



## **Effect of Computer Assisted Instruction (CAI) on Secondary School Students' Achievements in Mathematics in Uyo Local Government Area, Akwa Ibom State**

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### **ABSTRACT**

The study analyses the effect of computer assisted instruction (CAI) on secondary school students' achievements in mathematics in Uyo local government area of Akwa Ibom State, Nigeria. The study adopted the non-equivalent control group quasi-experimental design. The study also adopted a purposive sampling technique in selecting 2 public schools and 152 students (70 males and 82 females) from fourteen public secondary schools in Uyo Education Zone for data analyses. The instrument used for data collection in this study was Mathematics Achievement Test (MAT). The instruments were duly validated, and its reliability estimate of 0.86 established. The data were collected and collated, and research question answered as well as two null hypotheses tested at .05 alpha level using an independent t-test analysis statistical tool. The result showed that there is significant effect of using CAI approach in teaching Mathematics on the Academic achievement of SS2 students in Mathematics in Calabar Education Zone. Also, Male SS2 students in Uyo Education Zone did not significantly differ from their female counterparts in their academic achievement in Mathematics when taught using the CAI approach. Based on this result It was recommended among others, that CAI approach should be deliberately adopted by teachers when teaching and learning basic concepts in Mathematics, as it enhances effective understanding, aid visualization and improve students interest in mathematics, male and female students should be advised to put equal efforts in understanding mathematics concepts, most especially the females.

**Keywords:** Computer Assisted Instruction (CAI), Approach, Academic Achievement, Mathematics,

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### **INTRODUCTION**

Education is a step-by-step process that transmits developmental skills, understanding, knowledge, change in behavior and innovations via the applications of a continuous training of the learner using an organized set of information, guidelines, and instructions within a conducive learning environment. It is indeed pivotal in every human endeavor as learning itself goes beyond the classroom. A nation's prosperity is proportionate to its level of education (Abasi & Ado, 2021) and as a fulcrum, global development and freedom hangs on the quality education (Oluwadayo & Samuel, 2021). Considering the wealth of benefits that accompanies qualitative education and the eminent dangers that surrounds the lack of it, Nigeria as a nation according to Business Day of 26th sept, 2023, allocated 25 percent of her 2023 budget to Education Sector so as to meet global standards, improve quality of learning and retain the best hands in the system.

For any educational system to be useful and meaningful to its society, it must have workable and standardized curriculums. As one of the core subjects in Nigeria's Education curriculum and a prerequisite for gaining admission into the tertiary institutions in Nigeria, Mathematics has proven to be essential to every learner at all levels of education. Mathematics is a collection of complementary sciences with focus on numbers, space, shapes and quality and their interrelatedness via special notations (Odo, 2021). It is the bedrock for scientific and technological knowledge (Oliweh & Oyem, 2021), a vital part of human culture which educational system is designed to transmit (Eya, 2017) and it affects all the aspect of human life (Tele and Gyang, 2015), Mathematics is the language of life (Esuong, 2022). However as crucial as the application of the knowledge of Mathematics to the economy and growth of the society, researchers observed an upward persistent trend in the poor performance of students in the subject (Ayanwoye, 2017 and Kayode, 2021) and according to Oraka (2018), Ofonime (2023), and Owan, Eno, & Esuong, (2019). this poor performance in the achievement test gives great concerns to the teachers, parents and the Government.

These poor performances can be attributed to many factors such as unconducive learning environment, unsuitable teaching methods, lack of confidence by the students (Riskiningtyas & Wangid, 2019), lack of laboratories (Etsu et. al., 2021), negative signals from those who do not appreciate the subject especially those who see the subject as abstract, boring, unattractive and problematic thus encouraging phobia (Abasi & Ado, 2021), poor teaching method (Esuong & Effiong, 2023) and anxiety (Yakubu, 2018) for the subject among the learners and in some cases, dislike towards the teacher.

However, Mathematics is an inevitability and indispensability subject to the learner and the society, the need for improvement in the academic achievements of learners of Mathematics is non-negotiable. Researchers are of the opinion that the way the learner learns mathematics should be prioritized, the instructions effectively implemented (Ajai and Imoko, 2015) and the teaching process more practicable and learner centered (Effiong & Esuong, 2023). It is perceived that these opinions can be achieved via the use of Computer Assisted Instruction (CAI) packages in place of but not replacing the conventional traditional teaching approach.

Computer Assisted Instruction (CAI) is a carefully planned electronic education which is either online or offline whereby the computer acts on the already programmed modules keyed in by the teacher/instructor to interact and convey the necessary knowledge and skills embedded in the modules to the learner in a more convenient and friendly way in the absence of the teacher/instructor (Effiong & Esuong, 2023). The learner uses CAI packages to perform simulations, drill-and-practice or tutorial which is posed by the computer or as supplements to the conventional instructions by the teacher (Ukaigwe, 2022). This student-centered and activity-based teaching/ learning approach aids students to monitor and direct their achievements with good feedback while improving students understanding of mathematics content. It is on this premise that this study therefore investigates effect of Computer Assisted Instruction (CAI) on Secondary School Students' Academic Achievements in Mathematics in Akwa Ibom State.

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## PURPOSE OF STUDY

The main purpose of this study is to examine the effect of Computer Assisted Instructions (CAI) on Academic Achievements of Secondary School Students in Mathematics in Akwa Ibom State. Specifically, this study seeks to:

1. Examine the influence of CAI approach on Students' Academic Achievements in Mathematics
2. Determine the gender difference and Students' Academic Achievement in Mathematics when taught using the CAI approach

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## RESEARCH QUESTIONS:

1. Does CAI approach influence students' academic achievement in Mathematics?
2. Is there any gender differences in the mathematics achievements of students when taught using CAI?

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## RESEARCH HYPOTHESIS:

Hypothesis 1:

HO1: there is no significant effect of CAI approach on the academic achievement of students in Mathematics.

HA1: CAI approach has significant effect on the academic achievement of students in Mathematics.

Hypothesis 2:

HO1: There is no significant gender differences in academic achievement of students when taught mathematics using CAI approach.

HA2: There is significant gender differences in academic achievement of students when taught mathematics using CAI approach.

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## RESEARCH METHODOLOGY:

The research design employed in the study was the quasi-experimental non-equivalent (pre-test and post-test) control group. The design was considered appropriate for the study because it was not possible to randomly assign the subject to the control and the experimental groups. The experimental group were treated with CAI software while traditional method of teaching was used to treat the control group. The population of the study consisted of all SS2 students that registered for 2022/2023 academic session in the 14 public secondary schools in Uyo Local Government Area in Akwa Ibom State. The total population was 3162.

Purposive sampling technique was used to select two co- educational schools from the population with computer laboratory. The intact class of SS2 in each of the purposively selected secondary schools were used in the study. Making a total sample size of 152 students (70 males and 82 females) which formed two intact classes for the experimental and control groups. The study used Mathematics Achievement Test (MAT) consisting of thirty items with options A to D and only one correct response. The topics covered for the MAT in the package were Arcs and chords, Area of a circle and triangles as well as statements which reflect the students' perception on the use of CAI package. The reliability coefficient of 0.826 was obtained using Kuder Richardson formular 20. This the instrument was adjudged to be valid and reliable. Data collected was analyzed using the Statistical Package for the Social Science (SPSS) in accordance with the research objectives of the study. The hypothesis were tested using t-test at 0.05 level of significance.

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## RESULTS

The data were analyzed, and the results presented as follows:

### Research Question 1:

Does CAI approach influence students' academic achievement in Mathematics?

**Table 1: Mean and Standard Deviation for achievement of students in Experimental and Control Groups.**

Groups	N	Mean	SD	Mean Difference
Experimental	69	11.42	2.321	1.76
Control	83	9.66	1.915	

The result in table 1 shows that the mean score difference between the experimental group and the control group is 1.76. With this result, it is revealed that the experimental group achieved more than the control group.

**Research Question 2:**

Are there any gender differences in the mathematics achievements of students when taught using CAI?

**Table 2: Mean and Standard Deviation of Male and Female Students in the Experimental group**

Gender	N	Mean	SD	Mean Difference
Male	30	16.96	2.030	0.032
Female	39	16.68	1.998	

The result in table 2 shows that the mean score difference between the male and the female is 0.032. This result further revealed that male did better than female when taught using CAI approach although the point difference is small.

**Hypothesis One:**

there is no significant effect of CAI approach on the academic achievement of students in Mathematics.

**Table 3: Independent t-test analysis for the Experimental and Control group**

Groups	N	df	Mean	SD	t-cal	t-crit.	Decision (p<0.05)
Experimental	69	151	11.42	2.321	3.12	1.98	Significant
Control	83		9.66	1.915			

The result in table 3 shows that t-cal is greater than t-crit, hence there exists a significant effect of CAI approach in the academic achievement of students in Mathematics. The null hypothesis  $H_0$  is rejected and the alternate hypothesis  $H_1$  is accepted.

**Hypothesis 2:**

There are no significant gender differences in academic achievement of students when taught mathematics using CAI approach.

**Table 4: Independent t-test analysis of students' gender and their academic performance in mathematics.**

Gender	N	df	Mean	SD	t-cal	t-crit.	Decision (p<0.05)
Male	30	68	16.96	2.030	0.610	1.99	Not Significant
Female	39		16.68	1.998			

The result in table 4 shows that t-crit > t-cal. There is no significant gender difference in the academic achievements of students when CAI approach was used in teaching and learning Mathematics.

## DISCUSSION OF FINDINGS:

Inference drawn from the research was that there existed a significant difference in the achievements of students who were taught with CAI approach as compared to those taught with the traditional way. The result was in line with the findings of Effiong and Esuong (2023) that CAI facilitates the academic progress of the learner since the learners' enthusiasm is raised when they participate actively in what they see on the computer screens.

This finding also corroborated with Ukaigwe (2022) who opined that learner uses CAI packages to perform simulations, drill-and-practice or tutorial which is posed by the computer or as supplements to the conventional instructions by the teacher.

The study further showed that CAI is not gender bound. That is the mean difference and standard deviations in table 2 as well as the t-test in table 4 showed no significant difference. The findings coincide with the research works of Okwuzo et. al., (2018) and Gakbish et. al., (2021) who in their opinion have justified no gender barrier in the use of electronic medium in understanding and solving mathematical problems.

## RECOMMENDATIONS:

1. Teachers of Mathematics should adopt the CAI approach to teach concepts in Mathematics
2. Government should train the teachers on how to use the softwares in CAI for effective lesson delivery.

3. Effective advocacy amongst educational stakeholders should be intensified on the need to adopt the use of CAI in teaching and learning mathematics concepts
4. Efforts should be made by the teachers to ensure that gender does not hinder the learning of mathematics among students by encouraging females.

## REFERENCES

- Abasi, A. U & Ado, I.B (2021). Effects of Problem- Solving Method On Secondary School Students' Academic Achievement and Attitude in Mathematics In Uyo Local Government Area, Nigeria. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 342-352
- Ajai, J. T & Imoko, I. I. (2015). Gender Difference 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.
- Ayanwoye, O. K (2017). Teacher Personality Traits and Teaching Behaviours as predictors of Students' Achievement and Attitude to Mathematics In Oyo State, Nigeria. *Unpublished Doctoral dissertation*. University of Ibadan, Ibadan, Nigeria.
- Effiong, I.A and Esuong, U.U (2023): Professional Development of Science, Technology and Mathematics Education (STME) Teachers in Nigeria and the Use of Computer Assisted Instruction (CAI) for Teaching Mathematics. *African Journal of Science, Technology and Mathematics Education (AJSTME)*, 9(5). 379-385. ISSN: 2251-0141
- Etsu, S. M., Manko, U. A., and Habiba, M. (2021). Comparative Effective of Laboratory-Based Activity, Peer Tutoring Strategy and The Conventional Teaching Method on The Attitude Of Slow- Learners Towards Geometry Among Secondary Students In Niger State. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 303-313
- Esuong, U. U. (2022). Mathematics language instruction and students' academic achievement in word problem in Calabar Education Zone. Unpublished M.ED thesis University of Calabar, Calabar Nigeria.
- Esuong, U. U., & Effiong, I.A (2023). Enhancing the teaching of basic concepts in circle geometry using E-learning approach; a quasi-experimental study. *International Journal of Research Publication and Reviews (IJRPR)*. 4(12), 416 – 422.
- Eya, H. C. (2017). Unpacking Pedagogical Content Knowledge: Conceptualizing and Measuring Teachers' Topic-Specific Knowledge of Students. *Journal of Research in Mathematics Education*, 39 (4), 372-400
- Gakbishi, J. G., Golji, G. G. and Augustine, M. Y. (2021). Effect of Geogebra software on senior secondary students Academic Achievement in Algebra in Pankshin LGA of Plateau State *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 170-177.
- Kayode, A. O. (2021). Students' Learning Styles as Determinants of Mathematical Achievement in Oyo State. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 65-76.
- Odo, J. A. (2021). Challenges Of Implementing the NCE Mathematics Programme in State and Federal Colleges of Education in South-East Geographical Zone Of Nigeria. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 22-26
- Ofonime, F. U. (2023). Effects of multimedia, problem – based learning and conventional teaching strategies on students' academic performance, interest and retention in sets and statistics in Akwa Ibom State, Nigeria. Unpublished Ph.D Dissertation, Micheal Okpara University of Agriculture Umudike, Nigeria.
- Okwuoza, S. O., Gimba, R. W., and Durojaiye, D. S. (2018). Effects of Computer Assisted Instructional Package on Senior Secondary School Students' retention in Latitude and Longitude in Abuja, Nigeria. *ABACUS. A journal of Mathematical Association of Nigeria (MAN)*. 43(9). 127-137
- Oluwadayo, A. T., & Samuel, O. O. (2021). Classroom Management as Predictor on Students' Learning Achievement in Secondary School Mathematics. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 1-13
- Oliweh, I. S., & Oyem, I. M. (2021). Gender Differential Mathematics Achievement of Students in Selected Senior Secondary Schools Ind Delta State, Nigeria. *ABACUS: Journal of Mathematical Association of Nigeria*, 46(1), 58-64
- Oraka, O. (2018). *Nigeria, Achieving Quality Education for All. Centre For Study of Economics of Africa. (CSEA)*. <https://allafrica.com>. 14 August, 2018
- Owan, V. J., Eno, E.-E., & Esuong, U. U. (2019). Administration of punishment, students' test anxiety, and performance in mathematics in secondary schools of Cross River State, Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 9(6), 415–430. <https://doi.org/10.6007/IJARBS/v9-i6/5963>
- Riskiningtyas, L., & Wangid, M. N. (2019). Students' self-efficacy of mathematics through brain-based learning. *journal of physics: Conference Series*, 1157(4). <https://doi.org/10.1088/1742-6596/1157/4/042067>
- Tele, F. M., & Gyang, L. J. (2015). Towards a better performance in Secondary school mathematics The task before before the teacher. *Journal of the Science Teachers Association of Nigeria*, 50(1), 118-127.
- Ukaigwe, P. C., & Goi-tanen, K. E. (2022). Effects of computer-assisted instruction on mathematics achievement among secondary school students in rivers state, Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS)* 6(4), 341- 347

Yakubu, J.Z (2018). *Relationship between mathematics test-anxiety and achievement of senior secondary three students in Kafanchan Educational Zone of Kaduna State*. Unpublished M.Sc (Ed) Thesis, University of Jos, Plateau State.