PROSPECTS OF ICT IN RESHAPING LEARNING AND RETENTION ABILITY OF ECOLOGICALCONCEPTS IN BIOLOGY AMONG YOUTHS OF SCHOOL AGE

BY

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Abstract

This study investigated the learning and retention ability as improved by the use of Computer Animation Model (CAM) among Biology students in some selected senior secondary schools at Gwale LGA of Kano State, Nigeria. A control group using Quasi-experimental design was applied during the investigation in which a pretest and a posttest were used.The population size for the sampled schools was 4105 in which a sample of 200 was randomly selected from four schools out of the population (50 students per school comprising both male and female). Biology Performance Test Questionnaire(BPTQ) technique was adopted for collecting Data with reliability coefficient value of 0.89. The experimental group wastaught Ecological Concepts (Adaptation, Food chain, Food wave, Pyramid of number and Sampling technique) using Computer Animation Model (CAM) teaching strategy), while the control group was taught using the conventional Teaching Method. Two research questions and two null hypotheses were formulated. Research questions were analyzedusing descriptive statistics. While the null hypotheses were tested using t-test at P< 0.05 level of significance. Findings of the results indicated that there was a significant difference between performance and retention ability of students taught by CAM and those taught using conventional teaching strategy in support of investigational group. Also, analysisof the null hypotheses showed that there was no significant difference between the performance and retention ability of male and female students in the investigational group and those in the control group. Based on the findings, it was recommended that Biology teachers at secondary schools should be persuaded to use CAM for the teaching of ecologicaland other topics in Biology, as it enhances the performance and retention ability of secondary school students in preparation for WAEC, NECO and UTME examinations.
Keywords: Computer animation, Performance, Retention, Ability, Ecology, Quasi Experimental Design

Introduction

Nigeria as a developing nation needs to lay emphasis on Science, Technology, Engineering, and Mathematics (STEM) education in order to achieve a sustainable national development. National Policy on Education (Federal Ministry of Education National Policy on Education. Lagos:, 2004) recommends that 60% of admission into higher institutions should be for students in sciences and science related courses, while 40% should be for social science and humanities. Cognitive skills include the ability to recognize environmental problems, analyze the environment, and put plans in to action. In the process of training specialists of any specialty, the issues of ensuring high quality of training on the basis of advanced technologies of education are relevant. Creating operational ecological literacy is among the objectives of biology education. Understanding and interpreting the state of ecological systems and taking steps to preserve, repair, orrestore them are two aspects of ecological literacy important for ecosystem conservation. In today's society, citizens' ecological literacy is critical for their understanding of sustainable development (Changchen & Shumin, 2023).

To teach Biological concepts such as ecology effectively, the teacher needs to employ methods that will enable the students to learn more, retain more and apply what is learned by engaging in significant and appealing activities in which the Computer Animation Model best suits the topics using high powered projector in slides format (Musa, 2016). Severalstudies have been conducted on the academic performance in sciences. Jibrin and Zayum (2012) carried out a study on the effect of peer-tutoring instructional methods on the academic performance in Biology among secondary schools' students in Zaria metropolis, and found that students taught using peer instructional method performed better than thosetaught using expository method. However, in-spite of this, the progress in science teaching still remained un-appreciable.

It is in view of this that Ayua (2011) and BetikiL (2000) suggested that instructional materials if carefully and properly chosen may enhance the teaching and learning of basic science, by making it retainable, pleasurable, attractive, and friendly. Therefore, this study is aimed at testing the impact of computer animation model on performance and retention ability among biology students in some selected senior secondary schools in Gwale LGA of Kano State, Nigeria.

The Concept of Biology and Computer Animation Model (CAM) is a natural science which concerns with the living world. The subject geared at how living organisms Plant and Animal interact and benefit from each other. It also expresses the relationship and co-existence among different species of plants and animals in an association (Mutualism, Commensalism, Predation, Parasitism as well as Symbiosis relationship) (Musa, 2016). Biology is a requirement for further learning, training and development, for many sciences related professional courses such as Medicine, Pharmacy, Botany, Zoology, Agriculture, Biotechnology, Biomechanics, Conservation, Ecology among other disciplines (Falemu & Akinwumi, 2024).

Similarly, Abubakar (2012) and Neteiyin (2012) observed that Biology, as a discipline, has contributed immensely to the financial, physical and aesthetic benefits of humanity and Nation building (Entrepreneurship). In Nigeria, the teaching of most science subjects, biology inclusive is done through the use of conventional lecture method that requires only the use of chalk and board. Conventional method of teaching is one of the science teaching instructional strategies that encourages rote learning and regurgitation of information without necessarily bringing in understanding, enhancing academic performance and retention ability as observed by Bichi (2002), Mari (2004) and (Maikano, 2007). It is associated with short comings of not taking care of how to acquire the science process skills. In finding out shortcomings of conventional method, researchers emphasize the use of novel "Hands on Mind on" teaching methods like, the use of 5E learning model and computer animation model. Therefore, this study intends to assess the impact of Computer Animation Model (CAM) on Performance and Retention ability among biology students in some selected senior secondary schools in Gwale LGA of Kano state.

Computer Animation Model (CAM) is a procedure in which the illusion of movement is created by displaying on a screen, or recording on a recording device, as a series of individual states of dynamic scene. Literally the term animation is a process of attempting to move something that cannot naturally move on its own treaty. The technique involves photographing successive drawings or positions of puppets or models to create an illusion of movement when the film is shown. On the other hand, the concept of animation can be seen as a way of making a movie by using a series of drawings, computer graphics, or photographs of objects that are slightly different from one another and that when viewed quickly; the pictures will create an appearance of movement (Nnalue, *et al*., 2024).

According to Mayer and Moreno (2002), animation refers to a simulated motion; picture depicting movement of drawn objects or as an image in motion. Educational setting animation is a technique of visualization in order to foster learning experiences. The study, therefore, aimed at investigating the role of CAM on academic performance and retention ability among Biology students in Kano, Nigeria.

Statement of the Problem
Biology, as a subject, is concerned with the natural environment and needs not to be failed by students at various examination bodies i.e. WEAC, NECO and UTME. Students' performance in biology is still not encouraging. The gender, type of school, and school location affect students' academic performance in Biology (Bizimana, 2021). Experimental investigations carried out by different researchers showed that factors such as none availability and usage of teaching and learning resources, poor method of teaching, as, well as lack of dedication and improvisation on the part of the science teachers are among the factors that cause poor academic performance in science subjects. The general poor performance of students in national examinations in recent past have brought about doubts from relevant quarters as to the activities of stakeholders towards improving students' performance in science and generally Science Education. Researchers have succinctly identified causes of poor performance among students and have acted in various capacities to remediate this occurrence (Badmus, 2018). However, government, teachers and students have peculiar challenges for effective and successful improvement from the status quo. The research investigated the impact of Computer Animated Model (CAM) on academic performance and retention ability among senior secondary school biology students in Gwale LGA of Kano State Nigeria.

Objectives of the Study

The objectives are therefore;

1. To determine the effect of Computer Animated Model (CAM) on performance among biology students in seniorsecondary schools
2. To evaluate the effect of Computer Animated Model (CAM) on the retention ability of biology students in seniorsecondary schools

Research Questions

1. What is the effect of Computer Animated Model (CAM) on performance among biology students in senior secondaryschools?
2. What is the effect of Computer Animated Model (CAM) on the retention ability of biology students in seniorsecondary schools?

Research Hypotheses

Ho1: There is no significant difference between the performances of students taught Ecological concepts usingCAM and those taught using the conventional method

Ho2: There is no significant difference between the retention ability of students taught ecological concepts usingcomputer animation model and those taught using conventional method

Methodology Research Design

Quasi experimental control group design was involved for the purpose of this research, employing pretest, posttest and post posttest as recommended by Keriinger (1973). Two groups were used for the study, an experimental group and a control group consisting of both male and female students. A pretest was administered to the two groups before the treatment to determine their entry level. The experimental group was taught using CAM Instructional teaching strategy,while the control group was taught the same concept using the conventional method. At the end of the treatment period,a posttest was administered to both groups of students in order to determine the effectiveness of the treatment using Biology Performance Test Questionnaire (BPTQ). Two weeks after, a post posttest was administered to the students in order to determine the level of retention ability.

Population of the Study

The population of the study consisted four public Senior Secondary Schools (SSII) biology students in Gwale Local Government Area of Kano State. The size of the population is 4105; and a sample of 200 was randomly selected, comprising of both male and female students.

Sample and Sampling Technique

Simple random sampling, involving 'balloting method' was used to select four schools out of the population. The schoolsselected were Government Senior Secondary School, Goron Dutse (Boys), Government Girls Senior Secondary School,Jan Bulo Kabuga, Government Senior Secondary School, Dorayi Babba (Boys), and Government Girls Senior SecondarySchool, Gwale. The schools and the control group were assigned into experimental groups. From the four schools, two science classes consisting of 50 students were randomly selected. This gave a total Dumber of four intact classes for thestudy, which were randomly assigned into control and experimental groups. Thus, the total sample for the study remained200 both male and female students.

Instrumentation

The instrument used for the study was Biology Performance Test Questionnaire (BPTQ). The instrument was adapted from past question papers of WAEC and NECO in addition to Biology textbooks. It consisted of 35 objective questionsWith four options provided for each question.

Administration of Treatment

The experimental group was taught using the computer animation model. The treatment was done in stages, namely pre-animation stage, the content delivery stage, and the post animation stage.

The pre-animation stage

- The pre-animation stage deals with the provision of enabling environment for the conduct of computer animation model teaching activity. This includes the provision of computers, projector, animation software, flash cards, and power supply and so on
- Assembling the computer, projector, and installation of the software into the computer ready for use
- Proper sitting arrangement

The content delivery or animation stage

- Theoretical introduction of the lesson by the teacher
- Power point presentation of the animated model on the topic of discussion
- While the presentation is going on the students are expected to observe, comment and discuss
- Factual evidence of what is going on in the cartoon will at the same time be Projected for discussion in orderto generate argument and find a conclusion
- The teacher evaluates the lesson by asking questions to assess and achieve the stated objectives

The treatment last for a period of six weeks, with two hours interaction per week. After wards, a posttest was administeredto assess the effectiveness of the treatment.
Two weeks after a post posttest was administered to determine its effect on the retention ability of the students.The control group was taught the same concept using the conventional lecture method.

Data Analysis and Result Discussion

Question One: What is the effect of computer animated model (CAM) on academic performance among biology studentsin senior secondary schools?

Table 1

Mean Scores of Students taught some Ecology concepts using CAM instructional teaching strategy and those taughtusing conventional Method

Variable	Groups	N	Mean	Std. dev.	Mean differences
Performance mean scores	Experimental control	100	22.9	2.16	11.2
	Control	100	10.8	2.11	

Table 1 showed that there was a difference in the mean score of students taught ecology concept using CAM instructional teaching strategy and those taught using conventional method. The mean score of the experimental group was 22.9 while 10.8 for the control group; with a mean difference of 11.2

Question Two: What is the effect of computer animated model (CAM) on the retention ability of biology students insenior secondary schools?

Table 2

Descriptive statistics (Mean and Standard Deviation) results of the difference in Academic Performance of male andfemale taught ecology concept using CAM female taught ecology concept using CAM

Variable	N	Mean	Std. dev.	Mean difference
Male	100	87.96	83.43	
				2.76
Female	100	93.18	89.7	

Table 2 showed that the performance of males in the experimental group had a mean score of 87.96 and standard deviationof 83.43. However, the mean score of female counter parts was 93.18 with a standard deviation of 89.74. Therefore, themean difference is 2.76, implying that the difference between the academic performance of male and female students was not significant.

Hypothesis One: There is no significant difference between the mean scores of Students taught ecology concept using CAM and those taught with conventional method.

Table 3
t-test comparison of posttest means scores of the experimental and the control groups

Variable	N	Mean	Std dev	Dft-cal	P
Experimental	100	21.17	2.19		
				11017.48	0.00
Control	100	10.48	2.12		

Table 3 showed that there was a significant difference between the mean scores of students taught biology concept using the CAM instructional teaching strategy and those taught using the lecture method. This is because the calculated p value of 0.00 is lower than the 0.05 alpha level of significance and the calculated t-value of 36.1 is higher than the 1.96 t critical value at df 200. This implies that students of the experimental group performed better than their counterparts in the control group, therefore, null hypothesis was rejected.

Hypothesis Two: There is no significant difference between the retention ability of students taught ecology concepts using computer animation model and those taught using conventional method

Table 4
t-test comparison of the post posttest mean scores of biology students taught using CAM instructional teaching strategy.

Variables	N	Mean	Std. Dev	Df	t-cal	P
Experimental	100	21.17	2.23			
				110	17.48	0.67
Control	100	19.2	2.06			

Table 4 showed that there was no significant difference between the posttest scores of • male and female students taught
ecology concept using the CAM instruction teaching strategy. Therefore, hypothesis two was retained.

Discussion of Result
Analysis in Table 3 showed that a significant difference existed between the mean scores of students taught ecology concept using CAM instructional teaching strategy and those taught using the conventional method. This implies that there is a positive change on the academic performance of students taught ecology concept using CAM. The effectiveness of CAM in the teaching process has enhanced the students' academic performance. This study is in agreement with the results of Ala, *et al*., (2022) who found that the use of CAM in the teaching of biology concepts has improved the grades of the students and encouraged active participation (Ala, *et al*., 2022). Hein. (2012) also found that students taught using the CAM instructional teaching strategy had better biology exam results than those who had been taught through traditional teaching methods.

The findings of the study showed that students in the experimental group taught using CAM instructional method was better than that taught by the normal classroom teaching method. This agrees with the study of Campbell, (2014) who reported that laboratory activities combined with CAM instructional strategy was more influential than the conventional laboratory techniques in facilitating students' learning in biology laboratory. The present finding disagrees with report of Sanchcez, *et al.,* (2010) who found no significant difference between CAM instructional strategy and the conventional method of teaching in biology (Ali , et al., 2021).

Conclusion
Results of this study showed that Computer Animation Model (CAM) employed as instructional teaching method is an effective approach in enhancing students' academic performance and retention ability over conventional method of teaching. This is because significant difference existed between the mean scores of students taught ecology concept using CAM instructional teaching method and those taught using conventional method. This implies that a significant positive impact exists in favor of the experimental group.

The finding also indicated that gender status does not have any significant impact in the mean scores of students taught ecology concept using the CAM and their counterpart. Therefore,CAM instructional teaching method is gender responsive.

Recommendations

The following recommendations were drawn base on the present finding:

1. Biology teachers should incorporate the use of CAM instructional teaching method in the teaching of biological concepts. The method improves students' academic performance irrespective of gender.

2. Federal Ministry of Education (FME) and organizations such Science Teachers Association of Nigeria (STAN), should organized seminars, workshops and conferences on the CAM instructional teaching strategy for Biology teachers at all level education.

3. Examination bodies should encourage the use of Computer Base Technology (CBT) during exam as it was successfully done by UTME with less complication, this will be enhanced and encourage the student to be acquainted with computer and STEM.

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