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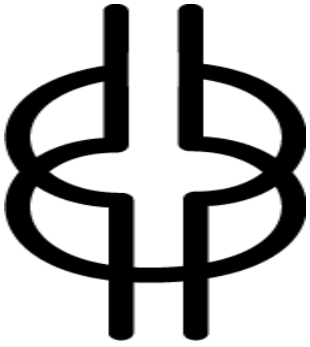

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Effectiveness of frequency of Testing on Anxiety and Achievement in Mathematics among Secondary School Students in Ogun State, Nigeria

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Abstract

Achievement Testing is the general means of finding out how much the students have learnt, but it could lead to test anxiety, which may affect students' achievement. Thus, this study examined the effectiveness of frequency of testing on test anxiety and academic achievement in mathematics among secondary school students in Ogun State, Nigeria. Four research hypotheses were postulated to direct the study. Quasi experimental pre-test/post-test control group research design was used for the study. The population of the study comprised all Senior Secondary II Students in Ogun State. The sample for the study comprised 157 (76 male and 81 female) Senior Secondary II students selected using multistage sampling process. The study used five Schools as experimental groups and each of these schools was tested at varying test frequencies. The Mathematics Achievement Test (MAT) and Mathematics Anxiety Rating Scale (MARS) were the instruments used for collecting data for the study. The data generated were analysed using Analysis of Covariance (ANCOVA), tested at 0.05 level of significance. The findings showed that there were significant differences in the mean scores of students experiencing test Anxiety and Achievement in Mathematics as a result of exposing students to varying test frequencies. In addition, the study revealed that gender was not a significant factor when planning to moderate students' Mathematics Anxiety and improving Achievement in Mathematics. A periodic testing of every two weeks was recommended for students experiencing poor achievement in Mathematics. Also, weekly testing was recommended for students experiencing test anxiety.

Key words: Frequency of Testing, Test Anxiety, Academic Achievement, Gender.

Introduction

Test is used for several purposes in the school system. Some of the most important purposes a test serves include the measurement of skills and knowledge learnt after instructions, reporting instructional progress in a subject area which serves as a basis for the evaluation of learners' academic progress and determining learners' difficulties during lessons for the teachers to assist. However, giving such test often trigger anxiety which can affect the academic achievement of students (Kuku, 2016). Despite the importance of a mild level of anxiety which could drive learners towards better performance, some learners often feel intense nervousness such that it affects learners' mood during testing and achievement in school subjects (Aletan, 2000).

Mathematics is an importance school subject which has great impact and application to learners' immediate environment, employability and the development of a nation. However, several researchers have reported an inverse relationship between test anxiety and academic achievement (Yara, 2009; Zaheri, Shahoei, & Zaheri, 2012; Iroegbu, 2013; Park, Ramirez & Beilock 2014; Kuku, 2016). Seligman, Walker and Rosenthal (2001) perceived anxiety as a physiological state characterized by cognitive, somatic, emotional and behavioural components which combine to create sweating, dizziness, headaches, racing heartbeats, nausea, fidgeting, drumming on a desk, fear, apprehension and worry. Test anxiety can be perceived as behavioural changes such as uneasiness or apprehension experienced before, during or after examination (Kuku, 2016). Poor learning or study habit may lead to test anxiety (Yara, 2009), while test anxiety negatively affects academic achievement.

Alade and Kuku (2017) observed that the extent to which classroom activities and learning take place is judged using the students' academic achievement. Nuthanap (2007) denotes academic achievement as the knowledge attained and skill developed in the school subject, usually designated by test scores. Besides, the achievement of students in their secondary school certificate examination with at least credit level pass determine if their achievement can further be used for higher studies as well as for employment. However, students' achievements in mathematics have

been low despite the importance of the subject on individual learner and the nation.

Table 1*:* Statistics of May/June (Senior Secondary Certificate Examination) Mathematics Performance (Nigeria) From 2010 to 2014

Year	Total Entry	Total Pass at Credit Level and Above	Percentage Pass
2010	1,351,557	534,841	40%
2011	1,540,250	587,630	38%
2012	1,672,224	649,156	39%
2013	1,543,683	889,636	58%
2014	1,692,435	529,427	31%
Average	1,560,030	638,138	41%

Source: West African Examination Council, Research Division Annual Reports.

Students' low achievement in mathematics is evident in the West African Examination Council's report between 2010 and 2014 presented in Table 1, which shows that out of an average enrolment of 1.5 million entrants, an average of 41% had credit pass and above. The low achievement in mathematics in West African Senior Secondary Certificate Examination (WASSCE) has been great concern to stakeholders. Maliki, Ngba and Ibu (2009) reported that the poor performance in mathematics over the years has been attributed to the fact that the subject is difficult as well as students' performance in the mathematics test vary from person to person and from school to school. However, studies have proved that test anxiety varies negatively with academic achievement.

Achievement test given to students is part of assessment and the method of usage may vary across schools. Assessment measures if and how students are learning and if the teaching methods are effectively relaying the intended messages (Kuku, 2016) and it is a process through which the quality of an individual's work or performance is judged (Mwebaza, 2010). Assessment techniques include test, project, observation, sociometric rating scale, checklist, inventory and questionnaire. Test is carried out during and at the end of the term. Before the use of continuous assessment in Nigeria

secondary schools, one-shot examination was in use. It involves administering test at the end of the term or the school year. Its several defects which include poorly accounting for students' cognitive, affective and psychomotor abilities throughout the entire academic period led to the introduction of continuous assessment (Obioma, 1984; Ononyumolo, 2012; O'Kwu & Orum, 2012). However, Section 1 of the National Policy on Education (Federal Republic of Nigeria, 2013), which deals with the philosophy and goals of Education in Nigeria, paragraph 9(g) states that "educational assessment and evaluation shall be liberalised by their being based in whole or in part on continuous assessment of the progress of the individual" (p.9).

In the school system, when using test (which is an assessment tool), it could be observed that giving students continuous short tests and exams during the school year should not put students under great pressure as final examination does at the end of the term and during school certificate examination. Therefore, every institution (primary, secondary and tertiary) spelt out the weight of Continuous Assessment out of the entire hundred percent score (100) in each subject taken. Continuous Assessment is usually either thirty (30%) or forty (40%) of the entire one hundred (100%) score in every subject taken during the term. These efforts can be seen to be able to provide the necessary feedback required in order to maximize the outcomes of educational efforts and programmes. The assessment of students' learning provides the objective evidence necessary in the decision making process in education.

As a result of the frequent feedback for the teachers and students during instruction, students' test anxiety would be mild and improved achievement will be experience if the students are tested frequently. The Nigerian National Policy on Education support the use of test as one of the continuous assessment tools, but have not specified the ideal rate to test learner such that anxiety experienced during mathematics test is mild as well as improvement in achievement. It against this backdrop that this study intends to study the ideal frequency students should be tested in other to achieve greater achievement in mathematics test and moderation in students' anxiety during testing.

Research Hypotheses

The following hypotheses guided the study:

1. Test anxiety scores will not significantly differ among students exposed to the varying frequency of test.
2. There is no significant difference in the achievement scores in mathematics of students exposed to varying frequency of test.
3. Test anxiety scores will not differ significantly among students exposed to the varying frequency of test due to gender.
4. Achievement scores in mathematics will not significantly differ among students exposed to the varying frequency of test due to gender.

Methodology

The research design adopted for this study was quasi experimental pre-test/post-test control group. The quasi experimental pre-test/post-test control group design was considered appropriate for the study due the introduction of intervention (which is testing at varying frequency) and inability to fully randomize. The population of the study consisted of all Public Senior Secondary School Students in Ogun State. The target population was all senior secondary school II students (SS II) in public secondary schools.

Multistage sampling process was used for this study due to different stages undergone to select participants. At the first stage, simple random sampling method was used to select one of the four geo-political regions in Ogun State (that is, Remo, Ijebu, Yewa and Egba). Ijebu geo-political region was selected through hat and draw method. Ijebu geo-political region has six Educational Zones. Five Education Zones were selected through simple random sampling from Ijebu geo-political zone.

The next step of sampling was selecting one co-educational public secondary school from each Local Education Zone through simple random sampling. Four of the five schools selected for the study were used as the periodic testing groups while the remaining one was used as the control group. The assignment of the schools into experimental (periodic testing) groups was randomly done.

Furthermore, a number of criteria were met by the participants before they were deemed qualified for selection into experimental groups. These were:

(1) All the participants scored below forty per cent in their Mathematics Achievement Test (MAT); and (2) The Students scored above sixty per cent in the Mathematics Anxiety Rating Scale (MARS);

The participants who qualified for inclusion in the experimental programme were randomly assigned into the experimental groups as shown in Table 2. Figures in Table 2 describe the number of students who participated in the Baseline assessment (Pre-Testing Periods) and those who actually completed the Periodic Testing Conditions in this study. From Table 2, a total sample of 250 students was pre-tested on the MAT, MARS and SHI instruments. A total of 187 students qualified and started the periodic testing conditions.

Table 2: Distribution of Students in the Baseline Assessment and Experimental Groups

Schools (Testing Groups)	***Pre-Assessment Participants***			***Frequency of Testing***	***Experimental Participants***		
	M	***F***	***Total***		***M***	***F***	***Total***
School A	27	31	58	Weekly Testing	16	17	33
School B	23	26	49	Two Weeks Testing	14	17	31
School C	26	22	48	Three Weeks Testing	16	15	31
School D	22	21	43	Four Weeks Testing	16	16	32
School E	23	29	52	Control (No Test)	14	16	30
Total	***121***	***129***	***250***	***Total***	***76***	***81***	***157***

Note: Male - M, Female - F

However, only 157 students completed the periodic testing programme due to experimental mortality. In addition, of the participants who completed the periodic testing conditions (that is, 157 participants), 76 were male while 81 were female. The distribution of the participants across the five selected schools was as shown in Table 2.

The following research instruments were used to obtain relevant data for the study.

1. Mathematics Achievement Tests (MAT) and
2. Mathematics Anxiety Rating Scale (MARS).

Mathematics Achievement Test was constructed and refined by the researcher. The instrument comprised three sections (Sections A, B and C). Section A aimed at getting the background data of students. Section B had fifty multiple choice items which attracted fifty marks while Section C was the Theory part consisting of three questions which attracted fifty marks. A test blueprint was used to align the content covered, objectives and assessment based on the Ogun State Ministry of Education, Science and Technology First Term Scheme of Work shown in Table 3. However, only the topics taught during the study were included and validated using the Test Blueprint (in Table 3). These items were also validated by experts in Mathematics Education and Measurement and Evaluation. Item analysis was carried out during the pilot study and the indices of difficulty ranged from 0.2 to 0.8. All the discrimination indices were positive values (Ilogu, 2005). Test-retest reliability was used to measure the consistency of the instruments which generated a reliability coefficient of 0.81.

Table 3: The Test Blueprint for the 50-item Multiple Choice Objective Mathematics Test

Item	Topics	School Testing Rate	Week(s) Schedule	Weight (%)	Knowledge 22%	Comprehension 34%	Application 44%	Total
1	Logarithm	A	2	24	3	4	5	12
2	Logarithm	A, B						
3	Circle theorem	A, C	3	22	2	4	5	11
4	Circle theorem	A, B, D						
5	Circle theorem	A						
6	Approximation and error	A, B, C	1	16	2	3	3	8
7	Quadratic equation	A	2	18	2	3	4	9
8	Quadratic equation	A, B						
9	Measure of central tendency	A, C, D	1	20	2	3	5	10
	Total		9	100	11	17	22	50

Mathematics Anxiety Rating Scale Revised by Plate and Parker (1982) was adapted for the study to measure the Mathematics anxiety of participants. The scale has 24 statements and is scored from 1 to 4; where *1* indicates *not at all* ," *2* indicates "*a little* ," *3* indicates "

much " and *4* indicates "*very much"*. There are two factors in the scale. The first factor is the Learning Mathematics Anxiety, which has 14 statements measuring anxiety experienced during activities that deal with learning mathematics. The second factor is the Mathematics Evaluation Anxiety, which contains 8 statements measuring the anxiety experienced during evaluation. The instrument has a minimum score of 22 points and a maximum score of 88 points. The adaptation process involved contextualizing and varying the statements in the MARS into Nigerian education system. The reliability coefficients of the Learning Mathematics Anxiety and Mathematics Evaluation Anxiety yielded 0.79 and 0.75 respective. As a result, the validation process produced an average reliability coefficient 0.77. Besides, the concurrent validity was used to determine the validity of the MARS and the process produced concurrent validity coefficient value of 0.76.

The administration of the instruments lasted for eleven (11) weeks, which occurred in three phases. The instruments were administered to the participants in groups by the researchers with the help of the research assistants. The details of the experiment procedure are as follows:

Phase One: Pre-Testing Periods: On resumption for the first term 2014/2015 academic session, a baseline assessment (or pre-test) was conducted for all the two hundred and fifty students selected across the five secondary schools. The researcher administered the pre-test using MARS and MAT.

Phase Two: Testing Periods: There were five experimental groups. Four groups were exposed to varying frequencies of testing during teaching/instruction in the course of the study, while the fifth group (that is, control group) was not given test. Group one was tested every week. Group two was tested every two weeks. Groups three and four were tested every three and four weeks respectively. The classes met four times in a week for nine weeks with a total of 160 minutes lesson session per week to teach students based on topics in the Ogun State Ministry of Education, Science and Technology's Scheme of Work for first term in Senior Secondary Schools in the State. However, apart from teaching the term's topics, the control group was not given any test during the study period.

Phase Three: Post-Testing Periods. In the eleventh week after the experiment was completed, the researcher re-administered MARS

and MAT to all the participants in both the experimental and control group in order to gather post-test data.

Descriptive and inferential statistical tools were used. Mean and Standard Deviation were computed for all the groups where applicable. The Statistical Package for Social Sciences (SPSS) was used for the analysis. All the hypotheses were tested with Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Results

Hypothesis 1: Test anxiety scores will not significantly differ among students exposed to the varying frequency of test.

Table 4: Descriptive Data on Pre-test and Post test scores on Test Anxiety among students exposed to the experimental conditions.

School Category	Testing Periods	PRE TEST			POST TEST			Mean Difference
		N	MEAN	STD	N	MEAN	STD	
School A	One Week Testing	33	65.88	6.3	33	51.45	5.57	-14.43
School B	Two Weeks Testing	31	65.74	7.45	31	55.06	5.99	-10.68
School C	Three Weeks Testing	31	65.52	6.89	31	57.42	12.64	-8.1
School D	Four Weeks Testing	32	66.13	6.88	32	60.16	6.63	-5.97
School E	Control Group	30	65.73	6.23	30	62.87	7.53	-2.86
Grand Total / Average		**157**	**65.8**	**6.68**	**157**	**57.3**	**7.26**	**-8.5**

The result in Table 4 shows that at pre-test, the mean scores of the participants in the experimental groups were 65.88 for School A, 65.74 for School B, 65.52 for School C, 66.13 for School D and 65.73 for School E. It also shows that at post-test, Schools A, B, C, D and E recorded lower mean score of 51.45, 55.06, 57.42, 60.16 and 62.87 respectively. School A (One Week Testing) had the highest reduction in anxiety level of -14.43 below the average Mean Difference of -8.5 as a result of frequent testing. To determine if these differences were statistically significant, the Analysis of Covariance (ANCOVA) was carried out and the result is shown in Table 5.

Table 5: Analysis of Covariance (ANCOVA) on Test Anxiety among the Experimental Groups.

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4632.67	5	926.54	39.08	*
Intercept	683.32	1	683.32	28.82	*
Covariates	2159.03	1	2159.03	91.06	*
Experimental Groups	2468.53	4	617.13	26.03	*
Error	3580.26	151	23.71		
Corrected Total	8212.93	156			

*Significant at 0.05; Fcritical at 0.05 (4, 151) = 2.37

The result in Table 5 shows that a calculated F-value of 26.03 resulted as the difference in post test scores on test anxiety across experimental groups. This F-value is statistically significant since it is greater than the critical F-value of 2.37, given 4 and 151 degrees of freedom at 0.05 level of significance. Thus, hypothesis 1 was rejected, which implies that test anxiety scores significantly differ among students exposed to the varying frequency of test. To determine where the significance of the group differences lies, post-hoc analysis was performed using the Least Significant Difference's (LSD) Post Hoc Multiple Comparism tool and the outcome of the statistical analysis is shown in Table 6.

Table 6: **Multiple Comparison of Test Anxiety among the Experimental Groups**

(I) Experimental Groups	(J) Experimental Groups	Mean Difference (I-J)	Sig.
SCHOOL E	SCHOOL A	11.493*	0.000
	SCHOOL B	7.807*	0.000
	SCHOOL C	5.326*	0.000
	SCHOOL D	2.929*	0.019

*. The mean difference is significant at the 0.05 level.

Evidence from Table 6 shows that School A (Mean diff = 11.493, p = 0.000), School B (Mean diff. = 7.807, p = 0.000), School C (Mean diff = 5.326, p = 0.000) and School D (Mean diff = 2.929, p = 0.000) all had significant reduction in test anxiety than School E (the

control group). This implies that School tested periodically more frequently had significant reduction in mathematics test anxiety (with School A having the highest reduction) than Schools tested less frequently.

Hypothesis 2: There is no significant difference in the achievement scores in mathematics of students exposed to varying frequency of test.

Table 7: **Descriptive Data on Pre-test and Post test scores on the Mathematics Achievement Test among students exposed to the experimental conditions**

School Category	Testing Period	PRE TEST			POST TEST			Mean Difference
		N	MEAN	STD	N	MEAN	STD	
School A	One Week Testing	33	20.55	5.61	33	60.6	9.24	40.05
School B	Two Weeks Testing	31	20.03	2.63	31	61.1	6.7	41.07
School C	Three Weeks Testing	31	20.06	4.49	31	42.65	8.01	22.59
School D	Four Weeks Testing	32	20.87	6.17	32	40.13	6.5	19.26
School E	Control Group	30	20.77	4.21	30	39.17	11.46	18.4
Grand Total / Average		**157**	**20.46**	**4.76**	**157**	**48.89**	**13.1**	**28.43**

Figures in Table 7 show School A has a pre-test score of 20.55 and School B has a pre-test score of 20.03. School C, School D and School E have 20.06, 20.87 and 20.77 respective. Also at post-test, Schools A, B, C, D and E had mean score of 60.6, 61.1, 42.65, 40.13 and 39.17 respectively. The table further shows that School B (Two Weeks Testing) had the highest mean difference of 41.07 above the average Mean Difference of 28.43. To determine whether there was significant difference in mathematics achievement test as a result of experimental conditions, an Analysis of Covariance (ANCOVA) was done and the results are presented in Table 8.

Table 8: Analysis of Covariance (ANCOVA) on Mathematics Achievement Test among the Experimental Groups

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	16237.61	5	3247.52	46.55	*
Intercept	12987.61	1	12987.61	186.17	*
Covariate	585.03	1	585.03	8.39	*
Experimental Groups	15846.44	4	3961.61	56.79	*
Error	10534.32	151	69.76		
Corrected Total	26771.94	156			

*Significant at 0.05; Fcritical at 0.05 (4, 151) = 2.37

The data in Table 8 shows that a calculated F-value of 56.79 resulted as the difference in achievement in mathematics test among the experimental groups. Since the F-value of 56.79 is greater than the critical F-value of 2.37, given 4 and 151 degrees of freedom at 0.05 level of significance, the null hypothesis was rejected. This indicates that students' achievement in the mathematics test significantly differed as a result of the exposing them to varying frequency of test. In order to determine the degree of difference in the experimental conditions in Mathematics Achievement Test, LSD's Post Hoc Multiple Comparison was carried out and the outcome is presented in Table 9.

Table 9: **Multiple Comparison of Mathematics Achievement Test and Experimental Groups**

(I) Experimental Groups	(J) Experimental Groups	Mean Difference (I-J)	Sig.
SCHOOL A	SCHOOL C	17.765*	0.000
	SCHOOL D	20.616*	0.000
	SCHOOL E	21.530*	0.000
SCHOOL B	SCHOOL C	18.465*	0.000
	SCHOOL D	21.316*	0.000
	SCHOOL E	22.230*	0.000

*. The mean difference is significant at the 0.05 level.

Table 9 shows that participants in School A had significant mean difference when compared to Schools C (Mean diff. = 17.765; p = 0.000), D (Mean diff. = 20.616; p = 0.000) and E (Mean diff. = 21.530; p = 0.000). Also, School B had significant mean difference when compared to Schools C (Mean diff. = 18.465; p = 0.000), D (Mean diff. = 21.316; p = 0.000) and E (Mean diff. = 22.230; p = 0.000). This indicates that participants tested weekly and every two weeks (that is, School A and B) had significant achievement in Mathematics when compared with other experimental groups. Besides, the result shows no significant difference in the achievement of Schools exposed to weekly (School A) and two weeks testing (School B).

Hypothesis 3: Test anxiety scores will not differ significantly among students exposed to the varying frequency of test due to gender.

Table 10: Descriptive Data on Pre-test and Post test scores on Mathematics Anxiety among students exposed to the experimental conditions

EXPERIMENTAL GROUPS	GENDER	N	PRE TEST		POST TEST		MEAN DIFFERENCE
			MEAN	STD	MEAN	STD	
SCHOOL A (Weekly Test)	MALE	16	65.38	5.6	50.31	6.14	-15.07
	FEMALE	17	66.35	7.04	52.53	4.93	-13.82
	TOTAL	**33**	**65.88**	**6.3**	**51.45**	**5.57**	**-14.43**
SCHOOL B (Two Weeks Test)	MALE	14	65.79	5.52	57.07	5.73	-8.72
	FEMALE	17	65.71	8.91	53.41	5.84	-12.3
	TOTAL	**31**	**65.74**	**7.45**	**55.06**	**5.99**	**-10.68**
SCHOOL C (Three Weeks Test)	MALE	16	64.06	5.98	57.06	5.56	-7
	FEMALE	15	67.07	7.65	57.8	4.66	-9.27
	TOTAL	**31**	**65.52**	**6.89**	**57.42**	**5.07**	**-8.1**
SCHOOL D (Four Weeks Test)	MALE	16	63.75	5.6	57.69	5.51	-6.06
	FEMALE	16	68.5	7.37	62.63	6.34	-5.87
	TOTAL	**32**	**66.13**	**6.88**	**60.16**	**6.36**	**-5.97**
SCHOOL E (Control Group)	MALE	14	65.57	6.8	63.64	5.5	-1.93
	FEMALE	16	65.88	5.91	62.19	9.07	-3.69
	TOTAL	**30**	**65.73**	**6.23**	**62.87**	**7.53**	**-2.86**
Grand Total / Average	**MALE**	**76**	**64.91**	**5.9**	**56.16**	**5.69**	**-8.75**
	FEMALE	**81**	**66.7**	**7.38**	**57.71**	**6.17**	**-8.99**
	TOTAL	**157**	**65.8**	**6.68**	**57.3**	**5.93**	**-8.5**

Figures from Table 10 shows that the pre-test mean value of Mathematics Anxiety for male participants were 65.38 in School A, 65.79 in School B, 64.06 in School C, 63.75 in School D and 65.57 in School E. Similarly, pre-test mean value of Mathematics Anxiety for female participants were 66.35 for School A, 65.71 for School B, 67.07 for School C, 68.5 for School D and 65.88 for School E.

The Table also indicates that (at post-test), the mean scores for male students ranged from 50.31 in School A, 57.07 in School B, 57.06 in School C, 57.69 in School D and 63.64 in School E. Similarly, post-test mean value of Mathematics Anxiety for female participants were 52.53 for School A, 53.41 for School B, 57.8 for School C, 62.63 for School D and 62.19 for School E.

Table 10 further shows that for School A male (-15.07) had the highest reduction in test anxiety below the average Mean Difference (-8.75). Also, School A female (-13.82) recorded the highest reduction in test anxiety below the average Mean Difference (-8.99). As a result, it is observed that School A (with weekly testing) had the highest reduction Mathematics Anxiety test for both male and female participants. To determine if these differences were statistically significant, ANCOVA was used to analyse the data as presented in Table 11.

Table 11: Analysis of Covariance (ANCOVA) on effect of Gender and Experimental Conditions on Test Anxiety

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4825.43	10	482.54	20.80	*
Intercept	709.58	1	709.58	30.58	*
Covariate	1993.39	1	1993.39	85.91	*
Experimental Groups	2466.87	4	616.72	26.58	*
Gender	6.83	1	6.83	0.29	ns
Experimental Groups / Gender	186.88	4	46.72	2.01	ns
Error	3387.50	146	23.20		
Corrected Total	8212.93	156			

*Significant at 0.05; ns = Not Significant; Fcritical at 0.05 (1, 146) = 2.37

Evidence from Table 11 shows that a calculated F-value of 2.01 resulted as the interaction effect of gender and Test Anxiety. This calculated F-value is not significant since it is lower than the critical F-value of 2.37 given 4 and 146 degree of freedom at 0.05 level of significance. Thus, the null hypothesis was upheld, indicating that there

is no significant difference in Test Anxiety in the experimental conditions due to gender.

Hypothesis 4: Achievement scores in mathematics will not significantly differ among students exposed to the varying frequency of test due to gender.

Table 12: Descriptive Data on effect of Gender and Experimental Conditions on Mathematics Achievement Test among participants

SCHOOL	GENDER	N	PRE TEST		POST TEST		MEAN
			MEAN	STD	MEAN	STD	DIFFERENCE
SCHOOL A (Weekly Test)	MALE	16	21.56	5.19	62.69	10.17	41.13
	FEMALE	17	19.59	5.97	58.65	8.08	39.06
	TOTAL	**33**	**20.55**	**5.61**	**60.61**	**9.24**	**40.06**
SCHOOL B (Two Weeks Test)	MALE	14	20.29	3.00	62.29	5.88	42.00
	FEMALE	17	19.82	2.35	60.12	7.33	40.29
	TOTAL	**31**	**20.03**	**2.63**	**61.10**	**6.70**	**41.06**
SCHOOL C (Three Weeks Test)	MALE	16	21.38	5.24	46.56	6.23	25.19
	FEMALE	15	18.67	3.11	38.47	7.74	19.80
	TOTAL	**31**	**20.06**	**4.49**	**42.65**	**8.01**	**22.58**
SCHOOL D (Four Weeks Test)	MALE	16	22.38	7.07	41.00	8.63	18.63
	FEMALE	16	19.38	4.90	39.25	3.36	19.88
	TOTAL	**32**	**20.88**	**6.17**	**40.13**	**6.50**	**19.25**
SCHOOL E (Control Group)	MALE	14	21.00	4.47	39.57	13.70	18.57
	FEMALE	16	20.56	4.10	38.81	9.52	18.25
	TOTAL	**30**	**20.77**	**4.21**	**39.17**	**11.46**	**18.40**
Grand Total / Average	**MALE**	**76**	**21.32**	**4.99**	**50.42**	**8.92**	**29.10**
	FEMALE	**81**	**19.6**	**4.09**	**47.06**	**7.2**	**27.46**
	TOTAL	**157**	**20.46**	**4.76**	**48.89**	**8.06**	**28.43**

Evidence from Table 12 shows that the mean achievement scores in mathematics for male participants at pre-test was 21.56 for School A, 20.29 for School B, 21.38 for School C, 22.38 for School D while School E scored 21. Likewise, pre-test mean values of Mathematics Achievement Test for the female participants were 19.59 for School A, 19.82 for School B, 18.67 for School C, 19.38 for School D and 20.56 for School E.

The Table further shows that at post-test, the male participants in School A has 62.69, School B has 62.29, School C has 46.56, School D has 41.00 and School E has 39.57. The post-test mean scores for female participants shows that School A, B, C, D and E have 58.65, 60.12, 38.47, 39.25 and 38.81.

Thus, it is observed that male (42.0) and female (40.29) participants in School B with periodic test every two weeks had the highest achievement above the average Mean Difference of 29.1 and

27.46 respectively. To determine whether significant difference existed on Mathematics Achievement due to gender and experimental conditions, analysis of covariance (ANCOVA) statistics was used. The result is presented in Table 13.

Table 13: **Analysis of Covariance on the effect of Gender and Experimental Conditions on Mathematics Achievement Test.**

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16751.53	10	1675.15	24.41	*
Intercept	13252.51	1	13252.51	193.09	*
Covariate	392.07	1	392.07	5.71	*
Experimental Groups	15897.83	4	3974.46	57.91	*
Gender	291.01	1	291.01	4.24	*
Experimental Groups / Gender	225.01	4	56.25	0.82	ns
Error	10020.41	146	68.63		
Corrected Total	26771.94	156			

*Significant at 0.05; ns = Not Significant; Fcritical at 0.05 (4, 146) = 2.37

The result in Table 13 shows that a calculated F-value of 0.82 as the interaction effect between gender and the experimental conditions. This calculated F-value of 0.82 is not significant since it is less than the critical F-value of 2.37 given 4 and 146 degrees of freedom at 0.05 level of significance. Thus, the null hypothesis was accepted, indicating that achievement scores in mathematics will not significantly differ among students exposed to the varying frequency of test due to gender.

Discussion of Findings

Hypothesis one stated that test anxiety scores will not significantly differ among students exposed to the varying frequency of test. The finding revealed that there was a significant difference in the mathematics test anxiety scores among students exposed to the varying frequency of testing. In addition, School A (given weekly test) followed by School B (given test every two weeks) had the highest reduction in test anxiety than those of Schools C (given every three weeks test), D (given every four weeks test) and E (control group). This finding aligns with findings of Shirvani (2009) who conducted a study

on the assessment and strategy on High School Hispanic Students. The researcher reported that frequent testing helps students to better monitor their learning when they pretend they understand a concept, yet are afraid to ask questions because they may be embarrassed or feel shy to ask questions. However, the findings contrast with the observation of Kimber (2009) during the study of the effect of training in self-regulated learning on Mathematics anxiety and achievement among preservice elementary Teachers in a freshman course in mathematics concepts. The researcher observed that the self-regulated learning strategies were not effective in reducing math anxiety among pre-service teacher.

Hypothesis two stated that there is no significant difference in the achievement scores in mathematics of students exposed to varying frequency of test. This research showed that significant difference exist in the students' achievement scores in mathematics when exposed to varying frequency of testing. The findings showed Schools tested every two weeks followed by School tested weekly yielded most impact towards achieving improved academic achievement than the other experimental groups (i.e. Schools tested every three weeks and four weeks), while the control group had the least achievement. The finding is in line with the study of Deck (2008) who found significant difference in achievement in the students tested weekly as against the monthly group. In other similar studies, it was observed that students in the treated group undertaking the intermediate examination performed better and got better grades than obtained by those in the control group (Shirvani, 2009; De Paola & Scoppa, 2010). In addition, the findings align with Zgraggen's (2009) view when he observed that students who were tested on a bi-weekly basis scored better in the final exam than the weekly tested group.

Hypothesis three states that test anxiety scores will not differ significantly among students exposed to the varying frequency of test due to gender. The findings showed that there exists no significant difference in the test anxiety scores among students exposed to the varying frequency of testing due to gender. The finding aligns with Iroegbu (2013), who reported no interaction effect of gender and test anxiety. However, the findings contrast Devine, Fawcett, Szucs, and Dowker (2012) who reported that test anxiety was higher for girls than for boys

Hypothesis four stated that achievement scores in mathematics will not significantly differ among students exposed to the varying frequency of test due to gender. The findings showed achievement scores in mathematics do not significantly differ among students exposed to the varying frequency of test due to gender. The findings align with those Parveen, Noor-Ul-Amin, and Nazir (2013), Devine, Fawcett, Szucs, and Dowker (2012), Ayodele (2011), Zhu (2007), Nuthanap (2007) and Joshi (2000) in their separate studies to determine whether gender difference in Mathematics performance existed among secondary school students', they all observed that there exists no difference between the performance of male and female students. However, the finding is in contrast with Tella (2007) who observed significant difference in academic achievement with respect to gender.

Conclusion

The study observed that frequency of testing will moderate anxiety among students who are experiencing test anxiety in mathematics. A weekly test after lesson is the ideal rate to moderate students' test anxiety in mathematics. Also, frequency of testing is an efficacious tool for improving students' achievement in mathematics. Giving test fortnightly is the most ideal rate for improving students' achievement in mathematics. However, frequency of testing is not an efficacious tool to adopt in order to improve both achievement and test anxiety in mathematics due to gender.

Recommendations

The following was recommended based on the findings from the study.

1. Students who experience anxiety in mathematics should be exposed to test every week after classroom instructions.
2. In other to improve achievement, students should be exposed to test after lessons every two weeks.
3. Besides, students experiencing test anxiety and low achievement in mathematics should be exposed to test every two weeks

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