

Assessment of Video– Advanced - Organizers on Academic Performance and Retention in Algebra Among Senior Secondary School Students in Safana Zonal Education Quality Assurance, Katsina State

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Abstract: This study was carried out on effect of Video-Advanced-Organizer on Performance and Retention in Algebra among Senior Secondary School Students in Safana Educational Zone of Katsina State Nigeria. The research adopted quasi-experimental pre-test, posttest, post posttest and non-equivalence control group design. Data were collected from a sample of 272 students comprising 143 males and 129 females from two randomly selected public senior secondary schools in Safana zonal education quality assurance of Katsina state. The schools were grouped into experimental and control group. Algebra Performance Tests (APT) was used to gather data. The APT was a researcher made instrument consisting of thirty multiple choices (30) items based on SSII Algebra mathematics topics. The APT was administered thrice, before experiment (Pre), after experiment (Post) and two weeks after post APT (Retention test). The reliability coefficient of APT was found to be 0.704 using SPSS and Cronbach alpha. Descriptive statistics (mean and standard deviation) were used to address the research questions and inferential statistic (independent samples t-test) was used to test the hypotheses at $\alpha = 0.05$. The

findings of this study are: there was a significant difference between the mean academic performance scores of students' taught mathematics with constructivism based blended learning approach and those in the control group. There is no significant difference between the mean achievement score of male and female students' taught mathematics with constructivism based blended learning approach. It was recommended that Mathematics teachers should be encouraged to use constructivism based blended learning approach to teach mathematics at senior secondary level.

Keywords. algebra, performance, retention and video-advanced-organizer

INTRODUCTION

Mathematics is a subject taught at primary, secondary and tertiary level of education in Nigeria which is found to be useful in most field of life. Mathematics according to Abakporo (2015) is the queen and substances of science and technology. The formal education of any country especially Nigeria is primarily responsible for providing scientific and Mathematics attitudes, fundamental

skills, and ways of thinking as well as developing value in science particularly mathematics. Korau (2007) viewed mathematics as the pivot on which any true science rests and no science can succeed without going through mathematical demonstration. Therefore, mathematics serves as the only core or compulsory subject across the globe.

The idea and theory of video advance organizers as learning resources in teaching mathematics is that, learning new knowledge is dependent on what is already known and video advance organizers are the resources that link prior knowledge with the new concept to be. Video advance organizer is information presented prior to learning and that can be used by the learner to organize and interpret new incoming information (Bergman and Sam, 2012). Gambari, Bello and Adeoye (2016) investigated the impact of Video classroom instructional model on secondary school Biology students' achievement and retention of mammalian skeletal system in Minna, Niger State, Nigeria. Finding revealed that the students taught using Video classroom instructional model performed better than those taught using conventional lecture method both in achievement and retention. Wachanga, Arimba and Mbugua (2013), investigated the effects of Advance Organizer Teacher Approach on students' achievement in Chemistry. The study revealed that those who were taught using AOTA achieved better in Chemistry learning than those who were taught through RTM. The findings of this study also indicate that gender has no significant effects on CAT scores in Chemistry learning when AOTA was used.

Academic Performance refers to an individual's academic attainment after a specified course of instruction. It is an individual's status in a specific content area of specified course of instruction after the individual or group has undergone tutoring in a programmed. Academic performance is the level of accomplishment of school educational goals by student over a stipulated time (Azuka, 2016). Retention as define by Hornby (2005) is the ability to remember things. The mind acquires the materials of knowledge through sensation and perception. These acquired materials in the mind should be preserved in the form of images for knowledge to develop. Whenever a stimulating situation occurs, retained images are revived or reproduced to make memorization possible.

Gender is defined as a set of characteristics distinguishing between male and female. Depending on the context, the discriminating characteristics vary from sex to social role to gender identity. Miller and King (2014) consider gender as a social, historical and cultural construct and conditioning, indicating acceptable and preferable forms of behavior and attitudes for both men and women in the society. This study is set to investigate the effect of Video-Advanced-Organizer on Performance and Retention in Algebra among Senior Secondary School Students in Safana Educational Zone of Katsina State Nigeria.

Statement of the Problem

The National Policy on Education (Federal Republic of Nigeria, 2014) placed mathematics as a core subject all secondary school students must offer at both the junior and senior school certificate levels. In spite of this emphasis, the performance of students in the subject is very low year by year. Literature is replete with evidence of poor performance in the subject. For example, West African Examination Council (WAEC) Chief Examiners' annual reports in mathematics from 2012 to 2020 revealed poor mathematics academic performance by secondary school students (WAEC, 2012-2020). A summary of the reports shows that over 60% of the total enrolment in mathematics for these respective years was unable to make up to credit pass and above in mathematics in the senior secondary certificate examination (SSCE). In addition, the reports further revealed that students were weak in answering questions of algebraic quadratic equation more especially in word problems and solution to quadratic equation by graphical method (WAEC 2016 and 2017). Many factors could be attributed to this poor academic performance these include; low retention ability of

the students, poor instructional resources, poor teaching methods, poor students' background, lack of motivation, large class size, poor evaluation, lack of students' attitude, unqualified teachers, poor syllabus coverage among others. One among the possible means of reducing the failure rate of this subject at the senior secondary schools is to improve the teaching and learning approach. It is in realization of this fact, this study is focus on the Assessment of Video Advance Organizers on Performance and retention in Algebra among Senior Secondary school students in Safana zonal education quality assurance, Katsina State, Nigeria.

Research Questions

The following research questions were raised to guide the study;

1. What is the difference between the mean academic performance scores of the students taught algebra using Video Advanced-Organizers and those taught using Conventional method?
2. What is the difference between the mean academic performance scores of male and female students taught algebra using Video Advanced-Organizers?
3. What is the difference between the mean of retention ability scores of the students taught algebra using Video Advance-Organizers and those taught using Conventional method?
4. What is the difference between the mean retention ability scores of the male and female taught algebra using Video-Advanced Organizers?

Research Hypotheses

The following null hypotheses are formulated and would be tested at 0.05 level of significance:

HO₁: There is no significant difference between the mean academic performance scores of the Students taught algebra using Video Advanced-Organizers and those taught using Conventional method.

HO₂: There is no significant difference between the mean academic performance scores of the male and female students taught algebra using Video Advanced-Organizers.

HO₃: There is no significant difference between the mean retention ability scores of the students taught algebra using Video-Advance-Organizers and those taught using Conventional method.

HO₄: There is no significant difference between the mean retention ability scores of male and female students taught algebra using Video-Advance-Organizers.

Methodology

Research Design

The study employed a quasi-experimental research design which has to do with pre-test, post-test non-equivalent control group. It is a non-equivalent control group quasi-experimental design because intact classes were used for the different experimental treatments and control groups. The study involved two groups: an experimental and a control group. Two intact classes (one as experimental and the other as control groups) was used for the study.

Population of the Study

The target population of the study covered all SSII students from twenty public senior secondary schools in Safana Zonal education quality assurance Katsina State with a total population of three thousand eight hundred and thirty (3,830) students. This comprises of 2157 male and 1673 female students of an average age of 17 years. The 20 public senior secondary schools that form the population of this study are all co-educational.

Sample and Sampling Techniques

A total of two hundred and seventy-two Senior Secondary School two (SSS II) Students were purposively selected from the two schools to constitute the sample for the study. A simple random sampling through balloting was used to select the sample schools. Two (2) schools from the twenty co-educational Senior Secondary Schools in the study area were selected. A total of 272 SS2 students were selected as sample of the study from two (2) public co-educational Senior Secondary Schools in Safana Zonal education quality assurance of Katsina State, Nigeria. Two intact classes one from experimental school and one from control school were selected using balloting without replacement. Details of the sampled schools and students' distribution is presented in table 1 below:

Table 1 Sample for the Study

s/no	Types	Schools	No. of SSII Students Enrolment		Total
			Male	Female	
1	Experimental	School A	75	76	151
2	Control	School B	68	53	121
	Total		143	129	272

Instrumentation

For the purpose of data collection, the researchers used Algebra Performance Test (APT) as the instrument for data collection in this study. The APT was developed by the researcher and it has 30-items of multiple choice objective test. The instrument was validated by experts in Mathematics education with the qualification of PhD and above from Isa Kaita College of education, Federal College of education Katsina and Umaru Musa Yaradua University Katsina. The result of the pilot testing was used to realize the reliability coefficient of the instrument as 0.704 with the aid of SPSS package 23.0 version.

Data Analysis and Results

Answer to Research Questions

Mean and standard deviation statistics are used in answering the research questions while t-test statistics is used in testing the null hypotheses as follows;

Research Question One: What is the difference between the mean performance scores of students taught Algebra using Video-Advanced-Organizer and those taught using Conventional method?

Table 2: Mean, Standard Deviation Statistics of Posttest APT scores for Students in Experimental and Control Groups

Group	N	Mean	STD	Mean difference
Exp (Video-Advanced-Organizer)	151	33.51	2.44	9.93
Control (Conventional method)	121	23.58	4.35	

Table 2 showed that the computed mean performances are 33.51 and 23.58 of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using lecture method respectively, with a mean performance difference of 9.93 in favor of students taught Algebra using Video-Advanced-Organizer. It means that difference exists between the mean performance scores of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method.

Research Question Two: What is the difference between the mean performance scores of male and female students taught Algebra using Video-Advanced-Organizer?

Table 3: Mean, Standard Deviation Statistics of Posttest APT scores for Male and Female Students in Experimental Group

GENDER	N	Mean	STD	Mean difference
Male	75	33.69	2.29	0.38
Female	76	33.30	2.62	

Table 3 revealed that the computed mean performances are 33.69 and 33.30 of Male and female SSII mathematics students taught Algebra using Video-Advanced-Organizer respectively. This shows that both male and female students have the same level of mean performance when taught Algebra using Video-Advanced-Organizer. Therefore, the descriptive Mean statistics revealed that there is no difference between the mean performance score of male and female SSII students taught Algebra using Video-Advanced-Organizer.

Research Question three: What is the difference between mean retention ability of mathematics students taught Algebra using Video-Advanced-Organizer and those taught using Conventional method?

Table 4: Mean, Standard Deviation Statistics of Post Posttest APT scores for Students in Experimental and Control Groups

Group	N	Mean	STD	Mean difference
Exp (Video-Advanced-Organizer)	151	30.97	2.03	11.22
Control (Conventional method)	121	19.75	3.93	

Table 4 revealed that the computed mean retentions are 30.97 and 19.75 with a mean retention difference of 11.22 in favor of students taught Algebra using Video-Advanced-Organizer. This shows the difference exists between the mean retention ability of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method.

Research Question Four: What is the difference between the mean retention ability of male and female students taught Algebra using Video-Advanced-Organizer?

Table 5: Mean, Standard Deviation Statistics of Post Posttest APT scores for Male and Female Students in Experimental Group

GENDER	N	Mean	STD	Mean difference
Male	75	30.94	2.00	0.55
Female	76	31.00	2.08	

Table 5 shows the computed mean retentions as 30.94 and 31.00 of Male and female SSII mathematics students taught Algebra using Video-Advanced-Organizer respectively. This indicates that there is no much difference between the mean retention ability of male and female SSII students taught Algebra using Video-Advanced-Organizer. This shows that both male and female students have the same level of mean retention when taught Algebra using Video-Advanced-Organizer.

Hypotheses Testing

The hypotheses formulated were tested using t-test statistics. The null hypothesis is rejected when the p-value is less than the alpha value of 0.05 and otherwise is retained.

Hypothesis One: There is no significant difference between the mean performance scores of SS II mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method.

Table 6: Summary of Independent Sample t-test of Mean Posttest APT Scores for Experimental and Control Groups.

Group	N	Mean	STD	Mean diff. (ES)	Df	T comp.	p
Exp (Video-Advanced-Organizer)	151	33.51	2.44	9.93	270	19.97	0.001
Control (Conventional method)	121	23.58	4.35				

$p < 0.05$, $t\text{-computed} > 1.96$ at $df=270$

Table 6 revealed that, the computed mean performances of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method are 33.51 and 23.58 respectively. The mean performance difference of 9.93 observed was in favor of students taught Algebra using Video-Advanced-Organizer. Therefore, significant difference exists between the mean performance scores of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method. Reasons being that the calculated p-value of 0.001 is lower than the 0.05 alpha level of significance and the computed t-value is 19.97 at df 270. Therefore, the null hypothesis which states that There is no significant difference between the mean performance scores of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method, is hereby rejected.

Hypothesis Two: There is no significant difference between the mean performance score of male and female SSII students taught Algebra using Video-Advanced-Organizer.

Table 7: Summary of Independent Sample t-test of Mean Posttest APT Scores for Male and Female in Experimental Group.

GENDER	N	Mean	STD	Mean diff.	Df	T comp.	p
Male	75	33.69	2.29	0.381	149	0.78	0.44

Female 76 33.30 2.62

P > 0.05, t-computed < 1.96 at DF 149

Table 7 shows the computed mean performances of Male and female SSII mathematics students taught Algebra using Video-Advanced-Organizer are 33.69 and 33.30 respectively. The table also indicated that there is no significant difference between the mean performance score of male and female SSII students taught Algebra using Video-Advanced-Organizer. Reasons being that the calculated p-value of 0.44 is greater than the 0.05 alpha level of significance and the computed t-value is 0.78 at df 149. This shows that both male and female students have the same level of mean performance when taught with students taught Algebra using Video-Advanced-Organizer. Therefore, the null hypothesis which stated that there is no significant difference between the mean performance score of male and female SSII students taught Algebra using Video-Advanced-Organizer is hereby retained.

Hypothesis Three: There is no significant difference between the mean retention ability of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method

Table 8: Summary of Independent Sample t-test of Mean Post Posttest APT Scores for Experimental and Control Groups.

Group	N	Mean	STD	Mean diff.	Df	T comp.	p
Exp (Video-Advanced-Organizer)	151	30.97	2.03				
				11.22	270	25.44	0.000
Control (Conventional method)	121	19.75	3.93				

p < 0.05, t-computed > 1.96 at df270

Table 8 revealed that, the calculated p-value of 0.00 is lower than the 0.05 alpha level of significance and the computed t-value is 25.44 at df 270. Their computed mean retentions are 30.97 and 19.75 of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method respectively, with a mean retention difference of 11.22 in favor of students taught Algebra using Video-Advanced-Organizer. Therefore, the t-test statistics showed that significant difference existed between the mean retention ability of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method. Therefore, the null hypothesis which states that There is no significant difference between the mean retention ability of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method, is hereby rejected.

Hypothesis Four: There is no significant difference between the mean retention ability of male and female SSII students taught Algebra using Video-Advanced-Organizer.

Table 9: Summary of Independent Sample t-test of Mean Post Posttest GPT Scores for Male and Female in Experimental Group.

GENDER	N	Mean	STD	Mean diff.	Df	T comp.	p
Male	75	30.94	2.00	0.55	149	-0.136	0.892
Female	76	31.00	2.08				

P > 0.05, t-computed < 1.96 at DF 149

Table 9 revealed that, the calculated p-value of 0.892 is greater than the 0.05 alpha level of significance and the computed t-value is -0.136 at df 149. Their computed mean retentions are 30.94 and 31.00 of Male and female SSII mathematics students taught Algebra using Video-Advanced-Organizer respectively. Therefore, the t-test statistics showed that there is no significant difference between the mean retention ability of male and female SSII students taught Algebra using Video-Advanced-Organizer. This shows that both male and female students have the same level of mean retention when taught with students taught Algebra using Video-Advanced-Organizer. Therefore, the null hypothesis which states that there is no significant difference between the mean retention ability of male and female SSII students taught Algebra using Video-Advanced-Organizer, is hereby retained.

Finding of the study

1. There is significant difference between the mean performance scores of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method.
2. There is no significant difference between the mean performance score of male and female SSII students taught Algebra using Video-Advanced-Organizer.
3. There is significant difference between the mean retention ability of SSII mathematics students taught Algebra using Video-Advanced-Organizer and their counterparts taught using Conventional method.
4. There is no significant difference between the mean retention ability of male and female SSII students taught Algebra using Video-Advanced-Organizer

Discussion of the results

The findings from the research questions answered and null hypotheses tested in this study are discussed as follows: The results in table 2 shows that students in the experimental group had a higher mean performance score than those in the control group. The difference was significant as indicated by the t-test analysis in Table 6. This signifies that, students taught Algebra concepts using Video-Advanced-Organizer had significantly higher mean performance score than those taught using Conventional Method. By implication, the Video-Advanced-Organizer was able to foster a significantly higher performance than the Conventional Method. Therefore, null hypothesis one is rejected. The significant difference indicates that students in experimental group recorded the higher mean performance score than those in the Control group. This finding supports that of

Wachanga, Arimba and Mbugua (2013). These researches revealed that students exhibited significant improvements in performance as a result of treatment with Video-Advanced-Organizer as compared to the conventional method. From the findings in Table 3 and 7, it was revealed that no significant difference in the performance of male and female students when exposed to Video-Advanced-Organizer. This showed that the strategy is gender friendly in terms of performance. This is in harmony with the findings of Wachanga, Arimba and Mbugua (2013) found that boys in heterogeneous groups do not dominate their female counterparts in performance. The results in table 4 show that students in the experimental group had a higher mean retention ability than those in the control group. The difference was significant as indicated by the t-test analysis in Table 8. This signifies that students taught Algebra concepts using Video-Advanced-Organizer had significantly higher mean retention ability than those taught using Conventional Method. By implication, the Video-Advanced-Organizer was able to foster a significant higher retention than the Conventional Method. The significant difference implies rejection of null hypothesis three and retaining alternate hypothesis. The significant difference indicates that students in experimental group recorded the highest mean score than those in the Conventional Method. This finding supports that of Joseph (2017) which revealed that students exhibited significant improvements in retention ability as a result of treatment with Video-Advanced-Organizer as compared to the conventional method. The findings of this study also agree with findings of Gambari, Bello and Adeoye (2016). From the findings in Table 5 and 9, it was revealed that no significant difference in the retention of male and female students when exposed to Video-Advanced-Organizer. This showed that the strategy is gender friendly in terms of retention ability. This is in harmony with the findings of Gambari, Bello and Adeoye (2016) found that boys in heterogeneous groups do not dominate their female counterparts in retention.

Conclusion

Based on the findings of this study, the following conclusions are made:

1. Academic performance and retention in Algebra concepts can be enhanced significantly by the use of Video-Advanced-Organizer.
2. The use of Video-Advanced-Organizer is gender-friendly as it boosts academic performance and retention among both male and female students.

Recommendation

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

1. Secondary school Mathematics teachers should frequently employ the Video-Advanced-Organizer in teaching difficult and abstract concepts in Mathematics like Algebra.
2. Mathematics teachers should encourage students to actively participate in Video-Advanced-Organizer explorations, discussions and elaboration of learnt concepts for better acquisition of attitude and performance.
3. School administrators like principals and senior masters should perpetually encourage and support Mathematics teachers in providing (or improvising) and using Video-Advanced-Organizer to facilitate classroom explorations and hands-on learning.
1. 4. Seminars, workshops and conferences should be given priority so as to sensitize various stakeholders to support schools and to ensure its implementation in classrooms

REFERENCES

1. Abakporo J.E. (2015). Effectiveness problem solving in mathematics: Challenges and prospects. *Journal of issues in mathematics education. The Annual Publications of mathematics, Panel of STAN*, 8(1): 19-33
2. Azuka, B.F.(2016). Popularization of Mathematics. A Paper Presented at the NMCPTDF Workshop for Mathematics Teachers. 8th-13thDecembe, 2016.
3. Bergmann, J. & Sam, A. (2012). How the Video Classroom is Radically Transforming Learning. Retrieved July 3, 2013, from <http://www.theDailyriff.com> article/how the Video Classroom is Radically Transforming Learning 536.
4. Federal Republic of Nigeria (2014). *National policy on education*, (6th ed.). NERDC Press.
<http://www.standardresearchjournals.org/journals/SJERE/pdf/2013/December/Kolawole.pdf>
5. Gambari, A.I., Bello, A.T. & Adeoye, M.A. (2016). Effects of video Instructional Packages on Achievement of Senior Secondary School Students Mathematics in Minna, Nigeria. *ATBU, Journal of Science, Technology & Education (JOSTE)*; pp 23
6. Hornby, A.S (2005), Oxford advanced learners' dictionary. Oxford University Press.
7. Korau, Y.K. (2017). The effect of using formula approach to the teaching of mathematical concepts in senior secondary school in Kaduna State. *Sokoto Educational Review Vol. 9 No.2*
8. Miller, C. & King, F. (2014). A glossary of concepts and themes used in peace and conflict studies. Paper presented for humanity knights Network.
9. Wachnaga, S.W., Arimba, A.M., & Mbugua, Z.K (2013). Effect of Advance Organizers Teaching Approach on Secondary School Student' Achievement in Chemistry in Maara District, Kenya. *International Journal of Social Science and Interdisciplinary Research*, 2(6), 115-128
10. West African Examinations Council (WAEC, 2011 - 2020). Chief Examiner's Report. Katsina State, Nigeria.