Effect of Computer Assisted Instructional Package on Students' Performance in Quadratic Equation in Secondary Schools in Andoni Local Government Area, Rivers State

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Abstract
This study investigated the effect of Computer Assisted Instructional package on Students' Performance in Quadratic Equation in Senior Secondary Schools in Andoni Local Government Area of Rivers State. The main purpose of the study is to examine the effect of computer assisted instructional package on the academic performance of senior secondary school students in Andoni Local Government Area of Rivers state. The study has two research questions and hypotheses. The design adopted for this study was quasi-experimental with one experimental and control groups. The study was carried out with forty (40) senior secondary two (SS2) students of CSS Agwut-Obolo in Andoni Local Government Area of Rivers state. Mathematics Achievement Test (MAT) was used to collect data which was validated with a reliability coefficient of 0.78 using split-half method while the analysis of data was done using t-test statistical analysis at 0.05 levels of significant and the following results were obtained. There is a significant difference between the academic performance of students taught quadratic equation with CAI package and those taught with lecture method. There is no significant difference between the academic performance of male and female students taught quadratic equation with CAI package. Based on the findings some recommendations were made, among which are: Mathematics Teachers should be encourage to employ the use of CAI in the teaching and learning of mathematics, Federal/state government should provide all the senior secondary schools with computer facilities as to enable the students and teachers get use to CAI packages etc.

Introduction

The search for aids to make teaching and learning easy and effective has been long amongst educators. Odili (2006) opined that the four major sensory reinforcers in mathematics learning are visual (eye), auditory (ear), tactile (touch) and kinesthetic (muscular movement). However, many teachers use the eye and ear reinforcers without trying the other two. For this reason, Famwang and Isha (1991) encourage teachers to employ the use of suitable and appropriate teaching aids to include tactile and kinesthetic reinforcement. According to Award (1988) computers are becoming increasingly popular in developing countries especially as these reinforcers are facilitated in computer activities. When computer is used to assist instruction, it is referred to as computer-assisted instruction (CAI). Computer-Assisted Instruction (CAI) is a term used to describe the use of computers in providing instruction directly to the students in order to stimulate teaching and learning situation. It does not involve teaching about computers, but rather, using computer as an aid in the classroom teaching of a particular subject matter.

Computer-Assisted Instruction is an instructional strategy that has great potentials for enhancing teaching in the educational setting. Computer-Assisted Instruction is an instructional

technique whereby a computer is used to represent the instructional material and monitor the learning that takes place. This technique of learning mathematics requires manipulative skills. The benefit of Computer Assisted Instructional package is that computer can present information to a learner at his own pace. The tutor program of the computer assumes that the learners are in "tabula rasa" state. It presents some learning materials and asks questions. It then compares the response with the expected answers. If the learner is unable to get correct answers, it will then present to the learner some basic concepts that will represent the first frame all over again. The computer can repeat these processes as many times as required. In this way, the mastery of the subject matter is the concern of the computer based instruction (Abimbade & Egunjobi, 2003). Computer assisted instructional package on quadratic equation as used by the researcher refer to simulation package designed specifically for the teaching and learning of quadratic equation. Quadratic equation is a second order polynomial equation in a single variable, say x written in form $ax^2+bx+c=0$ where $a\neq0$ (Joseph and Paul, 2015). Quadratic equation is very useful in our modern world. Budd and Sanguine (2013) demonstrated about 101 ways the quadratic equation is applied; a few of these are quadratic curves such as ellipse, hyperbole and parabola. It can also be apply in the higher mathematics like second order differential equation, complex analysis, infinite series, partial differential equation etc.

Statement of the Problem
Research evidence had shown that the use of computer- assisted instruction could bring about improvement in students' achievement, enhances better retention, encourage the development of better attitude and speeds up learning rate.

Now, the question at this juncture is what could be the effects of computer assisted instructional package on students' performance in mathematics? However, in reference to Abimbade and Egunjobi's (2003) assertion, that effective application of Computer Assisted Instruction (CAI) in the Nigeria educational system could provide a significant impact to our educational problems. Hence, there is need to really find out, whether the use of computer assisted instructional package on quadratic equation will produce any difference in the performance of students in mathematics. It is on this background that the researcher want to find out if really computer assisted Instructional package have effect on the performance of students in mathematics in Rivers State.

Purpose of the Study
The main purpose of the study is to examine the effect of computer assisted instructional package on the academic performance of senior secondary school students in quadratic equation in Andoni Local Government Area of Rivers State.

Specifically, the objectives of the study are to:
1) Determine the effect of computer assisted instructional package on the academic performance of students in quadratic equation in secondary schools in Andoni LGA.
2) Determine the differences in the performance of students in terms of gender when exposed to computer assisted instructional package in Andoni LGA.

Research Questions
Based on the main objectives of this study, the following research questions were posed to guide the study.
1) What is the effect of CAI package in the academic performance of students exposed to computer assisted instructional package in quadratic equation and those taught using lecture method in Secondary Schools in Andoni LGA?

2) What is the mean difference in the academic performance of male and female students exposed to computer assisted instructional package?

Hypotheses

The null hypothesis formulated with reference to the specific objectives of the study and as well as the research questions were as follows:

1. There is no significant difference between the mean achievement scores of students taught quadratic equation with the computer assisted instructional package and those taught with lecture method.

2. There is no significant difference between the mean achievement scores of male and female students taught quadratic equation with the computer assisted instructional package.

Methodology

The research design adopted was a quasi- experimental with one experimental group and a control group. Both groups were pre-tested each on the academic performance of students in quadratic equation before the administration of treatment. This help to ensure uniformity and equivalence in the performance of students. The treatment is the computer assisted instructional package which was administered to the experimental group only, while the control group was taught using the lecture method. A post test was administered after treatment to determine the effect or compare student's performance in both groups.

Population of the Study

The population of this study covered all the Senior Secondary Two (SSII) students of the public schools in Andoni Local Government Area, Rivers State. These are made up of eleven (11) Senior Secondary Schools that are coeducational with about 1650 students that constitute the population of the study (Zonal Ministry of Education, Anolga, 2017).

Sample and Sampling Technique

The sample for this study consists of forty (40) Senior Secondary Two students from Community Secondary School Agwut-Obolo in Andoni local Government Area of Rivers State. The sample school was drawn using a purposive sampling technique based on the fact that it was the only school in the study area nearness to a well-equipped computer facilities provided by Federal Government of Nigeria through the Millennium Development Goals (MDGs). The intact class of the science arm of Senior Secondary Two (SSII) of the school consists of 64 students (34 male and 30 female). With simple random sampling process 40 students comprises 20 male and 20 female were selected from the science arm to constitute the required sample for the study.

Research Instrument

The instrument used for data collection in this study was a Mathematics Achievement Test (MAT) which was made up of sixty (60) multiple choice objective items, followed by four (4) options lettered (A - D) out of which one was correct, designed to measure the specific learning outcomes related to the concept of the study and are drawn from WAEC past question papers.

Validity of the Instrument

To ensure both face and content validity of the instrument used in this research work, the researcher gave the research instrument called Mathematics Achievement Test (MAT) to three experts in mathematics education for their advice, correction and contribution.

Thereafter, the researcher submitted the research instrument to his supervisor to properly examine it and for approval.

Reliability of the Instrument

The Mathematics Achievement Test (MAT) was test-run with ten (10) students from Community Secondary School, Ekede that was not part of the selected school but fall within the population of the study area, using a simple random sampling technique. A reliability coefficient of 0.78 was obtained using a split half approach from the student's scores.

Method of data Collection

The data for testing the hypotheses was collected from the pre-test and post-test administered to the students used in the study. The test was marked and scored over one hundred percent (100%). The experimental group was exposed to Quadratic Equation lesson using Computer Assisted Instructional Package for the period of four weeks while the control group was taught quadratic equation with lecture method. The total number of lesson within the four weeks was twelve (12) periods lasting for forty minutes each. After the duration of four weeks of treatment for both experimental and control groups, post-test was administered to both groups at the same time using paper and pencil method.

Method of data Analysis

The scores obtained from the post-test of the two groups were computed and used in testing the hypothesis. These data were analyzed using the mean, standard deviation and t-test statistical analysis with 0.05 level of significant which formed the basis for accepting or rejecting each of the hypotheses. Therefore, if the calculated t-value is less than the critical t-value, the hypothesis was accepted but where the calculated t-value is equal or greater than critical t-value, the hypothesis was rejected.

Data Presentation, Analysis and Discussion of Findings

The presentation of data and analysis of result was done in line with the specific research questions and hypotheses that guide the study after the pretest was presented.

The table below showed the mean and t-test comparison of pre-test mean achievement scores of students in both experimental and control groups.

Table 1: T-Test Comparison of Pre-Test Mean Achievement Scores of Students in the Experimental and Control Groups

Variable	N	Mean $(\bar{x})$	Sum of sq.	df	Standard error	t-cal	t-crit
Experimental group	20	19.2	1318.56	38	0.849	1.095	2.021
Control group	20	18.3	1248.20				
Total	40	37.5	2566.76				

Source: Researcher's Field work (2018)

The result of Table 1 indicated that there was no significant difference at 38 degree of freedom and 0.05 levels of significance between the mean achievement scores of students in both the experimental and control groups. Since, the calculated value of t (1.095) is less than the table value of t (2.021). This means that students in both the experimental and control groups were

at the same entry level with regard to academic performance before the mathematics lesson (quadratic equation) was presented to them.

Research Question I: What is the effect of CAI package in the academic performance of students exposed to computer assisted instructional package in quadratic equation and those taught using lecture method?

Table 2: Mean Difference and Standard Deviation of Students Performances in the Experimental and Control Groups.

Variable	N	Mean	Standard Deviation	Mean Difference
Experimental group	20	56.00	13.9	14.75
Control group	20	41.25	13.5	

Source: Researcher's Field work (2018)

The Table 2 showed the mean difference of 14.75 between the performance of students' in the experimental group and control groups. Students in the experimental group had higher mean score of 56 and standard deviation of 13.9 as compared to the mean score of 41.25 and standard deviation of 13.5 obtained by students in the control group.

Research question 2: What is the mean difference in the performance of male and female students exposed to computer assisted instructional package?

Table 3: Mean Difference and Standard Deviation of Male and Female Students Performances in the Experimental Group

Gender	N	Mean	Standard Deviation	Mean Difference
Male	10	59.0	15.3	6
Female	10	53.0	11.7	

Source: Researcher's Field work (2018)

The Table 3 above showed the mean difference of 6 between the performance of male and female students' in the experimental group. The male students have a higher mean score of 59 and standard deviation of 15.3 as compared to the mean score of 53 and standard deviation of 11.7 obtained by female students.

Hypothesis I: There is no significant difference between the mean achievement scores of students taught quadratic equation with computer assisted instructional package and those taught with lecture method.

Table 4: T-Test Comparison of the Post-Test Mean Achievement Score of Student in the Experimental and Control Groups

Variable	N	Mean $(\bar{x})$	Sum of square	df	Standard error	t-cal	t-crit
Experimental group	20	56.00	3880.00	38	1.408	10.473	2.021
Control group	20	41.25	3657.81				
Total	**40**	**97.25**	**7537.81**				

Source: Researcher's Field work (2018)

The result of Table 4 above showed that there was a significant difference between the mean achievement scores of students in the experimental and control groups at 0.05 level of significance since the calculated value of t (10.473) is greater than the table value of t (2.021). Therefore, the null hypothesis I, was rejected and the alternate hypothesis accepted. This implies that there was a significant difference in the performance of students taught quadratic equation with computer assisted instructional package and those taught with lecture method. Students taught with computer assisted instructional package performed better than those who were taught with lecture method.

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female students taught quadratic equation with computer assisted instructional package.

Table 5: T-Test Comparison of the Post-Test Mean Achievement Scores of Male and Female Students in the Experimental Group

Gender	N	Mean $(\bar{x})$	Sum of square	df	Standard error	t-cal	t-crit
Male	10	59	2340	18	2.867	2.092	2.101
Female	10	53	1360				
Total	**20**	**112**	**3700**				

Source: Researcher's Field work (2018)

The result from Table 5 showed that there was no significant difference between the mean achievement scores of male and female students in the experimental group since the calculated value of t(2.092) is less than the table value of t(2.101) at 0.05 levels of significance. Therefore, the null hypothesis 2 was accepted.
This implies that the performance of male and female students in the experimental group taught quadratic equation were equally enhanced by the use of computer assisting instructional package

Summary of the Findings
The findings of the study are summarized below:
1. There was a mean difference of 14.75 between the performances of students in the experimental and control groups. While hypothesis 1 tested shows that there was a significant difference between the mean achievement scores of students in the experimental and control groups.
2. There was a mean difference of 6 between the performances of male and female students in the experimental group. While hypothesis 2 tested shows that there was no significant difference between the mean achievement scores of male and female students taught quadratic equation with computer assisted instructional package.

Discussion of Findings
The findings of this study are discussed in line with the objectives of the study below:
Effect of CAI package in the academic performance of students exposed to computer assisted instructional package in quadratic equation and those taught using lecture method
Table 2 showed that there was a mean difference of 14.75 between the performances of students' in the experimental group and control groups. Students in the experimental group had higher mean score of 56 and standard deviation of 13.9 as compared to the mean score of 41.25

and standard deviation of 13.5 obtained by students in the control group. This means that CAI had positive effect on student's performance in the experimental group.

With respect to the first hypothesis of no significant difference between the mean achievement scores of students taught quadratic equation with computer assisted instructional package and those taught with lecture method; The findings in Table 4 revealed that the calculated value of t(10.473) is greater than the table value of t(2.021) at 38 degree of freedom and 0.05 level of significance. Based on the fact that the calculated value of t(10.45) is greater than the table value of t(2.021), the null hypothesis 1, is therefore rejected. The respective mean scores of students in the experimental and control groups in table 2 also showed that students in the experimental group has a higher mean score than those in the control group. This indicate that there was a significant difference in the performance of students taught quadratic equation with computer assisted instructional package and those taught with lecture method. This implies that students taught quadratic equation with computer assisted instructional package performed better than those who were taught with lecture method.

This result was in agreement with Tuatongha (2007) which stated that a statistically significant difference exists between the mean achievement scores of the experimental and control groups. Iyekekpolor & TsueAvar (2008), Michael, Omiola, Awoyemi, & Mohammed (2014) also supported that computer assisted instructional package produced higher mathematics achievement in students than lecture method.

The finding however, disagreed with Petsangsri (2002) which stated that there was no significant difference between the achievements of learners in the control group and in the experimental group in the study carried out to determine the significance of the effect of computer assisted instruction (CAI) on the use of CAL-modules for learning compared with a control group. This could be that the students were already exposed to computer activities in the location before the experiment was carried out.

Mean difference in the performance of male and female students exposed to computer assisted instructional package

Table 3 showed that there was a mean difference of 6 between the performance of male and female students' in the experimental group. The male students have a higher mean score of 59 and standard deviation of 15.3 as compared to the mean score of 53 and standard deviation of 11.7 obtained by female students.

The finding in Table 5 showed that the calculated value of t(2.092) is less than the table value of t(2.101) at 18 degree of freedom and 0.05 level of significance. The respective mean scores of the male and female students in the experimental group in table 3 showed that the male students had a higher mean score than the female students but the analysis in appendix I, revealed that the null hypothesis 2, was accepted which means that there was no significant difference between the mean achievement scores of male and female students taught quadratic equation with computer assisted instructional package. This implies that the male and female students taught quadratic equation with computer assisted instructional package are on the same level of performance or performed equally well. The performances of male and female students were equally enhanced by the use of computer assisted instructional package. Hence, computer assisted instructional package can be said to be gender friendly. This result was consistent with the finding of Michael, Omiola, Awoyemi and Mohammed (2014) which stated that there was no significant difference between the mean achievement scores of male and female students taught mathematics with computer assisted instructional package. The result indicated that the use of computer is effective in enhancing students achievement in mathematics but the finding however, disagreed with that of Iyekekpolor and TsueAvar (2008) which stated that boys performed better than girls in their study on effect of computer assisted

instructional package on student's achievement in the north-east geo-political zone of Nigeria. There could be many reasons or factors that help them to improved equally or affect the performances of the girls in mathematics. This is in accordance with Chebet (2016) which stated that boys has a strong affinity and interest towards mathematics than girls in her study of gender differences in performances in mathematics among form three students in Bureti sub-country, Kenya. According to Oakes (1990) a number of socio-cultural factors have been suggested as possible influence on gender differences in mathematics. These factors include differential treatment of boys and girls in mathematics classroom, differences in advice given to boys and girls by their parents and high school counselors etc.

Conclusion

Based on the findings of this study it was concluded that computer assisted instructional package has a better facilitative effect on student's achievement in quadratic equation than the lecture method. It is also gender friendly and enhanced effective learning of mathematics. The outcome of the result also revealed that students' performance in quadratic equation was positively affected by the use of computer assisted instructional package.

Recommendations

Based on the result of the findings, the following recommendations were made.
1.   Mathematics teachers should be encouraged to employ the use of CAI in the teaching and learning of mathematics.
2.   Federal/state government should provide all the senior secondary schools with computer facilities to enable the students and teachers get use to CAI package.
3.   Mathematics teachers and school administrators should be trained frequently on how to use CAI packages through workshops and seminars in order to be updated on the new trends of learning science, technology and mathematics.

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