

Effect of Computer-Assisted Packages on the Performance of Senior Secondary Students in Mathematics in Awka, Anambra State, Nigeria

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Abstract

This study investigated the effect of computer-assisted instruction (CAI) package on the performance of Senior Secondary Students in Mathematics (Algebra) in Awka, Anambra State, Nigeria. The study examined the significance of retention achievement scores of students taught using computer-assisted instruction and conventional method. The sample consisted of forty senior secondary school students drawn from two secondary schools. Stratified random sampling was used to select 40 students (20 males and 20 females). Three research questions and three hypotheses were formulated, and tested at 0.05 level significance. The Algebra Achievement Test (AAT) was made of 50 items of multiple-choice objective type, developed and validated for data collection. The Algebra achievement Test (AAT) was administered to students as pre-test and post-test. The results of students were analyzed using t-test statistic to test the hypotheses. The result indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Students taught using CAI performed better than the control group in retention test. Also there was no significant difference in the post-test performance scores of male and female students taught using CAI of package. Based on the findings it was recommended that Computer-Assistant Program should be encouraged for teaching and learning of mathematics.

Key words: Computer, Assisted Instruction package; Mathematics, Gender; Retention

1. Introduction

Mathematics studies in Nigeria have continued to generate a great deal of interest. The fact that the average Nigerian child seems to under-achieve in mathematics is a source of serious concern to educationists, parents and the general public. Mathematics occupies a central place in the Nigerian educational system. The importance of mathematics to nation building has led the Federal Government of Nigeria to make mathematics a core subject to be offered by students at all levels of education in Nigeria (FRN, 2004). Okafor (2002) notes that mathematics is compulsory for entry requirement into university education. One is expected to credit mathematics to qualify an individual to study.

A close examination of the performance of students in Anambra State in the West African Senior Secondary Certificate Examination (WASSCE) results of four consecutive years revealed that most students would not get admission into university owing to their failure to credit mathematics (WAEC, 2012). Anagolu (2006) observes that students have problems on how to study mathematics. These problems emanate as a result of a lot of problems facing the effective teaching and learning of mathematics at all levels of Nigerian educational institution (Bankolere, 2006). Okafor (2002) and Okeke (2006) identify poor teaching methods as the major factor contributing to the poor performance of students in mathematics. Onyeduligbo (2003) also observes that poor study habit contributes to students poor performance in mathematics. Okoli (1995) notes that the mathematics classroom in Nigeria has been typified by traditional patterns of teaching and learning which have remained unchanged. On this, Karron, and Bryne (2005) note that in Nigeria today, teachers, textbooks, chalkboards and traditional facilities are no longer adequate to cope with the amount and type of skills and competences expected of students. Accordingly, Ogoni (2003) suggests that teachers need resources that can assist them to carry out their duties efficiently. Williams (2004) state that teaching methods over the years have revealed that there have been changes from one position to another, many efforts have been made to improve the teaching methods through the use of instructional material such as computer.

The use of computer in the classroom has given rise to Computer Assisted Instruction software packages for classroom instructional purposes. According to Umaru (2003), Computer Assisted Instruction is 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 traditional methods. Computer has been used in both junior and senior secondary schools to teach various subjects (Nwobi & Uwandu, 2007) According to Ezeliora (2000), the use of CAI provides the learner with different backgrounds and characteristics. Using teaching software such as CAI, concepts are presented to the students in such a well organized manner that makes for greater clarity and easier understanding. Okoro and Etukudo (2001) found CAI for teaching chemistry, Paul and Babaworo (2006) in technical education courses, Egunjobi (2002) in geography and Karper, Robinson, and Casado – Kehoe (2005) on counseling education; they all confirmed that CAI seen to be effective in enhancing students' performance in other subjects than the conventional classroom instruction.

Looking at gender of students' performance at secondary school level Ash (2005), Basturk (2005) and Dantala (2006), found no significant difference between male and female students taught, physics and history respectively using computer-assisted instructional package.

According to Russell (2004) teachers are expected to provide assistance, equip the students, provide the techniques involved and at the end clarify students' worksheet. Hence, mathematics teachers should be involved using computer assisted instruction. On this basis, this study investigated the effect of computer assisted instruction on the performance of senior secondary students in mathematics.

Research Questions

- * Is there any difference in the academic achievement of students taught mathematics using computer assisted instructional package and those taught without it?
- * Is there any difference in the retention test of students taught Algebra (mathematics) using computer-assisted instructional package and those taught without?
- * Is there any difference between male and female students taught Algebra (mathematics) using computer-assisted instructional package?

Hypotheses

- * There is no significant difference between the mean achievement scores of students taught Algebra using computer-assisted instructional package and those taught without.
- * There is no significant difference between the mean achievement scores in the retention of students taught Algebra using computer- assisted instructional package and those taught without.
- * There is no significant difference between male and female students taught Algebra using computer-assisted instructional instruction.

2. Method

The research design adopted for this study is the pretest-posttest experimental control group design. The population for the study was made up of all senior secondary schools in Awka metropolis, Anambra State. The sample constitutes 40 (20 males and 20 females) students who were randomly selected from two secondary schools. In each school, 20 students were randomly selected for the study and gender was considered in the selection.

The research instrument was made up of Algebra Achievement Test (AAT). It was jointly developed by the researchers and a computer programmer. The program was written in mathematics programming language. The second term scheme of work of senior secondary school was used. The fifty item multiple choice objective test that made up the achievement test were validated and its reliability determined as 0.79.

The teaching was done for four weeks with control group being taught with conventional (chalk-and-talk) method and the experimental group with CAI package. The test questions were administered to the students before and after treatment. Each of the tests was marked and scored accordingly. The research questions were answered using mean and standard deviations and t-test for the hypotheses at 0.05 level of significance

3. Result

3.1 Table 1 shows the t-test comparison of the mean scores of experimental and control group. This indicates that there is no statistical difference in the mean scores of experimental group ($\bar{X}=27.7$) and control group ($\bar{X}=26.45$) at 0.05 level of significance ($t=0.84$, $df = 19$, $p>0.05$) This means that the experimental and control groups have equal academic ability before the instruction started.

3.2 Table 2 shows the t-test comparison of the post test mean scores of the experimental and control group. The calculated t-value ($t_{cal}=11.15$) is higher than the critical t-value ($t_{crit} 1.83$). This indicates that there is statistical significant difference in the mean scores of experimental group ($\bar{X}=75.65$) and control group (54.50) at 0.05 level of significance ($t_{cal} - 11.15$, $df 38$, $P >0.05$) This shows that, the null hypothesis is rejected, therefore there is significant difference between the experimental and control group result.

3.3 Table 3 shows that the t-test comparison of retention mean scores of the experimental group and control group. The mean score for the experimental group was ($\bar{X}=75.20$) and control group ($\bar{X}=45.25$). This shows that t-value of ($t_{cal} = 6.55$) is greater than the t-value critical of ($t_{crit} - 1.83$). From the result it shows that there is score on the retention of the experimental group ($\bar{X}=75.20$) and control group ($\bar{X}=45.25$) at 0.05 level of significance. ($t_{cal}=6.55$, $df 19$, $P < 0.05$), the null hypothesis is rejected, therefore there is significant difference between the experimental and control group.

3.4 Table 4 shows the test result of male and female students that were taught using CAI package. From the table the calculated t-value ($t_{cal} = 0.177$) is less than the critical t-value ($t_{crit} = 1.63$). This shows that there is no statistical difference in the mean scores of males ($\bar{X}=75.20$) and females ($\bar{X}=75.60$) experimental group at 0.05 level of significance ($t_{cal} = 0.177$, $df 19$, $P > 0.05$). The table shows that the hypothesis was not rejected. Therefore there is no significant difference between the mean achievement scores of male and female taught mathematical (Algebra) with the CAI package.

4. Discussion

The results of the analysis of t-test on the performance of students taught Algebra using CAI packages and those taught using conventional method of instruction indicate a significant difference in favour of the students taught with CAI. The students exposed to CAI package performed better than those exposed to conventional method of instruction.

The findings agree with Okoro and Etukudo (2001), Paul and Babaworo (2006), Egunjobi, (2002) and Karper, Robinson, Casado – Kehoe (2005) that students taught with CAI in chemistry, geography and Counseling Education respectively performed better than those taught with normal classroom instruction. The result of the analysis of t-test on the retention performance of students taught Algebra using CAI packages and those taught using conventional method of instruction show a significant difference in favour of the students taught with CAI. The students exposed to CAI package performed better than those exposed to conventional method of instruction in the retention test.

The influence of gender on the academic performance of student. The results of analysis of t-test on the performance of male and female taught using CAI package indicate no significant difference. The finding agree with Ash (2005), Basturk (2005) and Dantala (2006) who found no significant difference between male and female students taught physics and history using CAI package. Thus, this shows that computer- assisted instruction enhanced the performance of both male and female students.

4.1 Conclusion

The study showed that the use of CAI packages improved the performance of students in mathematics (Algebra). The better performance in Algebra could be as a result of the effectiveness of the CAI package. Also, the CAI package significantly enhanced the retention performance of students taught Algebra than those taught with conventional method. In addition, the effect of CAI on male and female students in algebra was the same.

4.2 Recommendations

Based on the findings of the study the following recommendations were made:

1. Computer-Assisted Instruction/Learning should be encouraged for teaching and learning of Algebra (mathematics).
2. Computer should be used to motivate male and female students especially in algebra (mathematics).
3. Computer should be provided and adequately programmed with variety of computers-assisted instructional packages.

5. References

- Anagolu, P. C. (2006). Study habits problems in secondary schools: The way forward *Journal of Educational Studies*, 2(1) 206-215.
- Ash, J. E. (2005). The effectiveness of computer-assisted instruction on middle school mathematics achievement. Retrieved on 30th March, 2011, from <http://www.research.ensta.edu/dissertation/AA13187984>.
- Anobi, C. S and Uwandu J. (2007). Towards Effective Technology Education. *Journal of Technology Education*, 12(1) 62-74.
- Bankolere, T. (2007). Mathematics teaching in secondary schools. Enugu: Timex, (Chapter 3).
- Basturk, R. (2005). The effectiveness of Computer-Assisted Instruction in teaching introductory statistics. *Educational Technology and Society*, 8 (2) 170-128.
- Dantala, N. M. (2006). Effect of Computer-Assisted Instruction (CAI) package for individualized learning of history in the senior secondary school in Niger State, Nigeria. An unpublished M. Tech. Thesis, Science Education Department, Federal University of Technology, Minna.
- Egunjobi, A. O. (2002). The efficacy of two computer-assisted instructional modes on learners' practical geography achievement at the secondary school level in Ibadan metropolis, Nigeria. Paper delivered at NAEMT conference, 20-23 November 2002.
- Ezeliora, B. (2002). Improving Chemistry Teaching and learning using Computer. 41st Annual Conference Proceeding of Science Teachers Association of Nigeria (STAN), 186 -187:
- Federal Republic of Nigeria (2004). National Policy on Education. Lagos: Federal Government Press.
- Karper, C., Robinson, E. H.& Casado-Kehoe, M. (2005). Computer-assisted instruction and academic achievement in counselor education. *Journal of Technology in Counselling*, 4 (1)
- Karon, S. & Bryne, T. C. (2005). Poor facilities to cope with challenges of ICT in Nigeria. Ibadan: University Press, (Chapter 6).
- Ogoni, C. P. (2003). Resources for Teachers effective teaching of Mathematics. Enugu: Fulladu Publishing Company, (Chapter 3).

- Okafor, O. T. (2002). Teaching methods of mathematics in secondary schools. Ibadan: Special Book Ltd (Chapter 4).
- Oseke, S. (2006). Poor teaching method: The way forward. Onitsha: Noble Graphic, (Chapter 2).
- Okoli, J. U. (1995). Restoring Quality in secondary schools in teaching of mathematics. Owerri: Totan Publishers Ltd, (Chapter 5).
- Okoro, C. A. & Etukudo, U. E. (2001). CAI versus extrinsic motivation based traditional method: It's effect on female genders' performance in chemistry. A paper presented at 42nd STAN conference in Ilorin.
- Onyezuligbo, A. (2003). Dimensions of study habit problems in mathematics. Journal of multidisciplinary studies 3, 82-88.
- Paul, S. Y. and Babaworo, S. (2006). Information and communication technologies (ICTs) in teacher education: The way forward. Proceeding of 19th Annual National conference of Nigerian Association of Teacher of Technology (NAIT).
- Russel, S. (2004). Techniques of teaching mathematics in schools. New York: McGraw-Hill Inc, (Chapter 10).
- Umaru, J. (2003). Introduction to Computer Studies Book 2. Ilorin: Nathedex Publishers, (Chapter 7).
- West African Examination Council (WAEC) (2010). Examiners Report in Science Subjects. Lagos: WAEC.
- Williams, C. P. (2004). Promoting the teaching of mathematics through the use of instructional communication technology. Higher Education Research and Development, 17(1) 64-73.

Table I: t-test Comparison of the Pretest Mean Scores of the Experimental and Control Group

Variable	N	Df	\bar{X}	SD	t-value calculated	t-value critical
Experimental Group	20	19	27.70	8.12	0.84	1.83 ns
Control Group	20		26.45	8.08		

Table 2: t-test comparisons of the Mean Scores of Experimental Group and control group on the posttest.

Variable	N	Df	\bar{X}	SD	t-value calculated	t-value critical
Experimental Group	20	19	75.65	4.23	11.15	1.83
Control Group	20		54.50	4.58		

Table 3: t-Comparison of the Mean Scores of Experimental Group and Control Group on Retention

Variable	N	Df	\bar{X}	SD	t-value calculated	t-value critical
Experimental Group	20	19	75.20	10.13	6.55	1.83
Control Group	20		45.25	13.24		

Table 4: t-test Comparisons of the Mean Scores of Males and Females Experimental Group.

Variable	N	Df	\bar{X}	SD	t-value calculated	t-value critical
Male	10	9	75.20	7.34	0.177	1.83 ns
female	10		75.60	5.20		