1993) where pressure of timed tests and risk of public embarrassment produces tension among students. It is also, in consonance with Trounce (1985) who was of the opinion that anxiety is a very common symptom and a certain amount is useful to the individual as it acts as a stimulant and increases efficiency hence we find that some students remain calm, relaxed and positive about their success in any mathematics test even with the hard nature of the subject.

RECOMMENDATIONS

The following recommendations are made based on the findings of the study.

- The Federal Ministry of Education, State Ministry of Education and the National Mathematical Center in Nigeria should design series of advertising campaigns-radio, television, newspapers and posters-designed to dispel mathematics phobia in teachers, students, parents, school administrators and the society in general just as it is being done by National Action Against Aids (NACA) to change peoples attitude towards people living with HIV/AIDS
- The teacher should re-examine his teaching methods to include less lecture and more student directed activities which involves more discussion to make the student feel more at home
- The government should help to establish in every secondary school a mathematics-learning center where, students could consult for homework assignments, examination or test preparation or exploration of mathematical concepts. The center should have different mathematics books from basic to advanced on arithmetic, algebra, trigonometry, statistics, geometry, calculus, mathematical games, calculators, computers and assorted tools for learning mathematics

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