Enhancing Secondary School Students' Interest in Geometry via the Utilization of Computer Animation in Ankpa Education Zone, Kogi State, Nigeria

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How to Cite this Article:
Oguche, B. A., Iji, C. O., Agbo-Egwu, A. O. & Ochu, A. N. O. (2023). Enhancing Secondary School Students' Interest in Geometry via the Utilization of Computer Animation in Ankpa Education Zone, Kogi State, Nigeria. *VillageMath Educational Review (VER), 4(1)*, 49-57. https://ngsme.villagemath.net/journals/ver/v4i1/oguche-iji-agbo-egwu-ochu

Abstract

The study determined the effect of computer animation on students' interest in Geometry in Ankpa Education Zone, Kogi State, Nigeria. Non-randomized pre-test, post-test, non-equivalent control group, quasi-experimental research design was adopted. Two research questions asked and three hypotheses tested at 0.05 level of significance. Purposive sampling of 170 (SS 3) students was used from the population of 3800 students for the

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study. The same technique was used in selecting two schools for the experimental and control groups. One instrument, Longitude and Latitude Interest Scale (LLIS) was used for data collection. The reliability of LLIS was ascertained using Cronbach Alpha was found to be 0.84 which showed that the instrument was reliable. The results revealed that students taught Geometry using computer animation had higher mean interest ratings. Also, there is no significant difference between the mean interest ratings of students in the experimental group based on gender. Both the male and female students improved in their interest in geometry taught using computer animation during the period of this study. Since the use of computer animation enhanced students' interest, new mathematics curriculum that aimed at making mathematics learning interesting by meeting the natural diversities that exist among students is recommended.

Keywords: Mathematics, Geometry, Longitude, Latitude, Computer Animation, Interest

Introduction

It is a common knowledge that mathematics is a subject encapsulated with abstractions. It is a subject that many students dread as a result of the myths that surround it (Buckley, 2013). It was revealed that students are generally weak in the area of geometry especially longitude and latitude, scale drawings, trigonometric relations among others (West African Examinations Council - WAEC Chief Examiners' Report, 2018).

Many reasons account for students' achievement in mathematics as reported by researchers. These include poor methods (Okeke, 2012), lack of confidence in the subject (Abakpa & Iji, 2011), abstract nature of mathematics (Githua, Changeiwo & Mwangi, 2018). Also, most mathematics teachers believed that the effective means of communicating knowledge is via conventional talk and chalk method (Kurumeh & Onah, 2013). Literature is replete with evidence to show that personality variables such as gender (Mberekpe, 2013), mathematics phobia (Babateen, 2011) and interest could influence students' achievement in mathematics.

However, studies by Udousoro (2021) shows that the problems of the use of traditional method of teaching may be solved by exposing students to active participation. Approaches such as: target task approach, laboratory method, heuristic method, mathematical games, models, simulation and concept mapping technique have been tried and tested (Iji, 2010). Olagunju and Jimoh (2021) maintained that adoption of learner-centered innovative strategies in teaching and learning process may enhance the students' interest and achievement in mathematics.

Interest is a subjective feeling of concentration or persisting tendency to pay attention and enjoy some activities or content (Imoko & Agwagah, 2014). Researchers maintained that though some students may be intellectually and physically capable of learning, they may never learn until their interest is stimulated. In addition, researchers unanimously agreed that when students become interested in a particular learning activity, they are likely to be more engaged in that learning (Okigbo & Okeke, 2011; Nzewi, 2014).Thus the students tend to learn more efficiently those things that appeal to their interest. Deductively, interest is defined as likes and dislikes or ones preference and

aversion. Abakpa and Igwe (2013) emphasized that interest is a strong factor that may enhance the achievement of students in Mathematics. Adeosun (2019) emphasized that interest of students in mathematics may be influenced by gender.

Gender could be regarded as a range of characteristics used to distinguish between male and female, particularly in the case of men and women .It is a construct used to differentiate male from female (Boys from girls) and a biological difference between male and female creation (Mberekpe, 2013).Studies on gender disparity in achievement in Mathematics are inconclusive. Hence, the controversial report on gender interest in mathematics necessitates the investigation on the differences in students' interest based on gender in geometry at senior secondary three level using computer animation instructional strategy.

The use of computer animation for teaching and learning may bring about a tangible increase in students' interest in Mathematics (Ityavzua, 2017). The researcher viewed animation as a technique of visualization. Educational animations are those produced for the specific purposes of fostering learning (Sanchez, Cana & Novak, 2013). Mayer (2011) notes that animated teaching involves the use of video compact disc (VCD), digital video disc (DVD), and power point or 16mm. The researcher maintained that animation teaching could be in form of lesson presentation in which still pictures, texts, graphics, motion pictures, background sound as well as some narrations are combined at the same time in order to enhance students' understanding of the concepts. Animation, according to Nweke (2013), includes the use of interactive elements such as video sound and cartoon teaching. In this study, the Effects of Computer Animation on Secondary School Students Interest in Geometry at SSIII level was investigated.

Geometry is a core content area of school Mathematics. Longitude and Latitude are topics in Geometry taught in SSIII as specified in core- curriculum of Mathematics (Nigerian Research Development Council - NERDC, 2012)). Geometry is a branch of mathematics which deals with the study of shapes, size, relative position of figures and the properties of space (Ahmed, 2013). According to Mathematical Association of Nigeria (2012), Latitudes are imaginary lines running from West to East on the surface of the earth while longitudes are those imaginary lines running from North to South on the earth surface. Longitude and Latitude are consistent in WAEC Chief Examiners' report as area of students' difficulty (WAEC Chief Examiners' Report, 2013-2018). The report shows that the performance of students in Geometry is low.

Generally, the relevance of Geometry and the difficulties experienced by the students at senior secondary school level in Nigeria made a study on it pertinent. Therefore, would SS III students' Interest be enhanced when taught geometry using Computer Animation?

Statement of the Problem

Though, researchers have carried out a number of studies on the relevance of Geometry to nation building and have recommended some innovative strategies that will enhance students' interest in the concept, there is persistent students' poor interest in geometry

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generally and longitude and latitude in particular as revealed in the performance of students in Senior School Certificate Examination (SSCE) (WAEC Chief Examiners' Report, 2018).

Some of the reasons for students' dismal performances in the concept have been argued to be the abstract nature of the concept, poor teaching methods and lack of teaching and learning resources among others. The researchers stressed that simulations have been used in some mathematics topics such as three dimension geometry with promising results. In an attempt to seek a teaching strategy that can improve students' interest in geometry, computer animation may be an alternative. The problem of this study, therefore, is to investigate the Effect of Computer Animation on Secondary School Students' Interest in Geometry in Ankpa Education Zone Kogi State, Nigeria.

Objectives of the Study

The purpose of the study was to determine the effects of Computer Animation on Secondary School Students' Interest in Geometry in Kogi State, Nigeria. Specifically, the study sought to:

i. determine whether the use of Computer Animation in teaching geometry enhanced Senior Secondary Students' interest.
ii. determine the effect of Computer Animation on Male and Female Senior Secondary Students' Interest in Geometry.

Research Questions

The following research questions were asked to guide the study:

i. What are the mean interest ratings of Senior Secondary Students taught geometry using Computer Animation and those taught with Conventional Method?
ii. What are the mean interest ratings of Male and Female Senior Secondary School Students taught geometry using Computer Animation?
iii. What is the interaction effect of Computer animation and Gender on Students mean interest ratings in Geometry?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance to guide the study:

i. There is no significant difference in the mean interest ratings of Students taught Geometry with Computer Animation and Conventional Method.
ii. There is no significant difference in the mean interest ratings of Male and Female Senior Secondary students taught geometry using Computer Animation.

Methodology

The design of the study was quasi-experimental. Specifically, the study adopted a non - randomized pre-test post-test control group design. The design was suitable for this study

as the researcher was interested in identifying the cause of any given effect. Also, intact classes were used to avoid threat of selection bias among the students and to avoid re-arranging and regrouping which would disrupt the normal lessons. The study was carried out in Ankpa Education Zone of Kogi State, Nigeria. The population of the study is 3800 SSIII students of 2012/2022 academic session comprising 2000 male and 1800 female students from 70 secondary schools. The sample of the study was one hundred and seventy (170) students comprising 95 male and 75 female selected from two secondary schools. Out of this, 80 students consisting of 45 male and 35 female students were used in experimental group and 90 students consisting of 50 and 40 female students were in control group. Purposive sampling technique was used in selecting the school and random sampling technique to select two schools for the study and the purposive sampling technique was used to assign schools for experimental and control groups. The instrument for data collection was Longitude and Latitude Interest Scale (LLIS). It is made up of 30 item statements. The instrument was face validated by five experts, Two Mathematics Educators and one expert in Test and Measurement from Joseph Sarwuan Tarka University, Makurdi and two Mathematics teachers from Ankpa Education Zone, Kogi State. Cronbach Alpha was used to ascertain the internal consistency of the instrument which gave the reliability score of 0.84.The statistical tools used in answering research questions asked were descriptive statistics of mean and standard deviation while the hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA).

Results

Result of this study is presented according to research questions asked followed by hypotheses formulated.

Research Question One

What are the mean interest ratings of senior secondary students taught geometry using Computer Animation and those taught with Conventional Method?

Table 1: Means and Standard Deviations of Students' Responses on Longitude and Latitude Interest Scale (LLIS)

Group	N	Pre-LLIS		Post-LLIS	
		Mean	SD	Mean	SD
Experimental	80	2.82	1.44	3.49	1.51
Control	90	2.81	1.48	2.98	1.59
Mean Diff.		0.01		0.51	
Total	170				

The result presented in Table 1 shows that in Pre LLIS, the experimental group had a mean interest ratings of 2.82 with a standard deviation of 1.44, while the control group had a mean interest rating 2.81 with a standard deviation of 1.48.

Also, the result shows that the mean interest ratings of the experimental group in Post LLIS is 3.49 with a standard deviation of 1.51 while the mean interest ratings in the

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control group is 2.98 with a standard deviation of 1.59. The mean difference in the pre LLIS between the experimental and the control group is 0.01 while in post LLIS, it is 0.51. This indicates that Computer Animation strategy improved students interest in geometry.

Research Question Two

What are the mean interest ratings of male and female senior secondary students taught geometry using Computer Animation?

Table 2: Means and Standard deviations of Male and Female Students' Responses on Longitude and Latitude Interest Scale (LLIS) in the Experimental Group

Group	N	Pre-LLIS		Post-LLIS	
		Mean	SD	Mean	SD
Male	45	2.84	1.65	3.52	1.29
Female	35	2.83	0.82	3.52	1.59
Mean Diff.		0.01		0.00	
Total	80				

Table 2 shows that in Pre-LLIS, the mean interest rating of male students in experimental group was 2.84 with standard deviation of 1.65 while the mean interest rating of the female students was 2.83 with the standard of 0.82. In the Post-LLIS, the mean interest rating of the male students was 3.52 with the standard deviation 1.29 while the female students mean interest rating was 3.52 with standard deviation of 1.59. The male and female students' Pre- LLIS mean interest rating difference was 0.01 whereas in their post- LLIS , the mean interest rating difference was 0.00.

Hypothesis One

H0[1]: There is no significant difference in the mean interest ratings of students taught geometry with Computer Animation and Conventional Method.

Table 3: Analysis of Covariance of Experimental and Control Groups in Longitude and Latitude Interest Scale (LLIS)

Source	Type III sum of sq.	df	Mean Sq.	F	Sig.	Partial Eta Sq.
Corr. Model	650.416[a]	2	325.208	147.218	.000	.638
Intercept	595.735	1	595.735	269.682	.000	.618
Pre LLIS	36.603	1	36.603	16.570	.000	.090
Group	615.819	1	615.819	278.774	.000	.625
Error	368.907	167	2.209			
Total	100143.000	170				
Corrected Total	1019.324	169				

R Squared = .638 (Adjusted R Squared = .634)

Table 3 shows that the mean interest ratings of students taught geometry in the experimental and control groups is $F_{(1,167)} = 278.77$, P = 0.000 < 0.05 level of significance and ŋ² partial = 0.625 implies 63% variance explained. That is there is

significant difference between mean interest ratings of students taught geometry using Computer Animation and those taught using conventional method as measured by LLIS. Hence, the null hypothesis is rejected.

Hypothesis Two

H0₂ : There is no significant difference in the mean interest ratings of male and female Senior Secondary Students taught geometry using Computer Animation.

Table 4 :Summary of Analysis of Covariance of Experimental Group Male and Female Students in Longitude and Latitude Interest Scale (LLIS)

Source	Type III sum of sq.	df	Mean Sq.	F	Sig.	Partial Eta Sq.
Corr. Model	2.762[a]	2	1.381	.680	.510	.017
Intercept	269.420	1	269.420	132.61	.000	.633
Pre LLIS	2.762	1	2.762	1.360	.247	.017
Gender	**.000**	**1**	**.000**	**.000**	**.989**	**.000**
Error	156.438	77	2.032			
Total	55916.000	80				
Corrected Total	159.200	79				

R Squared = 0.17 (Adjusted R Squared = .008)

Table 4 shows that the mean interest rating of male and female students taught geometry in the experimental group is $F(1,77) = 0.00$, $P = 0.989 > 0.05$ level of significance with η^2 partial = 0.000. The result shows a very high increase in both male and female students' interest in geometry among the experimental group. Hence, the null hypothesis of no significant difference between mean interest ratings of male and female students taught geometry using Computer Animation as measured in LLIS is not rejected.

Summary of Major Findings

The results of findings of this study based on analysis of data include:

    i.   Computer animation strategy had a more positive effect on the students in the experimental group in that they obtained a higher mean interest ratings than their counterparts in the control group who were taught using the conventional method. The higher mean score and the moderate standard deviation obtained by the experimental group indicates that the objective of the instructional strategy realized shows a good mastery of the concept which enhanced the interest of the learners.

    ii.   Both male and female students improved greatly on their interest in geometry using computer animation during the period of this study. The students' interest in geometry using computer animation is not based on gender.

Discussion
This study shows that the use of computer animation in teaching geometry improved students' interest during the period of the study. The improvement was statistically

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significant. The finding is in consonance with that of Onaifoh and Ekweme (2017) who found that the students taught plane geometry using Geogebra software and problem based learning showed significant higher interest than students taught same concept using the conventional method. Also, the finding supports the study of Emaikwu, Iji and Abari (2015) who found that the students taught Statistics with Geogebra showed significantly higher interest than those taught same concept using conventional method.

The study also found that the use of computer animation in teaching geometry improved both male and female students' interest. There was no significant gender difference in students' interest. The result agrees with Ayuba (2017) who found that there was no significant difference in the interest and retention of male and female students taught Mathematics with Computer Based Instruction. The finding of this study shows that the use of computer animation is effective in closing gender gap in students' interest in Mathematics concepts.

Recommendations

The following recommendations were made based on the findings of the study:

    i. There is need for re-training Mathematics teachers on the use of computer animation for teaching geometry to arouse the students' interest in the concept.

    ii. School administrators should keep abreast the current learning strategies, hold subsequent seminars and in- service training for teachers.

    iii. Policy makers are expected to use the information provided by this study as a base for taking decision on the best instructional strategy like computer animation to be adopted in Nigerian Senior Secondary School III Mathematics curriculum.

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