

EFFECTS OF COMPUTER ASSISTED INSTRUCTIONAL PACKAGE ON ACHIEVEMENT AND INTEREST OF SENIOR SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN BIDA METROPOLIS, NIGER STATE, NIGERIA

GIMBA, R. W.; HASSAN, A. A.; ABDULRAHAMAN, M. A. & BASHIR, A. U.

Abstract

This study compared the effects of the researcher designed Computer Assisted Instruction (CAI) package on achievement and interest of senior secondary school students in set theory to traditional teaching method. The study was carried out in Bida Metropolis. Two senior secondary schools were purposively chosen because of the availability of computers in these schools. A sample of one hundred and nine (109) SS1 students was involved in the study. The design used was quasi-experimental design. Two intact classes were used; four research questions and four hypotheses guided the study, while Mean, standard deviation and t-test were used to test the hypotheses at 0.05 level of significant. The result revealed that the mean and standard deviation of the post-test achievement score of experimental and control groups are 60.25 and Standard Deviation 0.12, and 31.15 and Standard Deviation 0.10 respectively in favour of the experimental group and the interest inventory score of experimental and control groups are 58.43 and Standard Deviation 0.18, and 32.23 and Standard Deviation 0.23 respectively in favour of the experimental group. The study revealed no significant difference in the mean achievement and interest scores of male and female students taught using CAI package. Some recommendations were made among which is mathematics teachers should include the use of computer assisted instructional package as one of the strategies to be employed in classroom teaching and learning.

Introduction

In recent years, many technological media devices and systems have been invented and developed. They have appeared to offer major contribution to the effectiveness and efficiency of educational instructions. Among the most widely known technological media devices and systems are motion pictures, television, videotapes and discs, computers, computer- assisted instruction (CAI) software package and programmed learning. A considerable amount of researches have been conducted on several of these technological media devices in identifying the kinds of educational contributions they can make to improve the teaching and learning of mathematics in schools (Adegunna, 2008).

Azuka (2001) stipulated that mathematics is the foundation of all sciences, technology and modern development, and for any nation to survive and develop, that nation has to improve on its technology which could 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). 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, 2005b). Parveen (2003) stated that the use of computer could revolutionize educational system,

prepare students for the information age and accelerate national development efforts. These could be achieved through the use of computer- assisted instructional (CAI) package in classroom instructions.

Ash (2005) defined CAI package as an interactive instructional technique whereby a computer is used to present the instructional materials and monitor the learning that takes place. It is a combination of text, graphics, sound and video in enhancing the learning process. CAI package is a tutorial activity that can present information through interactive approach and can illustrate a concept through sound and animation. The use of CAI packages in teaching and learning has been embraced by researchers of the developed nations as reported by (Johnson, Johnson and Stanne, 1996, 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, particularly in Niger State on the use of CAI package to teach set theory in order to improve students' achievement and interest in mathematics.

A set in mathematics is the collection of numbers or materials with similar characteristics and representation of information on a Venn diagram. Sambo, (2008) defined a set in mathematics as a well defined collection of objects, persons, or events. 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).

Gender is also one of the factors influencing students' performance in mathematics at senior secondary school levels. Several researches have been conducted in the areas of gender-related differences in the academic achievement and interest of students in different areas. Some studies revealed that girls scored significantly higher than boys in science related subjects (Ezeliora, 2007 and Gimba 2003). Contrary to this, Ifamuyiwa, (2004) and Iwende, (2007) in their studies revealed that male students are academically superior to their female counterparts in mathematics. While some studies revealed that there was no significant difference in the performance of boys and girls when taught Social Studies Fagbemi, (2004) and Dantala, (2004) using CAI packages. The contradictive evidences in academic achievement due to gender had resulted in the need to verify how CAI package can influence students' achievement and interest by gender in mathematics (Set Theory).

LITERATURE REVIEW

CAI Package, Achievement, Interest and Gender

Computer assisted instructional package (CAI) is the use of computer that has been programmed with instructional materials for teaching and learning. In line with this Abimbade (1998) defined CAI package as an automated instruction in which the computer is used to deliver instruction to the learner through interactive process. The activities of CAI 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, assigning tasks to be performed and any combination of the functions. Through the use of computer, the role of many teachers are changing from the traditional talk and chalk method of information 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; Liao 2005) have also found that CAI package enhances learning rate and improve students' interest in mathematics than with traditional instruction.

Interest is an important variable in learning because when one becomes interested in an activity, one is likely to be more deeply involved in that activity. Interest is a subjective feeling of concentration or curiosity over something (Harbor-Peters, 2001). The influence of gender on students' level of achievement and interest has been a matter of concern to mathematics and science educators. Research on gender is always inclusive because this comparison was not addressed by enough researchers to draw firm conclusions. Therefore, this study examined the effects of computer assisted instructional package in achievement and interest in set theory among senior secondary school students' in Bida, Niger State.

Purpose of the Study

The main purpose of this study is to determine the effects of computer assisted instructional package on achievement and interest in set theory among senior secondary school students in Bida, Niger State. Specifically the objectives are to:

1. Determine the effect of computer assisted instructional (CAI) package on the mean achievement score of secondary school students in set theory compared to those taught the same set theory using the traditional method.
2. Determine the effect of CAI package on the mean interest score of secondary school students in set theory compared to those taught the same set theory using the traditional method.
3. Find out whether differences exist between the mean achievement scores of male and female students taught set theory using the CAI package.
4. Find out whether differences exist between the mean interest score of male and female students taught set theory using CAI package.

Research Questions

The following research questions guided the study:

1. What is the mean achievement score of secondary school students taught set theory using the CAI package compared to those taught the same set theory using the traditional method?
2. What is the mean interest score of students taught set theory using the CAI package compared to those taught the same set theory using the traditional method?
3. What is the mean achievement score of male and female students taught set theory using the CAI package?
4. What is the mean interest score of male and female students taught set theory using the CAI package?

Hypotheses

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

- Ho₁: There is no significant difference in 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.
- Ho₂: There is no significant difference in the mean interest score of students taught set theory using the CAI package and those taught the same set theory using the traditional method.
- Ho₃: There is no significant difference in the mean achievement scores of male and female students taught set theory using the CAI package.
- Ho₄: There is no significant difference in the mean interest scores of male and female students taught set theory using the CAI package.

RESEARCH METHODS

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. The population for the study comprises all the 2,550 students' from 8 co-education senior secondary schools class one (SS1) in Bida Metropolis. Purposive sampling technique was used to obtain two senior secondary schools that are well equipped with Computers facilities and 109 students comprising 65 male and 44 female students that were randomly assigned to experimental and control groups using simple random sampling technique. The Experimental group consists of 29 male and 23 female students while the Control group consist of 36 male and 21 female students. Experimental group was taught set theory using CAI package while the control group was taught set theory using the traditional teaching method. This lasted for 4 weeks. Achievement Test on Set Theory (ATOST) and Interest Inventory on Set Theory (INIOST) were designed by the researcher and were used in collecting data for the study. The Achievement test consists of 20 (twenty) multiple choice items with four options (A-D) and

Table 2 shows mean and standard deviation of the interest scores for experimental and control groups as 58.43 and Standard Deviation 0.18, and 32.23 and Standard Deviation 0.23 respectively. The table revealed that the interest of experimental and control groups differ significantly as $t=1.984$ with $df=107$ is significant at $P=0.012$ which is less than 0.05 significant level set for the hypothesis, hence the hypothesis was therefore rejected.

Hypothesis Three

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

Table 3: Analysis of the Mean Achievement Scores of Male and Female Students Taught Set Theory Using CAI Package.

Variable	N	Df	$\bar{X}$	SD	t-value	P-value
Male	29	50	48.73	1.58	1.788 ^{NS}	0.324
Female	23		39.53	1.03		

NS = Not Significant at $P > 0.05$

Table 3 shows the mean and standard deviation of post-test scores of male and female students are 48.78 and Standard Deviation 1.58, and 39.53 and Standard Deviation 1.03 respectively. Therefore, the mean achievement score of the male students taught with CAI package is higher than that of the female students taught with the same CAI package, the table revealed that the male students' achievement did not differ significantly from the female as $t=1.788$ with $df=50$ is not significant at $P=0.324$ which is more than 0.05. This indicates that using CAI package produced no significant difference on gender. Therefore, the hypothesis is hereby not rejected.

Hypothesis Four

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

Table 4: Analysis of the Mean Interest Scores of Male and Female Students Taught Set Theory Using CAI Package.

Variable	N	Df	$\bar{X}$	SD	t-value	P-value
Male	29	50	54.25	1.82	1.788 ^{NS}	0.434
Female	23		29.72	1.24		

NS = Not Significant at $P > 0.05$

Table 4 revealed that the mean and standard deviation of post-test interest scores of male and female students are 54.78 and Standard Deviation 1.82, and 29.72 and Standard Deviation 1.24 respectively. Therefore, the mean interest score of the male students taught with CAI

package is higher than that of the female students taught with the same CAI package. The table revealed that the male students' achievement did not differ significantly from the female as $t=1.788$ with $df=50$ is not significant at $P=0.434$ which is more than 0.05. This indicates that using CAI package produced no significant difference on gender. Therefore, the hypothesis is hereby not rejected.

Discussion

The result in table 1 and 2 indicated that treatment using CAI package produce significant difference on students' achievement and interest in set theory. This result is in support of Yusuf and Afolabi, (2010), Etukudo (2009) and Tabassum (2004) who showed that the achievement and interest of students exposed to CAI was better than their counterparts exposed to conventional classroom instruction. The result in table 3 and 4 produced no significant difference in the achievement and interest 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. Therefore, the use of CAI package in classroom instruction is a means of motivating students' interest and improving students' achievement in Mathematics irrespective of sex.

Conclusion

The results of this study provide evidence that the use of CAI package enhanced students' achievement and interest in set theory. Therefore, the use of Computer Assisted Instructional Package could be a means of improving students' performance in mathematics.

Recommendations

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

1. Since the use of CAI package enhance achievement of students in mathematics, the mathematics teachers should use it as one of the strategies to be employed in classroom teaching and learning.
2. Workshops / Seminars should be organized by the Government for mathematics teachers to enable them 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.

References

- Abimbade, A. (1998). Information Technology: The Current Strategy for Effective Science and Technology Instructions. *Bichi Journal of Education*. 2 (1): 33- 39.
- Adegunna, A. D (2008). *Effects of Computer Interactive Package Involving Quadratic Equation among Senior Secondary School Students in Minna*. Unpublished B. Tec. Project Minna: Federal University of Technology.
- Afolabi, E.R. (2004). Mandatory Computer Education in Nigeria Secondary Schools: Prospects and Problems. *Journal of Educational Research and Evaluation*. 3(2): 32-38.
- Arbab, S. (2003). *Effects of Cooperative Learning on General Science Achievement of 9-Class Students*. A Master Level Thesis. PAF College of Education for Women Caklala, Rawalpindi, Pakistan 95p.
- Ash, J. E. (2005). *The effectiveness of computer-assisted instruction on middle school Mathematics achievement*. Retrieved on 30th March, 2011, from http://www.Enstae.edu/dissertation/AA_13187984.
- Azuka, B. F. (2001). Mathematics in Technological Development: Focus on the Next Millennium Implications for Secondary Education. *Journal of the Mathematics Association of Nigeria*, 25 (1): 74-82.
- Becta, (2003). What the Research Says About ICT and Whole School Improvement Coventry: Retrieved from Becta.http://becta.org.uk/pagedocuments/research/wtrsws_improvement.pdf.
- Chado, M. I (2009). *Development and Use of a Computer- Assisted Instruction Package for Teaching Metal Forging Technology at Nigerian Certificate of Education (Technical) Level*. Unpublished PhD Thesis Bauchi: Abubakar Tafawa Balewa University.
- Dantala, M. (2005). *Effect of Computer Aided Learning Package on the Achievement of History in Senior Secondary School in Minna, Niger State*. Unpublished M. Tech Thesis, Department of Science Education Federal University of Technology Minna, Niger State.
- Etukudo, U. E. (2009). The Effect of Interactive Basic Program Package on Students Performance on Graphs of Linear and Quadratic Inequalities. *ABACUS*, 34 (1): 7-18.
- Ezeliora, M. A. (2007). Sex Difference and Scientific Performances. *Women Journal of Science and Technology*, 4: 10-11.
- Fagbemi, P. O. (2004). *Effect of Self- Instructional Computer- Based Package on Social Studies Achievement among Senior Primary School Pupils in Niger State*. Unpublished M.Tech, Thesis Departments of Science Education, Federal University of Technology, Minna.

- Gimba, R. W. (2003). *Effects of Using Cube and Cuboids in Solving Ordinary Level Geometrical Problems in Minna Metropolitan Secondary Schools* Unpublished M. Tech thesis. Department of Science Education Federal University of Technology Minna. Niger State.
- Habor-Peters, V. F. (2001). Aspects of Further Mathematics that Present Difficulties to Graduating Senior Secondary Students. *ABACUS: JMAN*, 22 (1): 74- 78.
- Ifamuyiwa, A. S. (2004). *The Predictive Validity of Junior Secondary Mathematics on Senior Secondary Mathematics, Further Mathematics and Physics*. STAN 45th Annual Conference Proceedings.
- Iwende, B. C. (2007). *The Influence of Gender and Age on the Mathematics Achievement of Secondary School Students in Minna Metropolis*. Unpublished M. Tech Thesis. Department of Science Education Federal University of Technology Minna, Niger State.
- Iqal, M. (2004). *Effect of Cooperative Learning on Academic Achievement of Secondary School Students in Mathematics*. Unpublished Ph. D Thesis Submitted to the University Institute of Education and Research. University of Arid agriculture, Rawalpindi, Pakistan.
- Johnson, D. W; Johnson, R. T and Stanne, M. B. (2000). *Cooperative Learning Methods; A Mental –Analysis*. Retrieved January 28, 2007 from University of Minnesota, cooperative.
- Liao, Y. C. (2005). *Effects of Computer Assisted Instruction on Students Achievement in Taiwan a Meta- Analysis*. Retrieved 24th December 2008 from <http://www.Sciencedirect.com/science?ob=ArticleURL&udi=B6VCJ-4FDMY9V>.
- Parveen, Q. (2003). *An Experimental Study on the Effects of Cooperative Learning on Social Studies Achievement among 8th Grade Students: A Master Level Thesis* PAF College of Education for Women. Chacklala. Rawalpindi, Pakistan. P. 105.
- Sambo, A. A. (2008). *Research Methods in Education*. Stirling- Horden Publishers(Nig) Ltd Gaaf Building, 110-112 Oyo Road, Orogun, Off University of Ibadan Second Gate, Ibadan, Oyo State, Nigeria.
- Tabassum, R. (2004). *Effects of Computer Assisted Instruction (CAI) on the Secondary School Students Achievement in Science* PhD Thesis Rawalpindi: University of Arid Agriculture. Retrieved 2nd January, 2009 from <http://eprints.govpk/3501>.
- West African Examination Council (2007 - 2011). May/June Chief Examiner's Report.
- Xin, J. F. (2000). *Integrating Technology into Instruction in an Inclusive Classroom for Diverse Learners*. Retrieved 2nd January, 2009 from http://www.isec2000.org.uk/abstracts/papers_x/xin_1.htm.

- Yusuf, M. O. (2005b). *An Investigation into Teachers Self- Efficacy in Implementing Compute Education in Nigerian Secondary Schools*. Meridian: A Middle School Computer Technologies Journal, 8(2). (A Publication of College of Education, North Caroline State University of Raleigh, North Carolina. United State of America), Online at <http://www.ncsu.edu/meridian/sum 2005/computer ed nigeria schools/index.html>.