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Strategies to Reduce Pathological Fear in Mathematics among Secondary School Students in Adamawa State, Nigeria

ANAF SULIENAM YAHYA
sly2011m@yahoo.com
Centre for Graduate Studies,
Universiti Tun Hussein Onn Malaysia,
86400 Parit Raja, Batu Pahat, Johor, Malaysia

K.M. FASASI
Department of Science Education,
School of Technology & Science Education,
Modibbo Adama University of Technology,
Yola, Adamawa State of Nigeria

Abstract - The purpose of this study is to identify causes of pathological fear in Mathematics among secondary school students in Adamawa State, Nigeria. The study also examines strategies that could be adopted to reduce pathological fear in Mathematics among students. Three research questions and a hypothesis tested at $\alpha = 0.05$ level of significant were formulated to guide the study. A research questionnaire on Pathological Fear in Mathematics Questionnaire (PFMATQ) was used in collecting data from 250 senior secondary school students. They were selected by stratified random sampling technique from five educational zones in Adamawa State. Mean, standard deviation and t-test were used to analyse the data generated. The study reveals that causes of pathological fear in Mathematics among others include: parental indoctrination that Mathematics is difficult, the Mathematics teacher factor and the abstract nature of Mathematics. Strategies that could be adopted to reduce pathological

fear in Mathematics among others include; the use of mathematical games; uses of heuristic method of teaching and use of relevant set induction techniques. It is recommended that parents should stop indoctrinating their children that Mathematics is difficult; they should keep away their unpleasant experiences about Mathematics and present favourable ones to encourage them to develop interest in Mathematics. Recommendations were outlined.

Keywords - Mathemaphobia, Pathological Fear, Parental Indoctrination, heuristic Method of Teaching, Induction Techniques, Adamawa State of Nigeria and Mathematics Questionnaires

INTRODUCTION

Mathematics is one of the most important subjects in Nigerian Secondary schools. Thus, it is made compulsory for all students to study at the Senior Secondary School Certificate Examination (SSCE) level. This is because Nigeria as a nation depends upon Mathematics as one of the most important subjects that could help the nation meet her objective for science and technological advancement (Jegede 2002).

It is a fact that students have a very low interest in Mathematics. Students hate or dislike Mathematics. In most secondary schools in Nigeria, students do not attend Mathematics lessons (Fatola 2005). Those who attend the Mathematics lessons do not pay attention to the teacher. Most of the students do not practice Mathematics on their own, neither do they solve Mathematics problems on their own. According to Amazigo (2000), when the option is available, many students would prefer not to have anything to do with learning Mathematics.

This attitude has led them, among other things, to achieve poorly in Mathematics examinations both internal and external. On the other hand, the recent paucity of undergraduates in Mathematics and Mathematics education in Universities, Colleges of Education and Polytechnics suggests that Mathematics is no longer popular among students particularly at the secondary school level. There is no doubt that the poor achievement in the subject enhances students' hatred for the subject. This hatred is rooted in the fact that there is a general tendency for students to fear Mathematics whenever it is mentioned (Amazigo 2000).

Fear refers to a feeling of distress or alarm caused by danger or pain that is about to happen (Tobias 1993). In intensity, it varies from a mild sense of apprehension to paralyzing terror. In fear, there is always the desire to shrink, to get away or retreat from the exciting cause. The stimuli for fear are many and varied. In early infancy any sudden or intense stimuli like loud and sudden noise, unexpected jerk, and flash of bright light or loss of support may cause fear though there are large individual differences. Any sudden change in the environment, which the individual regards as threatening and for which he is unprepared, produces fear. When the threatening situation is removed or controlled, and the danger real or imaginary has passed, fear disappears. Also, as activities or experiences expand or interests and abilities grow, the number and kinds of fear increase. But as the power of adjustment through experience increases many of childish fears disappear.

Some fears are result of conditioning effect. They will have to be reconditioned by attaching pleasant circumstances and experiences with situations and objects, which arouse fear. Praise or rewards attached to or associated with fearful tasks or situations will help to reduce fear. Several experimental studies carried out on fears have shown that the only effective methods of overcoming fears were reconditioning and social imitation (Seaman 2000). There are some fears where the best thing to do is to act as the fear suggests, that is, get away. This would be true in the case of a poisonous snake, and fear of mad dog. However, with other fears we need to face what we fear, we must have courage. Example of such fear is pathological fear of Mathematics.

The phenomenon of fear in Mathematics is variously referred to as Mathemaphobia, Mathematics anxiety or pathological fear in Mathematics (Stephen 2007). Pathology refers to a scientific study and diagnosis of disease through examination of organs tissue, bodily fluids and whole bodies (Tobias 1993), whereas fear as already described, is an emotional response to threats and danger. It is a basic survival mechanism occurring in response to a specific stimulus, which in this study could be Mathematics tests or examination. Pathological fears in Mathematics therefore mean a behaviour disorder in which an individual becomes progressively unable to resist the impulse to fear Mathematics. It is an abnormal and persistent dread of

Mathematics; sufferers usually experience undue anxiety even though they may rationally realize that Mathematics does not pose a threat commensurate with their fears (Amazigo 2000).

Stephen (2007) describes Mathematics anxiety as an academic disease whose virus has not yet been diagnosed for an effective treatment in the class, though the symptoms of this anxiety are always expressed on the faces of the learners in Mathematics classes. This disease (otherwise known as pathological fear), is communicable as it is usually distributed to sciences that are Mathematics related. This probably explains why students are afraid to study science subjects in secondary schools. When a student is afraid of Mathematics, he will do everything humanly possible to avoid it. Where he must learn the subject, he does so with lack of interest, which usually worsens his performance.

In Adamawa State, the teaching and learning of Mathematics at secondary school level could be described to be in a dismal state. Experience has shown that, just as students find it difficult to understand, teachers also find difficulties in teaching some topics in Mathematics. These usually come to light through morbid fears always exhibited during internal and external examinations in Mathematics. The faces of students in the examination hall always say it all-weary and lacking confidence. Many of them always look stranded as they read through the Mathematics question papers of the West African Examinations Council (WAEC) Senior Secondary School Examinations. Mathematics and English Language examinations are always written amidst tight securities. These problems have caused many students to develop pathological fear in Mathematics beginning from the primary through the secondary to tertiary levels. This trend needs to be reversed. This paper therefore, examines the major factors responsible for students' pathological fear in Mathematics and suggests how it could be reduced to the barest minimum to enhance students' performance in Mathematics.

OBJECTIVES OF THE STUDY

The purpose of this study is to examine the strategies that could be adopted to reduce pathological fear in secondary school Mathematics.

Specifically, the objectives of this study are: to identify the causes of pathological fear in Mathematics among secondary school students; to ascertain the effect of pathological fear on students achievement in Mathematics; to identify strategies that could be adopted to reduce pathological fear in secondary school Mathematics.

The following research objectives guided the study

(i) to determine the causes of pathological fear in Mathematics among secondary school students;
(ii) to determine the effects of pathological fear on students' achievement in Mathematics; and,
(iii) to formulate the strategies that could be adopted to reduce pathological fear in Mathematics among secondary school students.

MATERIALS AND METHODS

The survey research design was adopted in the study. The sample consisted of 250 Senior Secondary (SSII and SSIII) students (150 boys and 100 girls) drawn from 15 selected secondary schools in five educational zones in Adamawa State. The subjects were selected by stratified sampling technique.

A research questionnaire on Pathological Fear in Mathematics Questionnaire (PFMAT Q) was developed by the researcher and administered on the students used for the study. The questionnaire was in four sections. Section A was about the bio data of the respondents, section B sought information about causes of pathological fear in Mathematics, section C dealt on the effects of pathological fear on students and section D was about probable strategies that could be adopted to reduce pathological fears in Mathematics among secondary school students.

The questionnaire was both face and content validated by three experts in Mathematics education in the Department of Science Education, Federal University of Technology, Yola. The reliability of the instrument was ascertained through a test-retest method to

estimate the stability of the instrument using Spearman's Rank order correlation. A reliability coefficient of 0.91 was obtained.

The respondents were asked to indicate their agreement or disagreement on a four-point scale ranging from strongly agree (4), agree (3), disagree (2) and strongly disagree (1). The mean of the four-point scale is 2.5, which implies that the mean lie between two boundaries 2.45 and 2.55 where 2.45 is the lower boundary and 2.55 is the upper boundary. The acceptance mean point of an item was 2.55 while below that indicated non-acceptance. Apart from the mean, t-test was used to determine if significant difference existed between the mean responses of boys and girls on the causes of pathological fears among secondary school students.

RESULTS AND DISCUSSION

The results of the study are presented in the following tables.

Table 1: Mean responses of male and female students on the causes of pathological fear of Mathematics among secondary school students

Items	Male		Female			Remark
	X	α	X	α	X_G	
1. Mathematics should be made interesting by using Mathematics games in the class.	2.96	0.61	2.76	0.60	2.86	Agree
2. It is my parents that made me to fear Mathematics through indoctrination	3.16	0.51	3.24	0.66	320	Agree
3. I lack self confidence when it comes to solving Mathematics problems	3.22	0.66	3.44	0.71	3.33	Agree
4. My Mathematics teachers instil fear in me during Mathematics lessons and tests.	2.88	0.82	3.12	0.68	3.00	Agree

5. I have poor background In Mathematics since primary school days	2.56	0.76	2.66	0.67	2.61	Agree
6. I always use 'fire brigade' approach to write Mathematics tests and examination.	2.64	0.68	2.82	0.56	2.73	Agree
7. Mathematics is abstract in some areas, I dread the formulae and symbols it involves.	3.12	0.55	3.42	.064	.327	Agree
8. I found it difficult to relate Mathematics knowledge into real life situations because. some topics are outside the cultural bearing of Nigerian society	2.74	0.42	2.96	.058	2.85	Agree
9. The nature of Mathematics demands a lot of thinking from students. I do not have that type of patience.	3.02	0.74	3.08	0.82	3.05	Agree
10. My classmates always make mockery of me if I answer Mathematics questions wrongly. I hate public embarrassment.	2.60	.066	3.26	0.76	2.93	Agree

Results in Table 1 show that items 2, 3,4,7,9 are major causes of pathological fears among secondary school students because they have high mean scores average.

Table 2: Mean responses of male and female students on the effect of pathological fear on students achievement in Mathematics

Items	Male		Female			Remark
	X	α	X	α	X_G	
1. Involvement in examination malpractice	2.88	0.71	2.64	0.59	2.76	Agree
2. Inability to recall what was learnt before tests and examination	2.92	0.62	3.02	0.66	2.99	Agree
3. Development of high blood pressure and other related health problems	3.42	0.53	3.12	0.60	3.27	Agree
4. Persistent failure in Mathematics.	3.22	0.49	3.16	0.70	3.19	Agree
5. Scouting for mercenary who will write exam for students (impersonation)	2.68	0.58	2.52	0.58	2.60	Agree
6. Stagnation or repetition of a class if a pass in Mathematics is a criteria for promotion	2.34	0.66	2.56	0.64	2.45	Dis-agree
7. Truancy rate may increase in Mathematics class	3.18	0.71	3.26	0.56	3.22	Agree
8. Students could bribe invigilators and supervisors during Mathematics examination	2.54	0.48	2.60	0.88	2.57	Agree
9. Lack of concentration and attention during Mathematics lessons	2.64	0.84	2.76	0.43	2.70	Agree
10. Fear in Mathematics could extend to other science courses offered by students	2.58	0.62	2.62	0.60	2.60	Agree

In Table 2, both male and female students indicate strong agreement with all the effects of pathological fear on students' achievement in Mathematics with the exception of item 6 which had a mean average

of 2.45 which is below acceptance level. Items 2, 3, 4, and 7 are major effects of pathological fear on students' achievement in Mathematics due to the high mean scores average.

Table 3: Mean responses of students to strategies that could be adopted to reduce pathological fear in Mathematics among secondary school students

Items	Male		Female			Remark
	X	α	X	α	X_G	
1. Mathematics should be made interesting by using Mathematics games in the class.	3.28	0.63	3.32	0.54	3.30	Agree
2. Mathematics teachers should adopt heuristic teaching method.	2.88	0.88	2.96	0.67	2.92	Agree
3. Incorrect responses in Mathematics questions must be handled in a positive way to encourage students participation and confidence.	3.42	0.52	3.22	0.58	3.32	Agree
4. Lessons in Mathematics should be presented in variety of ways through play acting, visual aids hands on activities and technology.	2.58	0.46	2.60	0.66	2.59	Agree
5. To learn Mathematics, students must be engaged in exploring, conjecturing and thinking rather than, engaging only in rote learning of rules and procedures.	2.56	0.72	2.54	0.64	2.55	Agree
6. Parents should show their wards how numbers are successfully used by them in positive pleasant ways, such as in cooking, sewing, sports and home repairs	3.30	0.76	3.12	0.72	3.21	Agree
7. Most students will master Mathematics concepts and skill more readily if they are presented in concrete, pictorial and symbols.	2.88	0.64	2.66	0.58	2.77	Agree
8. Cooperative groups learning should be encouraged among students to learn Mathematics.	2.96	0.80	2.72	0.70	2.84	Agree

The result in Table 3 confirms that students indicate strong agreement for items 1, 2, 3, and 6 because their means are too high. They also show agreement for all the other items as effective strategies that could be used to reduce pathological fear among secondary school students.

Hypothesis

H_{01} : There is no significant difference in the mean responses of male and female students on the causes of pathological fear in Mathematics among secondary school students.

Table 4: t-test difference between the mean responses of male and female students on the causes of pathological fear in Mathematics among secondary school students

Groups	n	mean	α	SE mean	t_{cal}	t_{crit}	df
Male students	150	289	0.82	0.07			
					1.90	1.96	2.48
Female students	100	3.08	0.78	0.08			

The calculated t-value of 1.90 is less than the critical value of 1.96 at 0.05 level of significance. Therefore, the null hypothesis is accepted, that is, there is no significant difference between the mean responses of both male and female students on the causes of pathological fears among secondary school students in Mathematics.

1. Pathological fear in Mathematics is very real and occurs among secondary school students. Much of these fears happen in the classroom due to lack of consideration of different learning styles of students by the teachers.
2. Pathological fear is a contributory factor to students' persistent failure in Mathematics in secondary schools.
3. To curb pathological fear in Mathematics, incorrect responses by the students need to be handled in a positive way to encourage students' participation and enhance students' confidence. Mathematics humour is also greatly needed

4. There is no significant difference between the mean responses of both male and female students on the causes of pathological fears in Mathematics among secondary school students which indicated consensus opinion on this finding.

From Table 1, it was found that students develop pathological fear as a result of parental indoctrination, abstract nature of Mathematics, teacher's use of inappropriate methodology and lack of confidence among students. This finding is in consonance with the findings of Betiku (2001) who opined that Mathematics is a highly structured subject. It is also abstract in some areas and it requires some special attention in learning. Hence students see Mathematics as a monster by its very nature. They reason that Mathematics is for people with special brains and talents and thus generally difficult.

Furthermore, some parents indoctrinate their children that Mathematics is difficult or that Mathematics is not compulsory or important for the course they want to do. Some parents tell their children how they hated or disliked Mathematics when they were in school. Thus some of these students copy their parents' attitude by fearing or disliking that which their parents feared or disliked. This finding is in line with the finding of Maduabum (2006) who found out that parent contributed to students' anxiety in Mathematics.

From the data obtained in Table 2, it can be inferred that inability of students to recall what was learnt, increase in truancy rate, involvement in examination malpractices and development of high blood pressure are major effects of pathological fear in Mathematics in secondary schools. These findings had earlier been pointed out by previous researchers like Amazigo (2000) and Stephen (2007). Amazigo stated that fear or panic impaired cognitive ability of students in the class. As a result the students, due to fear, could solve simple calculations under examination conditions wrongly. He therefore suggested that student needs to be calm and avoid nervousness prior to and during the time of Mathematics tests and examination. Also Stephen (2007) opined that one of the contributory factors to examination malpractices is the problem of mathemaphobia among students in secondary schools. Out of fear and anxiety students smuggled in prepared notes and textbooks into examination halls, which usually led to expulsion or

litigation in so many cases. Students need to build self-confidence and prepare adequately for tests and examination in Mathematics to avoid unnecessary embarrassment.

Four major strategies were identified for reducing pathological fears in Mathematics among secondary school students. The strategies are; use of mathematical games in teaching, handling incorrect responses from students in a positive way to encourage students participation and confidence, presentation of Mathematics lessons in a variety of ways through play acting, visual aids and technology and use of Mathematics humour in the presentation of some concepts in Mathematics. This tends to support earlier views of Ogunkunle (2000), Akinbola (2005) and Odili (2006), who pointed out those mathematical games, may be used to introduce concepts as a prelude to explicit teaching or practice skills or consolidate a concept after explicit teaching. Mathematics games facilitate Mathematics lesson, as they release boredom, tension and establish a friendly atmosphere, which allows for growth of skills and knowledge and remove fear in Mathematics. Every Mathematics teacher is encouraged to introduce relevant games in his lesson so that interest and excitement about learning Mathematics could be generated and sustained among students.

Furthermore, Odogwu (2002) pointed out that one way to overcome mathemaphobia among students is the use of relevant set induction techniques in the introduction of Mathematics lessons. He further noted that set induction is a potential determinant of the level of students' interest in Mathematics lesson. Thus, the teacher should set induce his students for two reasons. The first is to ascertain the level of their interest and knowledge. Secondly, he has to use it to generate and sustain students' interest in the lesson in particular and in Mathematics in general. Mathematics teachers could achieve good set induction through relevant jokes and riddles, asking questions and involving students in a brief mathematical activity particularly in a mathematical laboratory.

It appears that the fear of Mathematics is common among male and female students because there was no significant difference between the mean opinions of male and female students on the causes of pathological fear in Mathematics among secondary school students. This finding corroborates the finding of Maduabum (2006) who

reported that fear in Mathematics is common among students.

RECOMMENDATION

1. One way to allay the fear of students in Mathematics is to relate the uses and application of Mathematics in day-to-day life of students. For instance, the use of patterns in tailoring and dressmaking is an example of symmetry. The work involved in basket weaving, beadwork, and hairstyles are all forms of geometry.
2. Mathematics teachers need to use instructional materials to teach some concepts in Mathematics. This will stimulate and sustain students' interest and reduce their fear in Mathematics. The effective use of teaching aids concretize the abstract nature of Mathematics, it also stimulates students imagination and helps them retain the concept learnt.
3. Most Mathematics teachers are seen as 'monster' in the classroom by the students, teachers should have a sense of humour. The classroom needs to be a happy place and in fact teachers should be persons with whom children could have normal friendly human relationship. Mathematics teachers should possess a well-rounded chiselled personality.
4. Several mathematical games are available including those generated by the National Mathematical Centre, Abuja. Schools should purchase these games as they would assist the students in generating and sustaining their interest in Mathematics thereby reducing their phobia for Mathematics.
5. Teachers' use of dogmatic-method in teaching Mathematics is the cause of irrational fear students develop for Mathematics. Teachers should employ Heuristic method to encourage students' participation and discovery of concepts in Mathematics. Absence of students' participation makes the lesson boring and unexciting. Students' participation is important.
6. Parents and guardians should avoid socializing their wards away from Mathematics. They should keep away their

unpleasant Mathematics experiences from their wards and present favourable experiences before their wards. They should also keep their wards from peers that contribute to their negative attitude to Mathematics when they are aware of it.

7. One particular cause of phobia in Mathematics is lack of reader friendly Mathematics textbooks. Students develop hatred for reading Mathematics textbooks. It is recommended that schools should adopt use of reader friendly Mathematics textbooks in which topics are logically arranged to enable students work at their own rates and intensify students' involvement in the learning process thereby reducing their fears in the subject.
8. The school and the parents should complement the efforts of teachers in the classroom by organizing remedial programme to help slow learners. The remedial programme has helped many students who have pathological fear in Mathematics to overcome it.

LITERATURE CITED

Akinbola,A.D.
2005 Effects of pictorial and written advance organizers on students achievement in senior secondary school, Physics and Mathematics. *Journal of Science Teacher Association of Nigeria.* 40(2),109-116

Amazigo, J.C.
2000 Mathematics phobia diagnosis and prescription. National Mathematics Center First Annual Lecture, Abuja, July

Betiku,O.F.
2001 Causes of mass failure in Mathematics examination among students. A commissioned paper presented at Government Secondary School Karu, Abuja Science Day, 1st March.

Fatola, B.M.
2005 Improving attendance and behaviour in secondary schools. *Journal of Teacher Education*.4(2).18-22

Jegede, O.J.
2002 Science technology and Mathematics educations in Nigeria: Whose and what standards? A key note address of the 4th Annual Conference of the Nigeria Association for Science Education Research (NASER) held at University of Jos 25-29th November.

Maduabum M.A.
2006 Analysis of students performance in General Mathematics at SSCE level in Nigeria 1991-2002.*Journal of Research in Curriculum Teaching* 1(1),64-68

Odili, A.O.
2006 *Mathematics in Nigeria secondary schools; teaching perspective*. Nimo; Anachuna Educational Book Rex Charles & Park Limited.

Odogwu, H.N.
2002 The Mathematics teachers factor in achievement of goals of the Universal Basic Education (UBE). *Journal of Mathematics Association of Nigeria* 27(1), 72-78

Ogunkunle, R.A.
2000 Teaching of Mathematics in secondary schools. The laboratory approach. *The Nigeria Teacher Today*,8(2),180-184

Seaman, R.
2002 I've Got, a secret; Mathematics anxiety. Unpublished M.Ed Thesis University of Regina.

Stephen, T.K.
2007 Perception of students on the causes and effects of Mathematics anxiety among students of tertiary institution in Nigeria; *Journal of Education Studies* 13(1), 149-156

Tobias, S.
1993 *Overcoming Mathematicss anxiety*. New York: W.W. Norton and Company.

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