Effectiveness of Motivational Enhancement Therapy in Enhancing Mathematics Learning Gains among School-Going Adolescents in Oyo State, Nigeria.

Adebayo David Oluwole, Ph.D. and Muraina Kamilu Olanrewaju

Department of Guidance and Counselling, Faculty of Education, University of Ibadan, Ibadan, Nigeria.

E-mail: muraina_kamilu@yahoo.com

ABSTRACT

The purpose of this study was to examine the effectiveness of motivational enhancement therapy in enhancing mathematics learning gains among school-going adolescents in Oyo State, Nigeria. Pretest-posttest, control group quasi-experimental design with a 2X2 factorial matrix was used in the study. The simple random sampling technique was used in selecting sixty (60) participants from two (2) local government areas in Oyo State, Nigeria. The respondents were measured with relevant adopted standardized scales (instruments) and the data obtained was analyzed using Analysis of Covariance (ANCOVA) statistical analysis. Three research hypotheses were formulated and tested at 0.05 level of significance.

The result showed that there was significant main effect of treatment on students' mathematics learning gains ($F_{(2, 47)} = 82.224$, $p < .05$, $\eta^2 = .681$), there was no significant main effect of gender on students' mathematics learning gains ($F_{(1, 47)} = .133$, $p > .05$, $\eta^2 = .002$) and there was no significant interaction effect of treatment and gender on students' mathematics learning gains ($F_{(2, 47)} = .044$, $p > .05$, $\eta^2 = .001$).

In view of these findings, the study stressed that the students should be trained on the effective usage of this interventions (motivational enhancement therapy), Experts in educational testing/evaluation and Counseling/Educational psychologists should intensify their effort to organize seminars/conferences on the implications of this intervention and moderating variables (that is gender among others) as they interact with students' mathematics learning gains in the school.

(Keywords: motivational enhancement therapy, mathematics learning gains, school-going adolescents)

INTRODUCTION

Mathematics is one of the compulsory subjects that students must complete in Junior Secondary School (JSS), regardless of whether such students intend to be in science, commercial, arts or social science in Senior Secondary School (SSS) class. In secondary school curriculum according to National Policy on Education (2004), mathematics is one of the core subjects that for the students to further their studies in Senior Secondary School (SSS) or institutions of higher learning especially in University, students are expected to have credit in it. This makes mathematics one of the essential subjects for students' advancement.

Mathematics is one of the subjects that is taken very seriously in the school system, irrespective of country or level of education. It has been described as a model of thinking which encourages learners to observe, reflect and reason logically about a problem and in communicating ideas, making it the central intellectual discipline and a vital tool in science, commerce and technology.

In the words of Salman (2005), mathematics is a precursor of scientific discoveries and inventions. It is the foundation for any meaningful scientific endeavor and any nation that must develop in science and technology must have a strong mathematical foundation for its youths. In terms of curriculum relevance, mathematics is compulsory at the secondary school level and a prerequisite for moving from the Junior Secondary School (JSS) to the Senior Secondary School (SSS); just as at the tertiary level of education, a sound background in mathematics is a necessary condition for the study of all science, technology and social science based courses, as required by the Unified Tertiary and Matriculation Examination (UTME).

Learning gains are the outcomes and performance of students in the tests and examinations s/he has been exposed to. The concept of learning gains is has always being used synonymously with some concepts such as learning outcomes, academic achievement, academic performance, and academic success among others (Adejumo, Oluwole and Muraina, 2015).

Analysis of school certificate mathematics examination results shows that students' performances in mathematics are consistently poor. Uwadiae, (2014) reported that less than 42% of registered candidate in SSCE obtain credit pass in mathematics. Even the SSCE results released by WAEC and NECO for 2012 indicated poor achievement of students in mathematics. According to Olunloye (2010), this ugly trend of high failure rate in mathematics is a national disaster. Therefore, feasible ways of improving performance has remained an area of great concern for researchers.

However, it is disheartening that research and data from National Examination Bodies like West African Examinations Council (WAEC) have shown a consistent poor performance in this subject. Majority of school-going adolescents often dread and show negative readiness towards mathematics and the trends of their achievement in the Senior Secondary School (SSS) certificate examination is also a source of worry to the stakeholders (Ajayi and Muraina, 2011; Adejumo, Oluwole and Muraina, 2015). From available statistics, the national average hovers around 32 per cent for mathematics.

Uwadie (2014) in support of the above assertion noted that it was only 48.88% of candidates who sat for November/December 2013 West African Senior School Certificate Examination (WASSCE) that has credit while the rest of 51.12% of the candidates failed in mathematics. The 2014 May/June SSCE results also recorded mass failure by students across the country. In mathematics, 242, 162 students sat for the examination with only 23,042 representing 9.52% obtaining distinction. 15, 752 representing 6.50% got credit while 101,321 representing 41.8% got pass. 94.162 representing 38.9% failed while 7,886 representing 3.26% were involved in malpractice. By implication, only 16.02% (distinction and credit percentage) is qualified for admission into universities and polytechnics.

Motivational Enhancement Therapy (MET) is a therapeutic approach based on the premise that students will best be able to achieve change when motivation comes within themselves rather than being imposed by the stakeholders. Motivational enhancement therapy (MET) was developed by Miller and Rollnick (1991). Motivational enhancement therapy in this study refers to the process of developing and improving positive eagerness and motive of students towards success in mathematics. The goal is to increase the achievement motivation of students towards learning gains in mathematics.

In motivational enhancement therapy, participants are given guidance on how to think, talk and act like a person with high achiever and then examine carefully the extent to which they want to plan their lives in the immediate future. Researchers have used motivational enhancement therapy to assist in improving the performance of a number of different childhood populations, such as learning disabled students among others (Chan, 2001; Graham and MacArthur, 2008; Harris and Graham, 2005), reading and attributions disabled and impulsive children (Guevremont, Tishelman, and Hull, 2005). Although the use of this technique encompasses a variety of domains, such as cognitive skills and affective skills (Chan, 2001), an important area of application is learning gains.

Deci and Ryan (1985) and Elliot and Harackiewics (1996), stated that motivational enhancement therapy plays a crucial role affecting learning gains of students at different levels of education. Similar findings have also been reported in research conducted in Africa. Ali (2015) also investigated the relationship between motivational enhancement therapy and mathematics academic performance with a sample of college students in Zambia. He however found a significant and positive relation among motivational enhancement therapy and mathematics academic performance, indicating that students who had high motivational enhancement therapy performed significantly better than their counterparts who had low motivational enhancement therapy on academic performance, as measured by the averages of the term examination grades.

Research with high school students has also documented consistent findings that motivational enhancement therapy plays a vital role in

significantly and positively affecting learning gains.

Gender as the moderating variable in this study refers to differences of students in term of being male or female. Gender is a major factor that influences subject interest of students. Further explanation in this context shows that home economics, nursing, secretarial work, and other related careers have been traditionally regarded as aspects of the school curriculum reserved for females (Umoh, 2003). Based on this, males in Nigeria tend to choose male stereotyped occupations and females choose female stereotyped occupations. According to Umoh (2003) more difficult tasks are usually reserved for males while less difficult ones are considered feminine in a natural setting. An example of this is the breaking of firewood, which is often seen as a masculine task while washing of plates could be seen as a female task at home. Thus at school males are more likely to take difficult subject areas and challenging problem-solving situations while females have tended to prefer simple subjects and often shy away from difficult tasks and problem-solving situation.

In Nigeria, gender-achievement studies include Busari (2012) who found that female students perform academically better than their male counterparts. Also, Abiam and Odok (2006) found no significant relationship between gender and achievement in number and numeration, algebraic processes and statistics. They, however, found the existence of a weak significant relationship between gender and learning gains in geometry and trigonometry (Hopkins, 2004).

Ekeh (2003) discovered that male students performed better than females in science and mathematics. These differences in performance can be attributed to gender-biases which encourage male and female students to show interest in subjects relevant and related to the traditional roles expected of them in the society. Studies have shown that gender has a negative impact on cognitive performance of students as girls perform better without the boys and vice versa (Okon, 2003). The differences in the scholastic achievements of boys and girls are generally attributed to biological causes and/or to cultural and stereotypes (Klein, 2004).

The last two decades have been devoted to addressing gender inequality in education. Some studies (Okebukola, 1993; Jiboku, 2008) have shown an all-time low participation of women in education. Educators have therefore expended tremendous efforts in the study of the personal factors affecting learning gains especially in the sciences and social sciences. Notable among these variables is the study of the phenomenon of gender or sex equity in education. A rich harvest of explanation of causes, understanding of cost to the society and possible intervention has brought about several researches, workshops, seminars and training in this area.

The disadvantages associated with low socioeconomic status lead to lower than average test scores for low socio-economic status students. In widely available U.S. datasets, parents' education, family income and family possessions are usually used as measures of socio-economic status. There is some evidence that socioeconomic status impacts women more than men. Ware and Lee (2005) also showed that women from more privilege backgrounds are more likely to choose science major and among those in science majors, women are more likely than men to have mothers employed in prestigious occupations (Ware & Lee, 2005).

Despite the efforts of scholars and researchers in finding lastly solution to the problems of poor learning gains among students in the school, little studies have concentrated on the use of motivational enhancement therapy especially in mathematics. Also, studies related to the use of motivational enhancement therapy was majorly on reduction of substance abuse and was studied mostly outside Nigeria and the need to use these therapies in enhancing learning gains make this present study a peculiar one. Moreover, the moderating variables selected (gender) was mostly used in some studies not on mathematics learning gains.

Such research conducted on learning gains in mathematics used only aspect of mathematics such as algebra, calculus, simultaneous equations, trigonometry, and word problems among others. In order to fill the gaps in the previous study and add more to the existing literatures, the present study intends to examine the effectiveness of motivational enhancement therapy in enhancing mathematics learning gains among school-going adolescents in Oyo State, Nigeria.

STATEMENT OF THE PROBLEM

There is a negative perception among the students that mathematics is a very difficult subject. As much as possible students tend to avoid taking mathematics courses which make them to develop poor learning readiness toward mathematics. Poor learning readiness towards mathematics courses severely restricts the students to a limited field of study and jobs they can find nowadays.

Poor mathematics learning readiness makes students to avoid so many field of study in the universities, polytechnics, and colleges of education across science and non-science based courses. This is because mathematics is needed in all disciplines and also instruments that ease the learning of other discipline/subjects and prepares one for the future. Inability of students to proceed their studies in the higher institution of learning bring about academic drop out which has a lot of implications to the society such as disgrace to the family, disgrace to the students, low man power and involvement of students in different sort of hooliganism and crimes among others.

This study is therefore concentrates on the effectiveness of motivational enhancement therapy in enhancing mathematics learning gains among school-going adolescents in Oyo State, Nigeria.

PURPOSE OF THE STUDY

The main purpose of this study is to investigate into the effectiveness of motivational enhancement therapy in enhancing mathematics learning gains among school-going adolescents in Oyo State, Nigeria. Specifically other purposes include:

1. Finding out effect of motivational enhancement therapy on the students' mathematics learning gains

2. Investigating effect of gender on the students' mathematics learning gains

3. Examining the interaction effect of treatment and gender on the students' mathematics learning gains

HYPOTHESES

1. There will be no significant main effect of treatment on students' mathematics learning gains

2. There will be no significant main effect of gender on students' mathematics learning gains

3. There will be no significant interaction effect of treatment and gender on students' mathematics learning gains

METHODOLOGY

Research Design

The study adopted the pretest-posttest, control group quasi-experimental design with a 2X2 factorial matrix. In essence, the row consists of motivational enhancement therapy and the control. The row was crossed with gender varied at two levels (Male and Female). This is represented in the Table 1.

Table 1: A 2x2 Factorial Matrixes for Enhancing Mathematics Learning Gains.

Treatments	**GENDER**				
	MALE (B_1)		**FEMALE (B_2)**		
MET (A_1)	$A_1B_1C_1$ n=5	$A_1B_1C_2$ n=6	$A_1B_2C_1$ n=6	$A_1B_2C_2$ n=13	**n=30**
CG (A_3)	$A_3B_1C_1$ n=6	$A_3B_1C_2$ n=6	$A_3B_2C_1$ n=14	$A_3B_2C_2$ n=4	**n=30**
Total	**n=11**	**n=12**	**n=20**	**n=17**	**N=60**

Key: MA = Mathematics Anxiety, MET = Motivational Enhancement Therapy, SMT = Self-monitoring Training, CG = Control Group.

Population

The population for the study comprised all school-going adolescents in public secondary schools in Oyo North Senatorial District Area of Oyo State, Nigeria. This Senatorial District was selected as a result of their being sidelined in term of provision of basic amenities, qualified teachers, provision of teaching and learning materials and poor rural development among others. The researcher covered all school-going adolescents in JSS 2 in thirteen (13) Local Governments that constitute Oyo North Senatorial District Area of Oyo State, Nigeria.

Sample and Sampling Technique

Simple random sampling technique was used to select the participants for the study. The participants were selected from public secondary schools in Oyo North Senatorial District Area of Oyo State, Nigeria. Two (2) Local Governments (that is Itesiwaju and Saki West Local Governments) were selected from Oyo North Senatorial District Area out of thirteen (13) Local Government Areas in the Zone. One public secondary school was selected randomly in each selected Local Government Areas in the Zone; thirty (30) JSS 2 students were selected in each public secondary school through balloting. On the whole, sixty (60) school-going adolescents were drawn from selected public secondary schools in the Area.

The participants consisted of school-going adolescents in JSS 2 who had consistent records of low mathematics achievement and scored low in the screening instrument. However, in the two selected public secondary schools, one school formed motivational enhancement therapy class and the remaining one served as control group. The schools selected were Muslim Grammar School, Otu (Itesiwaju LG) and Baptist High School, Saki (Saki West LG).

Research Instruments

Attitude to Mathematics Scale (AMS): Attitude to mathematics scale consist of twenty (20) item instrument rated on four points type scale ranging from strongly agreed (SA) to strongly disagreed (SD). The instrument was adapted from attitude to mathematics scale developed by Akinsola (1994). The adapted and modified instrument contains 30 items validated through a pilot study. Example of the items in the scale was: *1. Sometimes I think mathematics assignment is easy when other students think it is hard; 2. I am one of the best students in my class; 3. I love to be solving mathematical problems.* The instrument has reliability coefficient of .77.

The instrument was however re-validated and Cronbach alpha value of .83 was obtained after administering the instruments in a pilot study to a selected sample of thirty (30) JSS 2 students in Ibadan, Oyo State, Nigeria. The items in the scale were scored as follows: Strongly Agree = 4, Agree = 3, Disagree = 2 and Strongly Disagree = 1. The points that were scored on all items were summed up to give participant's score on the scale. The items were also be coded because there were both negative and positive statements which were reversed. Scores on the scale ranged between 20 and 80. A score above 40 indicated high mathematics readiness and score below the norm indicated low mathematics readiness and the school adolescents with low mathematics learning readiness were used.

Mathematics Learning Gains Test (MLGT): This was made up of thirty one (31) multiple choice items with four options. All the questions are to be answered by the participants within an hour. The reliability coefficient of the instrument was determined using Kuder – Richardson formula 20 (KR20). Kuder – Richardson formula 20 (KR20) was used to determine the internal consistency and overall coefficient of the instrument. Item analysis was also used to carry out the difficulty index and discriminatory power of the test. This was done between the higher achievers and lower achievers in mathematics.

The difficulty and discriminating indices of each of the test items was computed for further validation of the instrument. The difficulty level of .51 and the discrimination index of .75 were obtained. However, writing of test items was followed by face and content validation. The face and content validation reduced the items from sixty (60) to forty five (45) after giving the test to three (3) mathematics teachers in secondary schools for scrutiny; while item analysis further

reduced the test items from forty five (45) to thirty one (31). The surviving items were administered on thirty students. Kuder-Richardson formula (KR) was applied to the scores in order to measure the internal consistency. Example of the items in the Test was: *1. Simplify (-8) x (-3)? 2. Solve for x in* x^2 *-5x = 6?; 3. Find the value of x if 4x + 7 = 5x + 6?* The internal consistency coefficient of .79 was obtained on the test-retest method used on the students within an interval of three weeks. However, to construct MLG, a table of specifications (or test blueprint) was drawn up for sixty (60) test items (as shown in Table 2 and 3).

However, the MLG was tailored on the lower level of cognitive domain (i.e., recall, understanding and application), simply because the researcher is concentrating on the lower secondary school classes and as such the higher levels (i.e., analysis, synthesis and evaluation) is more of further mathematics and this further mathematics is subject that is made optional/elective only for the science students in the Senior Secondary School (SSS) class Curriculum.

Inclusion Criteria

The following criteria were used in selecting the participants for the study:

i. Interested participants should be JSS 2
ii. Adolescents with consent from their parents
iii. Adolescents with consent from the school authority
iv. Adolescents willing to participate in the treatment programme.
v. Adolescents with low score in the attitude to mathematics scale for screening
vi. Adolescents with consistent record of low learning gains in mathematics

Exclusion Criteria

i. Participants' non readiness to sign consent form.

Table 2: Specifications for MLG.

S/N	Mathematics Areas	Recall	Understanding	Application	Total
1.	Indices and standard form	4	4	4	12
2.	Approximations	4	4	4	12
3.	Equations	4	4	4	12
4.	Plane and solid shapes	4	4	4	12
5.	Algebraic Expression	4	4	4	12
	TOTAL	**20**	**20**	**20**	**60**

Source: Authors' Field Work

Table 3: Survival Items Distribution of MLG in Bloom Taxonomy.

S/N	Mathematics Areas	Recall	Understanding	Application	Total
1.	Indices and standard form	17, 22, 29	19, 20, 26	18, 21, 23	9
2.	Approximations	8, 25	9, 15	10, 13	6
3.	Equations	2, 3	7	11, 24	5
4.	Plane and solid shapes	12	28	14, 16	4
5.	Algebraic Expression	1, 27	5, 4, 31	6, 30	7
	TOTAL	**10**	**10**	**11**	**31**

Source: Authors' Field Work

Procedure for Data Collection

The study was carried out in four phases: pre-sessional activities, pre-test, treatment and post-test. At the pre-session, activities include the screening, recruitment and assignment of participants to the two experimental and control group. Advertisement was made to request for participants in selected secondary schools. A preliminary meeting was organized to familiarize with the interested participants and to solicit their willingness to participate in the study.

At the pre-test stage Mathematics Learning Gains Test (MLGT) were administered to the participants. Participants in the experimental group only were exposed to eight sessions of treatment. Each session spanned for an average of 60 minutes (an Hour). Though the control group was not treated, they were exposed to a lecture titled *"Education and Sustainable Development".* The post-test was administered following the conclusion of the program.

The synopsis of treatment packages are given below:

Experimental Group 1 (Motivational Enhancement Therapy)

1st Week: General orientation and administration of the instrument to obtain pre-test scores.

2nd Week: This session focused on motivational enhancement therapy which entails the premise for students to achieve change when motivation comes from within themselves rather than being imposed by the therapist.

3rd Week: This session was based on the explanations of learning environmental mastery which deals with the ability of student to have a sense of mastery and competence in managing the learning environment and able to create or choose contexts suitable to personal learning needs and values.

4th Week: In this session, an attempt was made to explain the personal growth citing example the students will have a feeling of continued developmental trend; see themselves as growing and expanding and open to new learning experiences for learning mathematics.

5th Week: This session focused on urge and motive. Using the structure of motivational enhancement therapy identified above, the researcher explained that student who has urge and motive is an individual who is self-determined to learn irrespective of the conditions/situation; able to resist to solving problems; regulates behavior from within and evaluates self by personal acceptance.

6th Week: This session was on the meaning and strategies of developing discrepancy, stating clearly that such students who develop discrepancy; accepts his/her good and bad qualities; feels positive about past life in learning will have an improved mathematics leaning gains.

7th Week: During this session, the researcher defined the relationship and explained self-efficacy support with respect to how it could affect or influence their mathematics learning gains. This MET strategy refers to helping develop and support the client's belief that he/she can achieve change in learning mathematics.

8th Week: This session witnessed summary of motivational enhancement therapy, collection of post-test scores and formal closing of the sessions.

Control Group

Session 1: Introduction and pre-treatment.

Session 2: Education and Sustainable Development.

Session 3: Post testing and conclusion

Control of Extraneous Variables

Extraneous variables are those factors or attributes that may affect the outcome of the experimental study aside from the skill trainings to be employed. The researcher guided against effects of such variables through the following; appropriate randomization of participants into the two intervention groups and the control group; adherence to inclusion criteria; effective use of the 2x2 factorial matrix design and the Analysis of Covariance (ANCOVA) statistical tool that was used equally takes care of likely extraneous variables.

DATA ANALYSIS

Analysis of Covariance (ANCOVA) is the major statistical tools that were employed in this study. The Multiple Classification Analysis (MCA) was also used in this study to determine the directions of differences and significance identified.

RESULTS

The study investigated the effectiveness of motivational enhancement therapy in enhancing mathematics learning gains among school-going adolescents in Oyo State, Nigeria. Three (3) null hypotheses were formulated and tested at 0.05 level of significance. The results are presented below:

Hypothesis One: There will be no significant main effect of treatment on students' mathematics learning gains.

Table 4 showed that there was significant main effect of treatment on students' mathematics learning gains ($F_{(2, 47)}$ = 82.224, P < .05, η^2 = .681). This implies that there is a significant impact of the treatment in the groups test scores on mathematics learning gains of school-going adolescents. Therefore, the null hypothesis stated that there is no significant main effect of treatment on students' mathematics learning gains was rejected; the table also shows the contributing effect size of 68.1%. For further clarification on the margin of differences between the treatment groups and the control group, a Multiple Classification Analysis (MCA) which shows the comparison of the adjusted mean was computed and the result is as shown in Table 5.

Table 4: Summary of 2x2 Analysis of Covariance (ANCOVA) showing the Significant Main and Interactive Effect of Treatment Group and Gender among School-going Adolescents.

Source	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Remark
Corrected Model	41175.214[a]	12	3431.268	26.260	.000	.804	
Intercept	10038.719	1	10038.719	76.828	.000	.499	
Prescore	768.296	1	768.296	5.880	.018	.071	
Main Effect							
Treatment	21487.486	2	10743.743	82.224	.000	.681	S
Gender	17.327	1	17.327	.133	.717	.002	NS
2-Way Interaction							
Treatment * Gender	11.517	2	5.759	.044	.957	.001	NS
Error	10061.186	47	130.665				
Total	275038.000	60					
Corrected Total	51236.400	59					

(R Squared = .804, Adjusted R Squared = .773) **Significant at 0.05*

Table 5: Multiple Classification Analysis (MCA) showing the Direction of the Differences of the Treatment Groups, Gender and Mathematics Anxiety in Mathematics Learning Gains of School-going Adolescents.

Variable + Category Grand Maen = 49.87	N	Unadjusted Deviation	Eta	Adjusted Deviation	Beta
Treatment:					
MET	30	16.23		13.22	
SMT	30	10.90		12.38	
Control	30	-27.14	.809	-25.60	.759
Gender:					
Male	41	2.11		.16	
Female	49	-1.76	.081	-.14	.006
Multiple R Squared	.747				
Multiple R	864				

From Table 5, the mean scores of the different treatment and control groups are: motivational enhancement therapy (Grand Mean (49.87 + 16.23) = 66.10 and Control (Grand Mean (49.87 - 27.14) = 22.73, respectively. Also, the mean scores of gender differences are: Male (Grand Mean (49.87 + 2.11) = 51.98 and Female (Grand Mean (49.87 - 1.76) = 48.11, respectively.

From the arithmetic above, motivational enhancement therapy ranked highest (Grand Mean = 66.10), followed by the control group (Grand Mean = 22.74). This indicates that motivational enhancement therapy is effective in enhancing mathematics learning gains among students.

Hypothesis Two: There will be no significant main effect of gender on students' mathematics learning gains.

Table 5 shows that there was no significant main effect of gender on students' mathematics learning gains ($F_{(1, 47)} = .133$, $P > .05$, $\eta^2 = .002$). Hence, the null hypothesis was accepted. This denotes that there is no significant difference in the mathematics learning gains of male and female students. Table 5 further revealed that the mean score of male students (estimated mean = 51.98) while that of female (estimated mean = 48.11). The male has slightly higher mathematics learning gains compared to their female counterpart but the difference was not significant.

Hypothesis Three: There will be no significant interaction effect of treatment and gender on students' mathematics learning gains.

Table 5 showed that there was no significant interaction effect of treatment and gender on students' mathematics learning gains ($F_{(2, 47)} = .044$, $P > .05$, $\eta^2 = .001$). Hence, the null hypothesis was accepted. This is further illustrated in Figure 1. This demonstrates that gender did not significantly moderate the effectiveness of the treatment in boosting students' mathematics learning gains.

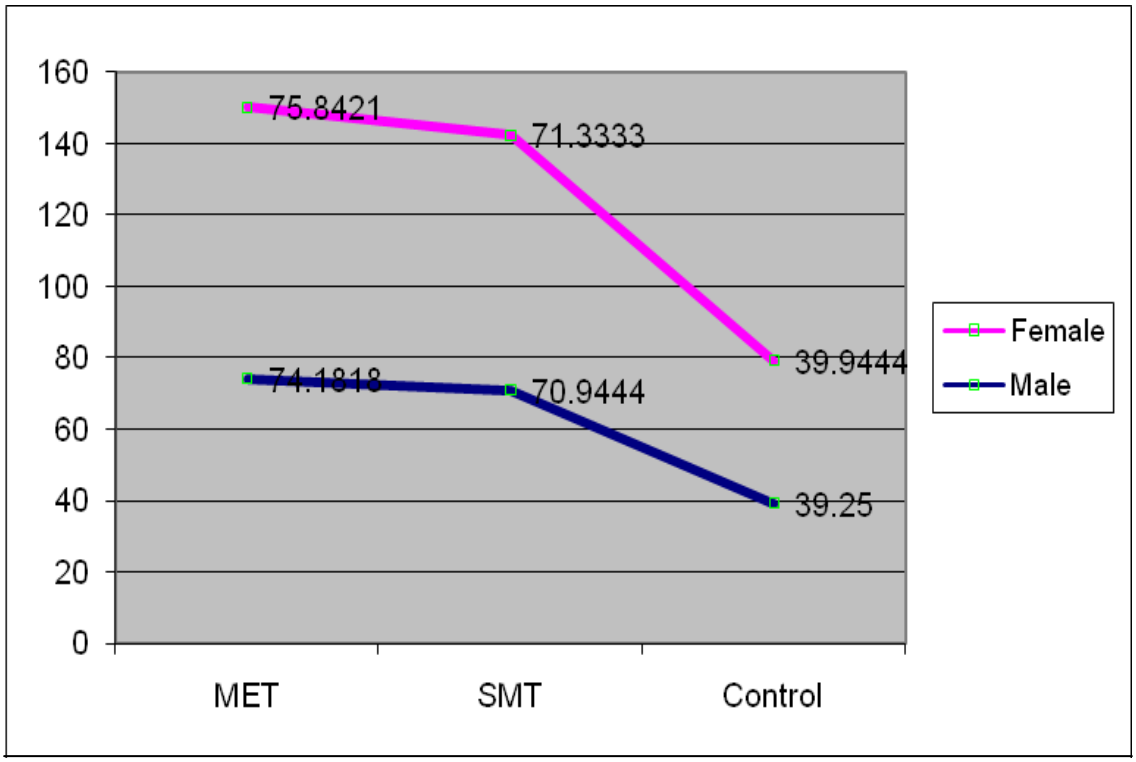

Figure 1: Lack of Interaction Effect of Treatment and Gender on Students' Mathematics Learning Gains.

DISCUSSION OF FINDINGS

The result of the first research hypothesis indicated that there was significant main effect of treatment on students' mathematics learning gains. The result further demonstrated that experimental group (Motivational Enhancement Therapy) has the highest mean than control group. By implication, motivational enhancement therapy is effective in enhancing mathematics learning gains among school-going adolescents. This corresponds with the finding of Deci and Ryan (1985) and Elliot and Harackiewics (1996) who stated that motivational enhancement therapy plays a crucial role affecting learning gains of students at different levels of education.

Similar findings have also been reported in research conducted in Africa. Ali (2015) also investigated the relationship between motivational enhancement therapy and mathematics academic performance with a sample of college students in Zambia. He however found a significant and positive relation among motivational enhancement therapy and mathematics academic performance, indicating that students who had high motivational enhancement therapy performed significantly better than their counterparts who had low motivational enhancement therapy on academic performance, as measured by the averages of the term examination grades.

Research with high school students has also documented consistent findings that motivational enhancement therapy plays a vital role in significantly and positively affecting learning gains.

The result of the second research hypothesis indicated that there was no significant main effect of gender on students' mathematics learning gains. This denotes that there is no significant difference in the mathematics learning gains of male and female students. In line with this finding, research of gender differences in cognitive processes, intellectual abilities, area of interest, stereotypical perceptions of every-day behaviors and the ability to perform various tasks has not been conducted. The differences in the scholastic achievements of boys and girls are generally attributed to biological causes and/or to cultural and stereotypes (Klein, 2004).

The last two decades have been devoted to addressing gender inequality in education. Some studies (Okebukola, 1993; Jiboku, 2008) have shown an all-time low participation of women in education. Educators have therefore expended tremendous efforts in the study of the personal factors affecting learning gains especially in the sciences and social sciences. Notable among these variables is the study of the phenomenon of gender or sex equity in education. A rich harvest of explanation of causes, understanding of cost to the society and possible intervention has brought about several researches, workshops, seminars and training in this area. By and large, gender has no effects on Mathematics learning gains of the students and being male or female does not influence the level of students' mathematics learning gains in the school system.

The result of the third research hypothesis demonstrated that there was no significant interaction effect of treatment and gender on students' mathematics learning gains. This demonstrates that gender (in term of being male or female) did not significantly moderate the effectiveness of the treatment in boosting students' mathematics learning gains. In support of this finding, societal factors that can lead to gender differences in mathematics achievement have been widely studied.

The disadvantages associated with low socioeconomic status lead to lower than average test scores for low socio-economic status students. In widely available U.S. datasets, parents' education, family income and family possessions are usually used as measures of socio-economic status. There is some evidence that socioeconomic status impacts women more than men. Ware and Lee (2005) also showed that women from more privilege backgrounds are more likely to choose science major and among those in science majors, women are more likely than men to have mothers employed in prestigious occupations (Ware & Lee, 2005).

Gender is known not to have interaction treatment and students' learning gains. This indication that the understanding of the treatment packages and training programs were not based on students being males or females. As a result of this, incessant gender discrimination should be avoided in given any related treatments to the students. The performance scores of the students in mathematics learning gains, as shown in this study, were not affected vis-à-vis the treatment program given with gender distribution of the students.

CONCLUSION

Base on the findings of this study, persistent poor learning gains of Nigerian secondary school students in mathematics need not to continue indefinitely. There is hope that with the use of motivational enhancement therapy, the situation can be changed for the better. The study discovered that motivational enhancement therapy could be used in enhancing mathematics learning gains among secondary school students in the school. By and large, motivational enhancement therapy has great effects on the mathematics learning gains among students. As such, it is very crucial to improve on the use of this therapy (motivational enhancement therapy) so as to eradicate the persistent occurrence of students' poor learning gains in this great subject.

RECOMMENDATIONS

Based on the findings in this study, the following recommendations were made:

1. The students in the school should be encouraged and trained on the effective usage of these interventions (motivational enhancement therapy and self-monitoring skill training). This will make the students to adopt effective learning skills towards enhancing their mathematics learning gains in the school.

2. Experts in educational testing/evaluation and Counseling/Educational psychologists should intensify their effort to organize seminars/conferences on the implications of these moderating variables (that is gender among others) as they interact with students' mathematics learning gains in the school.

3. Counseling/Educational psychologists should use in addition to other counselling interventions, motivational enhancement therapy in boosting mathematics learning gains among students in the school system. This will help the counseling/educational psychologists in reducing the rate of academic failure among secondary school student in mathematics.

4. The public and private schools should endeavor to provide enabling environment for the staff and students of the schools. This will help in enhancing the achievement motivation of the students and invariably improve students' mathematics learning gains in the school.

REFERENCES

1. Abiam, P. O. and J.K. Odok. 2006. "Factors in Students' Achievement in Different Branches of Secondary School Mathematics". *Journal of Education and Technology*. 1(1):161 – 168.

2. Adejumo, A., D.A. Oluwole, and K.O. Muraina. 2015. "The Influence of Some Psychological Factors on the Learning Gains of University Undergra*duates in Mathematics in Ibadan, Nigeria". Proceedings of International Conference for Pedagogical and Educational Sciences, Excellence in Research & Innovations for Humanity*. March, 15-18. Switzerland.

3. Ajayi, K.O. and K.O. Muraina. 2011. "Parents' Education, Occupation and Real Mother's Age as Predictors of Students' Achievement in Mathematics in Some Selected Secondary Schools in Ogun State, Nigeria". *Academic Leadership Online Journal*. 9 (2) spring 2011.

4. Ali, S.K. 2015. *Preventing Problem Behaviors: A Handbook of Successful Prevention Strategies.* pp. 57-84. Corwin Press: Thousand Oaks, CA.

5. Busari, A.O. 2012. "Evaluating the Relationship between Gender, Age, Depression, and Academic Performance among Adolescents". *Scholarly Journal of Education*. 1(1):6-12

6. Deci, A.Y. and E.J. Ryan. 1985. "An Examination of the Relationship between Teachers' Attitudes toward Arithmetic and the Attitudes of their Students Towards Arithmetic". Doctoral Dissertation. Case Western Reserve University: Cleveland, OH. 1970. Dissertation Abstracts International, 31, 3333A.

7. Elliot, S. and L. McGregor. 1999. "Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research". *Educational Studies*. 26, 243 – 254.

8. Graham, H. and K. MacArthur. 2008. "Increasing Participation of Female Students in Physical Science Class". Unpublished Master's Thesis. Saint Xavier University: Chicago, IL.

9. Guevremont, R., J. Tishelman, and P. Hull. 2005. *Psychology: The Science of Mind and Behavior*. Hodder and Stoughton: London, UK. p. 51.

10. Harris, K.R. and S. Graham. 2005. "Self-Monitoring among Students with LD and ADHD". In: B. Y. L. Wong (Ed.). *Learning about learning disabilities, 3rd ed.* pp. 167–195. Elsevier Academic Press: San Diego, CA.

11. Hopkins, T.M. 2004. "Gender Issues in Mathematics Achievement in Tennessee: Does

Rural School Locale Matter?". Ph.D. Dissertation. University of Tennessee: Knoxville, TN.

12. Jiboku, A.A. 2008. "Order of Treatment of Related Mathematical Principles, Gender and Ability Levels: Effect on Students Performance in Chemistry Quantitative Problems". *Nigerian Journal of Vocational Teacher Education*. 2(1):18-27.

13. Klein, A.A. 2004. "Executive Decisions and Regulation of Problem Solving Behavior". In: F.E. Weinert, and R.H. Kluwe (eds.). *Metacognition, Motivation, and Understanding*. pp. 31–64. Erlbaum: Hillsdale, N.J.

14. Miller, S.F. and S. Rollnick. 1991. *Motivational Interviewing: Preparing People for Change*. Guilford Press: New York, NY.

15. NECO. 2010. "Chief Examiners Report". National Examination Council: Minna, Nigeria.

16. Okebukola, P.A.O. 1993. "Effects of Co-operative Competitive and Individualistic Laboratory Interaction Pattern on Student Performance in Biology". Unpublished Ph.D. Thesis. University of Ibadan: Ibadan, Nigeria.

17. Okon, Y.U. 2003. "Formative Assessment and Motivational Enhancement Therapy Learning: A Model and Seven Principles of Good Feedback Practice". *Studies in Higher Education*. 31(2):199-218.

18. Federal Republic of Nigeria. 2004. "National Policy on Education". NERDC: Lagos, Nigeria.

19. Salman, N.M. 2005. "Public Images of Mathematics". Unpublished Ph.D. Dissertation. University of Exeter: Exeter, UK.

20. Umoh, C.G. 2003. "A Theoretical Analysis of the Effects of Gender and Family Education on Human Resource Development". *Journal of Curriculum Organization of Nigeria*. 10(1): 1 – 4.

21. Uwadie, H.J. 2014. "Relationship between Boy's and Girl's Nonverbal Ability and Mathematical Achievement". *School Psychology International*. 17:71-80.

22. WAEC. 2014. "Chief Examiners Report". West African Examination Council: Accra, Ghana.

23. Ware, D. and T. Lee. 2005. "Gender Difference in High School Students' Attitudes towards Mathematics in Traditional versus Cooperative Group". *The National Research Centre on the Gifted and Talented Newsletter*. Spring.

SUGGESTED CITATION

Oluwole, A.D. and M.K. Olanrewaju. 2016. "Effectiveness of Motivational Enhancement Therapy in Enhancing Mathematics Learning Gains among School-Going Adolescents in Oyo State, Nigeria". *Pacific Journal of Science and Technology*. 17(1):140-151.

Pacific Journal of Science and Technology