EFFECT OF INFOGRAPHICS MODEL ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN GEOGRAPHY IN AKWANGA LOCAL GOVERNMENT AREA, NASARAWA STATE, NIGERIA

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Abstract
The study investigated the effect of infographics model on Senior Secondary School Students' achievement in Geography in Akwanga Local Government Area, Nasarawa State, Nigeria. Two research questions and two hypotheses guided the study. The study employed quasi–experimental research design involving non randomized pre-test, posttest and control group design. The population of the study consisted of 4556 (3223 male and 1333 female) SS II Geography students from 26 Senior Secondary Schools in Akwanga Local Government Area of Nasarawa State, Nigeria for 2022/2023 academic session. A sample of 125 (45 male and 30 female) SS II students from two Senior Secondary Schools in Akwanga, Nasarawa State, out of 127 students sampled, 75 (45 male and 30 female) are in experimental group and 50 (35 male and 20 female) are in control group through simple random sampling technique. 50 multiple choice items with of 4 options Geography Achievement Test (GAT) was for data collection which was validated and established a logical and content index of 0.75 of expert and reliability of 0.86 for GAT using Kuder-Richardson method was used for the study. Descriptive statistics (mean and standard deviation) was used to analyze and answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Finding from the study showed that the students taught using infographics model had higher achievement mean scores than those taught using conventional method, while male and female students in experimental group had similar achievement mean scores in posttest. The study concluded that infographics model is an effective method of teaching Geography in senior secondary schools in Akwanga, Nasarawa State. The study therefore recommended that teachers and others relevant authority in field of teaching and learning should encourage the use of infographics model instructional approach, and teachers of Geography should be encouraged to use more infographics model in teaching to improve the performance of students in the subject, regardless of gender of students.

Keywords: Academic Achievement, Geography and Infographics Model

Introduction

The importance of Geography in every society cannot be overemphasized because is a subject that study features and systems of the earth's surface, including continents, mountains, seas, weather, rocks, and human activities on earth. It is the study of the diverse environment, places and spaces of earth's surface and their interactions. Geography seeks to answer the questions of why things are as they are and where they are. Geography is the study of places and the relationship between people and their environment. It explores both the physical properties of earth's surface and human societies spread across it. It is also the study of location spatial variation in both physical and human phenomena on earth (Balasubramanian, 2014). Geography educates society to understand how the world's basic physical systems work and affect every life, example the role of sun plays in providing heat and life on earth and how wind and ocean currents affect the weather; and also understand why and how global interdependence has grown; to have a better understanding of society and why we live in places we do; Geography helps us to understand why certain locations are ideal for living why others are not (Iwena, 2018). The knowledge of Geography is highly important in a society.

This is evident in the academic achievement recorded in Geography by students who wrote West Africa Senior School Certificate Examination (WASSCE) May/June 2019-May/June 2023. In 2019 the sum total of students that passed Geography from credit and above was 36.15%, in 2020, there was an increase which the statistic revealed 40.12%, while in 2021, there was a decline in student's achievement which the statistic showed 37.16%, in 2022, it was 42.15%, and 2023, there was a decline which was 41.18% recorded. The current state of affairs is displeasing and this trend could hinder meaningful development in Nigeria and Nasarawa State in particular. The poor academic achievement of students in Geography could be attributed to lack of utilization of appropriate instructional tool, abstract nature of teaching Geography among others. Afolabi (2019) posited that students usually fail in examination due to improper teaching method and lack of essential teaching tools for instructional delivery.

According to Dur (2014), there is a possibility that teaching and learning process using visual infographics is more effective than the conventional talk and chalk because the human mind might be capable of perceiving visual representation in a short time and in a more efficient and permanent way compared to written or verbal information.Infographics involves the use of imagery, maps, charts, slide in teaching and learning to highlight and explain concepts beyond only written and verbal communication. Infographics have might have distinct ability to capture attention, stimulate interest and inculcate information and encourage concept retention. Infographics may be effective tool for teaching complex information in easier, faster, simple and understandable (Smiciklas, 2012). By using appealing images, infographics may facilitate understanding of abstract ideas, and might be popular in education and other fields too when effectively used. Infographics are

graphic visual representation of information, data or knowledge intended to present them quickly and clearly.

Krum (2013) defined infographics as graphic design that combines data visualizations, illustrations, images, and text. Additionally, infographics is described as a visual presentation of information that is normally difficult to understand. Adapting more sense organ in teaching and learning it may bring better result (Naparin & Sa'ad, 2017). It is also defined as the delivery of information, ideas, data text in a visual form to students in a manner for easy comprehension than the traditional text methods (Smiciklas, 2012). Infographics might also change complex information to an easy manipulate form, which can be modified in accordance with the preference of users. Furthermore, infographics can be supported by the relevant text to enhance the perception of audiences. Dur (2014) and Li, Carberry, Fang, McCoy and Peterson (2014) opined that infographic aim at presenting intense and complex information on a certain topic to the receiver in a more understandable and visual manner. Infographics technologies are important instructional tools, it stimulates learner's interest, provides knowledge and enable the achievement of instructional objectives. Information and graphics is an instructional technology that houses a basic innovative approach that make it possible for the learners to access and attach good meaning to information easily, which led to active in learning, achieve functioning knowledge towards the study of Geography. Since the use of infographics model engages both male and female students actively at the same time, there is need to investigate if the two could help to streamline students' gender differences in Geography.

Gender is a prominent variable in our schools especially in Nigeria. Gender roles are roles which society assigns to a man or woman in accordance with the culture and tradition of that society. Gender is a set of characteristics distinguishing between males and females, particularly in the case of man and woman which, depending on the context, may vary from sex to social role to gender identity (Bland, 2013). Gender refers to the socially, culturally constructed characteristics roles which are ascribed to male and female in any society. In recent past, researches in education have tried to analyse students' achievement in relation to male and female performances though inconclusive. Significant researches have indicated that gender plays a part in students' academic achievement. Studies conducted by Gotip, Onuoha and Iorlian (2021) observed that students taught Economics using infographics achieved better result than those taught using conventional method, both male and female students in experimental group achieved higher scores than their counterpart while Zubairu, Daramola, Abubakar and Takura (2017) observed that there was no significant difference in the performance of JSS Students taught Social studies using infographics and those taught with lecture methods. The main objective of teaching is to transfer functional knowledge, skills, ideas and good moral values to learners to fit and function effectively in society. For effective teaching to take place, the teachers need to use different teaching method and

approaches, and the problem of under achievement in Geography may best be resolve by the use of infographics model instructional approach. Infographics model are well designed visual graphics with meaningful information that give a clear meaning about a particular topic at a time). It is an information graphics which conveys data in visual format that should be understandable at a glance (Fowler, 2015).

Integrating infographics technology in teaching of Geography subject it will create an educational environment that will attract the attention of learners' and increase learning opportunities as well as retention of information for a long period. Arwele (2017) indicated that students exposed to the use of infographics performed better than students taught English using conventional method. Infographics enhanced undergraduate achievement in English Studies. Also, Yanco (2016) found that the experimental group achieved high mean gain scores in posttest than their counterpart in conventional group. Gotip, Onuoha and Iorlian (2021) revealed that there was no significant different in the performance of male and female students taught social studies using infographics while Ebere and Cheta (2018) observed that there was significant difference between the male and female students' academic performance on the use of infographics in media systems. From the literature available to the researcher revealed that no conclusion has been reached on the differential effects of gender on students' achievement in Geography when taught using formative assessment strategy. The study explored the effect of gender as moderator variable on students' achievement in Geography when taught using infographics model in Akwanga Local Government Area of Nasarawa State. This is the gap the study filled.

Research Questions

The following research questions were raised guide the study:

1. What are the mean achievement scores of students taught Geography using infographics model and those taught Geography using conventional method?
2. What are the mean achievement scores of male and female students taught Geography using infographics model?

Hypotheses

To guide the study, the following hypotheses postulated and were tested at 0.05 alpha level:

Hypothesis One: There is no significant difference in the mean achievement scores of students taught Geography using infographics model and those taught using conventional method.

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female students taught geography using infographics model.

Methodology

The study employed quasi–experimental research design involving non randomized pre-test, posttest and control group design. The population of the study consisted of 4556 (3223 male and 1333 female) SS II Geography students from 26 Senior Secondary Schools in Akwanga Local Government Area of Nasarawa State, Nigeria for 2022/2023 academic session. A sample of 125 (45 male and 30 female) SS II students from two Senior Secondary Schools in Akwanga, Nasarawa State, out of 125 students sampled, 75 (45 male and 30 female) are in experimental group and 50 (35 male and 20 female) are in control group through simple random sampling technique. 50 multiple choice items with of 4 options Geography Achievement Test (GAT) was for data collection which was validated and established a logical and content index of 0.75 of expert and reliability of 0.86 for GAT using Kuder-Richardson method was used for the study. Descriptive statistics (mean and standard deviation) was used to analyze and answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

The data were presented and analyzed according to research questions and hypotheses formulated.

Research Question One: What are the mean achievement scores of students taught Geography using infographics model and those taught Geography using conventional method?

To answer research question 1, the students' scores from pretest and posttest with GAT were used to compute the means and standard deviations for two groups using IBM SPSS statistic 21 and the results obtained are presented in Table 1.

Table 1: Achievement Mean and Standard Deviation for Experimental and Control Groups

Treatment Groups	No of Cases	Pretest		Posttest		Achievement Gain
		Mean	SD	Mean	SD	
Experimental	75	58.35	8.776	85.56	8.566	27.21
Control group	50	56.56	8.704	72.96	5.983	16.40

Table 1 shows the pretest/posttest mean and standard deviation of students taught Geography using infographics model as 58.35, 8.776/85.56, 8.566 and of students in the control group 56.56, 8.704/72.96, 5.983. The mean gain 27.21 of students taught Geography using infographics model is greater than the mean gain 16.40 of students in the control group. This indicates that students in experimental group performed better than students in the control group.

Research Question Two: What are the mean achievement scores of male and female students taught Geography using infographics model?

To answer research question 2, the students' scores from pretest and posttest with GAT were used to compute the means and standard deviations for male and female students exposed to experimental group. The IBM SPSS statistic 21 was used and the results obtained are presented in Table 2.

Table 2: Mean and Standard Deviation for Male and Female in Experimental Group

Experimental	No of Cases	Pretest		Posttest		Achievement Gain
		Mean	SD	Mean	SD	
Male Students	45	58.53	9.079	86.34	8.337	27.85
Female Students	30	58.07	8.444	84.33	8.889	26.26

Table 2 shows the pretest/posttest mean and standard deviation of male and female students taught Geography using infographics model as 58.53, 9.079 and 86.34, 8.337 for males while 58.07, 8.444 and 84.33, 8.889 for female students. The mean gain of 27.85 for male students is slightly higher than the 26.26 mean gain of their female counterparts in the experimental group. This is an indication that infographics model has more effect on both male and female students' achievement in Geography related concepts as their achievement are closely related.

Hypothesis One: There is no significant difference in the mean achievement scores of students taught Geography using infographics model and those taught using conventional method.

To test null hypothesis 1, the pretest and posttest scores of students in experimental and control groups were used to compute the ANCOVA. The IBM SPSS statistic 21 was employed and the results obtained are presented in Table 3.

Table 3: ANCOVA Results of Pretest and Posttest GAT Scores of Students in Experimental and Control Groups

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	P-value	Sig
Corrected model	9937.459	2	4968.729	301.623	0.000	P<0.05
Intercept	3742.453	1	3742.453	227.183	0.000	P<0.05
Pre-GAT scores	5174.659	1	5174.659	314.124	0.000	P<0.05
Groups	**3775.468**	1	**3775.468**	**229.187**	0.000	P<0.05
Error	2009.741	122	16.473			
Total	822381.000	125				
Corrected Total	11947.200	124				

Table 3 shows the ANCOVA result F (1, 122) = 229.187 and P = 0.000. Since the P-value 0.000 is less than the level of significance value 0.05, the null hypothesis was rejected. Therefore, there is a significant difference in the achievement mean scores of students taught Geography using infographics model and those taught using

conventional method. Thus, the null hypothesis one which states "there is no significant difference in the mean achievement scores of students taught Geography using infographics model and those taught using conventional method" was rejected.

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female students taught geography using infographics model.

To test null hypothesis 2, the achievement mean scores of male and female students in experimental group from pretest and posttest with GAT were compared using ANCOVA. The IBM SPSS statistic 21 was employed and the results of ANCOVA obtained are presented in Table 4.

Table 4: ANCOVA Results of Pretest and Posttest Scores of Male and Female Students in GAT in the Experimental Group

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	P-value	Sig
Corrected model	3928.106	2	1964.053	94.126	0.000	P<0.05
Intercept	2290.787	1	2290.787	109.784	0.001	P<0.05
Pre-GAT scores	3852.870	1	3852.870	184.646	0.000	P<0.05
Groups	46.603	1	49.603	2.230	0.128	P<0.05
Error	1502.374	72	20.866			
Total	554469.000	75				
Corrected Total	5430.480	74				

The result presented in table 4 shows the ANCOVA result F (1, 72) = 2.230 and P = 0.128. Since the P-value 0.128 is greater than the level of significance value 0.05, the null hypothesis was accepted. Therefore, there is a no significant difference in the achievement mean scores of male and female students taught Geography using infographics model. Thus, the null hypothesis two which states "there is no significant difference in the mean achievement score of male and female students taught Geography using infographics model" was accepted.

Discussion of Findings

The result obtained in research question one revealed that students taught Geography in experimental group using infographics model had high mean gain scores than those students in the control group. Drawing inference from hypothesis one. The result indicated there was a significant difference in the achievement mean scores of students taught Geography using infographics model and those taught using conventional method. This is in agreement with the findings of Arwele (2017), Yangco (2016), Gotip, Onuoha and Iorlian (2021) which reported that there was statistically significant difference in the achievement mean scores of students taught Geography using infographics model instructional approach and those students

taught with conventional instructional method. This result however contradicts the findings of Zubairu, Sulaiman and Yero (2023) which revealed that students taught using infographics instructional strategy recorded almost the same level of performance with those taught using video instructional strategy. Also, Zubairu, Daramola, Abubakar and Takura (2017) revealed that there was no significant difference in the performance of JSS Students taught Social studies using infographics and those taught with lecture methods.

Findings based on research question 2 shows reveals that male students taught Geography with infographics model had slightly high achievement gain than their female counterpart in the same group. This finding negates the null hypothesis 2 earlier formulated by the researcher. Specifically, the result indicated that there was no significant difference in the achievement mean scores of male and female students taught Geography using infographics model. This finding is in agreement with the findings of Gotip, Onuoha and Iorlian (2021), Zubairu, Daramola, Abubakar and Takura (2017) which reported that there was no significant difference in the mean achievement scores of male and female students taught some concepts in Economics using infographics instructional strategy. This result however contradicts the findings of Ebere and Cheta (2018) which reported that there was significant difference between the male and female students' academic performance on the use of infographics in media systems. As result, the males performed better than females, males had a stronger affinity and interest towards the use of the infographics in media systems.

Conclusion

Given the finding of this study, the following conclusions were drawn: infographics model in teaching and learning activities is very effective in enhancing Geography students' academic achievement of the concept taught than conventional method. Also, gender was not a significant factor in student's achievement when taught Geography using infographics model.

Recommendations

Based on the finding of this research, the following recommendations are made.

1. Geography teachers should adopt the used of the infographics to teach Geography.
2. Teachers of Geography should be encouraged to use more infographics model in teaching to improve the performance of students in the subject, regardless of gender of students.
3. Nasarawa State Government through the Ministry of Education should organize workshops and seminar for Geography teachers from time to time to keep facilitators 'conversant with the contemporary advancement in Education researches.

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