EFFECTS OF VIDEO INSTRUCTIONAL PACKAGES ON ACHIEVEMENT OF SENIOR SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN MINNA, NIGERIA

By

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ABSTRACT

This study investigated the effects of video type instructional packages on the achievement of students in the mathematics among senior secondary schools in Minna, Nigeria. The study adopted quasi-experimental design. Five research questions and corresponding hypotheses were formulated and tested at 0.05 level of significance. 120 students (60 male and 60 female) were randomly selected from four secondary schools that were purposively sampled based on five criteria. The schools were randomly assigned to experimental group I Text + Animation, TA), Experimental group II (Text + Narration, TA), Experimental Group III (Text + Animation + Narration, TAN) and control group (Text Only, TO). The treatment instrument for the study was researchers' developed video type instructional packages on trigonometry concept in Mathematics which was used as treatment. A validated Trigonometry Achievement Test (TRAT) was used for data collection. TRAT was subjected to pilot testing and a reliability coefficient of 0.87 was obtained using the Kuder Richardson KR-20. TRAT was administered as pretest and posttest and data obtained were analysed using ANCOVA and Sidak Post-hoc test. The results revealed that there is significant difference in the mean achievement score of students taught mathematics using TO, TA, TN and TAN Video Type Instructional packages. Gender were found to have no significant effect in the mean achievement score of students taught using TO, TA, and TN. However, there was a significant difference between male and female students taught Trigonometry with TAN. Based on the findings, recommendations were made.

Keywords: Video Type; Achievement; Gender; Mathematics,

INTRODUCTION

Mathematics as a subject can be seen in all facets of life and in day to day occupations such as Internet technology, banking, construction, medicine, scientific discoveries and even in planning our daily activities to mention a few. Its importance made it a core subject in both primary and secondary schools (FRN, 2013). Credits pass in Mathematics at senior secondary school level determined students' success and access to University education in Nigeria. One of the reasons for the review of the National Policy on Education 1998 was to expand the National Mathematical Centre (NMC) whose role is to enhance Mathematics teaching and learning through research (FRN, 2013). The Joint Admission and
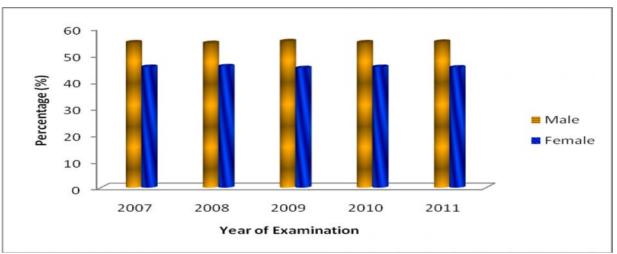
Matriculation Board (JAMB) brochure 2010 indicated that 80% of universities in Nigeria had Mathematics department in form of Pure Mathematics, Industrial Mathematics, Mathematics/Computer Science, Mathematics/Statistics or Mathematics/Physics. A survey report also shows that all 100 level students in every university that offered science, engineering and technology courses, take Mathematics as a general course. All these point to the importance of Mathematics in the development of the nation. In spite of the awareness of the relevance of Mathematics as a core subject in the nation's curriculum, and the importance of mathematics to people and the society at large, students' performance in Mathematics is still poor and

below average at West African Senior Secondary School Certificate Examination (WASSSCE) (WAEC, 2015). The performance of students in the subject at the WASSSCE from 2007 to 2011 in Nigeria is revealed in Figure 1.

Source: West African Examination Council

Figure 1: Performance of Mathematics Students in May/June WASSSCE, 2007-2011 in Nigeria at Credit Level
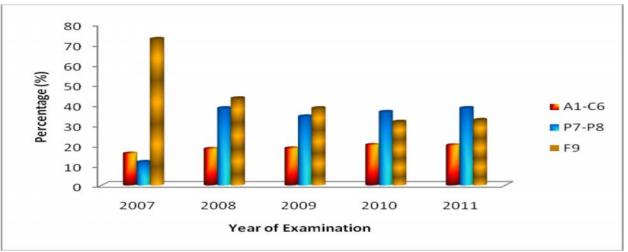
Figure 1 shows that the percentage of students that passed at credit level and above (A1 – C6) was consistently less that 50% for the past 5 years except in year 2008 where performance was above average 57.27% (WAEC 2015). This poor performance has become worrisome to Mathematics educators, parents, students and the stakeholders in Nigeria. This menace of poor performance affected both male and female students. The performance of male and female students in mathematics at the West Africa Senior Secondary School Certificate Examination (WSSSCE) from 2007 to 2011 in Nigeria is revealed in Figure 2.

Source: West African Examination Council

Figure 1: Performance of Male and Female Mathematics Students in May/June WASSCE, 2007-2011 in Nigeria

Figure 2 shows the percentage of male and female students' that pass at credit level and above (A1 – C6). Male students' performance was consistently higher than that of female from 2007 to 2011. Male students' performance is above average (50%) while female performance is less than average (50%) (WAEC, 2015). As illustrated in figure 2, it is obvious that male students'

performance is higher than female students. The performance of mathematics students in Niger State is a reflection of general poor performance in Nigeria. The students' performance in mathematics at the West Africa Senior Secondary School Certificate Examination (WASSSCE) from 2007 to 2011 in Niger State is shown in Figure 3.

Source: Research and Statistics Department, Niger State Ministry of Education

Figure 3: Performance of Mathematics Students in May/June WASSCE, 2007-2011 in Niger State

Figure 3 shows that the percentage of students that passed at credit level and above (A1 – C6) was consistently less than 50% within 2007 to 2011 in Niger State (Niger State, 2015). This has become a worrisome to Mathematics educators, parents, students and all other stakeholder in Niger State. On a general note, there has not been an improvement in student's performance in Mathematics. However, if this menace is not properly not checked, it may deny the placement chances of students into tertiary institutions, not only in Mathematics educations but also in other science related disciplines. This has serious implications for national development, economy and manpower.

Many researchers have attempted finding out the causes of students' poor performance in Mathematics. The problems identified include: poor teaching methods applied to teach Mathematics; inadequate instruction material; student's misconception

of Mathematics as a difficult subject (Sa'ad, Adamu, Sadiq, 2014; Mefor, 2014). Mathematics teacher's attitude towards teaching this subject, poor teaching skills and lack of active participation by the students among others, could be responsible for students' poor performance in the subject (Matazu, 2010).

In this 21st century, adoption of technology-based instructional strategy that motivate, captivate and enhance students' achievement and retention should be encouraged. One of such approach, according to Gambari, Yaki, Gana and Ughovwa (2014), Gambari, Ezenwa and Anyanwu (2013), Adegoke (2010); Kuti (2006); and Moreno and Mayer (2000) include technology enhanced learning such as multimedia presentation which could be either computer-based or video-based instruction. Multimedia presentation can be defined as presenting both words and pictures that are intended to foster learning. The *word* can be printed (e.g.

on-screen text) or spoken (e.g., narration). The *picture* can be static (e.g., illustrations, graphs, charts, photos, or maps) or dynamic (e.g., animation, video, or interactive illustrations). Animation refers to computerized simulation of processes using images to form a synthetic motion picture (Moreno & Mayer, 2003). Multimedia technology today uses various forms of communication media such as computers and videos.

Video instruction is a kind of multimedia that can transmit verbal and non-verbal with the combination of Audio and Visual materials. It develops continuity of thought and offers a reality of experience that stimulates self-activities on the part of the students (Nwoji (2000). In video instruction, teacher produces an instructional video package which is played on a video player connected to a television monitor which is put on, for the learner to view. At interval he may choose to stop playing and explain certain points or factors or probably wait till the end of the lesson. Learners have the opportunity to repeat the lesson over and over again (Orisabiyi, 2007).

Several studies indicated that multimedia such as video and computer can improve learning and retention of material presented during a class session or individual study period, as compared to "traditional" lectures or study materials that do not use multimedia (Anyanwu, Gambari & Ezenwa, 2013; Gambari & Olumorin, 2013; Gambari, Ezenwa & Anyanwu, 2013; Gambari, Yaki, Gana & Ughovwa, 2014; Mayer, 2001). For instance, Siskos, Antoniou, Papaioannou and Laparidis (2005) reported that the Greek primary pupils taught physical education using multimedia computer-assisted instruction (MCAI) performed better than those that used the traditional approach. In this study, effects of four video instructional types were examined, that is, Text + Animation (TA), Text + Narration (TN), Text + Animation + Narration (TAN) and Text Only (TO).

The studies on Narration with Text (NT) mode, Mayrath (2009) found that students who received the voice-only (narration) tutorial performed significantly better on the transfer test than students who received the text-only tutorial. In another study, Gambari, Ezenwa and Anyanwu (2013) found that students taught geometry with Animation with Text (AT) performed better than those taught with traditional method. Similarly, on

Animation with Text (AT) mode, Yen, Lee and Chen (2012) reported that the group using image-based (animation) concept mapping showed higher level than the text-based group in the dimension of understanding and creating. Similarly, Mahmood (2002) revealed that CAI involving Animation with Text (AT) and Animation with Narration (AN) improves students' achievement in mathematics. However, Koroghlanian (2000) found that participants in the Text treatments achieved the same as participants in the Audio (narration) treatments on both the practice and post-test. In another study, Jolly (2003) reported no significant differences in the performance level of the students in animation-with text as compared to graphics-with-text when exposed to Life Cycle of a Monarch Butterfly in biology.

Empirical evidences on Animation and Narration (AN) mode of multimedia are inconclusive. For instance, on Narration with Text (AN) mode, Mayrath (2009) found that students who received the voice-only (narration) tutorial performed significantly better on the transfer test than students who received the text-only tutorial. Gambari, Ezenwa and Anyanwu (2013) reported no significant difference between students taught geometry using animation with narration and those taught using Animation with Text (AT). However, those taught using animation with narration performed better than those taught with traditional method.

Studies on text, animation and narration was supported by Moreno and Mayer (2000) and Tabbers et al. (2004) which found that learning outcomes of students who learnt physics with courseware version of animation + narration were better than their colleagues who learnt physics either with animation + on-screen text or animation + narration + on-screen text. Mayer and Anderson (1991) reported that simultaneous presentation of text, animation and narration improved learning. Adegoke (2010) examined the effect of animation, narration, and on screen text-based materials when combined simultaneously; the result showed that students in the animation + narration + on-screen text group scored significantly higher on the postphysics achievement test than their colleagues who were in the animation + narration only group, as well as those who were in the animation + on-screen text group. However, Okwo and Asadu (2002) and Gambari, Yaki, Gana and

Ughovwa (2014) reported that three media (text, animation and narration) were found to be equally effective when used for teaching physics and biology respectively. However, Gambari et al (2014) reported that text with animation, text with narration and text, animation and narration performed better that those in traditional method. Contrarily, Saibu (2002) found that students exposed to traditional teaching method performed slightly better than those exposed to narration. Multimedia can be effective teaching approach to all categories of abled students irrespective of gender.

Gender has also been identified as one of the factors influencing students' performance at all levels of education. Aguelel and Uhumuavbi (2003) observed that gender differentials in enrolment and achievement in higher education is invariably rooted in inequality at the primary and secondary levels where the real sorting out of university bound students take place. Gender disparity in the Nigerian education system is attributed to socio-cultural and traditional reasons (Wasagu & Muhammad, 2007; Aguelel & Agwagah, 2007). Studies by Gambari and Adegbenro (2008), Osemmwinyen (2009) and Yusuf (2006) found no significant difference between male and female students' achievements and retention when taught geometry, trigonometry and statistics using computer-assisted instruction.

Similarly, Gambari, Falode and adegbenro (2013) reported no significant difference in the mean performance scores of male and female students taught geometry using computer animation; and male and female students taught using geometrical instructional model. Similarly, Gambari et al (2013) reported that there was no statistically significant difference in the mean scores of male and female students taught using computer-based multimedia instructional package (Animation with Text; and Animation with Narration). However, Kurumeh (2004) reported that female students achieved higher than male students on effects of ethno-mathematics approach and interest in geometry and mensuration, while, Kolawole (2007) found that male students achieved significantly better than female students in science education.

In Nigeria, emphasis has not been laid on innovative strategies that can enhance students' performance in mathematics. Using video-based multimedia instruction to teach students may help in solving learning problems in mathematics by increasing their motivation, achievements and retention. However, the extents of the interaction effects of students' achievement levels (high, medium, and low), gender and retention on different modes of video-based instruction (VBI) are yet to be fully investigated in Nigeria. Therefore, this study investigate the effects of video instructional package on students' achievement in mathematics

Research Objectives

1. Find out the difference in the mean achievement scores of students taught mathematics using TO, TN, TA and TAN Video Instructional packages
2. Find out the difference in the mean achievement scores of male and female students taught Mathematics with TO Video Instructional package
3. Determine the difference in the mean achievement scores of male and female students taught Mathematics with TA Video Type Instructional package
4. Find out the difference in the mean achievement scores of male and female students taught Mathematics with TN Video Type Instructional package
5. Determine the difference in the mean achievement scores of male and female students taught Mathematics with TAN Video Type Instructional package

Research Questions

The following research questions were raised to guide the study:
1. Is there any difference in the mean achievement scores of students taught mathematics using TO, TN, TA and TAN Video Type Instructional packages?
2. What is the difference in the mean achievement scores of male and female students taught Mathematics with TO Video Type Instructional package?

3. What is the difference in the mean achievement scores of male and female students taught Mathematics with TA Video Type Instructional package?
4. What is the difference in the mean achievement scores of male and female students taught Mathematics with TN Video Type Instructional package?
5. Is there any difference in the mean achievement scores of male and female students taught Mathematics with TAN Video Type Instructional package?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference in the mean achievement scores of students taught Mathematics using TO, TN, TA and TAN Video Type Instructional packages.
2. There is no significant difference in the mean achievement scores of male and female students taught Mathematics with TO Video Type Instructional package.
3. There is no significant difference in the mean achievement scores of male and female students taught Mathematics with TA Video Type Instructional package.
4. There is no significant difference in the mean achievement scores of male and female students taught Mathematics with TN Video Type Instructional package.
5. There is no significant difference in the mean achievement scores of male and female students taught Mathematics with TAN Video Type package.

METHODOLOGY

Research Design

The research design adopted for this study was a quasi-experimental design. It is a pretest, posttest experimental and control group design. The design involves four levels of independent variable (TO, TA, TN and TAN) and two levels of gender (male and female). The independent variable (experimental and control groups) was given the pretest before the treatment. Experimental group 1 was exposed to Trigonometry concept using 'Text with Animation (TA)', experimental group 2 was taught using 'Text with Narration (TN)'; experimental group 3 was exposed to Trigonometry using 'Text, Animation and Narration (TAN) Video Type Instructional packages, while the control group was taught using 'Text Only (TO)' Video Type Instructional package. The posttest was administered on the groups after the four weeks treatment. The research design layout is shown in table 1.

Table 1: Research Design Layout

Group	Pre-test	Treatment	Pre-test
Experimental Group 1	O_1	TA (x_1)	O_2
Experimental group 2	O_3	TN (x_2)	O_4
Experimental Group 3	O_5	TAN (x_3)	O_6
Control Group	O_7	TO (x_0)	O_8

The independent variables in this study are the Video Type Instructional packages (TA, TN, TAN and TO). The dependent variable is the posttest achievement of students in the four groups. The moderator variable is gender.

Sample and Sampling Technique

The population for this study was made up of 63,256 Mathematics students in Niger State. The target population was senior secondary mathematics students in SSS class II (SSSII). One hundred and twenty (120) SSSII students were randomly selected from four senior secondary schools. A four-stage sampling technique was adopted. First, a purposive random sampling technique

was adopted to obtain four secondary schools in Minna, Niger State. These schools were purposively sampled based on equivalence (laboratories, facilities and manpower), school type (public schools), gender composition (mixed schools), ICT equipment (computer laboratories under the School Net programme), exposure (students and teachers exposure to the use of computer in their schools), and candidates' enrolment (enrolling students for WASSSCE Mathematics examination for a minimum of ten years). Second, the selected four co-educational schools were randomly assigned to each of the four experimental and control groups using simple random sampling technique. Each school was assigned into experimental (TA, TN, TAN) and control (TO) groups. Thirdly, an arm of the Mathematics class was randomly selected using simple random sampling technique.

Treatment Instrument

The instructional content was developed by the researcher based on the content of senior secondary school year two (SSSII) Mathematics scheme of work. The developed instructional content was typed by the researcher and given to a computer programmer who used different software in bringing together, designing and animating the Trigonometry concept showing such as Pythagoras theorem, proof of angle 30, proof of angle45, proof of angle60, evaluation of angle 30, 45 and 60, cosine rule, sine rule. The researcher developed a Video-Based Multimedia instructional package of four types, Text, Animation with Narration (TAN), Text with Animation (TA), Text with Narration (TN), and Text only (TO). The package consists of the following topics (Pythagoras theorem, proof of angle 30, proof of angle 45, proof of angle 60, and evaluation of angle 30, 45, and 60, cosine rule, sine rule, evaluation of angles with mathematical table.

The four types of video instructional packages were developed from lesson plan of Trigonometry concepts. The lesson plan was transformed to script which was used to guide the video recording process. In Text, Animation with (TAN) video instructional package, content of Trigonometry recorded with animated pictures supported by narration and on-screen text. The audio was edited using Adobe premiere software and

Adobe effect was used to animate the package. For Text with Animation (TA), similar procedures were followed with exclusion of Audio recording. On-screen text was recorded and matched with animated graphics explaining the concepts of Trigonometry. In Text with Narration (TN) video instructional package, On-screen text was recorded in accordance with lesson plan and supported with Audio recording. While in Text only (TO) video instructional package, script developed from trigonometry concepts lesson plan was video recorded.

Test Instrument

The test instrument used for this study is the Trigonometry Achievement Test (TRAT). The TRAT consists of a 30 multiple choice objective items adopted from the past Senior Secondary School Certificate Examinations of West African Examinations Council (WAEC) and the National Examinations Council (NECO) questions (from 2001 - 2011). The Trigonometry Achievement Test (TRAT) was based on SS2 curriculum consisting of Pythagoras theorem, Angle 30, angle 45, angle 60, cosine rule, sine rule, and evaluation of angle 30, 45 and 60, evaluation of angle 30, 45, and 60 with the use of mathematical table. The TRAT was administered as pre-test and posttest to the experimental and control groups.

Validation of Research Instruments:

Research instrument was validated by expert in Mathematics Education, Education Technology experts, National Examination Council (NECO) Chief examiner in Mathematics Unit.

Reliability of the instrument

To test the reliability of the (TRAT) a random sample of 20 (SSII) students who were part of the research population but not part of the sample for the study were selected from Day Secondary School Tunga Minna. The test was administered on the pilot sample. The data collected was tested using the test-retest method. The reliability coefficient of the instrument was 0.78 using Pearson Product Moment Correlation.

Methods of Data Collection

The cooperation of the students and staff in the four selected schools were sought. Orientation were conducted for one week followed by administration of the pre-test. Video Type Instructional packages were installed on computer systems for all the groups. Treatment on the three experimental groups and at the same time teaching the control group with the text only Video Type Instructional packages lasted for four weeks while the Trigonometry Achievement Test (TRAT).

Experimental Procedure

Control Group: Text Only (TO): the students in this group were exposed to Video Type Instructional package which displayed text in MS word depicting the explanations of the concepts of trigonometry in text.

Experimental Group 1: Text + Animation (TA): the students in this group were exposed to Video Type Instructional package which displayed animation depicting concepts of trigonometry with concurrent presentation of on-screen text. To reduce cognitive load, the corresponding words and graphics animation were presented near each other on the page.

Experimental Group 2: Text + Narration (TN): the students in this group were exposed to Video Type Instructional package which displayed text depicting the explanations (narration) of the concepts of trigonometry.

Experimental Group 3: Text + Animation + Narration (TAN): The students in this group were exposed to Video Type Instructional package which display text, animations with narration simultaneously depicting the explanations of the concepts of trigonometry.

RESULTS

The TRAT was administered to the three experimental and one control groups as pre –test and posttest. The data obtained from the schools was subjected to inferential statistics using Analysis of Variance (ANCOVA) and Sidak pos-hoc test.

Hypothesis One

There is no significant difference in the mean achievement scores of students taught mathematics using TO, TN, TA and TAN Video Type Instructional packages.

Table 2a: ANCOVA Posttest Scores of TA, TN, TO and TAN Using the Pretest as Covariate

Source of Variation	Sum of Square	df	Mean Square	F	Significance (P)
Covariate (Pretest)	6.448	1	6.448	0.103	0.749
Main Effect (Treatment)	8604.663	3	2868. 221	45.737*	0.000
Model	9160.630	4	2290. 157	36.519	0.000
Residual	7211.748	115	62.711		0.000
Total	456268.130	120			

*: Significance at 0.05 alpha level

As illustrated in Table 2a, there was a significant main effect of learning strategy on post-test achievement, F(3, 115), = 45.737, p = 0.000. The results revealed that the Video Type Instructional package produced a significant effect on the posttest achievement scores of students when covariate effect (pretest) was controlled. The result indicates that the treatment, using TA, TN, TO and TAN accounted for the difference in the posttest achievement scores of the students. This implies that a statistical significant difference exists among the four groups of TA, TN, TO and TAN. Since it was established that there was a significant difference in the post-test scores of the groups, Sidak test post-hoc analysis was done to identify

the direction of the difference among the treatment groups as shown in Table 2b.

Table 2b: Sidak Post-hoc Analyses of the Groups Mean Scores

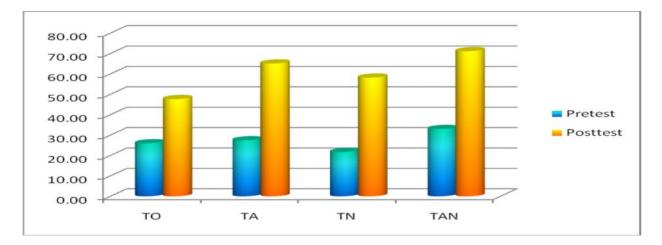| Groups	Mean Scores	Group I (TO)	Group II (TA)	Group III (TN)	Group IV (TAN)
Group I (TA)	65.13	*0.000		*0.012	*0.036
Group II (TN)	58.22	*0.000	*0.012		*0.000
Group III (TAN)	71.17	*0.000	*0.036	*0.000	
Group IV (TO)	47.67		*0.000	*0.000	*0.000

*: Significance at 0.05 alpha level

Table 2b indicates significant difference in the posttest mean scores of TA (X = 65.13) and TN (X = 58.32) in favour of TA. It also indicates significant difference in the posttest scores between TN (X = 58.32) and TAN (X = 71.17) in favour of TAN. Significant difference was established in the posttest mean scores between TAN (X = 71.17) and TO (X = 57.24) in favors of TAN Video Type Instructional packages. To further show the improvement in learning after treatment, the mean gain scores between the pretest and posttest mean scores of the four groups (TA, TN, TAN & TO VBI packages) are as shown in Table 2c and Figure 1. —

Table 2c: Mean Gain Scores of Students Taught Mathematics Using TA, TN, TAN and TO Video Type Instructional packages

Group	Pretest	Posttest	Mean Gain Score
TA	27.47	65.13	37.66
TN	21.75	58.22	36.47
TAN	33.00	71.17	38.17
TO	26.00	47.67	21.67

From Table 2c, it was observed that all the groups had improvement as observed in their posttest. For instance, TAN had highest mean gain scores 38.17; followed by TA with the mean gain scores of 37.66, and .

TN had mean gain scores of 36.47, while the TO had the least mean gain scores of 21.67. This shows that all the groups benefited, with TAN VBI package having the highest posttest performance mean

Figure 1: Main Gain of Students' Taught Mathematics Using TA, TN, TAN & TO

Hypothesis Two

There is no significant difference in the mean achievement scores of male and female students taught mathematics with TO Video Type Instructional package.

Table 3a: ANCOVA of Male and Female Students Taught Mathematics Using Text Only Video Type Instructional package

Source of Variation	Sum of Square	df	Mean Square	F	Significance (P)
Covariate (Pretest)	42.273	1	42.273	1.270	0.270
Main Effect (Gender)	65.780	1	65.780	1.976^{ns}	0.171
Model	105.058	2	52.529	1.578	0.225
Residual	898.969	27	33.295		
Total	1004.027	30			

Ns: Not Significance at 0.05 alpha level

As illustrated in Table 3a, there was no significant main effect gender on learning strategy in the post-test achievement, $F_{(1, 27)} = 1.976$, $p = 0.171$. The F value of 1.976 was not significant at 0.05 alpha level. The result shows that there was no significant difference in the performance of male and female students taught using Text Only VBI package. On this basis, hypothesis two is therefore retained. This shows that male students' achievement did not differ significantly from that of female students when both taught with Text Only (TO) Video Type Instructional package. The mean gain scores between the pretest and posttest of male and female in the TO Video Type Instructional package group were tabulated and graphically illustrated as shown in Table 3b and Figure 2.

Table 3b: Mean Gain Scores of Male and Female Students Taught Using TO Video Type Instructional Package

Group	Pretest	Posttest	Mean Gain Score
Male	26.22	49.11	22.89

Female	25.78	46.22	20.44

From Table 3b, it was observed that male and female students benefited from the method. The male students had higher mean gain score of 22.89 while the female students had a mean gain score of 20.44. This shows that all the groups benefited from the treatment, with male students having better performance and mean gain than the female students. However, these difference are not significant. The comparison in the mean scores between their pretest and posttest is shown in figure 2.
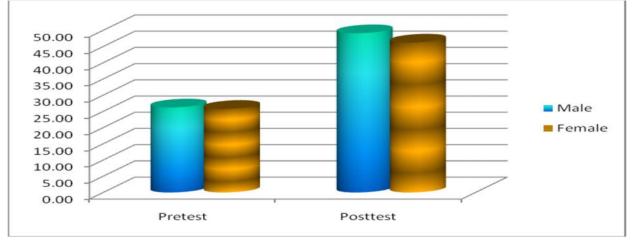

Figure 2: Performances of Male and Female Students' Taught Mathematics Using TO Video Type Instructional Package

Hypothesis Three

There is no significant difference in the mean achievement scores of male and female students taught Mathematics with TA.

Table 4a: ANCOVA of Male and Female Students Taught Mathematics Using TA Video Type Instructional Package

Source of Variation	Sum of Square	df	Mean Square	F	Significance (P)
Covariate (Pretest)	74.266	1	74.266	1.026	0.320
Main Effect (Gender)	288.853	1	288.853	3.991^{ns}	0.056
Model	289.738	2	144.869	2.001	0.155
Residual	1954.381	27	72.384		
Total	129488.600	30			

Ns: Not Significance at 0.05 alpha level

As illustrated in Table 4a, there was no significant main effect of gender on learning strategy in post-test achievement, $F_{(1, 27)} = 3.991$, $p = 0.056$. The F value of 3.991 was not significant at 0.05 alpha level. The result shows that there was no significant difference in the performance of male and female students taught using Text with Animation (TA) Video Type Instructional package. On this basis, the hypothesis three is not rejected. This shows that there is no statistical difference in the achievements of male and female

students taught with TA Video Type Instructional package. The mean gain scores between the pretest and posttest of male and female in the TA group were tabulated and graphically illustrated as shown in Table 4b and Figure 3.

Table 4b: Mean Gain Scores of Male and Female Students Taught Using TA VBMI Package

Group	Pretest	Posttest	Mean Gain Score
Male	32.91	67.81	34.90
Female	21.99	62.45	40.46

From Table 4b, it was observed that both male and female students benefited from the treatment. The female students had higher mean gain score of 40.46 while the male students had mean gain score of 34.90. This shows that all the groups benefited from the treatment, with male students having better performance than female but female had mean gain higher than the male students. The comparison in the mean scores between their pretest and posttest is shown in Figure 3.
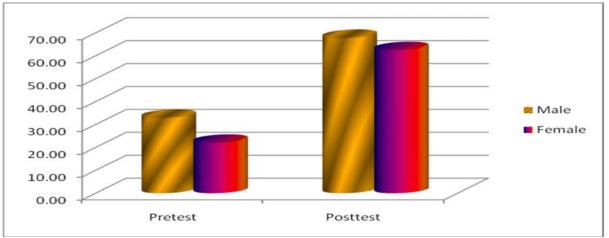

Figure 3: Performances of Male and Female Students' Taught Using TA Video Type Instructional package

Hypothesis Four

There is no significant difference in the mean achievement scores of male and female students taught mathematics with TN Video Type Instructional package.

Table 5a: ANCOVA of Male and Female Students Taught Mathematics Using TN Video Type Instructional package

Source of Variation	Sum of Square	df	Mean Square	F	Significance (P)
Covariate (Pretest)	7.380	1	7.380	0.161	0.692
Main Effect (Gender)	43.966	1	43.966	0.957^{ns}	0.337

Model	44.566	2	22.283	0.485	0.621
Residual	1240.622	27	45.949		
Total	102972.240	30			

Ns: Not Significance at 0.05 alpha level

As illustrated in Table 5a, there was no significant main effect of gender on learning strategy in the post-test achievement, $F_{(1, 27)} = 0.957$, $p = 0.337$. The F value of 0.957 was not significant at 0.05 alpha level. The result shows that there was no significant difference in the performance of male and female students taught using TN Video Type Instructional package. On this basis, the hypothesis four is not rejected. This shows that there is no statistical difference in the achievements of male and female students taught with TN Video Type Instructional package. The mean gain scores between the pretest and posttest of male and female students in the TN group were tabulated and graphically illustrated as shown in Table 5b and Figure 4.

Table 5b: Mean Gain Scores of Male and Female Students Taught Using TN Video Type Instructional package

Group	Pretest	Posttest	Mean Gain Score
Male	23.73	59.33	35.60
Female	19.77	57.11	37.34

From Table 5b, it was observed that both male and female students benefited from the treatment. The female students had higher mean gain score of 37.34 while the male students had a mean gain score of 35.60. This shows that all the groups benefited from the treatment, with female students having better performance at posttest gain than the male students. The comparison in the mean scores between their pretest and posttest is shown in Figure 4.
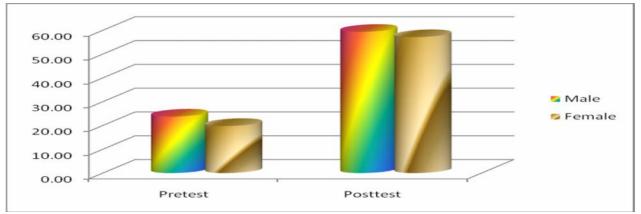

Figure 4: Performances of Male and Female Students' Taught Using TN Video Type Instructional package

Hypothesis Five
There is no significant difference in the mean achievement scores of male and female students taught mathematics with TAN Video Type Instructional package.

Table 6a: ANCOVA of Male and Female Students Taught Mathematics Using TAN Video Type Instructional package

Source of Variation	Sum of Square	df	Mean Square	F	Significance (P)
Covariate (Pretest)	3.934	1	3.934	0.061	0.807
Main Effect (Gender)	935.508	1	935.508	14.487*	0.001
Model	941.377	2	470.688	7.289	0.003
Residual	1743.486	27	64.574		
Total	2684.863	30			

*: Significance at 0.05 alpha level

As illustrated in Table 6a, there was a significant main effect of gender on learning strategy in post-test achievement, $F_{(1, 27)} = 14.487$, $p = 0.001$. The F value of 14.487 was not significant at 0.05 alpha level. The result shows that there was a significant difference in the performance of male and female students taught using TAN Video Type Instructional package. On this basis, the hypothesis five is rejected. This shows that there is statistical difference in the achievements of male and female students taught with TAN Video Type Instructional package. The mean gain scores between the pretest and posttest of male and female in the TAN group were tabulated and graphically illustrated as shown in Table 5b and Figure 5.

Table 5b: Mean Gain Scores of Male and Female Students Taught Using TAN Video Type Instructional package

Group	Pretest	Posttest	Mean Gain Score
Male	33.11	76.76	43.65
Female	32.89	65.58	32.69

From Table 5b, it was observed that male and female students benefited from the treatment. The male students had higher mean gain score of 43.65 while the female students had a mean gain score of 32.69. This shows that all the groups benefited from the treatment, with male students having better performance and mean gain than the female students. The comparison in the mean scores between their pretest and posttest is shown in Figure 5.
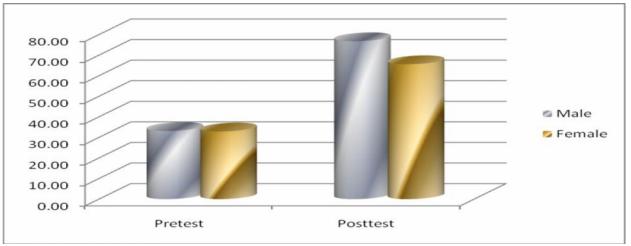
Figure 5: Performances of Male and Female Students' Taught Using TAN Video Type Instructional package

DISCUSSION

Hypothesis one revealed that there were significant differences in the mean achievement scores of students taught using Text Only (TO), Text with Narration (TN), Text with Animation (TA), and Text, Animation with Narration (TAN) in favour of those in TAN Video Type Instructional package group. These findings are in agree with the findings of Dahlgvist (2000) who reported that a picture is better than (a sound) words, an animation is better than a still picture and sound is better than silence. This was supported by Gambari, Falode, Yaki, Anyanwu and Olatunji (2014) who reported that performance of students taught geometry with Animated Graphics with Narration and Text performed better than their counterparts in other modes of multimedia instruction. This finding also agreed with the findings of Adegoke (2010) who found that students in the animation + on-screen text + narration perform better than those in animation + on-screen text, animation + narration and lecture method and text only group. However, the findings of this study contradict the findings of Gambari, Yaki Gana and Ughovwa (2014) who reported that students in Text with Animation with Narration (TAN) multimedia instruction group performed better than their counterparts in the conventional teaching method. However, the findings of this study contradict the finding of Grobe and Struges (2000) who reported that conventional methods achieved a mean post-test score slightly higher than those taught by the audio-tutorial method. The superiority of text, animation

with narration group over other groups may be influenced by the opportunity to read the text on the screen, view the animation and listen to narration concurrently. This was supported by Mayer and Anderson (1991) assertion that simultaneous presentation of text and animation improved learning.

Hypothesis Two revealed that there was no significant difference on the post-test mean scores of male and female students taught using Text only (TO) Video Type Instructional package, this finding is in disagreement with the finding of Eze (1999) who revealed that the boys performed better than girls in the essay section of the achievement test when taught Bible using text with pictures.

Hypothesis Three revealed that there is no significant difference on the post-test mean scores of male and female students taught using Text + Animation (TA) Video Type Instructional package. This finding agreed with findings of Mahmud (2005), Gbodi and Laleye (2006) and Osokoya (2007) who reported that there was no significant difference in the performance of male and female students exposed to video instructional package in Islamic studies, integrated science and history respectively.

Hypothesis Four revealed that there is no significant difference on the post-test mean scores of male and female students taught mathematics using Text + Narration (TN) Video Type Instructional package. This finding agreed with finding of Gambari and Zubairu (2006) who reported that there was no significant

gender influence on the performance of pupils taught primary science using videotape instructional package.

Hypothesis Five revealed that, 'there was significant difference on the post-test mean scores of male and female students taught mathematics using Text + Animation + Narration (TAN) Video Type Instructional package. This finding supported Geist and King (2008) whose finding from the reviewed literature and research on differences in boys and girls concluded that there are difference in the way boys and girls learn and process mathematics. This finding also agreed with the finding of Eze (1999) who revealed that the boys performed better than girls in the essay section of the achievement test. It also agreed with the findings of Ifemuyiwa (2004) and Iwendi (2007) who reported that male students are academically superior to their female counterparts in science courses at junior and senior secondary school levels respectively. However, this finding contradicts the findings of Mahmud (2005), Gbodi and Laleye (2006), Gambari and Zubairu (2006) Adebayo (2008) who reported that there was no significant gender influence on the performance of students taught Islamic studies, integrated science, primary science and mathematics using videotape instructional package.

CONCLUSION

The use of TAN was find to be effective for teaching concepts of Trigonometry in mathematics for senior secondary school students. Text, Animation and Narration video instructional package enhanced students' achievement than other types of video instructional delivery employed in this study. Video-Based Instructional packages such as TA, TN and TO give equal learning opportunities to both male and female in Mathematics. However, TAN is gender bias.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:
(i) TAN Video Type Instructional package should be encouraged in schools for teaching mathematics.
(ii) Teachers should be trained on the use of TAN Video Type Instructional package that can bring

better results in teaching and learning of Mathematics.
(iii) Science, Technology and Mathematics in particular should be taught in such a way that students can see, feel and practise what have been taught on their own. Therefore animation should be an integral part of Science, Technology and Mathematics instructions. In achieving this, Workshop seminars, symposia and conferences should be organized periodically to acquaint new mathematics teachers with recent research findings that would lead to effective and meaningful teaching and learning.

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