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Impact of Instructional videos and Infographic on Self-efficacy and Performance among Senior Secondary Geography Students in Katsina State, Nigeria

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Abstract

This study examined the comparative effects of instructional videos and infographics on the self-efficacy and academic performance of Senior Secondary School Geography students in Katsina State, Nigeria. A quasi-experimental pretest–posttest design using intact classes was adopted. The population consisted of 4,211 SS II students, from which 151 students were selected through random sampling. Data were collected using two validated instruments: Geography Performance Test (GPT) for measuring academic achievement and the Geography Self-Efficacy Questionnaire (GSQ) for assessing students' confidence in learning Geography, and validated by experts with reliability coefficient of 0.67 and 0.85. Data analysis involved Analysis of Covariance (ANCOVA) to determine differences in academic performance while controlling for initial scores, and the Kruskal-Wallis H-test to analyse variations in self-efficacy among groups. Findings from the ANCOVA revealed a significant difference in academic performance, with students taught using instructional videos outperforming those taught with infographics and those exposed to the conventional lecture method the mean self-efficacy scores of students taught Geography using Instructional Videos and Inforaphics and those taught using Lecture Method is rejected. It therefore recommends the adoption of video-based instruction for effective Geography teaching at the senior secondary level in Katsina State.

Keywords: Instructional videos, infographics, self-efficacy, geography and Performance

Introduction

Geography is the science which seeks to explain the character of places, the distribution of people, features and events, and the way they occur and develop over the surface of the earth (Fatıma, 2016). Geography is the scientific study of Earth's physical features, environments, and the relationships between humans and their surroundings. It investigates the spatial distribution of natural phenomena and human activities, exploring how these elements interact and influence each other. Geography bridges the natural sciences (e.g., climatology, geomorphology and landforms) and social sciences (e.g., urban planning, cultural studies) to provide a comprehensive understanding of the world (Patel, 2025). According to Dakur, (2022) Land form is conceptualized as the arrangement or organization of the land. Geographic land form therefore can be defined as the configuration of a specific geographical area or of a region or the entire earth surface resulting from interaction of physical processes and crustal movements with the geology of the surface layer of the earth. The physical process involves the vertical and horizontal movement of crustal material of the earth, resulting from forces generated from its interior due to its movement (rotation), as well as action of agents of weathering and erosion. The study of land form is referred to as Geomorphology.

Teaching strategies are necessary in order to make geography lessons more meaningful for students and to facilitate teaching and learning in geography (Karadeniz, 2010). Teaching methods are used by teachers in classrooms in various ways to encourage and aid students in achieving the educational outcomes prescribed by the curriculums (Domaćinović, & Vuk, 2022). The main reason we teach is to bring about change in the learners' behavior. Change in learners' behavior is the work of teachers. Teachers have a number of techniques or methods to choose from depending on the need and circumstance. The concept of teaching method is vast; it comprises the process, whether pedagogical or andragogical. Geography is one of the oldest subjects that uses different teaching techniques or strategies (Muhammed, Lawal, Suleiman & Ahmed, 2021). Video-supported instruction in geography facilitates a learner-centered mode of learning by giving students control over the tempo of learning activities during lessons and beyond formal classroom boundaries.

Instructional videos refer to 'video' made for instruction, that is, video 'made purposely to facilitate learning' or, more precisely, 'video made purposely to facilitate a permanent change of knowledge or

behavior in the viewer'. Video enables the integration of multiple information channels (sound, pictures and text) into a single stream that allows for a captivating and immersive experience (Santos Espino, 2019). Advantage of the video materials is that they provide original and authentic input as they are produced originally. Videos can be used in variety of instructional and teaching settings in classroom, as a way of presenting content, initiating discussion, for providing illustration for a certain topic and content, self-study and evaluation situations (Bajrami, & Ismaili, 2016).

Infographics are visual representations of data using graphic elements, such as pie charts, bar graphs, line graphs, and histograms. Infographics allow for conveying data and information to the learners more easily (Bhat, & Alyahya, 2023). Infographic is an image, which shows certain information using text and graphics. It is not intended to replace the text of an informational message, but only to help communicate complex information to the consumer in a clear and accessible form (Tarkhova, Tarkhov, Nafikov, Akhmetyanov, Gusev & Akhmarov, 2020). Many instructional tools are now designed to enhance students understanding and self-efficacy by minimizing the level of abstraction and theory in subjects like Geography.

According to Kolbe (2019) Self-efficacy refers to an individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments. Self-efficacy reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment. These cognitive self-evaluations influence all manner of human experience, including the goals for which people strive, the amount of energy expended toward goal achievement, and likelihood of attaining particular levels of behavioral performance (Beattie & Fakehy, 2019). This means that those individuals with higher levels of self-efficacy could be subject to doing better in school and being more organized.

Objective of the Study

1. find out the impact of instructional videos and infographics on Academic Performance in Geography among Senior Secondary School Students in Dutsin-ma Zonal Education Quality Assurance, Katsina State, Nigeria.
2. examine the impact of instructional videos and infographics on Self-efficacy in Geography among Senior Secondary School Students in Dutsin-ma Zonal Education Quality Assurance, Katsina State, Nigeria.

Research Questions

1. What is the difference between the mean academic performance scores of Students taught Geography using instructional videos and infographics and those taught using lecture method in senior secondary Schools of Dutsin-ma zonal Education Quality Assurance, Katsina State, Nigeria?
2. What is the difference between the mean Self-efficacy scores of Students taught Geography using instructional videos and infographics and those taught using lecture method in senior secondary Schools of Dutsin-ma zonal Education Quality Assurance, Katsina State, Nigeria?

Research Hypotheses

H_{O1}: There is no significant difference between the mean academic performance scores of Students taught Geography using instructional videos and infographics and those taught using lecture method in senior secondary Schools of Dutsin-ma zonal Education Quality Assurance.

H_{O2}: There is no significant difference between the mean Self-efficacy scores of Students taught Geography using instructional videos and infographics and those taught using lecture method in senior secondary Schools of Dutsin-ma zonal Education Quality Assurance.

Methodology

The study employed a quasi-experimental control group design involving pre-test and post-test for both the experimental and control groups. The study has three groups; two experimental (EG_1&EG_2) and one control (CG). Before treatment, the three groups were pre-tested (O1) to ensure selection of schools with comparative abilities. The two experimental groups were exposed to instructional treatments; Experimental Group 1 was taught using instructional videos (X_1) while Experimental Group 2 was exposed to infographics, (X_2) for a period of six weeks. Control group (X_0) were taught using lecture method.

There were sixteen (16) senior secondary schools in Dutsin-ma Zonal Education Quality Assurance, nine (9) in Dutsinma local government area and seven (7) in Kurfi Local Government Area. All the schools were offering Geography. The schools have a total population of four thousand two hundred

and eleven (4,211). The sample of this study consists of a total number of 151 SSII students selected from three public senior secondary schools offering Geography in the study area. The three schools are GDSS Birchi, GDSS Dabawa and GDSS Tsauri. Initially, these schools were selected using a random sampling. An intact class of SSII was used from each school. The choice of 151 students is in line with central limit theorem developed by Turing (1934) which prescribed that, a minimum of 30 participants is adequately enough to form a sample in an experimental study of this nature.

The study utilized two namely instruments for this research, Geography Self-efficacy Questionnaire (GSQ) and Geography Performance Test (GPT). The Geography self-efficacy Questionnaire (GSQ) were 25 items self-efficacy questionnaire adapted from Abao, Kapuya and Prado (2021) to determine the self-efficacy of students before and after the treatment on the concepts of landforms**.** The items of the questionnaire were developed using Likert's (1970) 4-point rating scale involving strongly Agree (SA); Agree (A); Disagree (D); and Strongly Disagree (SD). Each option carries weight in the order of priority from four (4) to one (1) in positive responses and from one (1) to four (4) in negative response on landforms concepts by simply ticking one of the four options that suit their interest. The GPT instrument consists of forty (40) items test adapted from West African Senior School Certificate Examination (WASSCE) conducted by the West African Examination Council (WAEC) from 2017 to 2021. All the 40 questions adapted for this instrument are objective (multiple choice) items in Physical Geography with four options (A-D) out of which only one option is correct for each of the items, for GPT test-retest method was used and the scores obtained were analyzed using Pearson Product Moment Correlation (PPMC), for GSQ split-half method were used odd and even numbered items were employed, the scores of the students obtained from the pilot test were analyzed using Cronbach Alpha. The items were based on the topics selected from SS II Geography syllabus relating to landform concepts.

Results

Table 1: Kruskal Wallis H-test of Self-efficacy Scores of the Subject in the Experimental and Control Groups

Groups	N	Mean Rank	Sum of Rank	H-Value	P-Value	Remark
Instructional Videos	51	104.35	5322.00			
Graphics	43	85.63	3682.00			
Lecture Method	55	39.47	2171.00	63.61	0.00	Sig.
Total	149					

Table 1 presents Kruskal Wallis H-test of significant difference between the mean self-efficacy scores of geography students taught landform concepts using instructional videos, infographics and those taught the same concept using lecture method. From the result, Geography students taught landform concepts using instructional videos scored a mean rank of 104.35 and sum of rank of 5322.00, then Geography students taught landform concepts using Infographics scored a mean rank of85.63 and sum of rank of 3682.00, while those taught same concept using lecture method scored the mean rank of 39.47 and sum of rank of 2171.00, the H-Value recorded is 63.61 and p-value obtained is 0.00. The P-Value is less than the alpha value of 0.05, hence there was a significant difference. However, null hypothesis which stated that there is no significant difference between the mean self-efficacy scores of students taught Geography using Instructional Videos and Infographics and those taught using Lecture Method was rejected.

Table 2: ANOVA of Performance Scores of the Subject in the Experimental and Control Groups

Grouping	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	593.73	2	296.86	34.98	0.01
Within Groups	1239.05	146	8.487		
Total	1832.79	148			

Table 2 presents ANOVA of significant difference between the mean performance scores of geography students taught landform concepts using instructional videos, infographics and those taught the same concept using lecture method. From the result, sum of squares between groups is 593.73, sum of squares within groups is 1239.05. F-Value recorded is 34.98 and p-value obtained is 0.01. The P-Value is less than alpha value of 0.05, hence there was a significant difference. Consequently, null hypothesis which stated that there is no significant difference between the Mean Academic Performance Scores of Students taught Geography using Instructional Videos and Infographics and those taught using Lecture Method is rejected. To determine the direction of disparity, the researcher ran a post-Hoc test using Sheffer and the result is presented in Table 3.

Table 3: Sheffer's posthoc test of Direction of Difference among Groups

(I) grouping	(J) grouping	Mean Difference (I-J)	Std. Error	Sig.[a]	Remark
Instructional Videos	Graphics	1.57091*	.60313	.04	*Sig.
	Lecture Method	4.64955*	.56631	.00	*Sig.
Graphics	Instructional Videos	-1.57091*	.60313	.04	*Sig.
	Lecture Method	3.07865*	.59302	.00	*Sig.
Lecture Method	Instructional Videos	-4.64955*	.56631	.00	*Sig.
	Graphics	-3.07865*	.59302	.00	*Sig.

Table 3 presented Sheffer post hock test of Direction of Difference among Groups. Result revealed significant difference between geography students taught landform concepts using instructional videos and those taught same concept using infographics at P=0.04<0.05. Significant difference also exists between the experimental groups and control group at P=0.00<0.05.

Discussion of the Findings

The first, second and third findings showed that Significant difference exist between the mean scores of Geography students of the experimental and control groups. Research conducted by Gwon (2020) investigated the impact of multidimensional graphics for teaching Mathematics to promote student's self-efficacy and performance in Scotland high schools. The findings showed that significant differences exist on self-efficacy and Performance between students taught Mathematics using multidimensional graphics and those taught without it. The study also supported by Namaziandost (2020) which investigated the influence of Videos on student's self-efficacy and learning achievement in Geography in Shahrekord, Iran. The findings showed that significant differences exist on self-efficacy and Performance between students taught Geography using videos and those taught without it.

Conclusion

Based on the findings of this study, the study concluded that Instructional videos and infographics are capable of improving student's academic performance and self-efficacy far better than lecture methods. The combined use of instructional videos and infographics produced a synergistic effect. Whole videos enhanced learning by providing structured visual summaries. These complementary relationships strengthening both cognitive achievement and affective outcomes, particularly students' confidence and motivation to learn geography. Their adoption in classroom practice can foster improved learning outcomes, increased student confidence, and greater engagement with geographical content.

Recommendation

1. The use of instructional videos and graphics in teaching geography in schools should be encouraged by State Ministries of Education through training of teachers periodically using seminars and workshops to teachers on how to use instructional videos and infographics in teaching.
2. Katsina state ministries of education should ensure adequate provision of devices that can be used in schools for instructional videos and infographics for improving academic performance and self-efficacy towards school subjects, and suggestions on sustenance of power.

3. The Teacher Training Institutions and professional bodies such as NTI and STAN, to organize a special re-training, workshops, and seminars to Geography teachers on how to use instructional videos and infographics.
4. Devices and technological tools for applying the strategies includes but not limited to: Smartphones and tablets, laptop and desktop computers, multimedia projectors, interactive whiteboards, internet connectivity, external storage device, solar power backup systems etc.

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