EFFECTS OF COMPUTER ANIMATION INSTRUCTIONAL PACKAGE ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN BIOLOGY IN NIGER STATE, NIGERIA

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Abstract

The study investigated the effects of Computer Animation Instructional Package on secondary school students' achievement in Biology in Niger State, Nigeria. The study adopted a pre-test, post-test, non-randomized, non-equivalent quasi-experimental design. Two research questions and two corresponding null hypotheses were formulated and tested at 0.05 level of significance. The sample was made up of 240 students captured from intact classes selected from six secondary schools using a multi-stage sampling technique. Biology Achievement Test (BAT) was used an instrument to gather data for the pre-test and posttest. Computer Animation Instructional Package (CAIP) was used as treatment instrument for the experimental group while the control group was taught using discussion method only. Content and criterion validation of CAIP was done by expert Educational Technologist, Computer Programmer and Biology lecturers from Niger State College of Education while BAT was validated by biologist and expert in test and measurement. Test-retest method was used to administer BAT and the reliability coefficient was determined using the Pearson Product Moment Correlation and found to be 0.70. The results showed that there was a significant difference in the mean achievement scores of the experimental and control groups in favour of the experimental group. However, there was no significant difference in the mean achievement scores of male and female students taught Biology using computer animation instructional package. Based on the findings of this study, it was recommended, that the use of CAIP should be encouraged in teaching and learning of Biology among others.

Keywords: Animation, Achievement, Biology, Instructional Package

Introduction

Biology is an important subject among the core science subjects taught at senior secondary school level in Nigeria. It occupies a unique position in the school curriculum and that can be deduced from the ever increasing number of students offering the subject in WAEC examination (WAEC, 2017). Biology is a natural science that deals with the living world. It concerns with how the world is structured, its functions and what these functions are, how it develops, how living things came into existence and how they react to one another as well as their environments (Umar, 2011). The study of Biology thus provides an ideal preparation and a prerequisite for pursuing a number of careers in sciences which include Medicine, Pharmacy, Biochemistry, Botany, Nursing, and Zoology. The knowledge of Biology provides an individual with useful information in solving everyday life challenges. Studies have shown that Biology contributes towards the socio-economic development of a country (Umar, 2011,). Despite this great significance, most teachers are still using the traditional teaching method which rendered the teaching process passive and look more of an abstract. Several studies have shown that factors affecting the effective teaching and learning of Biology. The factors include; teacher centred methods and inadequate use of ICT and other technological gadget (Yisa, 2014; Falode, Sobowale, Saliu, Usman & Falode, 2016).

The aforementioned factors affecting the learning of Biology have led researchers to carry out studies to find ways of integrating ICT in the classroom as supplements for conventional to enhance the performance of students in Biology. Some of these alternative methods of teaching Biology are product of computer tools such as Biology virtual laboratory, Web-Based learning, Programmed Instruction (PI), Computer Assisted Instruction (CAI), Biology simulation experiments, Biology Mobile Learning Application (BMLA) and Computer Animation Instructional Package (CAIP).

Computer animation is simply bringing inanimate objects to life on a screen. Animators make the characters both believable and larger than life. The gestures and emotions need to be spot-on the landscapes magical and life-like. Animation is classified into 2D, 3D and all these animations are geared towards improving students' achievement level. Achievement level is the cumulative performance of student, displayed in competencies to demonstrate a specific skill or knowledge actualization. CAIP if well tailored as the mandate and capacity to teaching of Biology will improve student's achievement with no nexus to gender disparity on achievement level (Achuonye, 2011).

According to World Health Organization (2018), gender refers to the socially constructed characteristics of women and men such as norms, roles and relationships of and between groups of women and men. Gender is a cardinal variable to be considered in this study to clarify the assumptions and other issues which include perception of visual information by male and female, difference in acquisition of scientific knowledge through the use of computer, disparity in academic achievements in science courses and ICT.

Musa, Ziatdinov and Griffiths (2013) examined the importance on animation, which is basically a form of pictorial presentation, has become the most prominent feature of technology-based learning environments. It refers to simulated motion pictures showing movement of drawn objects. The study noted that educational computer animation has turned out to be one of the most elegant tools for presenting multimedia materials for learners, and its significance in helping to understand and remember information has greatly increased since the advent of powerful graphics-oriented computers.

Gambari, Falode and Adegbenro (2014) examined the effectiveness of computer animation and geometry instructional model on Mathematics achievement and retention of Junior Secondary School Students in Minna, Nigeria. The results indicated that the students taught geometry using computer animation performed significantly better in posttest and retention test than their counterparts taught geometry using instructional model and conventional method respectively. However, there was no significant difference reported in the posttest performance scores of male and female students taught geometry using computer animation and instructional model respectively. These findings indicated that geometry concept in mathematics could be taught and learnt meaningfully through the use of computer animation.

Falode, Sobowale, Saliu, Usman, and Falode (2016) determined the effectiveness of Computer Animation Instructional Package (CAIP) on academic achievement of senior secondary school agricultural science students in animal physiology in Minna, Nigeria. Influence of gender was also examined. Findings revealed that there was significant difference between the mean achievement scores of the two groups in favour of those taught with CAIP. Also, the package improved the achievement of both male and female students taught.

Yisa and Ojiaku (2016) study investigated the effectiveness of computer animation package on a progressive learning achievement and level of secondary school biology students in Niger State, Nigeria. The finding of the study showed that there was significant difference between the groups. The package harmonized the academic achievement of the students from SS I – SS III. Several other studies have shown those computer animation instructional packages are more effective in enhancing students' achievement in Biology and other science subjects (Bamidele & yoade, 2017; Hamzat, Bello & abimbola, 2017; Ikwuka & Samuel 2017)). Incorporating computer animation package into could just be one potential way to meet the needs of both students. Hence, the urgent need to look for alternative instructional strategies might be achieved through computer animation package. It was against this background that this study investigated effects of computer animation instructional package on senior secondary school students' achievement in Biology in Niger State, Nigeria.

Statement of the Problem

Studies have shown that most of the problems secondary school Biology students encounter is deduced from the traditional teaching method currently in use to teach the subject at Secondary School. However, Gambari, Falode and Adegbenro (2014) and Bamidele and Yoade (2017) showed that the performance of biology students in practical biology is on the declined, and the primary causes of the poor performance are the inadequate biology laboratory equipment and use of conventional method for practical activities.

The increasing failure rate of students from year to year in Biology, in school examinations are becoming alarming. Observations and investigations on student's performance in Biology in the SSCE had revealed that only a small percentage of the students perform well in the examination especially when compared with other science subjects. Despite students' interest in the subject, majority of the students still continue to perform poorly (WAEC Chief Examiner's reports, 2017). The observed poor trend of students' performance in Biology therefore calls for concern. Hence, this study determined the effects of computer animation instructional package on senior secondary school students' achievement in Biology in Niger State, Nigeria.

Research Questions

The following research questions were raised to guide the study:

(i) What is the difference in the achievement score of students taught Biology using Computer Animation Instructional Package and those taught with discussion method?

(ii) Does gender have any influence on students' achievement in Biology when taught using Computer Animation Instructional Package?

Research Hypotheses

Ho_1: There is no significant difference in the mean achievement score of students taught biology using computer animation instructional package and those taught with discussion method.

Ho_2: There is no significant difference in the mean achievement scores of male and female students taught biology using computer animation instructional package.

Methodology

The design adopted for this study was Quasi-experimental design. A pretest, posttest, non-randomized and non-equivalent control group design was adopted. The population of the study comprised all the 7,435 senior secondary school students of 2017/2018 academic session in Minna Metropolis. The target population was biology students in Senior Secondary two (SSII). SSII students were chosen as the target based on the fact that identified difficult biology concepts were contained in their syllabus.

The sample for the study was 240 students from intact classes of two co-educational public schools in Minna, Niger State capital. The two schools were purposively selected based on availability of manpower, equivalence in terms of curriculum, ICT facilities, examination mode and students' exposure to electronic learning. The schools were randomly assigned to experimental and control groups. The experimental group taught with computer animation instructional package was made up of 130 students (70 males and 60 female) while the control group taught with discussion method was made up of 110 (60 males and 50 females) students.

The research instrument used for the study was Biology Achievement Test (BAT), which is the test instrument. BAT was made up of 30 multiple choice items constructed by the researcher. Each item was provided with four possible options A-D out of which a student is expected to choose the correct answer. One mark (1mark) was awarded for every correctly answered question. The score obtained out of 30 was later converted to percentage.

The treatment instrument Computer Animation Instructional Package (CAIP) was developed by the researchers using DigiCel's Flip Book animation software and it contains introductory page, lesson objectives, formative evaluation questions, animated-images, text, and well-structured biology lessons on concepts of digestive system, respiration, and circulatory system with narrations. CAIP was validated by two Computer experts, two Educational Technology specialists at Federal University of Technology, Minna and two secondary school Biology lecturers, while face and content validation Biology Achievement Test (BAT) was done by two Biology experts and two test and measurement experts. Based on experts' suggestions and recommendations, the instruments were modified and re-structured.

Trial testing and pilot study of CAIP and BAT were carried out in a secondary school within the study area but outside the schools selected for the main study using 40 SSII students were used. After a single administration of the test instrument, split-half method was used and the reliability co-efficient of 0.76 was obtained using Spearman Brown Correlation Coefficient formula. The data collection procedure lasted for twelve weeks, BAT was administered as pre-test and post-test for both experiment and control group while computer animation and discussion method were used to present the selected biology topics to experiment group only. While the control groups were taught using discuss method only. The collected data were analyzed with descriptive and inferential statistics. The hypotheses were analyzed using t-test statistics at0.05 alpha level of significance.

Results

Ho_1: There is no significant difference in the mean achievement score of experimental and control group.

Table1: t-test analysis of achievement score of students taught biology using CAIP and discussion method

Test	Group	N	df	X	SD	t-value	p-value
Pre test	Experimental Group	130	238	28.35	6.43	0.45	0.48^{ns}
				27.26	7.38		
Post test	Control Group	110		74.36	8.31	10.03^{ns}	0.00*
				68.34	7.66		

Table 1 shows the t-test analysis of achievement score of students in biology when Computer Animation Instructional Package (experimental group) and discussion method (control group) of instruction is used. The table shows that the two groups were equivalent before the administration of treatment since there was no significant difference between

their mean achievement score at pretest (t = -0.45, df = 238, p >0.05). At posttest, the table revealed significant difference between the mean achievement scores of the two groups (t = -10.03, df = 238, p<0.05). Hence, hypothesis one was rejected. This implies that students taught Biology through Computer Animation Instructional Package (average mean score =74.36) achieved better than their counterparts taught the same concept through discussion method (average mean = 68.34).

Ho_2: There is no significant difference in the mean achievement scores of male and female students in the experimental group.

Table 2: t-test analysis of achievement score of students taught Biology through CAIP and discussion method

Test	Group	N	df	X	SD	t-value	p-value
Pre test	Male	70		47.17	10.27	0.55ns	0.64
	Female	60	238				
				39.36	14.78		
Post test	Male	60		88.43	5.95	0.37ns	0.56
	Female	50		85.83	7.87		

Table 2 shows the t-test analysis of achievement score of male and female students taught Biology through Computer Animation Instructional Package. The table shows that both male and female students were equivalent before the administration of treatment since there was no significant difference between their mean achievement score at pretest (t = 0.55, df = 238, p >0.05). At posttest likewise, the table revealed that there was no significant difference between the mean achievement scores of the two groups (t = 0.37, df = 238, p >0.05). Hence, hypothesis two was not rejected. This implies that Computer Animation Instructional Package improved the achievement of both male (average mean score = 88.43) and female (average mean = 85.83) students in biology.

Discussion

The result of the study revealed that CAIP is more effective than discussion method in enhancing students' achievement in Biology. This finding is in consonance with the assertion of Musa, Ziatdinov and Griffiths (2013) who noted that the basically a form of pictorial presentation, has become the most prominent feature of technology-based learning environments which increase the achievement level of the students. This result is contrary to the finding of Akpoghol, Ezeudu, Adzape and Otor (2016) who stated that students exposed to another method performed better than those exposed to animation. However, the result agreed with findings of Gambari, Falode, and Adegbenro (2014), Falode, Sobowale, Saliu, Usman and Falode (2016) and Yisa and Ojiaku (2016). Their studies found that students taught using computer animation performed better than their counterparts taught without the use of computer animation.

The second finding from this study showed that there is no gender influence on the achievement of male and female students taught Biology using computer animation instructional package. That is, both the male and female students benefitted from the package. The finding stimulates and arouses the students with no regard to gender to achieve the lesson stated objectives. This result is in agreement with the findings of Gambari, Falode, and Adegbenro (2014), Yisa and Ojiaku (2016), Bamidele and Yoade (2017) and Ikwuka and Samuel (2017) who found that there is no significant difference in the academic achievement of male and female students taught using computer animation.

Conclusion

The findings of this study revealed that Computer Animation Instruction Package produced a better achievement in students when supplemented with discussion method of instruction. The results derived from this study had not supported one major idea of shifting the blame of academic failure on students thus the instructional method could also be responsible. The result strongly supports the view that Computer Animation Instruction Package produced higher level of student's achievement than conventional method of teaching. This implies that inequalities in learning outcomes among students are not necessarily as a result of individual differences. The inequalities could be ascribed to consequences of providing students with instruction that are not adapted to the learning characteristics and the needs of individuals. If instruction is tailored to the characteristics and the need of individual students, and appropriate time given, majority of the students could attain high level achievement in biology.

Recommendations

Based on the findings, the following recommendations were made:

(i) Computer Animation Instruction Package should be adopted in the teaching of Biology in school.

(ii) In view of the effectiveness and feasibility of the package, teachers should be willing to use such programme to solve some of the problems of teaching the students.

(iii) Computer animation development should form a course for any would- be teacher in sciences and especially Biology in our schools such teachers who have succeed with development of computer animation package will continue to use it thereafter. Ideally such strategy should be a part of the pre-service education of new biology teachers in our colleges of education and faculties of education in our universities.

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