Effectiveness of the Use of Tablet Teaching Strategyon Secondary School Students' Achievement in   Mathematics in Osun State, Nigeria

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ABSTRACT: *The purpose of this study was to use Tablet Teaching Strategy (TTS) to ascertain students' geometry achievement at senior secondary school one. The research was carried out in Osun west education district of Osun State with a population of 12,431 senior secondary one students. 168 students were sampled from four schools out of 68 government owned senior secondary schools. Quasi-experimental design of non-randomized pre-test post-test control group design was adopted. The research instrument was Geometry Achievement Test (GAT) which was used for collection of data. The GAT was validated by experts and this gave a reliability index of 0.68. Three research questions were asked and answered using means and standard deviations. The three hypotheses formulated were tested at 0.05 level of significance using Analysis of Covariance. The study found among others that the students taught using tablet teaching strategy improved in their geometry than those taught without tablet teaching strategy. It was therefore, recommended that tablet teaching strategy should be incorporated into the mathematics curriculum.*
KEYWORDS:*Tablet Teaching Strategy, Achievement, Geometry, Secondary SchoolStudents, Mathematics Education.*

I.   INTRODUCTION

The development of any nation is dependent on its improved mathematics education programme which establishes basis for the technological advancement. Also, science is the bedrock that provides the spring board for the growth of technology, which Mathematics is the gate and key to the science (Patrick,2016). Importance and contributions of Mathematics to the modern culture of science and technology was further acknowledged, and then asserted that without Mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society (Imoko & Isa, 2015). Mathematics is an important subject because it is the basis for scientific, industrial and technological advancement of any country. It is associated with more academic and career opportunities (Iji, Omenka & Honmane, 2016). Despite the importance attached to mathematics as key subject in realizing any nation's scientific and technological aspiration, it has experienced a flood of persistent high failure (Onah, 2015). This may be due to lack of innovative pedagogical strategy that will enable teachers meet the challenges of teaching of the subject especially in this era of information age.

Anyamene, Nwokolo, Anyachebelu and Anemelu (2012), observed that students have problems on how to study mathematics. These problems emanate as a result of problems facing the effective teaching and learning of mathematics at all levels of Nigerian educational institutions. Azuka (2013), identified poor teaching methods and lack of knowledge of technological innovations by the mathematics teachers, as the major factors contributing to the low achievement of students in Mathematics. Onah (2015), also observed that poor study habits contribute to students low achievement in mathematics. There is an ample evidence of continued low interest and achievement in the subject by Nigerian students (Iji, Ogbole & Uka, 2014).

Today, teachers, textbooks, chalkboards and traditional facilities are no longer adequate to cope with the amount and type of skills and competences expected of students, teachers need resources that can assist them to carry out their duties efficiently (Anyamene, Nwokolo, Anyachebelu & Anemelu, 2012). The authors also, state that teaching methods over the years have revealed that there have been changes from one position to another, many efforts have been made to improve the teaching methods through the use of instructional material such as computer.Tablet can be defined as small, wireless, mobile personal computers which have finger-driven touch screens and are backed-up by diverse applications in a well-provisioned application marketplace (Falloon, 2013). Tablet Teaching Strategy is a teaching process in which an instructor uses a tablet as a medium of

disseminating and receiving information from his/her students. Tablets have fantastic applicationsthat can be used for drawing, writing, and animation during a presentation. Students can circle, highlight, or write in points as they present their latest research or findings. When they are done, the presentation is saved and can be emailed to the teacher for grading. Textbooks are expensive, they are also hard on the environment and inefficient when the information is outdated, an entire new version must be released. Tablet e-book solves this problem. Students can highlight and bookmark easily the major points on their e-book, they can even be inspired to create their own e-book through Tablet. If Games in the Tablet are used by the students with moderation, this can boost creativity and imagination of the students (Julie, 2017).

Again the review of studies show inconsistence on results of male and female students' achievement in mathematics public examination and in Mathematics achievement tests. Reports from studies of Gambari, Falode and Adegbenro (2014), Malik and Salman (2016), all show no significant differences among male and female students in Mathematics achievement tests. However, Ogbonna (2007), Iji, Omenka and Akpan (2017) indicates that there is significant difference among male and female students in mathematics achievement tests. Specifically, most of the studies did not examine the achievement of male and female students in geometry achievement tests but rather, Mathematics in general. Since the Tablet has been recognized as a machine that does not recognize gender, but only keeps to instruction, it was necessary to find out if Tablet Teaching Strategy when used in teaching geometry would lead to bridging of gap in gender achievement in Geometry.

II. PURPOSE OF THE STUDY
The purpose of this study was to determine the effectiveness of Tablet Teaching Strategy (TTS) in mathematics classroom. Specifically it determined whether the use of Tablet Teaching Strategy (TTS);
1. enhanced secondary school students' achievement in geometry.
2. attempt to resolve the controversy of the inconsistency in researchers' report in achievement in geometry of male and female secondary school students.
3. had interaction effect of male and female and TTS on secondary school students' achievement in geometry.

III. RESEARCH QUESTIONS
The following research questions were asked to provide guide for the study.
1. What are the mean achievement scores of SS1 students taught geometry with (TTS) and those taught without Tablet Teaching Strategy?
2. What are the mean achievement scores of male and female SS1 students taught geometry with Tablet Teaching Strategy?
3. What is the interaction effect of male and female and TTS on SS1 students' mean achievement scores in geometry?

IV. RESEARCH HYPOTHESES
The following hypotheses were formulated and tested at 0.05 level of significance.
1. There is no significant difference between the mean achievement scores of SS1 students taught geometry with (TTS) and those taught without Tablet Teaching Strategy.
2. There is no significant difference between the mean achievement scores of male and female SS1 students taught geometry with Tablet Teaching Strategy.
3. There is no significant interaction effect of male and female and TTS on SS1 students' mean achievement scores in geometry.

V. METHODOLOGY
The research design for this study was quasi-experimental. Precisely, the study used a non-randomized pre-test post-test control group design. The subjects of the study were not randomized into experimental and control groups but were left as intact classes. This was to avoid the disruption of the school programmes. However, the study was conducted in Osun West Education District of Osun State, Nigeria. The population of this study was 12,431 Senior Secondary School one (SS 1) students from sixty eight government Secondary Schools in the study area. Simple random sampling was used to select four schools from 68 senior secondary schools. The choice of senior secondary one was purposive. This was basically because it is at this level that vigorous academic work begins in preparation for both internal and public mathematics examinations. The sample size for this study was 164 students. This was made of 84 students for the experimental group and 80 students for the control group. The choice of which schools and classes to be used as experimental and control was done through simple random sampling with the use of flip of a coin. The Instrument of the study was Geometry Achievement Test (GAT). It consisted of 32 items made up of 12 lower order questions and 20 higher order questions. These items were developed in line with the instructional objectives as contained in the senior secondary one text book by the Mathematics Association of Nigeria (2012). GAT covered all the units taught

during the period of this study. It was validated by two mathematics teachers, two mathematics educators and one measurement and evaluation experts. It has a reliability index of 0.68, established using Kuder-Richardson (KR-20) formula. The study lasted for four weeks. Data collected and collated were analyzed using mean, standard deviations and Analysis of Covariance (ANCOVA). The choice of ANCOVA for the test of hypotheses was based on it statistically removes the initial differences across the non randomized group by variation due to extraneous variable, thereby increasing the precision of the experiment.

VI. RESULTS

The results from analysis of data for this study are presented according to the research questions asked and hypotheses formulated.

Research Question 1

What are the mean achievement scores of SS1 students taught geometry with (TTS) and those taught without Tablet Teaching Strategy? Answer to this research question is presented in Table 1.

TABLE 1: mean and standard deviation of achievement scores of ss1 students taught geometry with tts and those taught without tts

Group	N	Pre-test Mean	SD	Post-test Mean	SD
With TTS	84	8.65	2.30	20.05	5.45
Without TTS	80	8.66	2.52	16.01	5.36
Mean difference		**0.01**		**4.04**	
Total	164				

Table 1 shows that for pre-test, the TTS had a mean score of 8.65 while the control had a mean score of 8.66. Their mean difference is 0.01. For post-test scores, the TTS has a mean score of 20.05 while the control group had a mean score of 16.01. Their mean difference is 4.04.

Research Question 2

What are the mean achievement scores of male and female SS1 students taught geometry with Tablet Teaching Strategy? Answer to this research question is presented in Table 2.

TABLE 2: mean and standard deviation ofachievement scores of male and female ss1 students taught geometry using tts

Gender	N	Pre-test Mean	SD	Post-test Mean	SD
Male	43	8.93	2.37	21.26	5.98
Female	41	8.37	2.22	18.78	4.59
Mean difference		**0.56**		**2.48**	
Total	84				

Table 2 shows that for pre-test, the male had a mean score of 8.93 while the female had a mean score of 8.37. Their mean difference is 0.56. For post-test scores, the male has a mean score of 21.26 while the female had a mean score of 18.78. Their mean difference is 2.48.

Research Question 3

What is the interaction effect of male and female and TTS on SS1 students' mean achievement scores in geometry? Answer to this research question is presented in Table 3.

TABLE 3: the interaction effect of male and female and tts on ss1 students' mean achievement scores in geometry

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	165.189[a]	2	82.595	2.903	.061	.067
Intercept	1664.877	1	1664.877	58.515	.000	.419
PretestAchiev	36.590	1	36.590	1.286	.260	.016
Groups	667.352	1	667.352	22.686	.000	.124
Groups*Gender	**110.441**	**1**	**110.441**	**3.882**	**.052**	**.046**
Error	2304.620	81	28.452			
Total	36230.000	84				
Corrected Total	2469.810	83				

a. R Squared = .067 (Adjusted R Squared = .044)

The interaction effect of male and female and TTS on SS1 students' mean achievement scores is read from Table 8 across the row heading **Groups*Gender** and column heading **Partial Eta Square** (Groups*Gender: Partial Eta Square = .046). F = 3.882, df = 1 and Partial Eta = .046.The calculated percentage of interaction effect of male and female and TTS on SS1 students' mean achievement scores (.046 × 100 = 4.6%) is 4.6%.

Research Hypothesis 1

There is no significant difference between the mean achievement scores of SS1 students taught geometry with (TTS) and those taught without Tablet Teaching Strategy. The result of this hypothesis is presented in Table 4.

Table 4: two-way ancova result of achievement scores of ss1 students taught geometry with tts and those taught without tablet teaching strategy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	671.894ᵃ	2	335.947	11.420	.000	.124
Intercept	3543.349	1	3543.349	120.454	.000	.428
PRETEST	4.721	1	4.721	.160	.689	.001
GROUPS	**667.352**	**1**	**667.352**	**22.686**	**.000**	**.124**
Error	4736.076	161	29.417			
Total	59013.000	164				
Corrected Total	5407.970	163				

a. R Squared = .124 (Adjusted R Squared = .113)

Table 4 shows that the P-value of 0.00 was less than the significance level of 0.05. Since the p-value of 0.00 is less than the significance level of 0.05, the null hypothesis of no significant difference was rejected.

Research Hypothesis 2

There is no significant difference between the mean achievement scores of male and female SS1 students taught geometry with Tablet Teaching Strategy. The result of this hypothesis is presented in Table 5.

TABLE 5: Two-Way Ancova Result Of Achievement Scores Of Male And Female Ss1 Students Taught Geometry With Tablet Teaching Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	165.189ᵃ	2	82.595	2.903	.061	.067
Intercept	1664.877	1	1664.877	58.515	.000	.419
PretestAchiev	36.590	1	36.590	1.286	.260	.016
Groups	667.352	1	667.352	22.686	.000	.124
Groups*Gender	**110.441**	**1**	**110.441**	**3.882**	**.052**	**.046**
Error	2304.620	81	28.452			
Total	36230.000	84				
Corrected Total	2469.810	83				

a. R Squared = .067 (Adjusted R Squared = .044)

Table 5 shows that the P-value of 0.05 was equal to the significance level of 0.05. Since the p-value of 0.05 is equal to the significance level of 0.05, the null hypothesis of no significant difference was not rejected.

Research Hypothesis 3

There is no significant interaction effect of male and female and TTS on SS1 students' mean achievement scores in geometry. The result of this hypothesis is presented in Table 6.

Table 6: two-way ancova result of interaction effect of male and female and tts on ss1 students' mean achievement scores in geometry

Source	Type III Sum ofdf		Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	165.189ᵃ	2	82.595	2.903	.061	.067
Intercept	1664.877	1	1664.877	58.515	.000	.419
PretestAchiev	36.590	1	36.590	1.286	.260	.016
Groups	667.352	1	667.352	22.686	.000	.124
Groups*Gender	**110.441**	**1**	**110.441**	**3.882**	**.052**	**.046**
Error	2304.620	81	28.452			
Total	36230.000	84				
Corrected Total	2469.810	83				

a. R Squared = .067 (Adjusted R Squared = .044)

Table 6 shows that the P-value of 0.05 was equal to the significance level of 0.05. Since the p-value of 0.05 is equal to the significance level of 0.05, the null hypothesis of no significant difference was not rejected.

VII. SUMMARY OF FINDINGS

The following major findings were based on the data presented in this study:

1. Students taught geometry with TTS improved in their achievement scores during the period of this study.
2. The adoption of TTS in the Mathematics classroom enhanced male and female SS1 students' achievement in the geometry taught during the period of this study.
3. There was no significant statistical interaction effect with the use of TTS in the Mathematics classroom on male and female SS1 students' achievement scores in geometry.

VIII. DISCUSSION OF FINDINGS

The students taught geometry with TTS improved in their achievement during the period of this study. This finding is in line with that of Jennie (2012) and Osman, Erhan, Ramazan and Adem, (2015) who also found that students that were taught using iPad and computer-assisted instruction achieve higher than those taught with traditional strategy. The reason for the better achievement of students taught with tablet than those taught without tablet teaching strategy may most likely be that the students taught with tablet had the opportunity of interacting with both real and simulated material, whereas students taught without tablet teaching strategy did not. Interacting with the tablet gave students better opportunity to form their own cognitive models. Using tablet devices to learn geometry provides students with access to multiple representations of phenomena and the opportunity to manipulate the devices to solve geometric problems. The findings also showed that the adoption of TTS in the Mathematics classroom enhanced male and female SS1 students' achievement in the geometry taught during the period of this study.

Again the findings found that both sexes improved their achievement in geometry with tablet teaching strategy, though the male improved more than their female counterparts. However, this difference was not statistically significant. The result confirms the finding of Malik and Salman (2016) who found no significant difference in the mean achievement scores of male and female students using BridgeIT mobile application. This implies that if male and female students are given equal opportunities in the learning process using innovative teaching strategies such as tablet teaching strategy, the educational inequality in our educational system in terms of gender differences especially in mathematics may be addressed.

The findings also revealed that there was no significant statistical interaction effect with the use of TTS in the Mathematics classroom on male and female SS1 students' mean achievement scores in geometry. Though male students performed better than their female counterpart. This result agrees with Eze (2009) whose indicated that male perform better than female in mathematics. This means that TTS is not gender biased in terms of achievement. It should, therefore be employed in teaching and learning to enable the students understand, develop critical and creative thinking in their minds and eradicate the problem of poor achievement in both internal and external examinations.

IX. RECOMMENDATIONS

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

1. Tablet teaching strategy should be incorporated in the curriculum as a teaching strategy in teaching mathematics in the Mathematics classroom.
2. Teacher training institutions should include tablet teaching strategy as a strategy in the mathematical methodology course content.

X. CONCLUSION

It could be concluded in this study that tablet teaching strategy enhanced students' achievement in Geometry irrespective of gender. This implies that if mathematics teachers use innovative teaching strategies such as the tablet teaching strategy which is found to have enhanced students' achievement, the issue of low achievement in mathematics at the senior secondary school level could improve. Similarly, the gender gap created by continued use of unfavourable teaching strategy in geometry could also be bridged with tablet teaching strategy.

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