

THE EFFECT OF ANXIETY ON PERFORMANCE OF STUDENTS IN MATHEMATICS

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ABSTRACT

This research work "THE EFFECT OF ANXIETY ON PERFORMANCE OF STUDENTS IN MATHEMATICS" focuses on the relationship between Mathematics anxiety and students performance. A descriptive experimental research design was used to investigate the research questions. The population consisted of 120 pre-service teachers at Adeniran Ogunsanya College of Education, Ojo Local Government, Lagos State. A personal data questionnaire was used to gather demographic and anxiety information about the participants. The implication of this study of elementary teacher education programs point to increased attention on the Mathematics anxiety of pre-service teachers. This process is two folds. One, it is recommended that pre-service teachers be made aware of their Mathematics anxiety level and two, it is recommended that teacher education programs acknowledge and address the importance of these affective variable and their role in pedagogy.

INTRODUCTION

Nigeria envisaged attaining the status of a developed country by the year 2020. By then, the Nigeria society will have evolved into one that is democratic, liberal, tolerant, caring, progressive and possessing a competitive and dynamic economy. It is argued that establishing a scientific and technological culture will lay the foundation towards the attainment of such a society. Hence, Science, Mathematics and technology have always been emphasized in the national development plans. Mathematics certainly means many things to many people (Maritza, 2002).

Many aspects of daily life require some knowledge of Mathematics and the ability to use this knowledge is critical to the pursuit of many existing and newly emerging occupational fields. Moreover, all undergraduate students are required to take some level of Mathematics. If students suffer from Mathematics anxiety, their willingness to enroll and succeed in Mathematics courses diminished (Stubblefield, 2006).

Mathematics anxiety is a problem for many people. It can have detrimental effects for college students including feeling of nervous tension, fear of rejection, and stress (Truttschel, 2002).

Reported consequences of being anxious toward Mathematics include the avoidance of Mathematics and the decline in Mathematics achievement. This kind of "anxiety" is first detected in the late 1950s. Dredger and Aiken (1957), noticed undergraduate college student reacting emotionally to arithmetic and Mathematics. Although the reaction is appeared to be similar to test anxiety in general, they found that Mathematics anxiety is a potential factor prose. They have labeled it "number anxiety", which is often assumed to be a high level of anxiety impairs performance.

Many adult are blocked from professional and technical job opportunities because they fear or perform poorly in Mathematics. Most of these adults are brain capable of learning more Mathematics; it is not a failure of intellect, but of nerve. All people have some Mathematics anxiety, but it disables women and minorities more than others. There is a cure, but it involves changing learners and teachers attitudes at the same time.

Mathematics educators need to recognize the causes of Mathematics anxiety. Educators can become more informed about the effects of Mathematics anxiety by reading related literature and attending workshops and conferences on the topic. Pre-service teachers should be made to realize that myths such as Mathematics aptitude are genetic and Mathematics being a male domain is simply not true (Woodard, 2004).

Changing attitudes about Mathematics will require support from parents, teachers and society. If negative attitudes are not changed, students' performance, college and career choices will be limited (Shields, 2006). Mathematics anxiety is a reality for many students. Educators should be knowledgeable about its causes and provide supportive learning communities that assist students in overcoming it (Barnes, 2006).

SIGNIFICANCE OF THE STUDY

In a country such as Nigeria, many jobs demand sophisticated knowledge of Mathematics, in depth knowledge of mathematics is needed to obtain a desired position in the work force. In addition to its necessity in scientific and technological field, knowledge of mathematics is increasingly important in business, social sciences and humanities.

Jacob (2004) opined that mathematics provide students with a uniquely potent set of tools to understand and change the world, these tools include problem solving skills, logical reasoning, and the ability to think critically. Mathematics is important in everyday life in many form of employment, in the medical field, the economy, the environment, in science and technology, and in public decision making.

The result of this research work is to ensure that pre-service teachers learn to develop their potential and confidence in mathematics.

RESEARCH QUESTION

- Is there any significant effect of anxiety on students' performance in mathematics?
- What effect does pre-service teachers' gender have on mathematics anxiety?
- Will there be any significant impact of mathematics anxiety on students' interest to study mathematics?
- Will there be any relationship between mathematics anxiety and students perception of the value that society places on mathematics?

RESEARCH HYPOTHESIS

- There will be no significant effect of anxiety on students performance in mathematics
- There will be no significant relationship between mathematics anxiety and gender among pre-service teachers
- There will be no significant impact of mathematics anxiety on students interest to study mathematics
- There will be no significant relationship between mathematics anxiety and students perception of the value that society places on mathematics

LITERATURE REVIEW

MATHEMATICS ANXIETY

Green and Allerton (1999), 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 (2007) 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 mathematic courses.

SYMPTOMS OF MATHEMATICS ANXIETY

Physical Symptoms

- Increased heart rate
- Clammy hands
- Upset stomach
- Light headedness

Psychological Symptoms

- Inability to concentrate
- Feeling of helplessness
- Worry
- Shame

Behavioral Symptoms

- Avoidance of mathematic classes
- Putting off mathematics homework until the last minute
- Inadequate study time

CAUSES OF MATHEMATICS ANXIETY

Personality Factor

- Low self esteem
- Inability to handle frustration
- Shyness
- Intimidation

Environmental Factor

- Overly demanding parents
- Negative classroom experiences
- Unintelligible textbooks
- Emphasis on drill without understanding
- Poor mathematics teacher

Intellectual Factor

- Inability to understand mathematical concepts
- Mental age
- Brain tumor

STRATEGIES FOR REDUCING MATHEMATICS ANXIETY

Teacher Strategies for Reducing Students' Math Anxiety

- Develop Strong Skills And A Positive Attitude Toward Math.
- Relate Math To Real Life.
- Encourage Critical Thinking.
- Encourage Active Learning.
- Accommodate Students' Varied Learning Styles.
- Place less Emphasis on Correct Answers and Computational Speed.
- Organize Students Into Cooperative Learning Groups.
- Avoid Putting Students In Embarrassing Situations
- Never Use Math As A Punishment
- Use Technology in Classroom
- Dispel Harmful But Popular Misconceptions
- Use A Variety Of Assessment
- Prepare Students For High-Stakes Testing Sessions

Parent Strategies for Reducing Children's Math Anxiety

- Do Not Express Negative Attitudes About Math
- Have Realistic Expectations
- Provide Support And Encouragement
- Monitor Children's Math Progress
- Demonstrate Positive Uses For Math

Students Strategies for Reducing Math Anxiety

- Practice Math Everyday
- Use Good Study Techniques
- Study According To One's Own Learning Style
- Don't Rely Solely On Memory
- Focus on Past Successes
- Ask For Help
- Practice Relaxation Techniques

METHOD

Sample

The participants of this study comprise 120 pre-service teachers, selected randomly from 6 different combinations in department of mathematics.

SN	Department	100L	200L	300L	Total
1	PHYSICS/MATH	6	8	8	20
2	CHEMISTRY/MATH	10	6	8	24
3	COMPUTER/MATH	8	6	10	24
4	ECONOMICS/MATH	10	14	10	34
5	GEOGRAPHY/MATH	4	4	2	10
6	ISC/MATH	2	2	2	6

TOOLS AND MATERIALS

The instruments used in the research study are as follows

Chi Square: The data collected for the study were analyzed by using chi-square for the first twenty questions, the values attached to the responses of the questionnaire were based on the statistical means of SA- Strongly Agree, A- Agree, D-Disagree and SD-Strongly Disagree.

Mathematics Anxiety Rating Scale (MAR-S): This questionnaire was developed by the researcher and contained 10 items of situations which can cause math anxiety. Each item of this scale was rated on a four point Likert scale rating, from strongly agree-4 to not strongly disagree-1 and ratings were reversed for anxiety absent items.

RESULT

According to the hypothesis of the current investigation, the analysis of data is divided into two parts; at first part, the research hypothesis was evaluated and in the second part, pre-service teachers' level of mathematics anxiety based on self perceived measure and MARS are analyzed

Hypothesis 1:

There will be no significant effect of anxiety on students' performance in mathematics

Table 1: Score associated with students' anxiety and their performance in mathematics

Questions	SA	A	D	SD	Total	Degree of freedom	Level of significance	X^2_{cal}	X^2_{tab}	Decision
Do you always worry about being called on in mathematics class to answer or solved problems?	32	24	34	30	120	12	0.05	196.82	20.03	Rejected
Mathematics make me feel nervous	14	30	40	36	120					
When solving mathematical tasks, you need to know the correct procedure or else you would be lost	84	24	8	4	120					
Most of the topic taught in mathematics are too hard to understand	18	20	54	28	120					
Mathematics is challenging	56	48	12	4	120					

Hypothesis 2:

There will be no significant relationship between mathematics anxiety and gender difference among pre-service teachers

Table 2: Score associated with students' gender and mathematics anxiety

Questions	SA	A	D	SD	Total	Degree of freedom	Level of significance	χ^2 cal	χ^2 tab
In general, boys tend to be naturally better at mathematics than girls	20	32	36	32	120	12	0.05	166.20	20.03
Do female feel inferior to male when it comes to mathematical concepts?	16	38	46	20	120				
Is mathematics creative for females?	28	64	14	14	120				
Does teachers' gender stimulate the learning of mathematics?	22	30	40	20	120				
Male tend to be mathematically inclined than female	28	42	38	12	120				

Hypothesis 3:

There will be no significant impact of mathematics anxiety on students' interest to study mathematics

Table 3: Score associated with students' interest and anxiety level

Questions	SA	A	D	SD	Total	Degree of freedom	Level of significance	X^2 cal
1 Do you like mathematics because it is required in almost every profession?	42	50	14	14	120	12	0.05	55.09
2 Learning of mathematics is very interesting	62	46	10	2	120			
3 I find mathematics thrilling and fascinating than other courses	50	46	20	4	120			
4 I like to practice sum in mathematics rather than reading novel	56	40	20	4	120			
5 Interest is not a good determinant of performance in mathematics	16	16	48	40	120			

Hypothesis 4:

There will be no significant relationship between mathematics anxiety and students' perceptions of the value that society places on mathematics.

Table 4: Score associated with mathematics anxiety and students' perceptions of the value that society places on mathematics.

Questions	SA	A	D	SD	Total	Degree of freedom	Level of significance	X ² cal
To be good at mathematics you need to have a kind of mathematical mind	46	52	12	10	120			
Only the more able students can participate in multi-step problem solving activities	28	38	34	20	120			
The best way to do well in mathematics is to memorize all the formulas	16	36	32	36	120	12	0.05	95.57
It does not really matter if you understand a mathematical problem, if you can get the right answer	14	22	38	16	120			
Mathematics is a subject in which natural ability matters a lot more than effort	28	42	40	10	120			

Students' level of mathematics anxiety based on self perceived measure and MAR-s

Students perceived level of mathematics anxiety was measured based on their responses to the items raised in the questionnaire in section B.

Table 5: Students' perceived level of mathematics anxiety

S/N	Statement	Options	Year 1	Year 2	Year 3
1	I often avoid attending mathematics class	SA A D SD	2 12 6 20	2 2 14 22	4 2 8 26
2	Mathematics make me feel uneasy and confused	SA A D SD	10 10 10 10	2 6 18 14	6 4 8 22
3	I have problem with mathematics because I am always nervous when it comes to mathematics test or examination	SA A D SD	8 8 14 10	6 12 6 16	8 2 24 6
4	My mind usually gives blank anytime we have mathematics	SA A D SD	4 12 12 12	2 8 14 16	4 0 14 22
5	I often find it difficult to understand mathematics concept	SA A D SD	8 8 12 12	4 10 8 18	8 6 8 18
6	I always prefer studying other courses to mathematics	SA A D SD	10 6 14 10	6 12 8 14	6 4 10 20
7	I am usually restless and inattentive during mathematics class	SA A D SD	6 8 14 12	2 6 14 16	12 4 4 20
8	I usually sweat constantly from the armpit during mathematics class	SA A D SD	2 2 20 16	4 4 14 18	2 8 6 24
9	I sometimes feel happy during teacher's digression during mathematics class	SA A D SD	4 16 16 4	4 16 8 12	10 10 12 8
10	I often appear dull and bored during mathematics class	SA A D SD	6 8 6 20	2 12 10 16	4 2 14 20

Analysis of Math anxiety using MAR-S for Year 1

S/N	SA	A	D	SD
1	2	12	6	20
2	10	10	10	10
3	8	8	14	10
4	4	12	12	12
5	8	8	12	12
6	10	6	14	10
7	6	8	14	12
8	2	2	20	16
9	4	16	16	4
10	6	8	6	20
Total	60	90	124	126
Scoring	240	270	248	126
Average	22.1			
Anxiety Level	Moderate Anxiety			

Analysis of Math anxiety using MAR-S for Year 2

S/N	SA	A	D	SD
1.	2	2	14	22
2	2	6	18	14
3	6	12	6	16
4	2	8	14	16
5	4	10	8	18
6	6	12	8	14

7	2	6	16	16
8	4	4	14	18
9	4	16	8	12
10	2	12	10	16
Total	34	88	116	162
Scoring	136	264	232	162
Average	19.85			
Anxiety Level	Mild Anxiety			

Analysis of Math anxiety using MAR-S for Year 3

S/N	SA	A	D	SD
1	4	2	8	26
2	6	4	8	22
3	8	2	24	6
4	4	0	14	22
5	8	6	8	18
6	6	4	10	20
7	12	4	4	20
8	2	8	6	24
9	10	10	12	8
10	2	2	14	20
Total	64	24	108	186
Scoring	256	126	216	186
Average	19.6			
Anxiety Level	Mild Anxiety			

DISCUSSION

The study was carried out to investigate and analyze the effect of mathematic anxiety on performance of students in mathematics.

The result of the study revealed the finding of the analyzed data, the four null hypothesis formulated and tested were all rejected as the result revealed that the first hypothesis which the respondent agreed that students performance in mathematics greatly depend on their level of mathematics anxiety which was in support of what Cavanaugh (2002), explained that researchers and educators alike have dug further into the topic “mathematics anxiety” or the avenue in which students lack confidence in the subject “mathematics” which erode their academic performances and achievement in it..

The second hypothesis revealed that the respondents agreed that there is a relationship between gender difference and mathematics anxiety among pre-service teachers which was in support of what Firuju (2005), pointed out that, regardless of the anxiety level, the male perform better than the female in test which measure numerical, mechanical and spatial abilities.

The third hypothesis that the respondent agreed that mathematical anxiety will greatly impact students interest to study mathematics which was in support of what Yerilmez, Girgniner and Uzun (2007), explained that mathematics anxiety can occur in all levels of education from primary school to higher education, and once established, can persist in life, interfering with everyday activities involving numeracy and further learning of mathematics.

The forth hypothesis result shows that there is a relationship between mathematics anxiety and students’ perceptions of the value that society places on mathematics which was in support of what Baylor, Shen, Wawen (2000), discussed that students tend to have high level of nervousness, fear or discomfort towards mathematics, due to their prior experiences with mathematics teachers and other influential persons.

Mathematics anxiety scores, as measured on the MAR-S had a positive significant relationship with the students’ perceived level of mathematics anxiety. This result was in agreement with the conclusions reported by Shields (2006) that indicated a strong positive correlation between students’ perceived level of mathematics anxiety and mathematics anxiety score, as calculated on the MAR-S. This data reveals that simply asking the students to rank their anxiety level was comparable to administering the MAR-S which is the most widely used mathematics anxiety instruments.

CONCLUSIONS AND RECOMMENDATIONS

The results of the study, generally, indicated that most of the pre-service teachers did not exhibit high level of anxiety. Student prior experiences with mathematics teachers and other influential persons have been identified as the greatest influence on the development of mathematics anxiety. In concise term, this study showed the relationship between students’ perception about society mathematics myths and mathematics anxiety. It is worth mentioning that further research should be conducted on mathematics anxiety in relation to job prospects.

Based on the analysis on the effects of mathematics anxiety on performance of students, the following recommendations are made;

- Mathematics educators need to recognize the causes of mathematics anxiety. Educators can become more informed about the effects of mathematics anxiety by reading related literature and attending workshops and conferences on the topic.

- Students should be able to realize that interest to learn mathematics greatly influence their performance in mathematics.
- Changing attitudes about mathematics will require support from parents, teachers and society. If negative attitudes are not changed, students' performance, college and career choices will be limited
- Mathematics anxiety is a reality for many students; educators should be knowledgeable about its causes and provide supportive learning communities that assist students in overcoming it.
- Adopting various methods of teaching
- Organizing remedial classes for the low achiever in mathematics
- The use of relevant teaching aids to augment the teacher's verbal exposition

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