

EFFECT OF COMPUTER ASSISTED INSTRUCTION PROGRAMME (CAIP) ON THE PERFORMANCE AND RETENTION OF SENIOR SECONDARY SCHOOLS STUDENTS IN BORNO STATE

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Abstract

The study investigated the effects of Computer Assisted Instruction program on performance and retention of senior secondary school students in mathematics (logic and algebraic process) in Maiduguri Metropolitan zone of Borno state, Nigeria. The research design of the study was Quasi- Experimental design .The populations of the study consisted of twelve (12) government senior secondary schools in Maiduguri Metropolitan zone that have computer facilities, with a total number of three thousand and twenty one (3021) students. The sample consisted of three senior secondary schools purposively and proportionately selected consisting of (318) three hundred and eighteen students with a combination of boys and girls. Two research questions and two null hypotheses were formulated and tested at 0.05 level of significant. The logic, Algebraic process and mathematics performance test (LAAPMPT) was administered to student as pre- test, posttest and post posttest. The results of the students were analyzed using t- test statistic to test the hypotheses. The result showed that the students taught logic and algebraic process using computer assisted instruction program performed significantly better than those taught using conventional method of instruction, students using computer assisted instruction have higher retention level than those taught using conventional method of instruction. Also the results indicated there was no significance difference on the performance of male and female students taught logic and algebraic process using (CAIP) Computer assisted instruction program. Therefore based on the findings it was recommended that Computer Assisted Instruction program be encouraged for teaching and learning of mathematics in secondary schools in local government headquarters where there are computer facilities in Borno state.

KEY WORDS:-Computer-Assisted, Instruction, Performance Retention and Mathematics

Introduction

s always been considered as an integral part of any nation development, for no nation can developed without education, the 21st century world is called a scientific world advancing rapidly in information technology, medicine engineering, space communication, astronomy, astrophysics, artificial intelligences, robotics and many other disciplines. (Pramila&HarshaPatadia, (2012).Therefore, our country Nigeria requires technically skilled workers for all disciplines to which mathematic is the base.

The importance of mathematics to nation building has led the Federal Government of Nigeria to make mathematics a core subject to be studied by all students at all level of education in Nigeria (FRN, 2004).Apart from being a specific subject; it is to be learned as concomitant to any subject involving analysis and reasoning. The major reason for student's low performance is that the teachers quite often pay little attention to the basic concepts and generally adopt

methods of solving questions with crammed formulae (FRN,2004). There has been inadequate teachers' mathematics compared to number of students enrolled in schools at all. Levels. The enormous knowledge that man built over the last few centuries will be too burdensome to carry into future on the shoulders of ill-equipped school mathematics teachers. Okafor (2002) notes that mathematics is compulsory for all requirements into university education; students were expected to have credit in mathematics to qualify them to a course of study. The reason for the poor performance according to Anagolu (2006) was students have problems on how to study mathematics. These problems emanate because of ineffective teaching strategies at primary and secondary level of our educational system. Bankolere, (2006) Okafor, (2002) and Okeke (2006) identified teaching methods as the major factor contributing to the mass failure of students in mathematics, the teaching of mathematics has been characterized by the traditional method of teaching. The world is changing from traditional method in which the teacher talks to students through the chalk and board to an electronic age; as a result, teachers need resources that can assist them to carry out their duty effectively. In order to overcome the difficulties, face by students, teachers should adopt different methodology in teaching of mathematics like the drill and practice method using audio visual aids, Computer aided instruction, mathematics clubs etc. One of the methods is auto- instructional method; it is a method of individualized instruction. One of its forms is computer-assisted instruction (CAI) auto instructional teaching. In education, a teacher is a person who provides information to students. The role of a teacher is often formal and ongoing, carried out by way of occupation or profession at school or other places of formal education.

Application of computer in teaching gives enormous possibilities for learning according to individual needs, interest, and learning pace of an individual, learning by means of electronics media is attractive to students because of active and interactive communication, visualization of information dynamics. Electronic media are suitable for students because they provide students with information quickly, meet their curiosity; ensure the possibilities of fast ideas exchange, acquisition of knowledge through fun (Nadrljanski, and Solesa 2008).

The importance of education for progress of a society is indisputable just as the fact that innovation in education contributes to positive changes in society, but it is also evident that social innovative thinking affects education. Efforts are now being made to improve the teaching methods using instructional materials such as computers. The use of computers in the classroom has given rise to computer assisted instructional software packages for classroom instructional purpose. The role of computer in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy (Fitzgerald & Werner, 1996). According to Umaru (2003) computer assisted instruction is a program of instruction or package presented as computers software for instruction purpose. Therefore, the position of mathematics makes it necessary for the use of innovative strategies that will enable teachers meet the challenges of teaching and learning of the subject.

Ndiku (2003) indicated that computer literacy is now regarded as the new literacy; this has actually encouraged the desire to equipped schools with computer facilities and qualified personnel necessary to produce technologically proficient and efficient students in developing countries of the world. Computer assisted instructional package has the capacity to provide higher interactive potentials for users to develop their individual intellectual and creative ability. The main advantage of computer assisted instructional package over other teaching methods and aids include the development of human mental resources that allow people to both successfully apply the existing knowledge and produced new knowledge (Kaku 2005). The collective, rigid and passive nature of learning associated with the used of radio, television and films do partially contribute meaningfully in learning in those days innovative changes to

traditional methods in educational system is fast growing. In developed countries of the world computers (information communication technology) is being used for instructional purposes, which include teaching and learning. Okafor (2002) reported that attitudes are evaluated beliefs, which predispose the individual to respond in a preferential way; educators therefore have had the dynamic task of improving the curriculum, its delivery and resources in an attempt to improve positive learning attitudes. Literature abound that learning and attitudes are interconnected, and that a positive correlation exists between the two. Plate and Beattie (2004) pointed out that the interconnection of student's attitudes and their responses exist in information communication technology (ICT) education.

Computer assisted instruction and student's performance and retention

Computer is generally defined as an electronic device which accepts data, process data, store data and produces the result as information. Previously, computer was used mainly in education sector for administrative purposes like typing of documents and maintaining of students' and staff's record but as noted by Ughamadu (2006), the advent of microcomputer in recent times, had led to a rapid increase in the application of computers to direct instruction. According to him, Computer, when combined with electronic transmission system can find use in an almost unlimited variety of instructional situations and setting. Okwuoza et al (2018) in citing Parveen (2003), stated that the use of computer in instruction could help to transform educational system, prepare students for the information age and speed up national development. They added that the use of computer as a means of instruction could help students to retain what was learnt, improve on the attitude and interest of students to understand Mathematics more.

Computer Assisted Instruction (CAI) is both student-centered and activity-based teaching approach. Ughamadu (2006) defined CAI as an instructional design whereby computer system delivers instruction directly to learners by allowing them to interact or relate with the designed lessons that have been programmed into the system. Similarly, Ash (2005) views CAI as an interactive instructional method whereby a computer is employed in as an instructional material and monitors the learning that takes place. It is the combination of text, graphs, sound and video in enhancing the learning process.

There exists a robust literature on the computer assisted instruction in the teaching and learning of Mathematics. According to Lou, Abrami and Appollonia (2001) and Olga (2008), research on the effectiveness of computers on students' achievement can be traced back to Skinner's programmed instruction in 1960s. According to them, the result of such early studies revealed that computer has significant positive effects on the achievement of students' Mathematics test scores and retention.

Research Questions

1. Is there any difference in the retention level of students taught logic and algebraic process using Computer-Assisted Instruction program and those taught using conventional method of teaching?
2. Is there any difference between the students' performance when taught Logic and algebraic process using Computer-Assisted Instruction program and conventional method

Hypotheses

1. H_{01} There is no significant difference with students in the retention level with students Logic and algebraic process using Computer-Assisted Instruction program and those taught using conventional

2. H₀₂ There is no significance difference in students’ performance when taught logic and algebraic process using computer assisted instruction program and those taught using conventional

Methodology

The research design adopted for this study was Quasi – experimental design, with pretest and posttest, since the study requires the use of experimental and control groups. The design will help to establish the effects of Computer Assisted Instruction on mathematics performance of students.

The target population of the study consists all government senior secondary school SS11in Maiduguri metropolitan of Borno state having computer facilities. There are twelve schools having computer facilities with a population of three thousand and twenty-one (3021) of boys and girls of average age of (19 – 20) years.

The researcher for getting the sample used two sampling techniques. Purposive sampling technique proportionate sampling techniques .The selection of the twelve’s (12) schools from the population of twenty-three (23) schools was done by the use of purposive sampling techniques, because the nature of the study required the purposive selection of schools that have computer facilities. Since the study was on Computer Assisted Instructional (CAIP) must be conducted in schools where computers are available and accessible for students use. Then using proportionate sampling techniques one boy’s school, one girls school and one mix school were selected from the twelve schools to form the experimental and control group. The research instrument for this study was logic and linear algebra mathematics performance test (LALMPT) and computer assisted instructional (CAIP). Logic and algebraic process mathematics performance test (LAAPMPT).

The research instrument for data collection for this study were logic and linear algebra mathematics performance test (LALMPT), administered to both experimental and control group, which is made up of (30) thirty multiple choice items. Each item is followed by four options letter A - D out of which only “one” was correct and students were instructed to select only one option as answer for each item using the normal conventional way of answering questions using paper and pencil method, then the researcher with help of research assistant will conduct the pre-test and post-test mark and record the scores.

Descriptive statistic mean and standard deviation were used to present the data collected with the instrument to test the research questions, while inferential statistic such as t– test was also used to analysis the data. In order to test the null hypotheses, the two null hypotheses were tested using t-test statistic at 0.05 level of significant (α).

Data Analysis

Comparison of the pretest and posttest before treatment

Group	N	Mean	STD	Df	t-cal	t-tab	Decision
Experimental	55	48.2	3.01	108	0.950	1.645	No sig.
Control	55	46.7	2.94				

The result presented in table 1 shows that there is no significant difference in the mean scores of the experimental and control groups in the pre-test administered at 0.05 level of

significance. This by implication means that the subjects are homogenous. That is both groups have equal knowledge of logic and algebra before the treatment.

Table 2 Difference in retention level of the Mean Performance between CAIP and CONVENTIONAL

Variables	N	Mean	SD	Mean difference
CAIP	101	54.98	9.04	-2.2
CONVENTIONAL	59	57.22	10.98	

The result in Table 2 shows the difference in mathematics performance of students taught logic and linear algebra using computer assisted instructional package (CAIP). The CAIP students had a mean score of 54.98 and standard deviation of 9.04 while the conventional method had a mean score of 57.22 and standard deviation of 10.98, with a mean difference of -2.2, which is subjected to a further analysis.

Table3: Difference in performance of students taught logic and algebraic process using computer-assisted instruction program and conventional method

Variables	N	Mean	SD	Mean difference
CAIP	86	59.21	10.42	0.04
CONVENTIONAL	68	58.03	10.12	

The result in Table 3 shows the difference between CAIP and conventional method of students taught logic and linear algebra using computer-assisted instruction. The CAIP had a mean score of 59.21 with a standard deviation of 10.42 while the conventional method had a mean score 58.03 and standard deviation of 10.12 with a mean difference of 0.04 between students taught logic algebra with computer assisted instruction and conventional method is subjected to further analysis.

Testing of Hypotheses

Table 4: t-test analysis of Performances between students Taught Logic and Algebraic Process using Computer Assisted Instruction Program and conventional method

Group	N	Mean	SD	Df	t-cal.	t-tab.	Decision
Experimental	55	70.64	4.98	108	7.894	1.645	Sig.
Control	55	48.60	5.21				

Table above shows Statistical Comparison of the post-test mean performance and Retention scores of students who were taught logic and algebra using CAIP-Software (experimental group) and those taught with conventional method of teaching logic and algebra (control group). The result shows that the t-calculated and t-tabulated are 7.894 and 1.645 respectively. Since the

t-calculated exceed the t-tabulated, we reject the null hypothesis (H01) and infer that there exist a significant difference in the mean achievement and retention scores of students taught logic and algebra using CAIP- software and the students taught with the traditional teaching method.

Which affirms that the observed difference was in favor of those taught with CAIP-software. This by implication shows that teaching logic and algebra software with preferred based on its positive effects on students' performance and retention potentials.

Table 5: t-test analysis of Performance in Retention Level between students Taught Logic and Algebraic Process using Computer-Assisted Instruction Program and conventional method

Group	N	Mean	SD	Df	T-Value	P-Value	Remark
CAIP	86	64.29	10.08		8.37	0.142	Not Significant
CONVENTIONAL	68	60.55	7.42				

Not significant $\alpha = 0.142, P > 0.05$

Table 4 present the t-test result of performance of the student who were taught logic and algebraic process using Computer- Assisted Instructional program and conventional method ($P > 0.05$). Therefore, null hypothesis H_{02} is retained, this means that, there is no significant difference in the performance of the students exposed to Computer- Assisted Instruction Program.

Discussions of Findings

There is no significant difference between the performance of students’ taught logic and algebraic process (mathematics) using computer assisted instruction (CAIP) was retained. Base on the t-test result which shows that there is no statistical difference between male and female students exposed to (CAIP) with p value of 0.076 obtained at 0.05 alpha level which was found not to be significant, $p = 0.076, P > 0.05$) which meant that both sex performed equally better. The study is in agreement with the findings of Yusuf, Gambari and Olumorin (2012) who report that gender had no effect on academic performance of students when exposed to Computer-Assisted Instruction and cooperative learning. Also the findings of Basturk (2005) and Dantala (2006) found no significant difference between male and female students taught physics and history using computer assisted instruction. This mean that computer assisted instruction enhance both the performance of the students. The findings of Vainn, (2004) were also among those that found no significant gender difference in mathematics performance when exposed to computer assisted instructional package (CAIP). A 2004 report by the National center for Education Statistics on the education status of girls and women in elementary through post-secondary education in the United States concluded that female is now performing as well or better than males on many indicators of achievement. Gender bias in Nigeria and Africa as a whole is still very prevalent, (Vainn and Mji, 2004), However some researches’ found that there is still significant gender related difference in cognitive, affective and psychomotor skills achievement of students in respect of gender (Aguale and Uhumniah, 2007). There is no significant difference in retention memories of performance and retention students taught logic and algebraic process using computer assisted instruction (CAIP) was retained base on the t-test analysis which showed that, there is no significance difference in retention memories and performance of students when exposed to computer assisted instruction. p value (158)= 0.142, $P > 0.05$)

Conclusion

From the finding of the study the following conclusion were reached.

The result of the study shows that before the treatment (pre-test) the students in both experimental and control groups have equal knowledge of logic & algebra. In other words, there was no significant difference in the performance and retention scores of the students in both experimental and control groups before the commencement of the treatment. 2. From the result of the post-test mean performance and retention scores, it was revealed that there exists a significant difference in mean scores of students who were taught logic and algebra using CAIP Software and those that were taught the same logic and algebra using the traditional method of teaching logic and algebra. The observed difference was in favour of those that were taught with CAIP-software.

3.

The performance of senior secondary school students was significantly improved when taught using computer assisted instruction better than using the conventional method of teaching.

4

With computer assisted instruction all students can performed and retain well without discrimination

5 Using computer assisted instruction as learning techniques enhance better cognition retention than the conventional method.

6. Mathematics learning by the use of computer assisted instruction enhance better understanding

Recommendations

- 1 Computer Assisted Instruction Program center should be built in secondary schools and equipped with learning software this will engage students with creative thinking
- 2 Computer- Assisted Instruction should be introduced into school's curriculum. This can enable the teacher trainees to prepare their software for the teaching of various subjects
- 3 Teachers should keep abreast of time as technology changes by updating their knowledge to match with time
- 4 For higher efficiency in learning, it is recommended that teachers of mathematics should be trained on the effective use of computer base multimedia instruction through seminars, workshops and conferences.

Refference

- Adenyanju, T.L., (1997). *Creativity Learning and Learning Style*, Zaria Isola Ola & Son,
- Anagolu, P.C. (2006). Study Habit Problems in Secondary Schools: The Way Forward, *Journal of Education Studies*. 2(1) 206-215.
- Arigbobu, O. P. & Miji, O. U. (2004). Effects of cooperative learning strategy on junior secondary school students' achievement in integrated science. *Electronic Journal of Science Education*, 14(1), retrieved from <http://ejse.southwestern.edu>
- Ash J. (2005). The effects of Computer-assisted Instruction on middle school Mathematics

- Bankolare, T. (2006), Okafor, O.T. (2002) and Okeke, S., (2006). Effects of Computer Assisted Instructional Package on Senior Secondary School Students' Retention *American International Journal of Contemporary Research* Vol.2 No; 7.
- Basturk, V. (2005). *Individualized Spanish at an Undergraduate in Situation Implementation and Evaluation*, Mod, Lang, J. 66: 150 – 154
- Dantala B.P (2006), *Teacher Education and National Productivity, A Lecture Delivered at the Convocation Ceremony of the Federal College of Education (Technical) Omoku, River State*
- Federal Republic of Nigeria (2004). *National Policy on Education*: Lagos, Federal Government Press.
- Federal Republic of Nigeria (FRCN) (2004). *National Policy on Education*. Lagos: Federal Government Press.
- Kaku, F.A., (2005). *The Use of Internet by Secondary Schools Teachers in the Rural Areas of Delta State*: Unpublished B.Sc Project. Abraka Delta State University
- Lou, Y., Abrami, P.C. and Apollonia S. (2001). Small group and individual learning with
- Nadrljaniski, D. & Solesa, D. (2008). *Digital Media- Educational Software*, Sombor: Faculty of Pedagogy.
- Okeke, N. F. (2011). The Effects of Activity centred Teaching Approach using Low Cost Learning Kits in Facilitating Students Achievement and Interest in Mathematics. *Unpublished Masters Thesis Nnamdi Azikwe University*.
- Olga, P. (2008). The Effects of CAI on the Achievement, Attitude and Retention of fourth grade Mathematics course. A thesis submitted to the graduate school of social sciences of Middle East Technical University.
- Parveen, Q. (2003). An Experimental study on the Effects of cooperative learning on social studies Achievement among 8th grade students. An M.Sc thesis. PAF college of Education for women. Chacklala, Rawalpindi, Pakistan, p. 105.
- Pramila, R, and Harsha P.I (2012). *.Effects of Computer Assisted Instruction (CAI) on Secondary School Students Performance in Biology*. The Turkish On line Journal of Education Technology 9(1), Retrieved on 5th January 2010 from <http://www.toget.edu.com>
- Technology: A meta-analysis. *Review of Educational Research*, 71 (3), 449-521.
- Ughamadu, K.A. (2006). Innovative strategies in the teaching-learning process in K.A. Ughamadu and S.N Okoye Edited Principles methods and strategies for effective teaching. Onitsha: Lincel Publishers. .
- Vainn, T. J., & Myi, P. (2004) *Research on Cognitive Load Theory and its Design Implications for E – Learning Educational Technology Research and Development* 53(3), 5 -13