Studies in Learning and Teaching (SiLeT)
Homepage: https://scie-journal.com/index.php/SiLeT
Email: silet@scie-journal.com

p-ISSN: 2722-399X; e-ISSN: 2722-1857
SiLeT, Vol. 4, No. 2, August 2023
Page 341-348

Impact of Computer Assisted Instruction (C.A.I.) on Academic Behaviour of Computer Science Students at Ajayi Crowther University, Oyo State, Nigeria

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Article Info

Article history:

Received May 25, 2023
Revised June 22, 2023
Accepted August 10, 2023
Available Online August 31, 2023

Keywords:

Computer Aided Instruction;
Pre-test;
Post-test;
Computer science students;
Academic behaviour;

ABSTRACT

The impact of computer assisted instruction (C.A.I.) on the academic performance of computer science students at Ajayi Crowther University, Oyo was examined. The study investigated the post-test scores of both the control and experimental groups and the effect of pre-test scores on students taught using the traditional lecture method. Quasi-experimental study design was adopted; a pre-test and post-test were conducted for the sample groups. Simple random sampling technique was used to select 50 participants for the study. The instrument was administered twice, i.e., the pre-test and post-test. The pre-test was conducted on both the experimental and control groups, and both groups were presented with the post-test to ascertain the effectiveness of the C.A.I. The instrument's reliability yielded a coefficient of 0.78 Cronbach alpha. Data were analysed using an independent t-test. Results demonstrated that there was a statistically significant difference between the mean score ($t = 1.20$, $df = 38$, $p > 0.05$) of students taught using the conventional lecture method (control) and students exposed to C.A.I. (experimental). Based on the results, it was recommended that using C.A.I. for teaching and learning should be encouraged at Ajayi Crowther University, Oyo, Nigeria.

https://doi.org/10.46627/silet

INTRODUCTION

In today's scientific and technological age, the world is teeming with various software applications. Computer Assisted Instruction (C.A.I.) is gaining prominence. It is believed that with the proper application of C.A.I. in education, desirable results in teaching, learning, and testing can be obtained (Bello et al., 2022; Kaleli, 2020; Kara, 2020; Opesemowo et al., 2018). C.A.I., a type of computer application, is essential in human life. It establishes a connection or bond between individuals, groups, and organisations in order for them to understand one another. It fosters one-to-many interactions, reciprocation, and expertise, facilitating beneficial relationships. The introduction of computer-based education has necessitated a change in instructional methods from traditional to computerized in developed countries (Bello et al., 2022; Zhussupbayev et al., 2023). In Nigeria, computers are used to assist schools in data analysis and as a pervasive tool for optimizing students' learning. According to Nura (2016), educational needs have developed beyond the expertise of instructors alone; therefore, there has been an increasing prominence in all educational planning and development in Nigeria on the quality of teachers, teacher education programs, and the availability of training and development facilities.

Furthermore, when students are motivated, they are more likely to achieve high academic performance (Wong & Li, 2008; Wong & Csikszentmihalyi, 1991). The more motivated a pupil is to learn, the more involved he or she will be in the learning process. Motivating students through

https://doi.org/10.46627/silet.v4i2.234

computer technology is a common educational strategy with the emergence of C.A.I. (Kaleli, 2020; Ok et al., 2020) Which involve the use of technology can either positively or negatively affect the academic behaviour of learners, and it plays a significant role in the student's academic behaviours. Academic behaviour is the attitude displayed by students toward their studies. Also, it refers to how students handle their studies and how they cope with or accomplish several tasks given to them by their teachers.

C.A.I. is an automated instructional technique in which electronic devices such as computers are used to present instructional programs to the learner in an interactive manner. Audu and Agbo (2010) defined C.A.I. as an instructional method in which the computer educates the students, and the computer encloses a stored instructional programme premeditated to update, guide, control, and test the students until a specified level of expertise is attained. Similarly, Sharma and Kumar (2017) said C.A.I. is an interactive method of instruction in which a computer is used to present educational content and display student learning. Eyo (2018) noted that C.A.I. is a self-learning technique that uses the computer as an apparatus to expedite and advance instruction. In other words, C.A.I. is an instruction aided tool by a computer-controlled machine and a response entry device that uses an amalgamation of text, graphics, sound, and video to boost educational outcomes by enhancing the learning process through interaction. Using computer technology to supplement traditional classroom instruction is not a new phenomenon. In the classroom, computer-based teaching and learning had a positive impact. The usefulness of C.A.I. cannot be underestimated in the contemporary world. Gambari et al. (2013) stated in their study that the instructional value of computers, particularly in advanced countries uses computers and other technological gadgets for curriculum content delivery has resulted in the inclusion of Information Communication Technology (I.C.T.) in the teaching-learning procedure (Ayanwale, 2023; Hendikawati et al., 2019; Kaleli, 2021; Ogunmakin & James, 2019; Opesemowo et al., 2022; Usman & Madudili, 2020; Weng & Chiu, 2023; Zhussupbayev et al., 2023). The computer could be accessed independently or collectively, unlike in a traditional classroom where students are brought together irrespective of their differences and class size (McTigue et al., 2020; Ogunmakin, 2018; Wokocha & Allen, 2021). According to Garcia et al. (2023), the use of I.C.T. in education is a suitable and practical method of providing teaching to students with the goal of assisting them in developing the necessary capacity to work in the world (Adewuyi & Dwarika, 2023; Adeyemo & Opesemowo, 2020; Kosoko-Oyedeko & Tella, 2020; Mamuda et al., 2023; Ok et al., 2020). To the best of our knowledge, several researchers have conducted research using C.A.I. for teaching, but there is a dearth of research on C.A.I. at Ajayi Crowther University, Oyo, Nigeria. To this end, the study focuses on the impact of C.A.I. on the academic behaviour of computer science students at Ajayi Crowther University, Oyo, Nigeria, to determine the pre-test score of students in both control and experimental groups; ascertain the effect of the pre-test score on students taught using the conventional lecture method, and students trained using C.A.I.; and investigate the influence of the pre-test score on students taught using conventional lecture method and student trained using C.A.I.

Research Questions

The research poses the following questions.

1. What is the difference between the pre-test score of students in both experimental and control groups?
2. What is the difference between the post-test score of students in both experimental and control groups?

Research Hypotheses

$H0_1$: There is no significant difference exists between the pre-test scores of students taught using conventional lecture methods and those taught using C.A.I.

$H0_2$: There is no significant difference between the post-test scores of students taught using the conventional lecture method and those taught using C.A.I.

RESEARCH METHOD

Design

Quasi-experimental research design was adopted for this study. This design involves the periodic measurement of an interested group (i.e., the experimental group). In this design, samples are divided into two clusters (i.e., experimental and control clusters). The experimental cluster was the central focus of interest in this research and was exposed to the treatment, and the control cluster was given a placebo. Also, a pre-test was conducted for the sample group collected. Using the C.A.I. package, the researchers used CSC 4115, i.e., Human Computer Interaction, a course in the Department of Computer Science, Faculty of Sciences, Ajayi Crowther University. Also, the sample in the experimental cluster was taught for weeks using the C.A.I. package. The control cluster was given a placebo (i.e., the use of a conventional mode of teaching).

Population and Sample

The population for this study consisted of all the 400 level Computer Science students who participated in both the pre-test and post-test assessment for CSC 4115 – Human Computer Interaction. A random sample of 50 students was selected for the study. The experimental group was taken to the departmental computer laboratory for three weeks (between 10:00 am- 11:00 am) for intensive teaching using C.A.I.

Instrument

The instrument for the study was titled the Human Computer Interaction Test (HCTI) and consisted of two segments (segments A and B). Segment A is the demographic information that requires students to indicate their gender and matriculation number for record-keeping, while segment B was made up of ten (10) essay questions. The items in the instrument cover topics in CSC 4115 and were taught using both C.A.I. and conventional teaching methods. The instrument was validated using six experts' scrutiny, and the content validity ratio was examined with an estimate of 0.82. After establishing the content validity, the instrument was administered twice, i.e., the pre-test and post-test assessment, to determine the effectiveness of the C.A.I. package. The pre-test was administered to both experimental and control groups, and the post-test was conducted for both clusters. The instrument's reliability revealed a coefficient of 0.78 alpha level.

RESULTS AND DISCUSSION

Results

The analysis for the study is shown below according to the research questions and hypotheses.

Research Question One: What is the difference between the pre-test score of both students in experimental and control clusters?

Table 1. Mean and standard deviation of the pre-test score of both experimental and control clusters

Cluster	N	$\bar{\chi}$	SD
Experimental	15	23.40	2.61
Control	25	24.16	1.41

Table 1 indicates the mean and standard deviation of the pre-test scores for the experimental and control clusters in the study. No significant difference existed between the experimental and control clusters mean and standard deviation scores in the pre-test category. The implication is that the clusters (experimental and control) were relatively comparable in pre-test scores (N = 15, $\bar{\chi}$ = 23.40, SD = 2.61; N =25, $\bar{\chi}$ = 24.16, SD = 1.41).

Research Question Two: What is the difference between the post-test score of students in both control and experimental groups?

Table 2. Mean and standard deviation of the post-test score of students in both experimental and control clusters

https://doi.org/10.46627/silet.v4i2.234

Cluster	N	$\bar{\chi}$	SD
Experimental	15	70.53	6.75
Control	25	50.08	6.08

Table 2 demonstrates the mean and standard deviation of the post-test scores of both experimental and control clusters. The twenty-five computer science students in the control group were taught using the conventional method, while the remaining fifteen students in the experimental clusters were taught using C.A.I. It showed that both control clusters' mean and standard deviation scores demonstrated a significant difference. In the post-test score, the groups (experimental and control) were highly comparable (N = 15, $\bar{\chi}$ = 70.53, SD = 6.75; N =25, $\bar{\chi}$ = 50.08, SD = 6.08).

$H0_1$: There is no significant difference between the pre-test score of students taught using the conventional lecture method (control group) and students taught using C.A.I. (experimental group)

Table 3. T-test analysis of pre-test scores of both control and experimental clusters

Cluster	N	$\bar{\chi}$	SD	df	t	Sig.
Experimental	15	23.40	2.61	38	1.2	0.24
Control	25	24.16	1.41			

*Not significant at 0.05 level

Table 3 revealed the t-test result of the mean score of both the experimental and control groups. From Table 3, it was deduced that the experimental group had a higher mean score than the mean of the control group. It depicts that there was no statistically significant between the mean score ($t = 1.2$, $df = 38$, $p > 0.05$) of students taught using the conventional lecture method (control group) and students taught using the C.A.I. (experimental group). This is because the significant value of 0.24 was higher than the p-value of 0.05; hence the null hypothesis is accepted.

$H0_2$: There is no significant difference in the post-test scores of students taught using the conventional method (experimental group) and those taught using C.A.I. (control group).

Table 4. T-test analysis of post-test scores of both experimental and control groups

Cluster	N	$\bar{\chi}$	SD	df	t	Sig.
Experimental	15	70.53	6.75	38	-9.88	0.02
Control	25	50.08	6.08			

*significant at 0.05 level

Table 4 presents the t-test result of the post-test scores of the students in both experimental and control clusters. It demonstrated that at a 0.05 level of significance, there was a statistically significant difference in the mean scores of students ($t = -9.88$, $df = 38$, $p < 0.05$) in the experimental and control groups. Also, the statistically significant difference between the experimental and control groups is inverse. Since the $p < 0.05$ significant level, the null hypothesis is therefore rejected.

Discussion

The study's pre-test results revealed no statistically significant difference in the mean score of students taught conventionally and those taught using C.A.I. among computer science students at Ajayi Crowther University. It also revealed that a positive difference existed between the experimental and control cluster students. This result was supported by the study of Etim et al. (2016), who succumbed that computer simulation learning courses positively affected students' academic performance. Bello et al. (2022) also supported the result of their study. The post-test results revealed a statistically significant mean difference between the experimental and control

groups. This difference could be attributed to the introduction of C.A.I. to the experimental cluster of students, who relished paying attention, observation, and comparing their milieu when presented with meaningful information via computer packages. This outcome goes to expose the interactive nature of C.A.I., which may have aroused the students' curiosity and thus served as a motivator to learning by the students who partook in the experimental group.

The better concentration and incentive of the experimental group may have accounted for the enhanced achievement of the students in the Human Computer Interaction Test. This result corroborates the study of Obuekwe and Eze (2017), who opined that e-learning enhances and supports learning for student performance improvement. This finding also complies with Fakae (2014), who viewed that e-learning subset such as I.C.T. has upgrade teaching and learning drastically. According to Kadiri (2022), I.C.T. is an influential tool that can play instructional roles, like making learners feel more relaxed about learning. The introduction of technology into education can make learners become relaxed, and when learners are tranquil about learning, which positively affect the learner's academic behaviour leading to rising academic performance. The study by Onah and Agomuo (2016) found Computer Assisted Learning, C.A.I., and Computer Aided Design (CAD) worthy computer aided learning packages for promoting understanding of different subjects by students, including mathematics. In the study of Azare (2019), it was noted that using computers in teaching could foremost contribute to both teachers' knowledge and teaching effectiveness.

Falode et al. (2016) pointed out that students who were taught Agricultural Science via computer stimulation instructional package accomplished better academically than their colleagues who were taught the same concept with the conventional method. Nura (2016) revealed that instructional material performs such functions as an addition to the series of experiences available to learners and adds to the teacher's voiced explanations, thereby making the learning experience worthwhile and providing the teacher with interest in a wide variety of learning events. Ruzicka and Milova (2019) showed that the use of video analysis in providing feedback has a positive effect on the process of downhill skiing skill skills acquisition. The finding of Ugwuanyi and Okeke (2020) showed that tossed classroom instructional technology effectively enhanced students' achievement in physics. Ugwuanyi and Okeke (2020) demonstrated that C.A.I. significantly affected university students' achievement in physics.

CONCLUSION

This study contributed to lending support for using C.A.I. in teaching and learning various courses at the university. The use of C.A.I. will improve students' academic behaviour because they will find learning more intriguing. This (academic behaviour) will positively affect their academic performance in all courses and their interest in the learning process. However, C.A.I. should be mandatory at all levels (i.e., from first year to final year), and the university management should provide necessary I.C.T. equipment for proper C.A.I. deployment. The study did not consider public universities, which is one limitation of this study, and other researchers can delve into this area.

ACKNOWLEDGEMENTS

We appreciate the Head of Department Computer Science for providing us the computer laboratory and the students who made themselves available for the research.

REFERENCES

Adewuyi, H. O., & Dwarika, V. (2023). Psycho-personological correlates of academic help-seeking among in-school adolescents. *Studies in Learning and Teaching, 4*(1), 195-204. https://doi.org/10.46627/silet.v4i1.210

Adeyemo, E. O., & Opesemowo, O. A. (2020). Differential Test let Functioning (DTLF) in senior school certificate mathematics examination using multilevel measurement modelling. *Sumerianz Journal of Education, Linguistics and Literature, 3*(11), 249-253. https://doi.org/10.47752/sjell.311.249.253

Audu, U., & Agbo, J. (2010). *Educational technology in practice*. De New Creation Publishing House Ltd.

Ayanwale, M. A. (2023). Can experience determine the adoption of industrial revolution 4.0 skills in 21st century mathematics education?. *Research in Social Sciences and Technology, 8*(1), 74-91.

Azare, G. (2019). *Information and communication technology*. Foreword for SDGs Workshop, Kaduna: NTI.

Bello, S., Kamar, Y. M., Yusha'u, M. A., & Abubakar, H. S. (2022). Efficacy of computer assisted multimedia instruction on students' academic performance and retention of ecology in some northwestern states, Nigeria. *Journal of Educational Research in Developing Areas, 3*(2), 127-140.

Etim, P. J., Itighise, A. E., & Ema, I. B. (2016). Use of educational animation and academic performance of business studies students in Akwa Ibom State. *International Journal of Education, 4*(8), 1948-1547.

Eyo, U. E. (2018). Effects of computer assisted multimedia instruction on senior secondary school students' achievement in biology in two educational zones of Niger State, Nigeria, West Africa. *IOSR Journal of Research & Method in Education (IOSR-JRME), 8*(2), 53-59.

Fakae, B. (2014). The computer: An indispensable millennium educational tool. *Computer Education Research Journal, 1*(1), 1-5.

Falode, O., Usman, H., Ilobeneke, S., Mohammed, H., Godwin, A., & Jimoh, M. (2016). Improving secondary school geography students' positive attitude towards map reading through computer simulation instructional package in Bida, Niger state, Nigeria. *Bulgarian Journal of Science and Education Policy (BJSEP), 10*(1), 142-155.

Gambari, A. I., Shuaibu, A., & Shittu, A. T. (2013). Students' perception towards the use of computer-assisted instruction on learning mathematics in Minna, Niger State, Nigeria. *International Journal of Behavioral Sciences, 4*(1), 14-21.

Garcia, M. B., Yousef, A. M. F., de Almeida, R. P. P., Arif, Y. M., Happonen, A., & Barber, W. (2023). Teaching physical fitness and exercise using computer-assisted instruction: A School-based public health intervention. In M. B. Garcia, M. V. L. Cabrera, R. P. P. de Almeida (Eds.), *Handbook of research on instructional technologies in health education and allied disciplines* (pp. 177-195). IGI Global. https://doi.org/10.4018/978-1-6684-7164-7.ch008

Hendikawati, P., Zahid, M. Z., & Arifudin, R. (2019). Android-based computer assisted instruction development as a learning resource for supporting self-regulated learning. *International Journal of Instruction, 12*(3), 389-404.

Kadiri, G. (2022). The role of information and communication technology in language teaching and learning in University education. *Journal of Liberal Studies, 15*(1), 1-2.

Kaleli, Y. S. (2020). The effect of computer-assisted instruction on piano education: An experimental study with pre-service music teachers. *International Journal of Technology in Education and Science, 4*(3), 235-246.

Kaleli, Y. S. (2021). The effect of individualized online instruction on TPACK skills and achievement in piano lessons. *International Journal of Technology in Education, 4*(3), 399-412.

Kara, S. (2020). Prospective visual arts teachers' innovation skills and attitudes towards computer assisted instruction. *International Journal of Technology in Education and Science, 4*(2), 98-107.

Kosoko-Oyedeko, G. A., & Tella, A. (2020). Teacher's perception of the contribution of ICT to pupils performance in christian religious education. *Journal of Social Sciences, 22*(1), 7-14. https://doi.org/10.1080/09718923.2010.11892778

Mamuda, S., Usman, M., & Yage, D. D. (2023). Effects of computer-based instructional strategies on studentsperformance in physics in senior secondary schools in Jega local government, Kebbi state, Nigeria. *Journal of Advanced Education and Sciences, 3*(1), 16-20.

McTigue, E. M., Solheim, O. J., Zimmer, W. K., & Uppstad, P. H. (2020). Critically reviewing graphogame across the world: Recommendations and cautions for research and implementation of computer-assisted instruction for word-reading acquisition. *Reading Research Quarterly, 55*(1), 45-73. https://doi.org/https://doi.org/10.1002/rrq.256

Nura, B. (2016). Effects of instructional materials (computer) in promoting secondary schools students' academic performance in computer science in Kebbi State, Nigeria. *Journal of Advance Research in Social Science and Humanities, 2*(7), 01–06. https://doi.org/10.53555/nnssh.v2i7.188

Obuekwe, G. I., & Eze, R.-A. I. (2017). Promoting best practices in teaching and learning in nigerian universities through effective e-learning: prospects and challenges. *International Conference e-Learning 2017*, 184-188.

Ogunmakin, R. (2018). ICT-Based instructional practices: An assessment of in-service teachers in Ondo State. *Benchmark Journals, 6*(1), 72-86.

Ogunmakin, R., & James, F. (2019). Information communication technology utilization in strategic plan implementation in state ministries of education in south-western Nigeria. FUDMA *Journal of Educational Foundations, 2*(1), 12-25.

Ok, M. W., Bryant, D. P., & Bryant, B. R. (2020). Effects of computer-assisted instruction on the mathematics performance of students with learning disabilities: A synthesis of the research. *Exceptionality, 28*(1), 30-44. https://doi.org/10.1080/09362835.2019.1579723

Onah, E., & Agomuo, E. (2016). Level of utilization of computer aided design, instruction and learning by computer education lecturers and technical instructors in the colleges of education in south east Nigeria. *Journal of Technical Vocational Education, Training and Research, 1*(2), 90-100.

Opesemowo, O. A., Afolabi, E. R. I., & Oluwatimilehin, T. R. (2018). Development of a scale for measuring students' testwiseness in senior secondary school examination in Nigeria. *International Journal of Research, 5*(19), 464-474.

Opesemowo, O. A., Obanisola, A., & Opesesmowo, T. R. (2022). From brick-and-mortar to online teaching during the COVID-19 pandemic lockdown in Osun state, Nigeria. *Journal of Education in Black Sea Region, 8*(1), 134-142. https://doi.org/10.31578/jebs.v8i1.286

Ruzicka, I., & Milova, J. (2019). Increasing the efficiency of motor learning with the help of video analysis. *Cypriot Journal of Educational Sciences, 14*(4), 723-730.

Sharma, S., & Kumar, S. (2017). Role of computer assisted instruction (CAI) in teaching to children with special needs: review. *Bhartiyam International Journal of Education & Research, 6*(3), 1-10.

Ugwuanyi, C. S., & Okeke, C. I. (2020). Enhancing university students' achievement in physics using computer-assisted instruction. *International Journal of Higher Education, 9*(5), 115-124.

Usman, Y. D., & Madudili, G. C. (2020). Assessment of the impact of computer assisted instruction on teaching and learning in Nigeria: A theoretical viewpoint. *International Journal of Education and Development using Information and Communication Technology, 16*(2), 259-271.

Weng, X., & Chiu, T. K. F. (2023). Instructional design and learning outcomes of intelligent computer assisted language learning: Systematic review in the field. *Computers and Education: Artificial Intelligence, 4*, 100117. https://10.1016/j.caeai.2022.100117

Wokocha, G., & Allen, O. G. (2021). Use of computer supported collaborative learning in teaching and learning science in Nigeria. *GSC Advanced Research and Reviews, 9*(1), 111-122. https://doi.org/10.30574/gscarr.2021.9.1.0173

Wong, E. M. L., & Li, S. C. (2008). Framing ICT implementation in a context of educational change: A multilevel analysis. *School Effectiveness and School Improvement, 19*(1), 99-120. https://doi.org/10.1080/09243450801896809

Wong, M. M., & Csikszentmihalyi, M. (1991). Motivation and academic achievement: The effects of personality traits and the duality of experience. *Journal of Personality, 59*(3), 539-574. https://doi.org/10.1111/j.1467-6494.1991.tb00259.x

Zhussupbayev, S., Nurgaliyeva, S., Shayakhmet, N., Otepova, G., Karimova, A., Matayev, B., & Bak, H. (2023). The effect of using computer assisted instruction method in history lessons on students' success and attitudes. *International Journal of Education in Mathematics, Science and Technology,* 424-439.

https://doi.org/10.46627/silet.v4i2.234

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