

## **EFFECT OF COMPUTER-AIDED INSTRUCTION ON THE PERFORMANCE OF SENIOR SECONDARY SCHOOL STUDENTS IN GEOMETRY IN KATSINA, KATSINA STATE, NIGERIA**

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### **Abstract**

*This study investigated the effect of Computer-Aided Instruction (CAI) on the performance of Senior Secondary School Students in Geometry in Katsina, Katsina State, Nigeria. The study examined the significance of retention achievement scores of students taught using computer-aided instruction and those taught using the traditional method. The sample consisted of twenty senior secondary school students drawn from two secondary schools in Katsina. Stratified random sampling was used to select the 20 students (10 males and 10 females). Three research questions and three hypotheses were formulated, and tested at 0.05 level significance. Geometry Achievement Test (GAT) made up of 40 items of multiple-choice objective type, developed and validated by the researcher was used as an instrument for data collection. The Geometry Achievement Test (GAT) 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 results indicated that students taught using (CAI) performed significantly better than their counterparts taught using the traditional method of instruction. Similarly students taught using CAI performed better than the control group in retention test. It was also found that there was no significant difference in the post-test performance scores of male and female students taught using CAI package. Based on the findings it was recommended that Computer-Aided Instructions be encouraged for teaching and learning of Geometry and mathematics in our schools.*

**Keywords: Computer Literacy, Secondary Education, Mathematics, Performance, Traditional Method of Teaching.**

### **Introduction**

According to Wikieducator (2008), Computer Aided Instruction (CAI) is the use of computer as a tool to facilitate and improve instruction. It is an interactive technique whereby a computer is used to present learning materials and monitor the learning that takes place (Iqbal, 2009). Other terminologies used for computer aided instruction are Computer Assisted Learning (CAL), Computer Based Instruction (CBI), Computer Enriched Instruction (CEI), Computer Managed Instruction (CMI) etcetera. Nwafor (2015) pointed out that CAI are lessons delivered through Computer without constant teacher instruction. Computer Aided Instructions are now common place and they are becoming more diverse. Some CAI include computer visualisations of objects, guided drills and exercises. The Encyclopedia Britannica (2014) pointed out that the use of Computers in educational instructions provide one-on-one interaction with students, as well as an instantaneous response to answers. In the opinion of Igwe (2003), Education has improved through the process of Computer-Assisted Instructions

(CAI). On this basis, this study aimed to further find the effect of Computer Aided Instruction on the performance of Senior Secondary School Students in Geometry and hence Mathematics.

### **Research Questions:**

The following research questions were formulated to guide the study.

-Is there any difference in the academic achievement of students taught Geometry using Computer-Aided instruction and those taught using the traditional method?

-Is there any difference in the retention test of students taught Geometry using Computer-Aided instruction and those taught using the traditional method?

-Is there any difference between male and female students taught Geometry using Computer-Assisted instructions?

**Hypotheses:** The following hypotheses are also considered

1. There is no significant difference between the mean achievement scores of students taught Geometry using Computer-Aided Instruction and those taught using the traditional method.
2. There is no significant difference between the mean achievement scores in the retention of students taught Geometry using Computer- Aided Instruction and those taught using the traditional method.
3. There is no significant difference between male and female students taught Geometry using Computer-Aided Instructions.

### **Research design**

The design to be used 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 Katsina Local government area of Katsina State. The sample consisted up of twenty (20) students, 10 male and 10 female students who were randomly selected from two secondary schools. In each school, 10 students were randomly selected for the study and gender sensitivity was adhered to during the selection.

The research instrument was made up of Geometry Achievement Test (GAT) developed by the researcher. The course outline for senior secondary schools was used. A Forty (40) item multiple choice objective test made up of the achievement test. The test was validated and its reliability determined as 0.79.

The researcher used fifteen (15) working days to teach the control group. The teaching was done using the traditional method. Similarly the experimental group was taught using Computer-Aided Instruction for the same period of time. The test questions were administered to the students before the treatment and after the treatment. The tests were marked and the scores recorded. T-test was also used to test the hypotheses at 0.05 level of significance.

### Data analysis

The data collected from the tests was used to test the hypotheses using t-test at 0.95 level of significance for acceptance or otherwise.

The research hypotheses were therefore answered as follows:

#### Research Hypothesis 1:

There is no significant difference between the mean achievement scores of students taught Geometry using Computer-Aided Instruction and those taught using the traditional method.

**Table 1**

**t-test comparison of the Pretest Mean Scores of the students taught traditionally and those taught using the CAI**

Variable	N	Df	Mean	SD	t-value <sub>cal</sub>	t-value <sub>critical</sub>
CAI	10	9	28.10	8.21	0.83	1.82
Traditional method	10		26.50	8.10		

Table 1 above shows the t-test comparison of the mean scores of those taught using the CIA and those taught the traditional way. It can be seen that there is no statistical difference in the mean scores of those taught using the CIA (Mean=28.10) and those taught traditionally (Mean=26.50) at 0.05 level of significance  $t_{cal}=0.84$ ,  $df = 9$ ,  $p>0.05$ ). This go will along way to show that there is equal academic ability in both the two groups before the commencement of instruction.

**Table 2**

**t-test comparison of the Posttest Mean Scores of the students taught traditionally and those taught using the CAI**

Variable	N	Df	Mean	SD	t-value <sub>cal</sub>	t-value <sub>critical</sub>
CAI	10	9	77.25	4.26	11.25	1.82
Traditional method	10		53.90	4.59		

The table above shows the t-test comparison of the posttest mean scores of the students taught using the CIA and those taught traditionally. In this case the  $t\text{-value}_{cal} = 11.25$  which is higher  $t\text{-value}_{critical} = 1.82$ . It could be noted here that there is statistically significant difference in the mean scores of the students taught using CAI i.e. Mean=77.25 and those taught traditionally where Mean=53.90 at 0.05 level of significance with  $t_{cal} = 11.25$ ,  $df = 9$  and  $P > 0.05$ . We therefore reject the null hypothesis and conclude that there is significant difference between the students taught using CAI and those taught traditionally.

**Research Hypothesis: 3**

There is no significant difference between the mean achievement scores in the retention of students taught Geometry using Computer- Aided Instruction and those taught using the traditional method.

**Table 3:**  
**t-test comparison of the mean scores of students taught using the CAI and those taught traditionally on retention**

Variable	N	Df	Mean	SD	t-value <sub>cal</sub>	t-value <sub>critical</sub>
CAI	10	9	76.21	10.33	6.72	1.82
Traditional method	10		46.20	13.36		

The above table shows the t-test comparison of retention mean scores of the students taught using the CIA and those taught traditionally. It can be seen that the mean score for the students taught using the CAI =76.21 and those taught traditionally =46.20. This shows that the t-value of  $t_{cal} = 6.55$  which is greater than t-value critical which is  $t_{critical} =1.82$ . From the above result we reject the null hypothesis since there is significant difference between the students taught using the CAI and those taught traditionally.

**Research Hypothesis: 4**

There is no significant difference between male and female students taught Geometry using Computer-Aided Instructions.

**Table 4:**

Variable	N	Df	Mean	SD	t-value <sub>cal</sub>	t-value <sub>critical</sub>
CAI	5	4	77.21	7.53	0.187	1.82
Traditional method	5		77.40	5.36		

The table above shows the test results of the five (5) male and (5) female students selected that were taught using CAI. From the table the calculated t-value,  $t_{cal} = 0.187$  which is less than the critical t-value  $t_{critical} = 1.82$ . This indicates that there is no statistical difference in the mean scores of males which is=77.21 and females which is=77.40 on the students taught using CAI at 0.05 level of significance. ( $t_{cal} = 0.187, df 5, P > 0.05$ ). We therefore do not reject the null hypothesis indicating no significant difference between the mean achievement scores of male and female students taught Geometry using computer aided instruction (CAI).

**Summary of findings:**

The above results show that there is significant difference in the performance of students in Geometry when they are taught using CAI compared to those taught using the traditional method of instruction. The students taught with CAI appeared to perform better. This result is similar to the findings of Okoro and Etukudo (2001), Paul and Babaworo (2006), Egunjobi, (2002) and Karper, Robinson, Casado, Kehoe (2005) that students taught with CAI in some

subjects like chemistry, geography and Counseling Education performed better than those taught with traditional classroom instruction. It was also found using the t-test analysis on the retention performance of students taught Geometry using CAI and those taught using traditional method of instruction that a significant difference exist in favor of students taught with CAI. On the other hand the results of the t-test analysis on the performance of male and female students taught using CAI indicate no significant difference. This finding is in line with what other researchers such as Ash (2005), Basturk (2005), and Dantala (2006) found that there is no significant difference in performance between male and female students taught subjects such as physics and history using CAI package. The finding has gone a long way to prove that both male and female students benefit when they are taught using computer- aided instructions.

#### **4.1 Conclusion**

The study showed that the use of CAI packages improved the performance of students in Geometry and therefore it is an effective teaching strategy that should be employed by teachers of mathematics. The better performance in Geometry after the research 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 compared to those taught with conventional methods. In addition, the effect of CAI on male and female students in algebra was found to be the same.

#### **4.2 Recommendations**

Based on the findings of the study above the following recommendations are hereby made.

1. Computer-Assisted Instruction/Learning should be encouraged for teaching and learning of Geometry.
2. Computers should be used to motivate male and female students especially in Geometry since they enhance learning.
3. Computers should be provided and adequately programmed with variety of Computer-Aided instructional packages to assist teachers in their teaching delivery.
4. Workshops and seminars should be organized by stakeholders for teachers of mathematics on how to teach Geometry/Mathematics using computer-aided instructions.
5. Authors of Mathematics text books should endeavor to include topics on methods of teaching Geometry using Computer-Aided Instructions.
6. Computer Aided Instructions should be included in the Curriculum of teacher training institutions.
7. Computer literacy should be encouraged and improved upon in all our schools.

#### **References**

- Ash, J. E. (2005). *The effectiveness of computer-assisted instruction on middle school mathematics achievement*. Retrieved on 30<sup>th</sup> March, 2011, from <http://www.research.enstae.edu/dissertation/AA13187984>.
- 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.
- Encyclopedia Britannica (2014). Junior High School. Encyclopedia Britannica Ultimate Reference Suite, Chicago.
- Igwe, I. O. (2003), *Principles of science and science teaching in Nigeria (An Introduction)*. Enugu Jones Communication Publishers.
- Iqbal K. (2009). Computer assisted Instruction, School Improvement Research Series, 2009. <http://www.nwrel.org/scpd/sins/5/cu10.html>.
- Nwafor, C. E. (2005), Computer and internet literacy. Enugu. Jonnes Communications publishers.
- 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 42<sup>nd</sup> STAN conference in Ilorin.
- Paul, S. Y. and Babaworo, S. (2006). *Information and communication technologies (ICTs) in teacher education: The way forward*. Proceedings of 19<sup>th</sup> Annual National conference of Nigerian Association of Teacher of Technology (NAIT).
- WikiEducator (2008). *Computer Assisted Instruction (CAI)*. Retrieved from [http://wikieducator.org/computerassistedinstruction\(CAI\)](http://wikieducator.org/computerassistedinstruction(CAI)).