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Computer Assisted Learning (CAL) and Senior Secondary School Student's Academic Performance in Economics in Kaduna State, Nigeria

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Abstract

The study investigates the effect of Computer Assisted Learning (CAL) on the academic performance of Economics students in Senior secondary schools of Kaduna State. One of the objectives of integrating ICT as a policy into education by government is to increase the number of graduates in the education system that are competent to compete favorably anywhere in the world and enhance sustainable national development. The objectives of teaching economics, amongst others, are to produce graduates with knowledge and understanding of economic principles, economic analysis, economic and financial institutions to make economic decisions that will contribute to positive national development and international relationships. Chief Examiners of WASSCE in 2019-2022 observed that most students who sat for economics performed at average and below average levels at best. Some key factors are inadequate content knowledge of the subject matter and inability to draw and label good diagrams on the part of the students were mentioned. These might result from ineffective teaching methodologies used by the teachers and poor understanding of the subject matter on the part of the students. TPACK theoretical framework was adopted because it captures the essential knowledge that teachers requires if they want to effectively integrate ICT

facilities into their teaching and learning process. The research design is the 2 x 2 factorial pre-test post-test quasi-experimental control group designs. The targeted population is the sixty-two thousand and seventy (62,070) public Senior Secondary two (SS2) school students in twelve educational zones of Kaduna State. A stratified random sampling technique was adopted to draw out SS2 Economics students from the rural and urban centers of two educational zones in the State. An Economics Achievement Test (EAT) was developed and validated as a test instrument for data collection. The data was analyzed using descriptive and inferential statistics. One of this study's findings shows that if CAL facilities is effectively utilized by teachers, CAL can help students in rural areas compete favorably academically with their counterparts in urban areas. It was concluded that CAL significantly impacts students' academic performance in Economics. It was, however, recommended amongst others that if computer-assisted facilities are adequately provided by the government and utilized effectively by teachers in all schools, students in the remote areas will not feel disadvantaged due to their location and will compete favorably with their counterparts in the urban areas schools and hence, reducing rural-urban migration of youths.

Keywords: CAL, Students, Academic Performance, Economics

Introduction

Information and Communication Technology (ICT) has recently changed almost all spheres of human endeavor globally. The world has been reduced to a global village through the use of information and communication technology devices, promoting national development and better relationships with other nations. ICT refers to the electronic and communication devices associated with human interactive materials that enable users to employ them for various teaching and learning processes and personal use (Buhalis, 2022) ^[3]. The facilities provided by ICT cover areas such as technology, social, political, economic, education, etc., for transforming the world. Therefore, it becomes pertinent for teachers who serve as key implementers of the nation's education policy to be well-informed and adequately employ these ICT facilities to be effective and efficient in the teaching and learning process in the classroom. The purpose of the ICT policy on education, according to the Federal Ministry of Education (2010), amongst others, is to provide the needed guidance on what is expected in the entire process of ICT

integration in education to all stakeholders. Therefore, its implementation should lead to a speedy transformation of education's teaching, learning, and administration. This, in turn, will foster the production of graduates in the education system that can survive in contemporary society, sustain national development, and compete globally (Hauptmann *et al.*, 2022)^[9].

By implication, achieving this policy will largely depend on teachers' ability to effectively utilize these ICT facilities in their daily interaction with their classroom learners. According to Pandey *et al.* (2020)^[18], CAL is a product of computer technology that has proven to be a very effective teaching strategy in the classroom instructional process. CAL makes learners learn at their own pace both at home and in school and somehow handles the issue of individual differences amongst learners during the teaching and learning process in the classroom. Some of the teaching strategies can be through the guided discovery and inquiry method, which has proven to be very effective in realizing instructional goals. In applying the CAL mode of instruction, the computer is fed sequentially with what to teach, the steps to be followed, how to evaluate success, and how and when other classroom activities are to be carried out (Mothukuri *et al.*, 2021)^[14]. Hence, it makes the teaching and learning process learner-centered, and the teacher becomes a guide and a facilitator to the learners.

Economics as a social science subject was introduced into the Nigerian curriculum in 1967. Then, only ten (10) candidates registered and later sat for the senior secondary school final-year examination (Ezepue *et al.*, 2023)^[6]. One of the objectives of teaching economics is to produce graduates with knowledge and understanding of economic principles, economic analysis, and economic and financial institutions to make economic decisions that will yield positive national development and international relationships (WASSCE, 2004-2008 syllabus p.176). Due to the importance of Economics in all aspects of human endeavor, there has been a rapid increase in the percentage of candidates who register and sat for Economics every year in Nigeria at both the West African Senior Secondary Certificate Examination (WASSCE) and National Examination Council (NECO) levels (Nasir & Ciroma, 2023)^[15]. Due to the relevance of ICT in education, the Federal and State governments have shown commitment towards integrating ICT into education. This was done by making huge investments through an ICT-driven "School Net" project and donations from Non-Governmental Organizations to Secondary schools. Economics contributes immensely to national growth and development, especially in Nigeria that is undergoing the worst economic crisis due to botched economic reforms (Egoeze *et al.*, 2018)^[5]. The nation can be salvaged if economics students are adequately equipped from secondary schools with knowledge and skills that will enable them to make wise economic decisions and be good economic managers. It has been observed that some teachers in Nigeria have ill attitudes toward adapting to the global trend of utilizing and exploring the numerous advantages of CAL opportunities (Buhalis, 2022)^[3]. Fabunmi & Awoyemi (2017)^[7] asserted that there is still a long way to go before secondary school teachers in developing countries like Nigeria can take advantage of the opportunities provided by 21st-century technology to improve students' academic performance. Oyelade *et al.*, (2023)^[17] stated that 75 percent of teachers in Nigerian

secondary schools have little or no experience in ICT education. Based on the aforementioned submission, there is need to investigate the impact of CAL on performance of economics students in senior secondary schools in Kaduna State of Nigeria (Obikaeze *et al.*, 2023)^[16].

The modern trend in pedagogy focuses on flexible and dynamic strategies that is learner-centered approach which make students more capable of influencing content, activities, materials, and learning pace. This is particularly relevant in teaching economics, which aim is to produce graduates with the necessary knowledge to solve economic issues in their country and abroad (Joab-Peterside, 2021)^[10]. However, some teachers still resist this shift, believing that the traditional teaching methods may still be effective. The West African Senior Secondary School Certificate Chief Examiners' Report of 2021 revealed that candidates lost marks due to the inability to explain their points sufficiently, leading to content deficiency. The Chief Examiners suggested that candidates read widely, explain their points thoroughly with relevant examples, and have an in-depth knowledge of the subject matter to avoid confusion. These perceived problems could be due to the teaching strategies employed by economics teachers (Abu & Okpe, 2021)^[11]. CAL offers numerous advantages, including making teaching and learning easier, faster, immediate, effective, efficient, and individualized and as well cater for individual differences regardless of location. This study aims to determine the impact of CAL on senior secondary school students' economic performance at Kaduna State.

Objectives of the Study

The objectives include determining whether SS2 students taught Economics with CAL will perform better than those taught with the conventional method and examining the impact of Computer Assisted Learning on mean performance scores of SS2 students taught Economics in rural and urban settlements.

Literature Review

The Technological Pedagogical and Content Knowledge (TPACK) theory strives to capture some essential knowledge teachers require for technology integration during instructional process; while at the same time addressing teacher knowledge's complex, multifaceted nature (Sani, 2022)^[20]. TPACK is a theory developed to explain the knowledge teachers need to teach their students effectively while using technology (Tondeur, 2018)^[22]. Some experts have argued that computers alone do not influence teaching and learning. However, the influence is made by the type of pedagogical strategies that the teacher utilizes while employing computer technologies (Zou *et al.*, 2022)^[24]. The TPACK theory, therefore, emphasizes not only the usage of Information Communication Technological facilities in teaching and learning process but also helps teachers use adequate pedagogical strategies when engaging the computer. Tondeur, (2018)^[22] opines that TPACK theory identifies with teachers having the content knowledge of the technology to be utilized, especially in subjects that have broad contents like Economics. This is because it has an advantage of creating individualized learning opportunities that could help teachers to cover a good aspect of the Economics syllabus. These contents are information programmed into electronic device through the use of; CD-Roms, slides, films, flash

drives, video-cassettes, audio-cassettes, etc. Lessons can be presented logically by playing these devices through the use of electronic machines like video-cassette player, computer, laptops and projectors during teaching and learning process in the classroom (Zhang-Kennedy *et al.*, 2018)^[23].

Furthermore, a study on "Impact of Computer-Assisted Instruction on Students' Attitude to Mathematics" in Port-Harcourt, Rivers State was conducted by (Demir, 2019)^[4]. The study was aimed at determining whether students taught Mathematics using Computer-Assisted mode of instruction will show an improved attitude towards learning Mathematics. The experimental research method of pre-test – post-test control design was adopted. The result shows the calculated T-value (0.96) is less than the table value (2.021), which implies that the use of computer-assisted instruction in teaching Mathematics helped develop students' positive attitude towards the subject. Goh & Sigala, (2020)^[8] supported that CAI positively impacts learners by making learning interactive, help to construct knowledge and providing information that will help in finding alternative solutions thereby developing their problem solving skills. Tezci, (2010)^[21], carried out a study on the "Effects of a Computer Mediated System Teaching Approach on Mathematics Achievement of Engineering Students in Nigerian Polytechnics in Kaduna State". The aim of the study was to determine the Mathematics Achievement Level (MALs) of students taught Mathematics using the Computer Mediated System Teaching Approach (CMSTA) and those not taught with the same approach. A quasi-experimental research design was adopted for the study. The findings shows that students taught mathematics using the CMSTA significantly outperformed those taught with the conventional method. Mertens *et al.*, (2023)^[13], carried out a study on effect of computer-assisted instruction on students' academic achievement in physics at secondary school level. The finding shows that computer-assisted instruction has significant and positive effect on students' academic performance and retention. Russo *et al.*, (2024)^[19] opined that students using CAI have the ability to learn faster and easier than those taught with the conventional method. Furthermore, it was observed that those taught using CAI have better retention of content than those taught using the traditional method. Haizheng, *et al.* (2023) conducted a study on "The Impact of Computer-Assisted Instruction on Students Performance: Evidence from Dual-Teacher program. The aim was to evaluate student's performance in mathematics of the dual-teacher program through using the internet technology in accessing schools in poor and remote areas of China. The result showed that there was positive impact using the Dual-Teacher program in teaching mathematics to students in remote areas of China and even it has low-cost implication. It also bridges the gap between education outcomes between urban and rural settlements schools of China. Furthermore, other studies like Baker and Maclyntyre (2003), Kissau (2006) and Bosede (2010) found out that gender and location of school have influence on students' performance in some subject areas. The results of their findings tend to differ with some favouring males and urban locations while others favouring females and rural locations.

Research Methodology

Research Design

The research design for this study is the 2 x 2 factorial pre-

test, post-test quasi experimental control group design. The pre-test-post-test equivalent group design involving four (4) cluster groups of intact classes having co-educational students will be used.

Population and Sampling Design

This study focuses on 62,072 Economics students in senior secondary schools in Kaduna State, divided into twelve Educational Zones. A sample size of 300 students was drawn from the total population using a stratified random sampling technique. The study was conducted in Kafanchan and Zonkwa Educational Zones, with two schools selected: G.S.S Kafanchan (Urban) and G.S.S Madakiya (Rural). The sampling method was chosen based on the phenomenon spread over a wide area and schools with Computer Based Learning Facilities for adequate representation and meaningful comparison. The sample size was chosen to cover the characteristics intended to be investigated.

Table 1: SS2 Enrolment in public Senior Secondary Schools by Gender

LGA	Males	Females	Total
Birnin Gwari	712	360	1072
Chikun	1917	2245	4162
Giwa	579	563	1142
Igabi	2415	1923	4338
Ikara	1201	629	1830
Jaba	541	500	1041
Jemaa	1270	1394	2664
Kachia	1214	1048	2262
Kaduna North	2996	4411	7407
Kaduna South	1502	4195	5697
Kajuru	572	505	1077
Kagarko	1143	1288	2431
Kaura	1015	966	1981
Kauru	603	422	1025
Kubau	1000	719	1719
Kudan	480	309	789
Lere	1248	1006	2254
Makarfi	868	519	1387
Sabongari	1716	2853	4569
Sanga	825	745	1570
Soba	728	442	1170
Zangon Kataf	1566	1520	3086
Zaria	2946	4453	7399
Total	29057	33015	62072

Source: Kaduna State Bureau of Statistics (Annual School Census 2021/2022)

Instrumentation

The research instrument adopted for the purpose of this study is: Economics Achievement Test (EAT) which will serve as pre-test and post-test instrument. Economics Achievement Test will contain fifty (50) questions that consist of forty (40) multiple choice items and ten (10) items of fill in the blank short answers was used to derive answers to research questions and to test the hypotheses. The EAT questions is a teacher-made test on four (4) selected units in Economics: The theory of production, theory of costs and revenue, theory of demand and supply and theory of consumer behavior that was structured from the Federal Capital Territory Senior Secondary School Two (2) Teaching Schemes was adopted. Hence, the main instrument used for the treatment and control groups is the EAT for data collection. To ensure face and content validity of the instrument, the research instrument: Economics

Achievement Test" questions was given to three (3) supervisors and some experts in educational measurement and statistics who are computer literate for vetting. A pilot study using the pre-test and post-test was conducted in one selected public co-educational senior secondary school in another educational zone of Kaduna State which was not used when carrying out the field research. Students in SS2A intact class was used as the experimental group and students in SS2B intact class was used as the control group to determine content validity and reliability. Based on approval from the Ministry of Education, the researcher proceeded to the sampled schools to carry out a briefing session with the research assistants to intimate them and train them on how the "EAT" is to be administered. The "EAT" was administered before and at the end of the periods of eight (8) weeks teaching to students with the help of the research assistants in respective schools. The instrument was retrieved on spot or immediately to avoid loss.

Results and Findings

Hypotheses

1. **H0₁**: There is no significant difference between the performance of SS2 students taught Economics with the use of CAL and those taught with the use of conventional method.
2. **H0₂**: There is no significant difference in the use of CAL on the mean performance scores of SS2 students taught Economics in rural settlements.
3. **H0₃**: There is no significant difference in the use of CAL on the mean performance scores of SS2 students taught Economics in urban settlements.

Research Question One

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	sig
Conventional Method	40	21.00	2.52	78	15.61	1.96	.000
Computer Assisted Method	40	34.90	5.03				

Table 1 above result revealed that the t calculated value of 15.61 is greater that the t critical value of 1.96. This implies that there was a significant difference between the conventional method and the computer-based method of teaching Economic. Also, the mean scores of 34.90 for computer assisted method of learning Economics is greater than the mean score of 21.00 for conventional method of learning Economics.

Research Question Two

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	sig
Pretest	20	23.95	4.47	38	8.44	1.96	.000
Posttest	20	36.85	5.16				

Table 2 above result revealed that the t-calculated value of 8.44 is greater than the t-critical value of 1.96. This implies a significant difference between the pre-test and post-test impact of CAL on economics learning in rural settlements. Also, the post-test mean score of 36.85 exceeds the pre-test mean of 23.95 which reveals the students scored higher when taught with the use of CAL.

Research Question Three

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	sig
Pretest	20	23.10	3.83	38	7.59	1.96	.000
Posttest	20	32.55	4.03				

Table 3 above result revealed that the t-calculated value of 7.59 is greater than the t-critical value of 1.96. This implies a significant difference between the pre-test and post-test impact of Computer Assisted Learning of economics in urban settlements. Also, the post-test mean score of 32.55 exceeds the pre-test mean score of 23.10. This implies that the students performed better with the use of CAL mode of instruction.

Hypothesis One

There is no significant difference between the performance of SS2 students taught economics using CAL and those taught using the conventional method.

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	Sig
Conventional Method	40	21.00	2.52	78	15.61	1.96	.000
Computer Assisted Method	40	34.90	5.03				

Table 4 above result revealed that the t-calculated value of 15.61 is greater than the t-critical value of 1.96. This implies there is a significant difference between the conventional and Computer Assisted Learning methods of teaching economics. Also, the mean score of 34.90 for the computer-based method of learning Economics is greater than the mean score of 21.00 for the conventional method of learning Economics. The hypothesis that there is no significant difference between the performance of SS2 students taught Economics with the use of CAL and those taught with the conventional method is hereby rejected. This implies a significant difference between the performance of SS2 students who were taught economics using Computer Assisted Learning and those who were taught using the conventional method.

Hypothesis Two

There is no significant difference in using CAL on the mean performance scores of SS2 students taught Economics in the rural settlement.

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	sig
Pretest	20	23.95	4.47	38	8.44	1.96	.000
Posttest	20	36.85	5.16				

Table 5 above result revealed that the t calculated value of 8.44 is greater that the t critical value of 1.96. This implies that there was a significant difference between the pre-test and post-test impact of CAL on economics students in the rural settlement. Also, the post-test mean score of 36.85 is greater than the pre-test mean score of 23.95. The hypothesis which states that there is no significant difference in the use of CAL on the mean performance scores of SS2 students taught economics in the rural settlement is hereby rejected. This implies that there is a

significant difference in the use of CAL on the mean performance scores of SS2 students taught economics in rural settlements.

Hypothesis Three

There is no significant difference in the use of CAL on the mean performance scores of SS2 students taught Economics in the urban settlement.

Types of Learning	Number	Mean	SD	Df	t-cal	t-critical	sig
Pretest	20	23.10	3.83	38	7.59	1.96	.000
Posttest	20	32.55	4.03				

Table 6 above result revealed that the t calculated value of 7.59 is greater than the t critical value of 1.96. This implies that there was a significant difference between the pre-test and post-test impact of Computer Assisted Learning of economics in urban settlement. Also, the post-test mean score of 32.55 is greater than the pre-test mean score of 23.10. The hypothesis which states that there is no significant difference in the use of CAL on the mean performance scores of SS2 students taught economics in the Urban Settlement is also rejected. This implies that there is a significant difference in the use of CAL on the mean performance scores of SS2 students taught economics in the urban settlement.

Discussion of Findings

In the result of hypothesis one, the findings revealed that there is a significant difference between the conventional method and the Computer Assisted Learning of teaching economics. The findings agree with Martins-Umeh & Assimonye (2023) ^[12] that CAL positively affects mathematics students' academic performance more than those taught with the conventional method. It further agrees with Abubakar (2020) ^[2] that CAI has positive effect on academic achievement of students in Physics. In the result of hypothesis two, the findings revealed that there is a significant difference in economics students' performance taught with CAL than those taught using the conventional method in the rural schools. This was supported by Haizheng, *et al.* (2023) whose study revealed that CAI improved students' performance in Mathematics in remote areas and also bridges the gap between rural and urban settlements schools in China. Adeshina (2015) findings also revealed that teaching of economics using the CAI is not affected by location because students in the experimental group in the rural and urban areas performed almost equally with mean scores of 61.78 and 61.80 respectively. It can be said that utilizing CAL in teaching and learning will enable students in the rural settlements to improve their academic performance and even compete favourably with their urban settlements. In the result of hypothesis three, the findings revealed that there is a significant difference in economics students' performance taught with CAL than those taught using the conventional method in the urban settlements. This finding is consistent with the result of Makinde & Bamiro, (2023) ^[11] that CAI has effect in students in urban and rural areas in developing study habits. It can be deduced that when CAL is effectively used in the teaching and learning process, it will help students in the urban settlements to perform better.

Conclusion

Based on the findings of this study, it can be concluded that CAL has a significant positive effect on students' academic performance in Economics than the conventional teaching method. If CAL is effectively employed by teachers in teaching and learning process, it will help students in the rural settlements to improve their academic performance and compete favourably with their counterparts in the urban settlements. Utilization of CAL facilities will serve as a support to the teaching strategies employed by the teacher in the classroom thereby making pedagogy more real and interactive. This will result to an improved performance of students academically regardless of the schools' location. However, CAL cannot replace the role of the teacher in teaching and learning process but will go a long way in supporting the teacher to make teaching and learning easier and more effective in the classroom.

Recommendations

Based on the findings of this study, the following recommendations are hereby proffered:

1. Economics teachers should be encouraged to adopt CAL approach in teaching Economics due to its numerous benefits. Teachers must be ready to overcome their "technophobia" attitude and be determined to adapt to this teaching trend. This can be done by developing their computer utilization skills by attending trainings, workshops, and seminars on CAL utilization.
2. The government should adequately provide schools with functional ICT facilities. This will help improve students' academic performance, especially those in rural settlements. The students in rural school settlements will not feel disadvantaged in their academic performance due to their location. This might also reduce rural-urban migration of young people.
3. Students should be encouraged to develop social interaction skills with the computer system. Teachers will need to be motivated and encouraged to assist the students in learning using the computer because their role in the classroom while using the computer-assisted mode of learning, becomes that of a facilitator.

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