EFFECTS OF COMPUTER VIDEO INSTRUCTIONAL PACKAGE ON ACHIEVEMENT AND RETENTION OF SENIOR SECONDARY SCHOOL BIOLOGY STUDENTS IN MINNA METROPOLIS, NIGER STATE

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Abstract

The study investigated the effects of computer video instructional package on achievement and retention of Biology students in Minna Metropolis, Niger State. The study adopted quasi experimental design. The population of the study was the entire Biology students in SSII. Sample used was 93 students captured in the intact classes. Biology Achievement Test (BAT) was the instrument used for data collection and it was validated by three experts in the field of Science Education. Test re-test method was used in the pilot test. Pearson Product Moment Correlation formula was used to analyze the data obtained and reliability index of 0.85 was obtained. The scores of the students were analyzed using mean, standard deviation and t-test statistics to test the hypotheses. The results indicated that students exposed to computer video instructional package did better than those taught with conventional lecture method in both posttest and retention test. Based on the findings it was recommended that computer instructional video package should be encouraged for teaching and learning of Biology so as to enhance student achievement and retention.

Keywords: Computer, Instructional Video, Achievement, Retention, Biology

Introduction

The use of technology in education provides the student with a more suitable environment to learn, serves to create interest and learning centered, and help increase the student motivation. The use of technology in this way plays an important role in the teaching and learning process (Isman & Balkan, 2002). In parallel with the technological advances: technology devices particularly computers, began to be use in educational environment to develop audio-visual materials such as animations and simulation, which resulted in the development of the computer-based instructional techniques (Offili, 2010).

Computer instructional video package is another medium for teaching practical skills during the delivery of Biology and training via distance learning. This study sought to examine the instructional materials for teaching Biology learners. The teaching of Biology experiment requires the use of instructions to enable learners to follow the process and thereafter, repeat the skill whether within a conventional educational instruction or via distance learning. In a typical classroom-based educational institution, an instructor provides such instructions in laboratory using the appropriate apparatus. The most commonly used method for teaching practical skills according to (Umeh, 2013) is the use of print-based illustrations of step-by-step procedures. This approach has its shortcoming and therefore, in recent time alternatives have been sought. One of such alternatives used by the present special initiative on distance learning in the delivery of Biology lessons is video-based practical lessons, the comparative effectiveness of which is the focus of this paper.

Sigh (2005) investigated the effects of CAI in Biology as compared to traditional method on topics of tissues and cells. The findings revealed that both the methods were effective in enhancing learning about cell and tissue. ii. Lecture method was more effective than CAI for teaching cell. CAI was more effective than lecturer method for teaching tissue. Imhanlahimi and Imhanlahimi (2008) assessed the effectiveness of computer assisted learning strategy and

expository or traditional method of teaching Biology using Lumen Christi International High School, Uromi, Edo State Nigeria as a case study. Findings of the result showed that expository method of instruction was superior to computer assisted learning strategy. The expository group achieved significantly higher than those taught through individual's computer assisted learning strategy. Owusu, Monney, Appiah and Wilmot (2010) investigated the comparative efficiency of computer-Assisted Instruction (CAI) and conventional teaching method in Biology on Senior High School students. The results indicated that students that were instructed by the convectional approach performed better on the post-test than those instructed by the CAI.

However, the performance of low achievers within the experimental group improved after conventional approach group, the students in CAI group perceived CAI to be interesting when they were interviewed. Mudasiru and Adedeji (2010) investigated the effect of computer-assisted instruction (CAI) on secondary school student's performance in Biology and also the influence of gender on the performance of students' exposed to CAI in individualized or cooperative learning setting was examined. The findings of the study showed that the performance of students exposed to CAI either individually or cooperatively were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performances of male and female students exposed to CAI in either individual or cooperative settings. Ayotola and Abiodun (2010) investigated the effects of computer animation package on the academic achievement of Nigerian senior secondary school students in Biology. Findings showed that there is significant main effect of treatment on students' achievement in Biology.

Yusuf and Afolabi (2010) investigated the effects of CAI on secondary school students' performance in Biology. The findings indicated that the performance of students taught with CAI either individually or cooperatively were better than the control group students but there was no significant difference between the performance of male and female students exposed to CAI in both settings. Achor, Otor and Umoru (2013) determined the effects of CBI on students' retention in Biology in secondary schools in Olamaboro Local Government Area of Kogi State. Quasi experimental research design was used for the study. The findings from the research showed that significant difference existed between the group of students taught with CBI and those instructed by conventional method. In the same vein there was no significant difference in the retention scores of male and female students taught using CBI.

Akpomedaye (2014) investigated the effects of computer simulation on academic achievement and retention of secondary school students in Niger State. The findings from the research revealed that the simulation group did better than their counterparts in the control group taught with the traditional method; similarly, there was significant difference in the retention of concept taught via the computer simulation package. Mohammed (2014) investigated the effects of CAIP on the academic performance of Biology students in Niger State. The findings revealed that the experimental group did better than their counterparts in the control taught with traditional method of instruction. Ahmed (2014) investigated the effects of CAIP on Biology students' achievement in genetic concepts in Katagum Educational Zone, Bauchi State, Nigeria. Findings from the study revealed that the experimental group did better than the control group similarly the male and female students differs significantly when they were exposed to CAIP and equally significant difference existed between high, average and low ability groups. Gender is one of the cardinal factors interacting with the achievement; a lot of researches have been conducted but unresolved as to the cause of the disparity (Nusbaum, 2000).

Some researchers observed in the course of their studies that male have higher achievement than the female counterparts (Danmole, 2004).Non-significant difference between the two sexes was observed by researchers such as; Gambari, 2004; Ezenwa, (2005). While recent research studies

includes; Umeh (2013), Gimba (2014), Gana (2014), Yisa (2014) amongst others who noted that there was no significant difference between male and female students exposed to CAIP. Gender is a very vital moderating factor in any research, because it involves the use of computers and science subject (Biology) these two areas are usually stereotypes of male domains (Aydogdu, 2006). Gender as reported by various studies could be a factor when computers are used for instruction.

Statement of the Problem

Research evidence has shown that there is rapid increase yearly in the enrolment of students in science subject especially Biology (Nsofor, 2010). But the performance of students in (WAEC) examination results continues to decline (Nekang & Agwagah, 2010). Will these poor performances be associated to poor teaching strategies, the didactic method of teaching characterized by teacher centeredness, is it that some concepts are very difficult for teachers as well as the students to learn or lack of use of new technologies in teaching be the causes of these dismal performances? Several teaching methods have been used to salvage these situations such as Computer-Aided Instructional Concept Maps (CAICM), Computed Based Learning (CBL), Computer-Vee Maps, and Analogy among others. But these strategies of instruction have not yielded good results among Biology students' achievement and retention. Therefore, the need for a more effective method of instruction of concepts in Biology becomes imperative. An interactive strategy that can be used for improving this present trend of poor performance may be the use of CIVP. Based on the above, this research work investigated the effects of CIVP in teaching Biology concepts in relation to achievement and retention of secondary school Biology students in Minna Metropolis.

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance;

HO1: There is no significant difference in the mean achievement scores of students taught Biology with computer instructional video package and those taught with conventional lecture method.

HO2: There is no significant difference in the mean achievement scores of male and female Biology students taught with computer instructional video package.

HO3: There is no significant difference in the mean retention scores of students taught with computer instructional video package and those taught with lecture method.

HO4: There is no significant difference in mean retention scores of male and female Biology students taught with computer instructional video package.

Methodology

This study adopted quasi-experimental design which consisted of two groups. The design was considered appropriate because it establishes a cause effect relationship between the independent and dependent variables of the study (Nekang, 2010). In relation to this study, the design was adopted because it was not possible to have complete randomization of the subjects of the study without disrupting the school programmes. The participating schools were identified purposively and randomly assigned to experimental group using Computer Instructional Video Disc Package (CIVDP) and control group using Conventional Lecture Method (CLM). The study was design to investigate the effects of two methods of instruction on student's achievement and retention. The research design layout is shown in table 1.

The target population of this study was made up of the entire population of SS II students in two secondary schools in Minna Metropolis totaling 9,400. The choice of SSII class was based on the fact that the concepts to be taught fell under their syllabus and scheme of work and has learnt the basic knowledge or fundamentals of Biology in SSI and lastly SSII is not an examination

class.The study was conducted in two purposively selected senior secondary schools in Minna Metropolis of Niger State based on the availability of laboratory facilities and manpower. The two schools were classified into experimental group and the control group respectively. The selected secondary schools sampled are Ahmadu Bahago Secondary School Minna and Bosso Secondary School, Minna and have a population of 45 and 50 in the intact classes used. The intact classes were randomly selected. All the co-educational schools that were sampled are believed to share in common environmental conditions, class sizes, population, teachers, curriculum and routine but differ in computer facilities. The treatment instrument that was employed for this study was Computer Instructional Video Disc Package (CIVDP), while the test instrument that was used for data collection was Biology Achievement Test (BAT).

The test instrument (BAT) was validated by experts in science Education Department and Biological Science Department, FUT, Minna. The experts were requested to specifically examine the test items along the following criteria; clarity of the question asked, appropriateness of the question to the students' level of understanding and experience and agreement of the test item with the objective of the study (face validity). While the content validity focused on the materials taught, the adequacy of content, logical sequence and suitability of the biological words used. The lesson plans were also validated. The instrument was administered to a school which was not among the sampled schools used for the study for pilot test. The items were administered to thirty (30) SSII students twice at an interval of one week (test-retest method) the results were collated.

The data obtained from the field during the pilot testing was then used to obtain the reliability of the research instrument. The reliability coefficient of the instrument was calculated using Pearson Product Moment Correlation (PPMC) formula and a reliability co efficient of $r = 80$ was obtained. This was considered acceptable according to a thumb rule suggested by Frankel and Wallen (2000) that reliability of a test for research purposes should be at least 0.70 and preferably higher for the analysis. Biology Achievement Test (BAT) was administered to the students before the commencement of the experiment as pre-test. The scores obtained by the students served as pre-test score of the control and experimental groups. After the treatment, post-test was administered to obtain achievement scores of students in each group but the questions were reshuffled to look different from the pretest questions used. The pre-test, post-test and retention scores were subjected to data analysis. For scoring purpose, each of 20 items in the BAT was scored one (1) mark and thereafter the total was converted to percentage score. It was this percentage scores that was used for data analysis.The hypotheses were tested at 0.05 level of significance using t-test statistics. The Statistical Package for Social Sciences (version 20.00) was used for the analysis.

Results and Discussion

Table 1: t-test Analysis of Pretest Scores of Experimental and Control Groups

Group	N	d f	Mean	SD	t-cal	P. value
Experimental	50		12.36	3.463		
Control	45	93	11.42	3.991	1.226	0.223

ns: not significant p >0.05

Table 1 shows t-test comparison between the mean achievement scores of Control group and Experimental group in the pre-test. The mean and standard deviation of the experimental group are 12.36 and 3.463 while that of the control group are 11.42 and 3.991. The result (t=1.226, df=93, P=0.223 at P> 0.05). Hence, there is nosignificant difference between the two groups before the treatment. Therefore, the two groups were considered suitable for the research work.

Hypotheses

Ho₁: There is no significant difference between the achievement scores of students taughtBiology with CVDIP and those taught with conventional lecture method.

Table 2: t-test Analysis of Achievement Scores of Experimental and Control Groups

Group	N	df	Mean	SD	t-cal	P- value
Experimental	50	93	20.28	4.310	4.324	0.020
Control	45		16.47	4.273		

Significant at p <0.05 alpha level

Table 2 shows the t-test comparison between the mean achievement score of students taught with CVDIP and the mean achievement score of those taught using conventional method. The mean score and standard deviation of the control group are 16.47 and 4.273 while that of the experimental group is 20.28 and 4.310. This result indicates that there is a significant difference in the mean achievement score of students taught fertilization using the CVDIP and those who were taught with the use of conventional method. The t- cal is =4.324, df=93, P-value=0.020) less than P<0.05. Hence the null hypothesis was therefore rejected. Therefoe, there is significant difference between the two groups.

Ho₂: There is no significant difference between the achievement scores of male and female students taught Biology with the use of CVDIP.

Table 3: t-test Posttest Analysis of Mean Achievement Scores of Male and Female in Experimental Group

Group	N	df	Mean	SD	t-cal	p-value
Female	23		20.22	4.166		
Male	27	48	20.33	4.506	0.094	0.926

NS= Not Significant at p>0.05

Table 3 shows the t-test comparison of the mean achievement scores of male and female students taught with CVDIP. The mean score and standard deviation of the male students are 20.33 and 4.51 while that of the female students are 20.22 and 4.17 This result indicated that there is no significant difference in the mean achievement scores of male and female students taught fertilization using the CVDIP. The t-cal =0.094, df=48, P-value=0.926) at P> 0.05. Hence the null hypothesis stated above that there is no significant difference between the mean achievement scores of male and female students' taught fertilization with the use of CIVDP was retained. This means that there is no significant difference between the two groups on their respective achievement.

Ho₃: There is no significant difference between the mean retention scores of students taught with CVDIP and those taught with conventional lecture method.

Table 4: t-test Analysis of Achievement Scores of Experimental and Control Groups

Group	N	df	Mean	SD	t-cal	p-value
Experimental	50		20.04	4.130		
Control	45	93	16.33	4.595	4.142	0.000

Significant at p< 0.05 alpha level

Table 4 shows the t-test comparison between the mean retention scores of students exposedto CVDIP and those in the conventional group. The mean score and standard deviation of the control group are 16.33 and 4.130 while that of the experimental groupare 20.04 and 4.595. The t-calculated value is =4.142, df=93, P-value=0.000) less than P<0.05. This result indicated that there is a significant difference in the mean achievement scores of the students taught with the CVDIP than those taught with conventional method.

Ho₄: There is no significant difference between the mean retention scores of male and female secondary school students taught Map construction with the use of automated map software.

Table 5: t-test Analysis of Retention Scores of Male and Female in Experimental Group

Group	N	df	Mean	SD	t-cal	p-value
Male	27		19.96	4.395		
Female	23	48	20.11	3.974	0.131	0.897

NS= Not Significant at P> 0.05

Table 5 shows the t-test comparison between the mean retention score of male students and the mean retention score of female students taught with CVDIP. The mean score and standard deviation of the male students are 20.11 and 3.974 while that of female students is 19.96 and 4.395. This result indicates that there is no significant difference in the mean retention score of male and female students taught fertilization using CVDIP. The t- cal is =40.131, df=48, P-value=0.897) greater than P<0.05. Hence the null hypothesis was retained.

Discussion of Results

The result of this study revealed that the achievement level of the students in Biology was generally low at the initial stage of the study (pretest result) but the level of achievement improved significantly in the experimental groups after the treatment.

Table 4 showed the t-test analysis of hypothesis one. The result showed indicated that the CVIDP have significant effect on the achievement of students exposed to the treatment. The finding thus, is in agreement with the previous findings of: Mudasiru and Adedeji, (2012); Ayotola and Abiodun (2010) who noted that there was significant difference between the experimental and control exposed to Computer Assisted Instruction.

Table 5 showed the t-test analysis of male and female students in experimental group exposed to CVIDP. The result showed that the null hypothesis two was retained. This indicated that there is no statistical significant difference in the mean achievement scores of male and female students in the experimental group exposed to CVIDP. The result signifies that male and female students have equal opportunity to achieve better when exposed to the same learning conditions. The finding is thus, in agreement with the findings by Yusuf and Afolabi (2010); Nekang (2010)and Yisa (2014) who noted that the male and female students exposed to CAD did not show any significant difference in their performance. However, the finding is in disagreement with the findings by; Gambari (2010); Gana (2013) who noted that there was a significant difference in the performance of male and female students exposed to CVIDP.

Table 6 showed the t-test analysis of experimental and control groups exposed to CVIDP. The result showed that there is statistical significant difference in the mean retention scores of experimental and control group in exposed to CVIDP. The result signifies that students exposed to the treatment condition did better than their counterparts in the control group. The finding is thus, in agreement with the findings by Yusuf and Afolabi (2010); Nsofor (2010); Umeh (2013) and Gimba (2014) who noted that the experimental group did better than the control in retention of concepts taught when exposed to CAVD and those exposed to conventional method.

Table 7 showed the t-test analysis of male and female students in experimental group exposed to CVIDP. The result showed that there is no statistical significant difference in the mean retention score of male and female students in the experimental group exposed toCVIDP. The result signifies that male and female students have equal opportunity to achieve better when exposed to the same learning conditions. The finding is thus, in agreement with the findings by Yusuf and Afolabi (2010); Ibrahim (2014) and Gana (2014) who noted that the male and female students exposed to CAD did not show any significant difference in their performance.

Conclusion

From the research carried out in this project work, it was established that CIVP improved students achievement and retention in Biology. No significance difference exists in the performance of male and female students taught using CIVP.

Recommendations

Based on the findings of the study the following recommendations are made by the researcher. Teachers of Biology should be encouraged to use the CIVP for teaching and learning of Biology in secondary schools.All prospective Biology teachers in secondary schools should be trained to design the CIVP to be used in teaching some concepts in Biology.

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