Effect of Computer Aided Instructions (CAI) on Senior Secondary School Students' Retention in Mathematics in Makurdi Metropolis of Benue State, Nigeria

[1]Egbunu C. O, [2]Agbo-Egwu A. O, [3]Anyagh, P. I

[1] Egbunu C. O. Department of Mathematics/Statistics/Computer Science. University of Agriculture Makurdi, Benue State, Nigeria.
[2.] Agbo-Egwu A. O. Department of Science Education. University of Agriculture Makurdi, Benue State Nigeria.
[3.] Anyagh P. I. Department of Science Education. University of Agriculture Makurdi, Benue State, Nigeria.

Abstract- This study ascertained the effect of Computer Aided Instructions (CAI) on students' retention in mathematics at the senior secondary school level with the sole purpose of reducing the failure rate in specific topics proven to be difficult to pass in Mathematics. The topics considered includes; Sequence/Series and Quadratic Equations. The study adopted the quasi-experimental method so as to observe the difference between the CAI teaching method and the traditional teaching method. A sample of 50 students from SS2 were selected from two (2) different schools with similar academic standard with a number of 25 each representing the two methods. An achievement test (SSQAT) with 40 test items was developed covering the two topics with 20 test items for each topic. The groups were administered a pre-test which showed that there was no significant difference between the groups after which they were taught in a span of four weeks and a post-test was administered at the end. After three weeks, same test was administered to obtain data for students' retention. Data analysis was done based on the results the retention test and the analysis was done using mean, standard deviation and t-test. A significant difference was found in the mean retention scores between the two groups in favour of the experimental and a significant difference also occurred in retention between boys and girls of the experimental group in favour of the boys; implying that the boys retained better with CAI. It can be concluded that this study provides some evidence of the usefulness of CAI in the teaching of Mathematics and promises to be a productive and effective media of instruction for better retention of mathematical concepts and improvement of students' achievement in Mathematics.

Index Terms- Computer Aided Instructions (CAI), Retention, Students, Secondary School.

I. Introduction

Mathematics has a unique status in a school's curriculum as it was recommended as a compulsory subject by the education commission (1964 -66) and the national policy on education also emphasized its relevance as a foundational subject in analysis and logical reasoning. In spite of these, many students still find it difficult in learning Mathematics and actually fail mathematics. Bennett, Ross and Nillas (2011) defined retention as the ability to recall information about a topic or a concept over an extended period of time. Retention in Mathematics is a special area of interest that should be given attention as much as achievement in order to optimally improve the overall performance of students generally. Bennet, et al. (2011) in the bid to improve students' retention in mathematics and science tried to find out the activities that can help students to retain information about mathematical concepts and how improvement in retention of the concepts learned can be achieved. It was gathered that the use of technology in the classroom can increase retention of mathematical concepts and individual work by students can also foster retention.

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.

To determine the effectiveness of CAI is crucial. Ramani and Patadia (2012) opined that there are many failures in Mathematics than any other subject, hence the need for a supplement along the classroom teaching. Considering the issue of gender difference and achievement and retention in mathematics by students, some researchers are of the view that gender gaps in mathematics achievement can be attributed to some factors such as cultural, socio-economic or parental influence (Kaino, 2004). Other factors also considered includes students' interest, self-esteem, curricular materials, students' attitude etc. (Ajai & Imoko, 2015).

Ursini, Ramirez and Sanchez (2006) with the aim to determine significant differences in students within the ages of 12 and 13 years between boys and girls, and by gender (masculine, feminine, androgynous and undifferentiated traits); carried out a research where 1056 students were given a mathematical test with 50.7% females and 49.3% males. A 14 multi choice items questionnaire was used to test students' mathematical knowledge. The result showed that no significant difference was found considering sex, however students with masculine traits did better in terms of achievement. The results from the study going by gender cannot be reliable because over time gender traits can change especially as girls' gets older and maturity sets in.

In the view to find out if there is gender gap in the achievement and retention of Mathematics, Ajai & Imoko (2015) carried out a research to find out if there is a significant difference in achievement and retention on a group of male and female students who were taught mathematics using the problem-based learning (PBL) approach and results from the study showed that male and female students taught algebra using PBL did not differ significantly in their achievement and retention scores.

One way to bridge gender gap in mathematics is to give them equal opportunity of learning via an interesting medium like the computer and it is in this view that this study imbibes the Computer Aided Instruction (CAI) in the teaching of Mathematics in the bid to improve students' performance generally as well as handle the issue of gender difference in retention of Mathematical concepts by students in the senior secondary schools in Makurdi metropolis, Benue State of Nigeria.

II. STATEMENT OF THE PROBLEM

The study of mathematics can get students bored easily and students find it difficult to practice. Majority of the secondary schools in Makurdi have Computer Laboratories where students are privileged to learn with the computers and teachers as well are provided with assisted computer technologies for teaching base on demand. Yet, mathematical concepts are been taught traditionally. The concept of mathematics can be aided with visual images and pictures to simplify understanding and better retention which in turn would result in better performance by students. This study sees the need to find the effect that CAI can have on students' retention in mathematical concepts and it's also targeted at improving the overall performance of students in mathematics.

III. RESEARCH QUESTIONS

1. What are the mean retention scores in SSQAT of students taught mathematics in the experimental and control groups?
2.What are the mean retention scores in SSQAT of male and female students in the experimental group?

IV. RESEARCH HYPOTHESIS

1. There is no significant difference between the mean retention scores of students in the experimental and control groups.
2. There is no significant difference between the mean retention scores of the male and female students in the experimental group.
3.

V. METHODOLOGY

The study adopted quasi-experimental design. This is necessary in other to measure the effect of CAI on the students' retention as compared with the students who would be taught via the traditional method. The study was carried out in Makurdi Local Government Area of Benue State. The population of the study comprised of 5225 students from both private and government secondary schools in Makurdi L.G.A. The choice of SS2 students was based on the fact that the students must have been exposed to series of mathematical concepts. They are expected to have certain level of knowledge to be able to attempt the SSQAT. Also, majority of the students are preparing to sit for JAMB which is now computer based. The idea of exposing them to the teaching/learning of computer would encourage them to get trained in the use of Computer and most of them have access to computer devices like handsets of which the CAI could be installed on for personal reading and practice at their leisure time.

The sample size for the study consists of 50 students from two different schools with a class of 25 each from a school. The two secondary schools were selected in a non-random approach based on Teachers' access by the researcher and availability of functional computers/information technology as required for the CAI. The instrument used for the study was the Sequence and Series/ Quadratic Equation Achievement Test (SSQAT) that had a 40 multiple choice objective items with four options. To obtain a pre-test data, students were given the pre-test assessment that lasted for a day. After which different methods of teaching were adopted for the schools. The experimental used CAI while the control used the lesson plan in the conventional way. Participants were exposed to 40 minutes of teaching the topics twice a week for four weeks. At the end of the treatment, the same SSQAT was administered as the post test and the scores obtained provided the post-test data. Three weeks later, the same test SSQAT was administered to these same category of students for both the experimental and control groups and the scores obtained provided data for the retention test. The research questions were answered using mean and standard deviation while the formulated hypotheses were tested with two tailed t-test at 0.05 level of significance.

RESULT AND DISCUSSION

Research Question 1

What are the mean retention scores in SSQAT of students taught mathematics in the experimental and control groups?

Table 1 Retention Scores of the Experimental and Control Groups

Group	N	Mean	S.D	t-value	Level of Significance
Control	25	19.88	3.95	4.00	Significant
Experimental	25	25.00	4.87		

Table 1 indicates clearly that the mean achievement scores for the control and experimental groups are 19.88 and 25.0 respectively. The mean difference of 5.12 in the test suggests some huge difference in terms of students' retention scores in SSQAT. This implies that the students taught mathematics using CAI demonstrated a greater retention capacity than those from the control group.

Hypotheses 1

There is no significant difference between the mean retention scores of students in the experimental and control groups.

Table 1 indicates clearly that the mean achievement scores for the control and experimental groups are 19.88 and 25.0 respectively. The mean difference of 5.12 in the test suggests adifference in terms of students' retention scores in SSQAT. This implies that the students taught mathematics using CAI demonstrated a greater retention capacity than those from the control group.

Table 1 also shows that the t-value calculated for the mean scores is 4.0 which is greater than the critical value of t = 2.0106. This suggests a significant difference in the mean retention scores at 0.05 level of significance. Thus the null hypotheses of no significant difference in the mean scores of the experimental and control groups is rejected implying that the alternative hypothesis is accepted.

Research Question 2

What are the mean retention scores in SSQAT of male and female students in the experimental group?

Table 2 Retention Scores of Boys/Girls in the Experimental Group

Group	N	Mean	S.D	t-value	Level of Significance
Girls	11	23.63	4.05	2.41	Significant
Boys	14	25.86	5.17		

Table 2 clearly shows the mean retention scores for the girls is 23.63 while that of the boys is 25.86. There exists a mean difference of 2.23 in favor of the male students. The values of the standard deviation were 4.051 and 5.71 for the females and males respectively. The mean difference shows that the boys did better in the retention test than the girls.

Hypothesis 2

There is no significant difference between the mean retention scores of the male and female students in the experimental group.

Table 2 shows that the t-value calculated for the mean scores in the retention test for the boys and girls in the experimental group is 2.413 which is greater than the critical value of t (2.069). It is thus significant at 0.05 level of significance. Hence, the hypothesis of no significant difference in the retention scores of the male and female students is hereby rejected while the alternative hypothesis of a significant difference between the male and female students is accepted. This indicates clearly that the boys exhibited better retention capability than the girls in the SSQAT retention test.

VI. DISCUSSION OF FINDINGS

The results from table1indicates that there is a significant difference in the mean retention scores between the experimental and the control group. The mean scores from the experimental and control groups are 25.0 and 19.88 respectively. The t-value calculated for the mean scores is 4.0 which is greater than the critical value of t (2.0106). This suggests a significant difference in the mean retention scores at 0.05 level of significance. From these findings, it can be concluded that the students taught with CAI did better in the retention test than those taught in the traditional way; hence, the study have provided evidence of the usefulness of CAI in the teaching of Mathematics and promises to be a productive and effective media of instruction for better retention of mathematical concepts and improvement of students' achievement in Mathematics. This study agrees with Bennett, Ross & Nillas (2011) that the use of technology in the teaching of mathematical concepts enhances students' retention.s

The results from table 2 also indicates a significant difference in the mean retention scores between the boys and the girls in favor of the boys. This goes on to say that the boys did better in their retention capacity than the girls when taught with CAI. This finding shows that the boys related very well with the CAI; hence were able to perform better in the retention test. There are other researchers that of this same notion that the boys retain better when taught mathematics than the girls (Asante, 2012; Ajai & Imoko, 2015).

VII. CONCLUSION

The significant difference in the mean retention scores in favor of the experimental group concludes that a strong relationship exists between the use of CAI and students' performance in Mathematics. The study also found that the boys from the experimental group retained better than the girls. In conclusion, CAI needs to be properly harnessed to make learning interesting and hard to forget and should be embraced in the teaching of Mathematics.

VIII. RECOMMENDATIONS

1. Schools should make personal efforts to provide alternatives for power supply and encourage students in the learning of computers because for individualized

CAI learning to take place, students are required to be computer literate and should have no phobia in operating the computer.

2. More attention needs to be paid on this study in exploring more depths of CAI in various topics in Mathematics.
3. There is a need to modernize senior secondary schools classrooms by making provisions for a projector for each class and also avail computers to teachers to facilitate active learning.

REFERENCES

[1] Abdu-Raheem, B. O. (2012). Effects of Problem-Solving Method on Secondary

[2] School Students' Achievement and Retention in Social Studies in Ekiti State, Nigeria. Journal of International Education Research Vol 8 (1).

[3] Ajai, J. T. & Imoko, I. I. (2015). Gender differences in mathematics achievement and retention scores: A case of problem-based learning method. International Journal of Research in Education and Science (IJRES), 1(1), 45 – 50.

[4] Asante, K. O. (2010). Sex differences in Mathematics performance among senior high students in Ghana. Retrieved from http://www.faqs.org/periodicals/201012/2187713381.html#ixzz.1I5ycD0t3

[5] Bennett K., Ross S., and Nillas, L. Improving students' retention in mathematics and science concepts: the case of two teaching experiments. John Wesley Powell Student Research Conference. Paper 7. Retrieved from: http:/digitalcommons.iwu.edu/jwprc/2011/ESposters/7

[6] Kaino, L. M. & Salani, E. B. (2004). Students' gender attitudes towards the use of calculators in mathematics instruction. Retrieved from: http://www.emis.de/proceedings/PME28/RR/RR303_Kaino.pdf.

[7] Ramani, P. & Patadia, H (2012). Computer Assisted Instruction in Teaching of Mathematics. Journal of Humanities and Social Science. Volume 2(1).

[8] Umaru, J. (2003). Introduction to Computer Studies Book 2. Ilorin: Nathedex Publishers, (Chapter 7).

AUTHORS

First Author - Egbunu C. O, Department of Mathematics/Statistics/Computer Science, University of Agriculture Makurdi, Benue State, Nigeria.

Second Author – Agbo-Egwu A, Agbo-Egwu A. O. Department of Science Education. University of Agriculture Makurdi, Benue State Nigeria.

Third Author – Anyagh, P. I., Anyagh P. I. Department of Science Education. University of Agriculture Makurdi, Benue State, Nigeria.