EFFECT OF COMPUTER ASSISTED INSTRUCTION PACKAGE ON STUDENTS' ACHIEVEMENT IN MATHEMATICS SET THEORY

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Abstract

This study investigated the effect of computer assisted instruction package on students' achievement in mathematics set theory. Chanchaga Local Government Area was purposively chosen because of the availability of computers in schools. A sample of one hundred and twenty three (123) SS1 students was involved in the study. The design used was quasi-experimental design. Two intact classes were used; two research questions and two hypotheses guided the study. The research questions were answered using mean and standard deviation scores while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The result revealed that the mean and standard deviation scores of the post-test score of experimental and control groups are respectively in favour of the experimental group. The study revealed no significant difference in the achievement of male and female students taught using CAI package. Some recommendations were made among which is that mathematics teachers should include the use of computer assisted instruction package as one of the strategies to be employed in classroom teaching and learning.

Introduction

A qualitative science, technology and mathematics education is a means of understanding the present complex society (Gambari, 2004). Nigeria, like most African countries, reposes implicit confidence in the power of science, technology and mathematics to salvage her from the ravages of poverty, ignorance and diseases, the three indices which most effectively define the event of her under

development. Therefore, science and technology work cooperatively and mathematics is the language of science and technology. Azuka (2001) stated that mathematics is the foundation of all sciences, technology and modern development, and for any nation to survive and develop, it has to improve its technology, and this can only be achieved through effective teaching and learning of mathematics. The use of computer in classroom as a media of instruction could be a means of achieving effective teaching and learning of mathematics.

Computer is an electronic machine that is capable of solving problems or manipulating data by accepting data, performing prescribed operations on the data and supplying the results of these operations (Dantala, 2005). Parveen (2003) stated that the use of computer could revolutionize educational system, prepare students for the information age and accelerate national development effort, these could be achieved through the use of computer assisted instruction package in classroom instructions.

Computer assisted instruction (CAI) package refers to an instruction presented in a computer to assist teachers and students in teaching and learning process. The use of CAI packages in teaching and learning has been embraced by researchers of the developed nations as reported by (Xin, 2000 and Iqal, 2004). Nigeria is still coming up in terms of technological development. Therefore, the use of CAI packages in teaching and learning has not been fully embraced by secondary school mathematics teachers in Nigeria.

Mathematics is an important subject that is needed at any level of education. In respect of this the national policy on education (FRN, 2004) stated that mathematics should be taught as a core subject to all students at primary and secondary school level in order to give a sound basis for scientific and reflective thinking, and prepare them for the next level of education. However, mathematics has since become a puzzle, where some considered it as a friend and to some a foe, especially when it comes to the teaching and learning of set theory in mathematics. The performance of students in mathematics in WAEC (SSCE) in Niger State has become a thing of worry to curriculum developers, school administrators, parents and teachers..

The WAEC Chief examiner's reports pointed out that the question on set theory involving Venn diagram was badly tackled. Candidates were unable to represent

the information given on a Venn diagram correctly. The reports also revealed that many of the candidates omitted the universal set from their Venn diagrams which made the question on set theory difficult for them to answer correctly (Chief Examiners Reports 2007-2011)

Sambo, (2008) defined a set in mathematics as a well defined collection of objects, persons, or events. In a set, curly brackets { } are used to denote a set, symbols such as universal set (μ or ξ), union (∪), intersection (∩), compliments (A' or A^c) of set and so on are used. The Chief Examiners report (2004) recommended that teaching should be "students- centred" and oriented with the use of instructional materials like the use of CAI package in teaching and learning. Ezeliora (1997) stated in her study that computers have been used in the developed countries to solve most of educational problems. It could also be useful in Nigerian educational system to solve educational problems in mathematics and other school subjects and also improve on gender issues.

Gender is one of the factors influencing students' achievement in mathematics at senior secondary school levels. Several researches (Ezeliora, 2007, Gimba 2003, Ifamuyiwa, 2004 and Fagbẹmi, 2004) have been conducted in the areas of gender-related differences in the academic achievement of students in different areas. Ezeliora, (2007) and Gimba, (2003) revealed that girls scored significantly higher than boys in science related subjects. Contrary to this, Ifamuyiwa, (2004) and Iwende, (2007) revealed that male students are academically superior to their female counterparts in mathematics. While Fagbemi, (2004) and Dantala, (2004) revealed that there was no significance difference in the performance of boys and girls when taught Social Studies using computer assisted instruction package.

Computer assisted instruction package (CAI) is the use of software that has been programmed for the purpose of teaching and learning. Abimbade (1998) defined CAI software package as an automated instruction in which the computer is used to deliver instruction to the learner through interactive process. The activities of CAI software package include presenting materials or problem situations, giving students thinking, students responding to questions, assessing student's performances, and managing student's path through a course by selecting the materials to be presented and assigning tasks to be performed.

Educators are increasingly being faced with the challenges of

using modern technology (computer) for teaching in their institutions (Hennessy, Deaney & Ruthven 2005). Through the use of computer, the role of many teachers are changing from the traditional talk and chalk method of teaching to that of presenter, manager and facilitator of learning. For instance, in the United States, computers have been described as "the new basic" of education and the internet as "the black-board of the future" (Becta, 2003). Several researchers (Xin 2000 and Liao 2005) have also found that CAI package enhances learning rate, student's learning rate is faster with CAI package than with traditional instruction.

The influence of gender on students' level of achievement has been a matter of concern to mathematics and science educators. Researches on gender are always inconclusive because this comparison was not addressed by many researchers to draw firm conclusions. Naobi (2003) conducted a research study on enhancing student's performance using computer assisted instruction package in Tertiary institutions. The study revealed that there was a significant difference in the mean achievement between male and female in favour of the male.

Contrary to these Ahmadu and Raji (2004) under took a study on the effects of computer- based teaching method (CBTM) on senior secondary school students' achievement in mathematics for sustainable educational development in Nigeria. The results revealed that there were no significance difference between the mean achievement scores of male and female students in the pre- test and post-test taught using Computer Based Teaching Method. Therefore, this study examined the effects of computer assisted instruction package on students' achievement in mathematics set theory in Minna.

Purpose of the Study

The main purpose of this study is to determine the effects of computer assisted instruction package on students' achievement in mathematics set theory. Specifically the objectives are to:

(1). determine the effect of CAI package on the achievement mean score of secondary school students in set theory and those taught the same set theory using the traditional method.

(2). Find out whether differences exist between the achievement mean scores of male and female students taught set theory using the CAI package.

Research Questions

The following research questions guided the study:

(1) What is the achievement mean score of students taught set theory using the CAI package and those taught the same set theory using the traditional method?

(2) What is the achievement mean score of male and female students taught set theory using the CAI package?

Research Hypotheses

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

Ho_1: There is no significant difference in the mean achievement score of students taught set theory using the CAI package and those taught the same set theory using the traditional method.

Ho_2: There is no significant difference in the mean achievement scores of male and female students taught set theory using the CAI package.

Research Design

The research design for this study is quasi- experimental design using non- equivalent control group design. (Sambo, 2008). Two intact classes were used for the study.

Population

The population for the study comprises all the 4,212 students' from 12 co-education senior secondary schools class one (SS1) in Chanchaga Local Government Area.

Sample and Sampling Technique

Purposive sampling technique was used to obtain two senior secondary schools and 123 students comprised 77 male and 46 female students that were randomly assigned to experimental and control groups.

Research Procedure

Experimental group was taught set theory using computer assisted instruction package while the control group was taught set theory using the traditional teaching method. This lasted for 4weeks.

Research Instrument

Achievement Test on Set Theory (ATOST) was used in collecting data for the study. The test contained 20 (twenty) multiple choice items with four options (A-D). Only one option is the correct answer for each item.

Validity and Reliability of the Instrument

The instrument was subjected to face and content validity. A trial test was used to determine the reliability of the instrument. The coefficient of 0.82 was obtained for ATOST this indicated that the instrument was reliable.

The data collected for the study were analysed using Mean and Standard deviation to answer the research questions while Analysis of covariance (ANCOVA) was used to test the hypotheses formulated at 0.05 level of significance.

Results

Research Question 1

What is the mean achievement score of secondary school students taught set theory using the CAI package and those taught the same set theory using the traditional method?

Table 1

Mean and Standard Deviation of the Achievement Scores for Experimental and Control Groups

Group		Pre-Test	Post-Test	Mean Gain
Experimental	N	68	68	
	Mean	26.86	60.25	33.39
	S.D	8.48	9.12	
Control	N	55	55	
	Mean	30.24	31.15	0.91
	S.D	9.27	10.10	

Table 1 shows mean and standard deviation of the achievement scores for experimental and control groups are 60.25 ± 9.12 and 31.15 ± 10.10 respectively. This gives a mean gain score difference of 33.39 in favour of post-test. This indicated that the experimental group which were taught with CAI

package achieved higher mean score than the control group taught using traditional method.

Research Question 2

What is the mean achievement score of male and female students taught set theory using the CAI package?

Table 2
Mean and Standard Deviation of the Achievement Scores of Male and Female Students Taught Using the CAI Package

Sex		Pretest	Posttest	Mean Gain
Male	N	43	43	
	Mean	28.86	45.54	16.68
	S.D	1.27	1.91	
Female	N	25	25	
	Mean	27.81	47.82	20.01
	S.D	1.54	1.73	

Table 2 shows the mean and standard deviation of post-test scores of male and female students are 45.54 ±1.91 and 47.82 ± 1.73. However, the mean gain difference between male and female students is 3.33 in favour of the female students. Therefore, the mean achievement score of the female students taught with CAI package is higher than that of the male students taught with the same CAI package.

Table 3
Summary of ANCOVA Results

Source	Type III Sum Squares	Df	Mean Square	F	Sig.
Corrected Model	63543.484[a]	2	31771.742	245.129	.000
Pretest	166.991	1	166.991	1.288	.257
Treatment	59947.625	1	59947.625	462.514	.000
Error	38494.933	297	129.613		
Corrected Total	102038.417	122			

Table 3 reveals that the achievement of experimental and control groups differ significantly. F(1,297) = 462.514 is significant at 0.000 which is less than 0.05 significant level set for the hypothesis, hence the hypothesis which states that there is no significant difference in the mean achievement score of students taught set theory using the CAI package and those taught the same set theory using the traditional teaching method was therefore rejected.

Table 4
ANCOVA analysis of the achievement mean score of male and female student taught set theory using the CAI package

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	358.997[a]	2	179.498	1.202	.303
Pretest	31.986	1	31.986	.214	.644
Gender	348.819	1	348.819	2.336	.128
Error	22993.312	154	149.307		
Corrected Total	23352.309	67			

Table 4 reveals that the male students' achievement did not differ significantly from the female achievement. F(1,154) = 2.336 is not significant at 0.128 which is more than 0.05. This indicates that using CAI package produced no significant difference on gender. Therefore, the hypothesis which states that there is no significant difference in the mean achievement scores of male and female students taught set theory using the CAI package is hereby not rejected.

Discussion and Conclusion

The result in table 3 indicated that treatment using CAI package produced significant difference on students' achievement in set theory. This result is in support of Yusuf and Afolabi, (2010), Etukudo (2009) and Tabassum (2004) that the achievement of students exposed to CAI was better than their counterparts exposed to conventional classroom instruction. The result in table 4 produced no significant difference in the achievement of male and female students taught set theory using CAI package. This result agrees with Arbab, (2003) and Chado, (2009) which stated that computer is gender friendly

The results of this study provide evidence that the use of CAI package enhanced students' achievement, students taught set theory with the use of CAI package (experimental group) performed

better than their counterpart taught same set theory using the traditional method. There was no significant difference in gender achievement

Recommendations

The following recommendations were made based on the findings of this study.

1. Since the use of CAI package enhances achievement of students in mathematics, the mathematics teachers should use it as one of the strategies in classroom teaching and learning.
2. Workshops / Seminars should be organized by the Government for mathematics teachers to enable them learn how to develop software packages and also learn how to use computer in teaching mathematics especially set theory and other topics in mathematics.
3. Parents should be encouraged to buy computers for their children to use at home after normal classes. This will help the students to practice what they have learnt in school and also discourage them from engaging in unnecessary ventures after school hours.

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