

Effects Of Computer Assisted Instruction (Cai) On Secondary School Students' Achievement in Basic Science and Technology Ekiti State

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Abstract:

The study examined the effect of computer assisted instruction (CAI) on secondary students' achievements in Basic science and technology in Ekiti state, Nigeria. It also investigated the influence of gender on the achievement of students exposed to computer assisted instruction. The study was a quasi-experimental of non-equivalent, pretest, posttest control group design (two experimental and control group) with one hundred and twenty. Junior secondary school class two students as sample. Computer assisted instruction {animation and onscreen test, animation, on screen test and narration} was used as treatment while the instrument used to gather data is Basic Science and Technology Achievement Tests (BASATAT). The items of the instrument were subjected to face and content validity. The reliability of the instrument was established using test-retest method and a reliability co-efficient of 0.75 was obtained. Analysis Of Covariance (ANCOVA) was used in analyzing Data collected. The study found that, there was a significant difference between the posts –test mean score of the experimental groups and control group. The study also indicates no gender influence in the use of Computer Assisted Instruction (CAI) and student achievement.

Keywords: *Computer Assisted Instruction, Students' achievement, Basic science and technology, public schools, power supply.*

Introduction

Science is a systematic enterprise that builds and organizes knowledge in the form of

testable explanation and prediction about universe (Ajewole, 2010). It is an activity which involves a lot of manipulation and verification

through which a conclusion is drawn. The importance of science in the Nigerian educational system cannot be over emphasized. Science teaching is essential and could be an instrument through which technological, economic and political break through can be achieved. Hence science education is very paramount for any nation that wants to maintain relevance among the committee of nations (Omosewo 2012).

The nature of science differing from other courses makes it stand out and calls for effective mode of teaching the course. Adegoke (2010) opines that a proper assimilation of science concepts enhances acquisition of skill by learners. Considering the huge investment of government in science and technology education in Nigeria, its output in terms of students' achievement has been observed to be unequalled with government huge investment.

Consequent upon the observed deterioration in the secondary school students' achievement in basic science and technology in public schools, one begins to imagine if the high failure and poor quality of students' achievements is not a reflection of instructional strategy adopted by science teachers. Basic Science and Technology is the first form of science a student comes across at the junior secondary school level in Nigeria and it prepares students at the upper Basic Education Level for the study of core science

subject at the senior secondary level (Ochi & Huruna 2015). The overall implication is that students that are not well grounded in basic science /technology at the junior secondary school level may find it difficult to study some of the core science subjects at the upper class which will invariably affect the opportunity of the student to study science –based course at the tertiary levels.

In an attempt to improve student achievement in basic science and technology many research studies have been carried out. Documented research work found out among others that use of inappropriate instructional materials (Asubiojo & Aladejana, 2019), lack of motivation for teachers (Agbidiye ,2015), lack of classrooms, laboratories and multi-media structures (Eze & Bot, 2014), and teaching strategies employed by teacher (Owolabi & Ogini, 2014) are some of bane behind students' poor achievement in the subject.

The Basic Science & Technology curriculum emphasizes the switch of teaching and learning approach from the behaviorism to constructivism in order to enhance conceptual learning in science and technology and is to promote good attitude towards learning in science and technology. The curriculum demand teaching – learning strategies that place teacher as a facilitator and sees students in central focus of learning activity.

In a student- centered classroom, making use of some multi-media package especially computer aided instructional package may strengthen students' collaborative effort, forester their critical thinking in order to find alternative solutions to the problem at hand due to animation, color enhancement and graphical picture among other that computer –assisted instruction offers (Oyedeji, 2016).

Computer Assisted Instruction (CAI) refers to drill and practice, tutorial or simulation activities offered either by themselves or as supplement to traditional, teacher-directed instruction. it is an interactive instructional technique whereby a computer is used to present instruction and monitor the learning that takes place.

CAI uses a combination or text, graphics, and video in enhancing the learning process (Adejoke, 2010). It provides learners with better, comfortable and ample opportunity to learn at their own pace, enables learners to have equal opportunity with their counterpart in other parts of the world.

Kpebor and Ozobokeme (2007) opined |noted that animated teaching involves the use of computer-aided instruction such as digital video disc (DVD), power point to foster teaching and learning process. Bradley (2004) also observed

that animation interactive features such as text, graphic, motion picture, background sound as well as some narrations are synchronized at the same time to facilitate conceptual understanding in teaching and learning process. The features equally increase student class autonomy and ease the teachers' work and level of teaching in the classroom. Kylei (2012) affirmed that animation could be seen as a basic form of class entertainment which could attract the interest of all age groups. Furthermore, Iravani and Delfechhresh (2011) stressed that processing animated information imposes, higher, cognitive assimilation, by allowing flexibility of learning.

However, several criticisms have been raised on the relationship between gender and animated learning. Previous research indicates that gender may influence the effectiveness of certain multimedia designs, even when the designs followed commonly accepted principles. For-instance Lin (2011) compared the performance of 11-years-old boys and girls studying from either dual mode (pictures with corresponding speech) or single mode (picture with corresponding text) presentation. Result from their study shows boys perform better from dual mode presentation while girls performed best from single mode presentation. Research has also suggested that males and females differ with regards to certain mental abilities (Berk, 2005;

Hapern, 2004). One major finding in gender cognitive differences suggest that males perform significantly better in spatial-ability test while female perform in verbal ability test (Hapern, 2004).

However, Mayer (2009), extended cognitive load theory with this cognitive theory of multimedia learning based and propound that learning is activated through five basics steps:

Step 1- Selecting relevant words for processing in verbal work memory.

Step 2: Selecting relevant images for processing in visual working memory

Step 3: Organizing selected mages into a verbal metal model.

Step 4: Organizing selected images into visual mental model.

Step 5: Integrating verbal and visual representation as a well as prior knowledge.

Also, Mayer, 2009) applied simulation module on gender and found that female performed better than their male counterparts. It is against this background that the research sought to answer the following questions:

Purpose of Study

- The purpose of this study is to determine the effects of computer assisted instruction on secondary school students' achievement in Basic Science and Technology in Ekiti State, Nigeria.

- The researcher equally wants to find the extent to which gender influences students' achievement in Basic Science and Technology when exposed to Animation and Onscreen text Computer Instruction

Statement of Problem

It has been observed over the years that many students failed in the junior certificate examination in Basic Science and Technology Junior Secondary School Certificate Examination despite huge resources invested by government and parent.

Among the seemingly factors responsible for the students' poor academic achievement in the public exams are poor learning environment, lack of relevant instructional materials and lack of adequate supports from the school management but it seems that the instructional strategies adopted by teachers will go a long way to influence the overall achievement of students in Basic Science and Technology.

Based on this, the following general questions were raised:

- i. What is the different in the mean achievement scores of students taught with computer assisted instructional techniques and conventional method in Basic Science and Technology.

ii. Would there be any interactive effects of gender on students exposed to computer assisted instructional techniques in Basic Science and Technology.

Research Questions

(1) What is the different in the mean achievement scores of students taught with computer assisted instruction techniques and convention method in basic science and technology.

(2) Would there be any interactive effect of gender on student exposed to computer assisted instructional variables in Basic Science and Technology

Research Hypotheses

The following null hypotheses were formulated to guide its study:

1. There is no significant main effect on the academic achievement of students exposed to animation and on-screen text, Animation, on screen text and narration and control group.
2. There is no significant interactive effect of gender on the academic achievement of students exposed to animation and on-screen text.
3. There is no significant interactive effect of gender on the academic achievement of students exposed to animation, on screen text and narration.

Research Method

The design for this study was a non-equivalent pretest posttest control group design of quasi experimental design. The population of the study consists of all the senior secondary two basic science and technology students in Ekiti state. The sample consisted of 120 junior secondary school two Basic Science and Technology students which were selected using multi- stage sample technique.

The first stage involves the selection of four Local Governments each from the three senatorial districts of Ekiti state. The 2nd stage involved the selection of three schools from each of the selected Local Governments using simple random sampling techniques. This was followed by the selection of 10 students from the selected schools using purposive random sample techniques. The samples were assigned randomly to experimental and control groups. They were two experimental groups and one control groups. The three groups were administered a pretest before treatment and posttest after treatment. The experimental groups were subjected to treatment using animation and on-screen text, animation, onscreen text and narration and the control group was taught using conventional method.

The instrument used for the study was Basic Science and Technology Achievement Test (BASATAT) designed by the researchers. This consists of two sections A and B. Section A consists of Biodata of the respondent while section B consists of 40 items multiple – choice questions with four options (A-D) drawn from motion, Habitat and Basic technology tools with instruction to select the correct options.

The instrument was validated by experts from test and measurements and two experienced Basic Science and Technology teachers. The reliability coefficient of the instrument was found to be 0.75 using test – retest method.

The students in the experimental groups were taught using the multimedia method while the control group was exposed to normal classroom interactions.

The data collected from pretest and post test scores of the students were subjected to statistical analysis using Analysis of Covariance (ANCOVA) and post-hoc analysis.

RESULTS

Research Question 1: What is the different in the mean achievement scores of students taught with computer assisted instruction technique and convectional method in Basic science and technology.

Table 1: Mean achievement scores of students taught with computer assisted instructional techniques and convectional method in basic science and technology

Teaching method	N	Pretest		Posttest		Mean
		Mean	SD	Mean	SD	Difference
Experimental (Animation and Onscreen text)	60	13.85	2.67	25.75	1.68	11.90
Conventional	60	14.05	2.45	12.40	1.75	-1.65
Total	120	13.95	2.55	19.08	6.92	5.13

Table 1 presents the achievement scores of students with computer assisted instruction technique (animation and onscreen text and convectional method in basic science and technology). The result shows that students exposed to Animation and on-screen text had a mean achievement score of 13.85 while those in the convectional group was 14.05 prior to treatment. On exposure to treatment, students exposed to Animation and on-screen test had higher mean achievement score of 25.75 than their counterparts in the convectional group with mean achievement score of 12.40. This implies that there is difference in the mean achievement scores of students in the experimental and control group.

Research Question 2: Would there be any interactive effect of gender on student exposed to computer assisted instruction variables in Basic Science and Technology.

Table 2: Mean achievement scores of students taught with computer assisted instruction variable in basic science and technology by gender

Gender	N	Pretest		Post test		Mean Difference
		Mean	S.D.	Mean	S.D.	
Male	22	13.55	2.39	27.68	1.32	14.13
Female	38	13.53	2.34	27.87	2.15	14.34
Total	60	13.53	2.27	27.80	1.88	14.27

Table 2 presents the men achievement scores of male and female students taught with computer assisted instructional variable in Basic science and technology. The result indicates that male students exposed to computer assisted instruction technique had a mean achievement score of 13.55 while their female counterparts had achievement score of 13.53 prior to treatment. On exposure to treatment female students exposed to computer assisted instructional technique had a mean achievement score of 27.87 while their male counterpart had a mean achievement score of 27.68. This implies that there is no difference in the mean achievement scores of male and female students taught with computer assisted instruction technique in basic science and technology.

Hypothesis 1: There is no significant main effect on the academic achievement of students exposed to animation and onscreen text,

animation, on screen text and narration and control group.

Table 3: Analysis of covariance (ANCOVA) for post-test means scores of students inter the groups

Source	SS	df	Ms	F	Sig.	Partial Eta ²
Corrected Model	5348.404	2	2674.202	904.490	.000	.939
Intercept	1303.041	1	1303.041	404.725	.000	.790
Covariate (pre-test)	1.729	1	1.729	.585	.446	.005
Groups	5345.953	1	5345.953	1808.150	.000	.939
Error	345.921	117	2.957			
Total	49357.000	120				
Corrected total	5694.325	119				

P < 0.05

The result in table 3 shows that f-value (1808.150) with degree of freedom 1 and 117 was statistically significantly at P < 0.05 level of significance for the groups. The null hypothesis was rejected. The show that there is significant main effect on the academic achievement of student’s exposed to animation and on-screen test, animation, on screen test and narration and control group
In order to investigate the source of different observed in the groups Scheffe post-hoc test was carried out and the result is presented in table 4 below.

Table 4: Scheffee post-hoc analysis of treatments on students’ achievement in the groups.

Groups	Mean	Animation and onscreen test	Animation on screen text and Narration	Control
Animation and onscreen test	23.302	23.302	26.431	12.395
Animation on screen text and Narration	26.431	*		
Control	12.395	*	*	

* pair of group significant difference at $P < 0.05$

The table 4 shows that the posttest means scores of experimental groups was significantly different from those of control groups with students exposed to animation, onscreen text and narration performing better than their counterparts in other groups.

Hypothesis 2: There is no significant interactive effect of gender on the academic achievement of students exposed to animation and on-screen text.

Table 5: Analysis of covariance (ANCOVA) for interactive effect of gender on academic achievement of students exposed to animation and on-screen text in basic science and technology

Source	SS	df	Ms	F	Sig.	Partial Eta ²
Corrected Model	3.120	2	1.560	.542	.585	0.19
Intercept	1227.889	1	1227.889	426.427	.000	.882
Covariate (pre-test)	2.884	1	2.884	1.001	.321	.017
Gender	.866	1	.866	.301	.585	.005
Error	164.130	57	2.879			
Total	39951.000	60				
Corrected total	167.250	59				

$P > 0.05$

The result in table 5 shows that F-value (0.301) with degree of freedom 1 and 57 was not statistically significant at $P > 0.05$ level of

significance for the groups. The null hypothesis was accepted. This implies there is no significant difference in the mean achievement scores of male and female exposes to animation and on-screen test in basic science and technology. Less than 1% ($\text{Eta}^2 = 0.005$) of the observed variance in the mean achievement scores of students exposed to animal and on-screen test in basic science and technology can be attributed to gender.

Hypothesis 3: There is no significant interactive effect of gender on academic achievement of students exposed to animation, on-screen text and narration in basic science and technology.

Table 6: Analysis of covariance (ANCOVA) for interactive effect of gender on academic achievement of students exposed to animation, on screen text and narration in basic science and technology.

Source	SS	df	Ms	F	Sig.	Partial Eta ²
Corrected Model	.622	2	.311	.086	.918	.003
Intercept	1221.118	1	1221.118	336.285	.000	.855
Covariate (pre-test)	.136	1	.136	.038	.847	.001
Groups	.487	1	.487	.134	.715	.002
Error	206.973	57	3.631			
Total	46578.00	60				
Corrected total	207.600	59				

$P > 0.05$

The result in table 6 shows that F-value (0.134) with degree of freedom 1 and 57 was not statistically significant at $p > 0.05$ level of

significance for the groups. The null hypotheses were not rejected. This implies that there is no significant difference in the mean achievement scores of male and female students exposed to animation on screen test and narration in basic science and technology.

Discussion

The findings as indicated in the table 1 and 2 of the study shows that the treatment groups performed significantly better than their counterparts in the control group in Basic Science and Technology when using computer animation, onscreen test and narration which indicated the potency of the treatment in learning achievement. The findings agreed with the submission of Hoska (2009), Kimberly (2002) on what animation, onscreen text and narration can do in ensuring positive response from learners in the teaching and learning process as it offers both audio and visual information which appeals to both the sense of sight and hearing of the learner thereby making learners active in the learning process.

However, the result contradicts the findings of (Grimley, 2007) who established that there is no significant between computer basic instruction and the traditional method of teaching. The result of Hypotheses 2 and 3 show that there is no significant different between male and female students' achievement in Basic Science and Technology when exposed to animation and

onscreen test and also animation on screen text and narration in some selected topics in Basic Science and Technology. This finding is in agreement with the result of Owolabi and Oginni (2014) who found out that there was no significant different between male and female students' achievement when taught with animation in science subjects.

Conclusion and Recommendations

The use of computer assisted instruction as shown in this study has facilitated the improved student's achievement. It helps in making difficult content easier to understand especially if the subject matter is dynamic as in the case of science concepts. it was demonstrated that the use of animation, on screen text and narration helped the students to improve the academic achievement in basic science and technology.

It was equally shown from the result of this study that there was no significant interactive effect of gender on the academic achievement of students in basic science and technology when exposed to computer assisted instruction activities such as animation and on-screen text.

Based on the findings of the study, the following recommendations were made;

1. Basic science and technology teachers should adopt computer assisted instruction such as animation, onscreen text and narration as an

instruction technique to improve students' achievements in basic and technology and other related science subjects.

2. Training through workshop, seminar and conferences should be periodically organized for Basic Science and Technology teachers to equipped them with the necessary skills required to employ computer assisted instruction technique in delivery of instruction in the classroom setting.
3. Basic Science and Technology textbooks and other science related subjects should present the contents and concept of their textbook using computer assisted instructional technique.
4. School administrators should channel their resources towards creation of animated classrooms to improve learning in the classroom environment.
5. Animation, simulation on various practical activities should be provided in the basic science and technology laboratory. This will enable the students learn difficult task by imitation.

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