

Effects of Computer-aided Instruction on Students' Performance in Use of English in Tertiary Institutions in Anambra State, Nigeria

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doi: <https://doi.org/10.37745/gjahss.2013/vol11n105868>

Published November 12, 2023

Citation: Oguejiofor J. O. and Obidile J.I. (2023) Effects of Computer-aided Instruction on Students' Performance in Use of English in Tertiary Institutions in Anambra State, Nigeria, Global Journal of Arts, Humanities and Social Sciences, Vol.11, No.10, pp.58-68

ABSTRACT: The research departs from the realization that technological advancement, especially Information and Communication Technology (ICT) is greatly changing the process of teaching and learning, in higher institutions. While this process of change may not yet be so speedy in Nigeria, there is no doubt that the traditional or conventional teaching process is gradually giving way, and the ICT based teaching is setting into the fora of higher education. Using the quasi-experimental design involving pretest, posttest and non-randomized control and experimental groups, the study examined the achievement scores of students taught Use of English using computer-assisted instruction (CAI) and conventional method of teaching. The population of the study comprised all the year one students offering the Use of English. The sample of the study consisted of one thousand and eighteen students drawn from two Universities in Anambra State. Two research questions guided the study and three null hypotheses were tested at 0.05 level significance. The instrument for data collection was Use of English Achievement Test (UEAT) made up of 30 multiple choice test items with four options (A-D) from GSS 101 curriculum. The instrument was validated by three experts and a reliability coefficient of 0.80 was obtained using Kuder-Richardson Formula 20. Data collected were analyzed using mean scores to answer the research questions and Analysis of Covariance (ANCOVA) to test the null hypotheses. Findings revealed a significant difference in the post test scores of students in the control group and experimental group. Although, students in the experimental group (taught Use of English using CAI) had higher mean scores than their counterparts taught using the conventional method of teaching. Also there was no significant difference in the mean scores of male and female students taught Use of English using CAI. Based on the findings it was recommended that Computer-Assistant Instruction should be encouraged in the teaching and learning of Use of English.

KEYWORDS: Computer-Aided Instruction (CAI), Conventional teaching method, Pre-test, Post-test, Interaction effect, Academic achievement.

INTRODUCTION

Until a few years ago, teaching and learning was done using conventional teaching methods. Recently, however, the introduction and adoption of Information and Communication Technology (ICT) facilities in the education sector, has led to significant changes in the structure of education curricular. ICT facilities have led to the development and dissemination of electronic learning and distance learning that is evident across Universities and Open Universities. However, there are issues pertaining to such tools that are still unclear. Although, Odhegba, Zephaniah and Okoro (2019) stated that the computer has the capacity to provide higher interactive potential for users to develop their individual intellect and creative abilities. But, the effect of these tools on students' academic performance in tertiary institutions is yet to be conclusively determined. Generally in Nigeria, what can be called conventional teaching methods still largely hold sway. This method consists of the teacher standing between his/her students and the board, explaining orally the points he intends to impart, usually reading from a prepared text (books or handouts), demonstrating, asking questions or writing on the board when he feels necessary to do so.

Still it goes without saying that despite the predominance of traditional or conventional teaching method, the availability of ICT facilities is slowly but surely impacting on the practice of lecturing in Nigeria. While such highly developing phenomenon as CALL (Computer-Assisted Language Learning); and online teaching by means of the internet may for many reasons not be so widespread in Nigeria, computer assisted instruction is surely gaining inroad in many higher institutions of learning. In Nnamdi Azikiwe University, for example, the School of General Studies has completely computerized all its activities including registrations, teaching and examination through CBT (Computer Based Test). All General Studies lectures are delivered by Power Point presentation through projectors and screens. There have been moves to spread this practice and make it the standard way of delivering lectures especially in Faculties with many students.

The issue that still elicits divergence of opinion is precisely what impact this spreading computer-based instruction (using computer and its accessories as tools for instruction) has on the students, and how far it aids the lecturers to attain the desired level of understanding and appreciation of their delivery. Does computer based instruction help the students to attain better results? Is the lecturer's engagement in any way facilitated through the instrumentality of the computer? And precisely, how can one compare the conventional or traditional means of delivering lectures and computer aided instruction (CAI) on lecture, especially with specific focus on students' achievement? This research aims at reviewing generally the debatable points of computer-based instruction and attempts to contextualize the issue by conducting experimental teaching sessions to determine the effect of computer aided instruction (CAI) on the academic achievement of university students in Anambra State.

Research Questions

The following research questions guided the study;

1. What difference exists in the pre-test and post-test mean achievement scores of students taught Use of English using computer aided instruction (CAI) and those taught using conventional method of teaching?
2. What difference exists in the mean achievement scores of male and female students taught Use of English using computer aided instruction?

Null Hypotheses

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

1. There is no significant difference in the mean achievement scores of students taught Use of English using computer aided instruction and those taught using conventional method of teaching.
2. There is no significant difference in the mean achievement scores of male and female students taught Use of English using computer aided instruction.
3. There is no significant interaction effect of teaching methods and gender on students' academic achievement in Use of English.

REVIEW OF RELATED LITERATURE

A spate of research studies has been conducted to ascertain the effects of computer assisted instruction on students' academic performance in different disciplines. These research studies show inconsistency in their findings. Some concluded that computer assisted instruction could improve students' academic performance (Belias, Sdrolias, Kakkos, Koutiva & Koustelios, 2013; De Witte, Haelermans & Rogge, 2015; Wenceslao, 2022; Aimukhambet et al., 2023) while some studies revealed no significant difference in students' academic performance (Tsami, 2010). That is why there are still researches on issues and debates on the desirability of technology in imparting learning (Selwyn, 2017), and on the extent of use of computer to impart learning on students in the classroom teaching (Cuban, 2001). With specific reference to Nigeria, Kareem (2015) as well as Adebisi, Tayibat and Solomon (2014); Opesemowo and Omideyi (2023) concluded that there was significant difference in students' performance with computer-assisted instruction, while Adeyemi (2012) concluded that there was no significant main effect achieved by the employment of computer as instrument for teaching. Some other research studies assumed the positive effect of employing ICT tools like computer in teaching and sought to facilitate their employment (Magna & Marzano, 2014; Clark, 2008). Although there are studies that underline the effect of use of computer in the classroom teaching but, many of such studies were conducted outside Nigeria. It could therefore be assumed that as environment varies, there could also be variations in the results.

Considering the Nigerian higher institutions where the application of computer aided instruction (CAI) is being gradually introduced in the teaching and learning processes, it becomes necessary to ascertain its effects on students' academic achievement, especially as one may not rely exclusively or conclusively on researches done in other circumstances to ascertain the effect of computer assisted instruction. Hence, the need for this study within the specific context of Anambra State.

Significance of the Study

This study would be of benefit to the facilitators of learning (teachers), the students and the curriculum planners, the researchers and the society. The study would be of benefit to the teachers in the sense that when the findings are revealed it would help them to know the most effective approach to adopt in the teaching and learning processes. Also students would benefit from the findings of the study as it would enhance their knowledge on the suggested effective method to adopt in the learning processes. Findings of the study would also be of help to curriculum planners in the sense that, the findings would enlighten them on the effective approach to teaching and learning that could be adopted when preparing the curriculum.

Furthermore, the findings of the study would be of importance to the future researchers as it would provide empirical evidence which would serve as a reference material for researchers. Findings of this study would be of great benefit to the society in the sense that when the most effective teaching method is identified and utilized, it could enhance students' academic achievement in the subject and thus, help to produce graduates that would contribute positively to the society.

METHODOLOGY

The study employed the quasi-experimental design involving pretest, posttest non-randomized control and experimental groups. The study was carried out in two Universities in Anambra State. The tertiary institutions (universities) were chosen because that was the level that computer-assisted instruction was prominently used in education sector. The population of the study comprised all the year one students offering the Use of English. Use of English (GS 101) was chosen because it was one of the courses being offered by all the first year students in universities in the State. Purposive sampling was used to select two universities based on their uniformity in curriculum contents. From the institutions selected, simple random sampling was used to assign the universities into experimental group and control group. The instrument for data collection was Use of English Achievement Test (UEAT) prepared by the researchers from GSS 101 curriculum. It contained 30 multiple choice test items with four options (A-D). Items on the instrument were collected from the facilitators of GSS 101, which were modified by the researchers and validated by three experts. The reliability of the instrument was ascertained using 30 students who were not among the population of the study. Data collected were analyzed using Kuder-Richardson Formula 20 and a reliability coefficient of 0.80 was obtained. Kuder-Richardson Formula 20 was used

because, the test items were dichotomously scored and were not of equal difficulty. The students in experimental and control groups were both exposed to the same contents using the curriculum. The UEAT was administered to both groups by their classroom teachers on the first week as pre-test before the treatment, to determine the initial abilities of the students prior to the experiment. Each group had equal contact hours with the students. Data collected were analyzed using mean scores to answer the research questions, Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. The data collated from the study were analyzed using SPSS version 27.

Experimental Procedure

The researchers sought and obtained permission from the authorities concerned for the involvement of their institutions and teachers in the study. The actual research work covered a semester of 3 months of instruction (1st week for the pre-test, 2nd - 12th week for the study and 13th week for the post-test). The researchers briefed the research assistants (regular classroom teachers) on the techniques to be used before commencement of the experiment. In the first week, the researchers visited the schools and administered the pretest with the help of research assistants (the class teachers) to determine the initial abilities of the students prior to the experiment.

In the second week, the teaching commenced and ended in the 12th week. In the 13th week, post-test was administered by the class teachers so as to reduce the Hawthorne effect which might be introduced if the researchers administered the test. The teaching was conducted during the normal school hours. The experimental group was taught using computer-assisted instruction (CAI) and the control group was taught using conventional method of teaching. Extraneous variables that could influence the study were controlled. Thus, teachers of same qualification and same experience were engaged, initial differences in learners were taken care of by the use of ANCOVA. Also, intact classes were used to avoid disruption of the school activities. The instrument was administered to students as pre-test after the teaching, the same instrument but with the items reshuffled and the colour of the paper changed, was administered as the post test. Hawthorne effect was controlled as the school teachers were used as research assistants. Furthermore, to prevent subjects' interactions, the researchers ensured that the subjects were from different schools far apart from each other.

RESULTS

Research Questions 1: What difference exists in the pre-test and post-test mean achievement scores of students taught Use of English using computer aided instruction (CAI) and those taught using conventional method of teaching?

Table 1: Mean Achievement Scores of Students Taught with CAI and Conventional Method of Teaching

Groups	N	Pre-test X_1	Post-test X_2	Mean gain/loss $X_{G/L}$
CAI	486	39.16	62.32	23.16
Conventional	532	39.41	51.55	12.14

Data in Table 1 show the pre-test mean scores of students in the experimental and control groups as 39.16 and 39.41 and their post-test mean scores as 62.32 and 51.55 with mean gain scores of 23.16 and 12.14 for experimental and control groups respectively. This shows the positive effect for both experimental and control groups. However, the mean gain of 23.16 for the experimental group is higher than that of the control groups which is 12.14. This shows that students taught Use of English using CAI performed better with higher post-test scores than those taught using conventional method of teaching.

Research Questions 2: What difference exists in the mean achievement scores of male and female students taught Use of English using computer aided instruction?

Table 2: Mean Achievement Scores of Male and Female Students Taught using CAI

Gender	N	Pre-test X_1	Post-test X_2	Mean gain/loss $X_{G/L}$
Males	215	39.16	61.44	22.28
Females	271	38.96	61.37	22.41

Data in Table 2 show the pre-test mean scores of male and female students taught using CAI as 39.16 and 38.96 and their post-test mean scores as 61.44 and 61.37 with mean gain scores of 22.28 and 22.41 for male and female students respectively. This shows that achievement scores of male and female students taught Use of English using CAI are close in value, even though the mean gain of 22.41 for the female students is higher than 22.28 for their male counterparts. Both male and female students taught Use of English using CAI performed higher in their post test scores.

HO₁: There is no significant difference in the mean achievement scores of students taught Use of English using computer aided instruction and those taught using conventional method of teaching.

Table 3: Summary of ANCOVA on Students' Achievement in Control and Experimental Groups

Source	Type III Sum of Squares	Df	F	P-value	Decision
Corrected Model	38672.342 ^a	2	234.652	.000	
Intercept	1412.432	1	46.437	.000	
Pretest	83.633	1	0.006	.952	
Method	8367.782	1	126.320	.000	Sig
Error	47203.643	1015			
Total	542036.000	1018			
Corrected Total	13040.264	1017			

Note: S= Significant

Table 3 shows the obtained value of $F(1, 1015) = 126.320$ is significant at 0.000 for the method main effect ($p < 0.05$). This shows that there is a significant difference in the mean achievement scores of students taught Use of English using CAI and those taught using conventional method of teaching, thus, the null hypothesis was rejected.

HO₂: There is no significant difference in the mean achievement scores of male and female students taught Use of English using computer aided instruction.

Table 4: Summary of ANCOVA on Male and Female Students' Achievement in Experimental Group

Source	Type III Sum of Squares	Df	F	P-value	Decision
Corrected Model	6240.342 ^a	2	42.473	.000	
Intercept	2539.380	1	30.432	.000	
Pretest	86.204	1	0.009	.082	
Gender	264.737	1	0.634	.076	Not Sig.
Error	5437.244	483			
Total	283745.000	486			
Corrected Total	16345.172	485			

Note: Not Sig= Not Significant

Data in Table 4 show the obtained value of $F(1, 483) = 0.634$ is not significant at 0.076 for the gender main effect ($p > 0.05$). This shows that there is no significant difference in the mean achievement scores of male and female students taught Use of English using CAI. Hence, the null hypothesis was not rejected.

HO₃: There is no significant interaction effect of teaching methods and gender on students' academic achievement in Use of English.

Table 5: Interaction Effect of Teaching Methods and Gender on Students' Academic Achievement in Use of English

Source	Type III Sum of Squares	Df	F	P-value	Decision
Corrected Model	15347.386 ^a	3	42.476	.000	
Intercept	246387.476	1	1365.147	.000	
Method	13548.487	1	198.765	.000	
Gender	15.253	1	.028	.637	
Method * Gender	.065	1	.007	.846	Not Sig.
Error	18563.276	1014			
Total	247863.000	1018			
Corrected Total	39857.376	1017			

Table 5 shows the obtained value of $F(1, 1014) = 0.007$ is not significant at 0.846 for the interaction effect ($p > 0.05$). This shows that there is no significant interaction effect of teaching methods and gender on students' academic achievement in Use of English. The null hypothesis was therefore not rejected.

DISCUSSION

The study revealed that, students who were taught Use of English using Computer Aided Instruction (CAI) achieved higher post-test scores than those taught using conventional method of teaching. This result departs from the findings of Tukur, Yunusa and Abdulraheem (2014) which revealed that learning with computer-assisted instruction compared with traditional teaching methods did not produced higher level of academic achievement. Although findings of some studies such as Palculict (2022); Baiden and Agbene (2022) are in line with the present study which revealed that computer aided instruction could influence students' achievement positively in mathematics and physics respectively. The positive outcome of the study may perhaps be ascribed to students' engagement and active participation with the use of CAI, which might have enhanced their motivation and interest during instruction.

Findings from the study also revealed that male and female students taught using CAI had mean gains in their academic achievement. Although female students had a mean gain that was slightly above that of their male counterparts. However, the difference in the mean gain was not statistically significant. Perhaps, the difference might be a chance occurrence. This result is in line with the findings of Likita and Mshelizah (2022) which revealed that gender was not significant in the

academic achievement of students using CAI. Similarly, Ephraim, J. G. and Ephraim, E. (2019), found that there was no significant difference in the mean achievement scores of male and female students taught using CAI in Basic Science. The result of the findings implies that CAI was effective to both male and female students. The implication of the finding is that what matters in teaching and learning is the effectiveness of the instructional strategy used. Accordingly, once an instructional strategy motivates and engages students' attention, it may influence both male and female students evenly.

Findings of the study also revealed that, there was no significant interaction effect of teaching methods and gender on students' academic achievement in Use of English. This finding agrees with the findings of Obodo and Ani (2023) which revealed that there was no significant interaction effect of treatments and gender on students' academic achievement. This means that the combined effect of the teaching methods and gender had no significant effect statistically on students' achievement in Use of English.

CONCLUSION

Based on the findings of this study, it was concluded that Computer Assisted Instruction (CAI) has the potential to improve students' academic achievement in Use of English. Hence, it could be used in the teaching and learning of Use of English in universities to enhance performance, motivation and mastery.

Recommendations

The following recommendations were made:

1. The use of Computer-Assistant Instruction (CAI) should be encouraged in the teaching and learning of Use of English.
2. The Ministry of Education, curriculum planners and other stakeholders in education should create awareness by organizing seminars and workshops on the use of CAI in tertiary institutions.
3. At the pre-service level of teachers' training, the use of CAI should be included in their formation during micro-teaching and teaching practice exercise to enhance practical demonstration of CAI in the classroom.

Declaration of Conflicting Interests

The authors declare that there is no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research is financed by the Tertiary Education Trust Fund.

Acknowledgements

We are grateful to TetFund for financing this research study, and also to the research assistants who helped in the collection of data and our data analyst for the analysis of data.

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