

# EFFICACY OF TWO THERAPEUTIC TRAINING TECHNIQUES IN REDUCING EXPRESSED MATHEMATICS ANXIETY AMONG STUDENTS IN EMU EDO STATE NIGERIA

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## **Abstract**

*A pre-test and post-test experimental design was used to determine the efficacy of two therapeutic training techniques in reducing expressed mathematics anxiety among students in Emu Edo state Nigeria. The samples were 60 junior secondary school students expressing Mathematics anxiety. Samples were selected from three secondary schools based on their recorded performance of below 20% attain in three terms Mathematics examination in JSS2. The respondents were randomly assigned to treatment and control groups. The two treatment groups were exposed to eight-weeks training in cooperative learning and self-efficacy training techniques, while participants in the control group received no training. One validated*

*instrument: Mathematics Anxiety Rating Scale ( $\alpha=.93$ ) was used to collect data from the respondents. Two hypotheses were tested at 0.05 level of significance. Data were analysed using ANCOVA and Multiple Classification Analysis (MCA). The result indicated that the therapeutic training had significant effect on the pre-post Mathematics anxiety scores of students in the experimental and control groups ( $F(2,56) = 6.30, P < .05$ ). However, the moderating effect of gender and age on Mathematics anxiety of junior secondary school students in the pre-post Mathematics anxiety scores of students was not significant ( $F(2,59) = 0.29, P > .05$ ). Therefore, Students should be encouraged to engage in group work that would enhance cooperative learning synergy. Also, they could be help to foster positive attitude to learning as to make them confident and self-efficacious.*

**Keywords:** Age, Cooperative Learning, Gender, Mathematics Anxiety, Students, Self-Efficacy and School.

Mathematics is an interesting science that requires learners to apply creative ideas aligned with the use of basic skills and concept to solving human challenges and enhance positive wellbeing. The beauty of Mathematics hinge on it use of symbols, graphical elements, numbers and appropriate figures, applying systematic rules to measure relationship between objects, space and time. Despite this, studying Mathematics as a subject appears difficult and challenging to some learners as observed with their attained poor results in standardised examination such as (WAEC) overtime. For example, Okoiye (2011) reported that the performance of students who had credit passes required for admission into tertiary institutions including English and Mathematics in WAEC Senior School Certificate Examination results of the May/June 2009 was 25.99%, 2010 was 24.94%, 2011 was 38.93%. Also, Nigerian students credit performance from 2012-2016 as thus, 2012 was 38.81%, 2013 (36.57%) 2014 (31.28%) 2015 (38.68%) and 2016 (52.97%). Except for the year 2016, they have consistently recorded awful performances of below 40% which is quite disturbing and worrisome.

The implication is that calculating from 2009-2015 less than 40% of Nigerian pupils were qualified for admission for tertiary education. The dismal phenomenon putting Nigerian students at-risk of academic failure could be anxiety. Therefore, identifying factor such as anxiety that influences student achievement and motivation to study Mathematics is a great concern to researchers being that Mathematics anxiety could make affected students express low academic self-efficacy, low self-esteem and expressed helplessness. These could have some implications not only on the well-being of such students, but also on significant others and society. Despite this great shortcoming, educators continue to use methods which appears to be ineffective for many students. This development has made some students to experience academic

failure and unable to gain admission into tertiary institutions (Okoiye, 2011). This make investigating efficacy of two therapeutic training techniques in reducing expressed mathematics anxiety among students in Emu Edo state Nigeria germane.

Mathematics anxiety is experienced as stress, tension and strain brought into one's body and mind due to individuals inability to solve Mathematical task. Mathematics anxious individual are often confused attending to their mathematical tasks. Tobias (1993) contended that Mathematics anxiety is a feeling of tension and anxiety that interfere with the manipulation of numbers leading to examination anxiety and loose one's self-confidence. Likewise, Bamidele (2005) in his study mathematics not dreadful subject stated that in Nigerian schools, student's general impression is that it is a dreadful subject. But ironically, this subject is the basis for scientific and technological advancement of any country. This was corroborated by Ale (1989) that the subject is rather an interesting one hence, the establishment of the National Mathematical Center (NMC) in Abuja, Nigeria. Despite these, Mathematics is still more challenging for some students than others and students with problems in Mathematics subject often due to repeated anxiety experience based on poor performance continue to doing poorly via bad study habits, low confidence on days of Mathematics tests and low self-efficacy tend to inhibit their academic potential.

Masoud and Farah (2011) found that cooperative learning method in comparative with traditional way, decrease mathematics anxiety in students significantly and increase help seeking behaviour and decrease its avoidance component in them. Somayeh, Seyed and Mohammad (2013) posited that cooperative learning method reduces Mathematics anxiety significantly and improves academic achievement. Phillip (2015) averred that Mathematics anxiety has kept students from excelling in Mathematics; several methods of instilling confidence have been instituted within the classroom by countless teachers. However, structures of cooperative learning have been described as the best way for students to overcome their Mathematics anxiety.

Esrstrom, (1996) reported that psychologists and educationists are becoming aware of the fact that an individual self-efficacy, or the perception of their capability or ability, is intimately related to how they learn and behave. Researchers have tried to relate self-efficacy with academic performance. They found that self-efficacy correlated positively with achievement outcomes (Pintrich & Schunk, 2002; Aremu & Ogbuagu, 2005; Bandura, 1995). For example, students who believed they are able and will do well are often motivated, more persistent in behaviour than those who believed they cannot succeed (Pintrich & Schunk, 2002). Hence, learners aspirations and level of interest in intellectual pursuits affects their academic achievements. Furthermore, these beliefs influence emotional states such as stress, anxiety and depression which could intrude on and impair intellectual functioning (Zimmerman, 1995). This implies that students would like to participate in activities they are sure they will excel.

When learners are self-efficacious they express great level of determination and resilience in difficult situation. This disposition is the pivot for the attainment of success and academic excellence (Bandura, 1997; Pajares, 1996). The impact of gender in Mathematics achievement was reported in Josiah and Etuk-iren (2014). For example, Trends in International Mathematics and Science Study (TIMSS) found significant differences between male and female students in mathematics achievement, with male students significantly outperforming their female counterparts (Epstein, Elwood, Hey & Maw, 1998). However, a Nigerian study shows no significant gender-achievement relationship in number and numeration, algebraic process and statistics (Abiam & Odok, 2006). Similar results showing no significant gender difference in mathematics achievement were also found (Habibollah, Abdullahi, Arizan, Sharir & Kurma, 2009; Abubakar, 2010). In the same vein, Walker, Greenwood, Hart and Carta (1994) found significant difference in the academic attainment of old and younger students with older students performing better. Likewise, La Paro and Pianta (2000) reported that older children fared better academically than the younger ones. However, students experiencing Mathematics anxiety could be ill motivated to achieve academically and this could have a devastating negative effect on their academic and intellectual well-being. Also, the comprehension of possible bleak educational future and prospect by these students is indeed traumatic and impair their academic self-concept, self-efficacy, self-esteem and make them develop irrational doubt, inferiority complex, deviant behaviour, act of truancy and become self-isolated from others due to shame of failure.

### **Research Hypotheses**

There will be no significant effect of treatment on Mathematics anxiety of junior secondary school students

There will be no significant moderating effect of gender and age on Mathematics anxiety of junior secondary school students

### **Method**

The study adopted a pre-test, post-test control group quasi experimental design with 3x2x2 factorial matrix. The design is made up of three rows representing the two treatment groups, cooperative learning, self-efficacy and the Control Group (non-treatment group). There is also a column denoting age (young and old) and gender (male and female) participants as shown in table 1

**Table.1**

**1. A 3x2x2 Factorial Matrix Design on Mathematics Anxiety among Secondary School Students**

Treatment	AGE				
	Male		Female		Total
	Young 14-16 years	Old 17-19 years	Young 14-16 years	Old 17-19 years	
<b>A1 Cooperative Learning</b>	A1 B1C1n=7	A1 B1C2n=3	A1 B2C1n=6	A1B2C2n=4	20
<b>A2 Self-Efficacy</b>	A2 B1C1n=3	A2 B1C2n=7	A2 B2C1n=5	A2 B2C2n=5	20
<b>A3 Control Group</b>	A3 B1C1n=5	A3 B1C2n=3	A3 B2C1n=7	A3B2 C2n=5	20
<b>Total</b>	<b>15</b>	<b>13</b>	<b>18</b>	<b>14</b>	<b>60</b>

The population for this study consists of all JSS3 secondary school students in Emu town Edo State Nigeria.

The samples for the study consist of 60 JSS3 students purposively selected based on their recorded performance of below 20% attain in first, second and third term mathematics examination in JSS2. This information was got through their record in their cognitive cumulative record folder through the help of their class teachers' from three purposively selected secondary schools used for the study.

Mathematics Anxiety Rating Scale by Yucedag-Ozcan and Brewer (2011) was used in this study. The scale has 24 questions and is scored from 1 to 5, where 1 indicates no anxiety and 5 indicates high anxiety. There are two factors in the scale. The first factor is Learning Mathematics Anxiety, which includes items that measure anxieties experienced during activities that deal with learning Mathematics, such as listening to another student explain a Mathematics formula. The second factor is Mathematics Evaluation Anxiety, which contains eight items that measure the anxiety experience of being evaluated taking examination in a Mathematics course. The scale has a Cronbach's alpha of  $\alpha=.93$ .

The researcher got permission to carry out this research from the school principals and the parents of concerned students were contacted and their consent sought. Preliminary visits were made to the three secondary schools used for the study. And through the visits, the researchers informed the principals, teachers, class teachers and students of the purpose of the study and liaised with them to get the needed information from the students' cognitive cumulative record folder as to facilitate effectively the process of purposive sampling of students who have consistently scored below 25% in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> term Mathematics examination in JSS2. Similarly, the initial visit to the schools was used as a pilot study. Two of the

three secondary schools were used as the treatment groups while one served as the control group. The treatment groups received eight weeks training while the control group received no training. The groups were subjected to pre-test and post-test assessment. The treatment session was held for one hour on Mondays and Wednesdays of each week for experimental group one and two. However, the control group was not exposed to any treatment programme.

In controlling extraneous variables that possibly could affect the results of the study, the participants were randomly assigned to groups. Also, the Rosenthal effect was controlled by keeping the control group busy with their usual daily school routine during the experimental sessions. Via this measure, the contaminations which were beyond the reach of the design and other procedures of the research were taken care of by using ANCOVA statistical tool for analysis. ANCOVA (Analysis of Covariance) and Multiple Classification Analysis (MCA) as the statistical tools for the study. They were used to compare the differential effectiveness of the treatments.

### Result

Ho1: There will be no significant effect of treatment on Mathematics anxiety of junior secondary school students

**Table 2 Showing Effect of Treatment on Mathematics Anxiety of Junior secondary School Students**

	Sum of Square	df	Mean Square	F	Sig	Remark
Covariate	2251.08	1	2251.08	10.03	.000	
Treatment	2829.12	2	1414.56	6.30	.001	sig
Explained	11020.11	7	1574.30	7.01	.000	
Residual	11669.73	52	224.42			
Total	22689.84	59	384.57			

The result in table 2 showed that there is significant main effect of treatment in the pre-post Mathematics anxiety scores of students in the experimental and control groups ( $F(2,56) = 6.30, P < .05$ ). This means that there is a significant main effect of treatment in the mean post-test Mathematics anxiety scores of participants exposed to treatment and the control group. This also implies that students in the experimental groups benefited from the treatment package as it foster in them expressed motivational desire to achieve better than students in the control groups who were not

exposed to any treatment package Therefore, hypothesis 1 is rejected. In order to find out the magnitude of groups mean scores, Table 2 is presented.

**Table 3: Multiple Classification Analysis (MCA) Showing the Direction of the Results in the Pre-post Mathematics Anxiety Scores of Students in the Treatment Groups**

Variable + Category	N	Unadjusted variation	Adjusted Mean Score	Eta	Adjusted for independent + covariates deviation	Beta
<b>Grand Mean = 50.10</b>						
Treatment Groups:						
Cooperative Learning Group	20	-4.11	45.99		11.77	
Self-efficacy Group	20	-3.08	47.02		8.17	
Control	20	7.08	57.18	.83	9.13	.72
Multiple R-squared						.761
Multiple R						.784

The MCA as observed in Table 3 with the performance of all the groups in Mathematics anxiety. The Cooperative Learning Therapy group had the least adjusted post-test mean score ( $\bar{X} = 45.99$ ) followed by Self-efficacy Therapy with the adjusted mean score ( $\bar{X} = 47.02$ ) while the Control group had the highest adjusted post-test mean score ( $\bar{X} = 57.18$ ). This indicated that the participants in the treatment groups were able to reduce the impact of anxiety on their Mathematics achievement while participants in the control group were not. The MCA further revealed the differential-values of the pre and post treatment outcome and equally shows the effectiveness of the treatment package over the control (i.e. non-treatment group).  
Ho2: There will be no significant moderating effect of gender and age on Mathematics anxiety of junior secondary school students

**Table 4: Showing Moderating Effect of Gender and Age on Mathematics Anxiety of Junior Secondary School Students**

	Sum of Square	df	Mean Square	F	Sig	Remark
Covariate	2251.08	1	2251.08	10.03	.000	
Gender + Age	129.02	2	64.51	0.29	.201	N.s
Explained	11020.11	7	1574.30	7.01	.000	
Residual	11669.73	52	224.42			
Total	22689.84	59	384.57			

The result on table 4 shows that there was no significant moderating effect of gender and age on Mathematics anxiety of junior secondary school students in the pre-post Mathematics anxiety scores of students ( $F(2,59) = 0.29, P > .05$ ). Therefore the null hypothesis is accepted. This implies that the phenomenon of gender and age did not affect the way and manner student express anxiety when it comes to attending to Mathematical task.

### **Discussion of Findings**

The findings of Hypothesis 1 revealed that there was significant main effect of treatment in the pre-post Mathematics anxiety scores of students in the experimental and control groups ( $F(2,56) = 6.30, P < .05$ ). However, the Cooperative Learning Therapy group had the least adjusted post-test mean score ( $\bar{X} = 45.99$ ) followed by Self-efficacy Therapy with the adjusted mean score ( $\bar{X} = 47.02$ ) while the Control group had the highest adjusted post-test mean score ( $\bar{X} = 57.18$ ). This indicated that the participants in cooperative learning group were able to reduce the impact of anxiety on their Mathematics achievement more followed by self-efficacy group while participants in the control group where not. This finding is in consonant with that of previous researchers. For example,

Masoud and Farah (2011) found that cooperative learning method in comparative with traditional way, decrease mathematics anxiety in students significantly and increase help seeking behaviour and decrease its avoidance component in them. Somayeh, Seyed and Mohammad (2013) posited that cooperative learning method reduces Mathematics anxiety significantly and improves academic achievement. Cooperative learning also encourages students to interact and to communicate with peers in harmony.

Likewise, the result of hypothesis 2 revealed that there was no significant moderating effect of gender and age on Mathematics anxiety of junior secondary school students in the pre-post Mathematics anxiety scores of students ( $F(2,59) = 0.29, P > .05$ ). The reason for this could be that Mathematics anxiety is accompanied by feeling of helplessness because Mathematics anxious individual feels blocked, unable to find a solution to their problem. In support Tobias (1993) contended that Mathematics anxiety is a feeling of tension and anxiety that interfere with the manipulation of numbers leading to examination anxiety and loose one's self-confidence. Likewise, Bamidele (2005) in his study mathematics not dreadful subject stated that in Nigerian schools, student's general impression is that it is a dreadful subject. But ironically, this subject is the basis for scientific and technological advancement of any country.



### **Conclusion**

Mathematics is an interesting science that requires the application of fundamental principles aligned with the use of basic skills and concept to solving human challenges and enhance good quality of life. However, acquiring basic knowledge would enable students be competent and overcome the challenges of negative anxiety on their academic performance.

### **Recommendation**

1. Students should be encouraged to engage in group work that would enhance cooperative learning synergy.
2. Students should be help to develop the required learning capabilities as to enable them to be confident in self and self-efficacious.
3. Teachers should use appropriate teaching method that will enable students develop interest in Mathematics as to be knowledgeable and be competent in the subject.

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