

Impacts of Computer Assisted Instruction on Junior Secondary School Students Achievement in Statistics in Mokwa Local Government Area of Niger State

BY

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Abstract

This study investigated the impacts of computer-Assisted instruction (CAI) package on junior secondary school students' achievement in mathematics (Statistics) in Mokwa Local Government Area of Niger State. The design used for the study is Quasi-Experimental design. Four schools were purposively selected and four intact classes were randomly selected using simple random sampling technique. Two schools and two intact classes each were randomly assigned to experimental and control groups using simple random sampling technique. The sample consists of 137 students (81 male and 56 female) drawn from four purposively selected junior secondary schools in Mokwa Local Government Area of Niger State. Two research questions and two hypotheses were formulated for the study. The instrument used for data collection was Statistics Achievement Test (SAT) comprised of 30 multiple-choice objective items developed by the researcher and validated by experts was used for data collection. The reliability coefficient of 0.82 was determined on the instrument using test retest method. The SAT was administered to students as pre-test and post-test. The data collected were analyzed using mean standard deviation and t-test statistic to test the hypotheses formulated at 0.05 levels of significance. The result indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Also there was a significant difference in the post-test achievement scores of male and female students taught using CAI package in favor of the female students. Based on the findings it was recommended that Computer-Assistant Packages should be encouraged for teaching and learning of mathematics especially statistics at all levels.

Keywords: Impact, Computer-Assisted Instruction (CAI) package, Achievement, Statistics

Introduction

Computer is an electronic device that transforms data into meaningful information (Dantala, 2005) defined computer as 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. Computer has made knowledge the most prized commodity. It has been found useful in engineering, banking sector, medicine, communication, commerce and industries. The field of education has not been indifferent to the computer revolution (Yusuf, 2005). Computer can therefore, offer educators the opportunity to provide a new approach to learning, an approach that helps students retain what was learnt, develop interest in students to learn, help students to work together through collecting and understanding information together and thereby, using several higher-level thinking skills to solve daily and complex problems. These could be achieved through the use of computer-assisted instructional (CAI) package in classroom instructions.

Computer Assisted Instruction, (CAI), is an interactive technique whereby a computer is used to present the instruction and also to monitor the learning that takes place. Computer Assisted Instruction uses a combination of texts, graphics, sound and video in the learning process. Umaru (2003) defined Computer Assisted Instruction as a program of instruction or package presented as computer software for instructional purpose. Therefore, the position of mathematics makes it necessary for the use of innovative pedagogical strategy that will enable teachers meet the challenges of teaching and learning of the subject especially in this era of information age. Several researches have shown that using Computer-Assisted Instruction (CAI) has a positive effect on students achievement compared to conventional method. According to Ezeliora (2000) the use of CAI provides the learner with different backgrounds and characteristics. Many studies found CAI more effective (Etukudo, 2009) in chemistry, Yusuf (2006) in technical education courses, Egunjobi (2002) in geography and Dantala (2005) on counseling education) than the conventional classroom instruction. Recent technological developments, however, offer instructors an additional method for teaching Mathematics contents.

Mathematics is an important subject that is needed at every 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 levels 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, but some considered it as a friend and to some a foe, especially when it comes to the teaching and learning of statistics and other concepts in Mathematics. One could say that the problems with Mathematics started right from the early stages of educational development in Nigeria (Adebayo, 2008). For many years, the factors that affect the effective teaching and learning of Mathematics and Statistics in particular have sparked off discussions and controversy among mathematics educators and psychologists. Statistics is the science of interpreting data and graphs (Ja'afaru, 2008). The study of statistics can be tedious especially because of a lot of formulas to work with and computations that are long and difficult to use. Computer-assisted instruction (CAI) could be of great help because of the drill-and-practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional teacher directed instruction. Statistics courses serve as a general introduction to descriptive and inferential statistics theory and practice. Computer-assisted instruction (CAI) continues to increase, eventually offering several advantages. On this basis, this study investigated the impacts of computer assisted instruction on the achievement of senior secondary students in statistics.

Statement of the Problem

The Nigeria science education system is plagued with a lot of problems and one of the most serious problems is continuous poor performance of students in mathematics and other science subjects. The performance of students in Mathematics has been quite unsatisfactory over the years in Nigeria particularly in Niger state. The external examination bodies such as the West African Examinations Council (WAEC) and the National Examinations Council (NECO) have repeatedly reported the poor performance of students in mathematics. The picture emerging from research reports, chief examiners' reports of WAEC and NECO SSCE results revealed that the students have difficulty in solving Mathematical problems that require Mathematical formulas and diagrams like in statistics.

Several strategies were employed to improve students' performance in school subjects in Nigeria among them is the use of computer-assisted instructional package in classroom instruction. Based on this, the researcher argues that the teaching of statistics could be improved with the use of CAI package as medium of instruction rather than the conventional method.

Purpose of the Study

The purpose of this study is to:

1. Determine if the use of Computer-Assisted Instruction (CAI) will have impact on the achievement of senior secondary school students in Statistics.
2. Find out if the use of Computer-Assisted Instruction (CAI) will have impact on the achievement of male and female students in Statistics.

Research Questions

The following research questions were raised to guide the study:

1. What is the difference in the mean achievement scores of students taught statistics using Computer-Assisted Instructional (CAI) package and those taught with conventional teaching method?
2. What is the difference in the mean achievement scores of male and female students taught statistics using Computer-Assisted Instructional (CAI) package?

Hypotheses

In a null form the following research hypothesis were stated:

HO₁, There is no significant difference between the mean achievement scores of students taught statistics using Computer-Assisted Instructional (CAI) package and those taught with conventional teaching method.

HO₂, There is no significant difference between the mean achievement scores of male and female students taught statistics using Computer Assisted Instructional (CAI) package.

Significance of the Study

The use of CAI will encourage students to learn at their own pace. It will reduce the learners' dependence on rote learning hence, develop interest for the subject. It will also motivate Mathematics teachers to develop interest towards utilizing suitable teaching materials that will be possible means towards reducing failure in the teaching and learning of Mathematics particularly statistical concepts.

Scope of the Study

The geographical scope of the study covered Mokwa local government area of Niger State. The study is conducted using Co-educational public Junior Secondary Schools with specific consideration for JSS III students of Mokwa local government area of Niger State. The study was restricted to statistical concept, this idea was chosen based on the fact that not much study had been conducted in this area of Mathematics particularly in Mokwa Local Government Area of Niger State. Evidence in the background also showed that "Statistics" was among the concepts identified as difficult in the senior secondary school mathematics curriculum.

Research Design

The study was conducted using Quasi-Experimental design adopting pre-test, post-test non-randomized control group. The design was used when it is not possible for the researcher to randomly select samples, because the school authorities did not allow the disruption of their classes, time table, and other school programmes. The experimental group was taught using Computer-Assisted Instructional (CAI) package which is independent variable and Achievement after treatment, the dependent variable while the control group was taught using conventional method of teaching.

Population of the study

The population of the study comprised 36 junior secondary schools in Mokwa Local Government Area of Niger State with eight hundred and ninety-seven male students (897) and six hundred and seventy-five (675) female students which give the sum of one thousand, five hundred and seventy-two (1572) students (Source: Niger State Ministry of Education, 2013).

Sample and Sampling Techniques

The sample for the study consists of one hundred and thirty-seven (137) students randomly selected from four junior secondary schools purposively for the study based on the evidence of schools with computer facilities. Four intact classes were randomly selected, with two intact classes each also randomly assigned to experimental and control groups using simple random sampling techniques. The sample comprised of 81 male and 56 female students, and 78 male students and 59 female students were assigned to experimental and control groups respectively.

Research Instrument

The instrument used for this study was a researcher's developed Statistic Achievement Test (SAT). The SAT consists of 30 objectives multiple-choice items with four options only, with one correct option for each item. The Statistical Achievement Test (SAT) was used to conduct the pretest and the posttest of the experimental and control groups.

Validation of the Instrument

The instrument was subjected to face and content validation by experts in Mathematics education and secondary schools Mathematics teachers to ascertain the validation of the instrument. The instrument was scrutinized for content organization and ambiguity; the corrections of observations made were followed and effected.

Reliability of the Instrument

To ascertain the reliability of the instrument, the instrument was trial-tested on 40 subjects who are part of the population but not part of the sample of the study. However, a reliability coefficient of the instrument of 0.78 obtained using Pearson's Product Moment Correlation after the test-retest process.

Method of Data Collection

The Instruments were personally administered by the researcher with the help of three research assistants who are Mathematics teachers in the schools involved in the study. The experimental and control groups

were taught the concept of statistics for four weeks. The experimental group was taught statistical concepts using Computer-Assisted Instruction (CAI) package while, the control group was taught same statistical concepts using the conventional teaching method. The two groups were pre-tested and post-tested before and after treatment respectively.

Method of Data Analysis

The scores of pretest and posttest collected were analyzed statistically using Statistical Package for Social Science (SPSS), version 16. Mean and standard deviation were used to answer the research questions and ANOVA was used in testing the hypotheses formulated at 0.05 levels of significance.

Table 1: Mean, Standard Deviation and ANOVA of Pretest Scores for both Experimental and Control Groups

Variables	N	df	Mean(X) SD	F- value	p- value
Experimental	78		11.86	2.40	
		135			1.677 ^{NS} 0.099
Control	59		10.93	1.87	

NS = not significant at P > 0.05

Table 1 shows that the experimental group had a mean score of 11.86 and standard deviation of 2.40 while the control group had a mean score of 10.93 and standard deviation of 1.87 with (F-value 1.677 and p-value 0.099) which shows not significant at 0.05 level. Therefore, the two groups on this basis were considered equivalent in terms of their entry behavior of the subject Mathematics and thus considered satisfactory for the research study.

Hypotheses One: There is no significant difference in the mean achievement scores of students taught statistics using Computer-Assisted Instructional (CAI) package and those taught using conventional teaching method.

Table 2: Post-Test using ANOVA results of Experimental and Control Groups

Variables	N	df	Mean(X) SD	F- value	p- value
Experimental	78		68.92	6.29	
		135			9.395* 0.000
Control	59		36.07	3.91	

* = Significant at p < 0.05

The result of the analysis in table 2 shows that, the experimental group had a mean score of 68.92 and standard deviation of 6.29 while the control group had a mean score of 36.07 and standard deviation 3.91 (F- value = 9.395 and p-value = 0.000). This indicated that the experimental group performed better than the control group; as such, the null hypothesis was rejected meaning there was a significant difference on the use of computer assisted Instruction on the academic achievement of the students in statistics.

Hypothesis Two: There is no significant difference between the mean achievement of male and female students taught Statistics using CAI package.

Table3: Post-Test ANOVA Results of Male and Female Students taught using CAI Package.

Variables	N	df	Mean (X)SD	F- value	p - value
Male	42		42.80	4.83	
		76			1.846
Female	36		68.53	7.54	0.00

*= Significant at $p < 0.05$

The result of the analysis in table 3 shows that the male students had a mean score of 42.80 and standard deviation of 4.83 while the female students had a mean score of 68.53 and standard deviation 7.54 with (F-value = 1.846 and p-value 0.00. This shows that female students performed better than the male students exposed to computer assisted instruction package Based on this; the null hypothesis was rejected meaning there is significant difference on the mean achievement scores of the male and female students when taught statistics using CAI package.

Discussion

The results of the achievement of students taught statistic using CAI packages and those taught using conventional method of instruction indicated a significant difference in favour of the students taught with CAI package. The students exposed to CAI package performed better than those taught by conventional method of instruction. The findings agreed with Etukudo (2009), Yūsuf (2006), Egunjobi, (2002) and Dantala (2005) that students taught with CAI in chemistry, geography and Counseling Education respectively performed better than those taught with conventional teaching method.

The report from hypothesis two revealed that female students achieved higher mean scores than the male students in statistics when exposed to Computer-Assisted Instruction (CAI) package. This study is in agreement with the studies of (Anagboju & Ezeliora, 2007, Gimba, 2003, Olson, 2002) who observed that female students performed better than their male counterparts when exposed to instructional materials.

Recommendations

The following recommendations were therefore made after the findings:

1. That teachers particularly of Mathematics should be exposed relevant computer assisted instructional packages developed for use within the Nigerian school systems through workshops and Seminars to acquire computer literacy and operations.
2. Government and non-governmental organizations should equip secondary schools with Computer assisted instructional media facilities for effective teaching and learning.
3. Curriculum developer should expand the curriculum by including the use of Computer assisted instruction especially on topics which students find difficult to understand.
4. The federal government should ensure adequate provision of electricity in our schools at all times for effective use of computer facilities for teaching and learning of Mathematics.

Conclusion

The following conclusions were made based on the findings of this study. The result of this study provides empirical evidence that the use of CAI package enhanced students' achievement in statistics more than the use of conventional teaching method.

Secondly, students taught statistics with the use of CAI package (experimental group) performed better than their counterparts taught same statistical concepts using the conventional method. There was significant difference in gender achievement of student taught statistics with CAI package in favour of the female students. This implies that gender has significant effect on achievement of students in statistics with CAI package. Therefore, the use of CAI package enhanced the teaching and learning of statistical concepts and gradually it will be gender friendly.

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